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U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

FMVSS 108

Lamps, Reflective Devices, and Associated Equipment

Office of Vehicle Safety Compliance
West Building, NVS222
1200 New Jersey Avenue, SE
Washington, DC 20590

REVISION CONTROL LOG

FOR OVSC LABORATORY
TEST PROCEDURES

TP-108
Lamps, reflective devices, and associated equipment

TEST PROCEDURE		FMVSS 108		DESCRIPTION
REV. No.	DATE	AMENDMENT	EFFECTIVE DATE	
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OVSC LABORATORY TEST PROCEDURE NO. 108
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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 is used to determine if a specific vehicle or item of motor vehicle equipment is potentially non-compliant with an applicable 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 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

Federal Motor Vehicle Safety Standard (FMVSS) No. 108- *Lamps, reflective devices, and associated equipment*, herein referred to as "the Standard" or "this Standard," specifies requirements for original and replacement lamps, reflective devices, and associated equipment. The purpose of the standard is to reduce traffic accidents and deaths and injuries resulting from traffic accidents, by providing adequate illumination of the roadway, and by enhancing the conspicuity of motor vehicles on the public roads so that their presence is perceived and their signals understood, both in daylight and in darkness or other conditions of reduced visibility. The standard applies to passenger cars, multipurpose passenger vehicles (MPVs), trucks, buses, trailers (except pole trailers and trailer converter dollies), and motorcycles, and to lamps, reflective devices, and associated equipment for replacement of like equipment on vehicles to which this standard applies.

Each vehicle shall be equipped with at least the number of lamps, reflective devices, and associated equipment specified in the Standard, and required equipment shall be designed to conform to the SAE Standards or Recommended Practices referenced in the Standard as applicable.

3. SECURITY

The contractor shall provide appropriate security measures to protect the OVSC test 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 test 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 safety compliance testing program shall be released to anyone except the COTR, unless specifically authorized by the COTR, the COTR's Branch or Division Chief, or by the Contracting Officer.

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

4. GOOD HOUSEKEEPING

Contractors shall maintain the entire equipment compliance testing area, test fixtures and instrumentation in a neat and clean 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 COTR.

6. TEST DATA DISPOSITION

The contractor shall make all equipment 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 in accordance with the contract schedule.

All backup data sheets, strip charts, recordings, plots, technicians notes, etc., shall be retained by the contractor for a minimum of five years after conclusion of each delivery order, purchase order, etc. The COTR shall direct final disposition at that time.

7. GOVERNMENT FURNISHED PROPERTY (GFP)

EQUIPMENT MARKING, SECURITY AND STORAGE

Government supplied test items must be stored in a clean, dry and secure storage area to prevent deterioration of the samples in any manner which might affect test results.

All test items shall be inspected and inventoried within one week of receipt and copies of this inventory shall be forwarded to the OVSC within ten days of equipment arrival.

Each test item shall be identified and marked to prevent improper test sequencing. The marking shall be permanently affixed to each sample in a manner which does not affect test results.

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. Guidelines for setting up and maintaining such calibration systems are described in MIL-C-45662A, "Calibration System Requirements". 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 except for static types of measuring devices such as rulers, weights, etc., which shall be calibrated at periodic intervals not to exceed two years. 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

(2) Date of next scheduled calibration

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 unless the calibration is performed by a licensed commercial facility.

(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.

9. PHOTOGRAPHIC DOCUMENTATION

Each final test report shall include color images (minimum size 4 x 6 inches), with minimum resolution of 150dpi. The color images must be sufficiently clear to be reproducible in black and white using standard office equipment.

10. DEFINITIONS

ACCURATE RATED BULB

A seasoned bulb operated at design luminous flux and having its filaments located within the tolerances indicated in SAE J1383 DEC96.

AIMING PLANE

A plane defined by the surface of the three aiming pads on the lens.

AIMING REFERENCE PLANE

A plane which is perpendicular to the longitudinal axis of the vehicle and tangent to the forwardmost aiming pad on the headlamp.

AIMING SCREWS

The horizontal and vertical adjusting screws with self-locking features used to aim and retain a headlamp unit in the proper position.

AXIS OF REFERENCE

The characteristic axis of the lamp for use as the direction of reference (H = 0°, V = 0°) for angles of field for photometric measurements and for installing the lamp on the vehicle.

BACKUP LAMP

A lamp or lamps which illuminate the road to the rear of a vehicle and provide a warning signal to pedestrians and other drivers when the vehicle is backing up or is about to back up.

BEAM CONTRIBUTOR

An indivisible optical assembly including a lens, reflector, and light source, that is part of an integral beam headlighting system and contributes only a portion of a headlamp beam.

CARGO LAMP

A lamp that is mounted on a multipurpose passenger vehicle, truck, or bus for the purpose of providing illumination to load or unload cargo.

CLEARANCE LAMPS

Lamps which show to the front or rear of the vehicle, mounted on the permanent structure of the vehicle as near as practicable to the upper left and right extreme edges to indicate the overall width and height of the vehicle.

COATED MATERIALS

Material which has a coating applied to the surface of the finished sample to impart some protective properties. Coating identification means a mark of the manufacturer's name, formulation designation number, and recommendations for application.

COLOR

Fundamental definitions of color are expressed by Chromaticity Coordinates according to the International Commission on Illumination (C.I.E.) 1931 Standard Colorimetric System.

COLOR BLEEDING

The migration of color out of a plastic part onto the surrounding surface.

COMBINATION CLEARANCE AND SIDE MARKER LAMPS

Single lamps which simultaneously fulfill the requirements of clearance and side marker lamps.

CRACKING

Separation of adjacent sections of a plastic material with penetration into the specimen.

CRAZING

A network of apparent fine cracks on or beneath the surface of materials.

CUTOFF

A generally horizontal, visual/optical aiming cue in the lower beam that marks a separation between areas of higher and lower luminance.

DAYTIME RUNNING LAMPS (DRL'S)

Steady burning lamps that are used to improve the conspicuity of a vehicle from the front and front sides when the regular headlamps are not required for driving.

DELAMINATION

A separation of the layers of a material including coatings.

DESIGN VOLTAGE

The voltage used for design purposes.

DIRECT READING INDICATOR

A device that is mounted in its entirety on a headlamp or headlamp aiming or headlamp mounting equipment, is part of a VHAD, and provides information about headlamp aim in an analog or digital format.

EFFECTIVE LIGHT-EMITTING SURFACE

That portion of a lamp that directs light to the photometric test pattern, and does not include transparent lenses, mounting hole bosses, reflex reflector area, beads or rims that may glow or produce small areas of increased intensity as a result of uncontrolled light from an area of ½º radius around a test point.

EFFECTIVE PROJECTED LUMINOUS LENS AREA

The area of the orthogonal projection of the effective light-emitting surface of a lamp on a plane perpendicular to a defined direction relative to the axis of reference. Unless otherwise specified, the direction is coincident with the axis of reference

EXPOSED

Material used in lenses or optical devices exposed to direct sunlight as installed on the vehicle.

FILAMENT

That part of the light source or light emitting element(s), such as a resistive element, the excited portion of a specific mixture of gases under pressure, or any part of other energy conversion sources, that generates radiant energy which can be seen.

FLASH

A cycle of activation and deactivation of a lamp by automatic means continuing until stopped either automatically or manually.

FULLY OPENED

The position of the headlamp concealment device in which the headlamp is in the design open operating position.

H-V AXIS

The line from the center of the principal filament of a lamp to the intersection of the horizontal (H) and vertical (V) lines of a photometric test screen.

HAZE

The cloudy or turbid appearance of an otherwise transparent specimen caused by light scattered from within the specimen or from its surface.

HEADLAMP

A lighting device providing an upper and/or a lower beam used for providing illumination forward of the vehicle.

HEADLAMP CONCEALMENT DEVICE

A device, with its operating system and components, that provides concealment of the headlamp when it is not in use, including a movable headlamp cover and a headlamp that displaces for concealment purposes.

HEADLAMP MECHANICAL AXIS

The line formed by the intersection of a horizontal and a vertical plane through the light source parallel to the longitudinal axis of the vehicle. If the mechanical axis of the headlamp is not at the geometric center of the lens, then the location will be indicated by the manufacturer on the headlamp.

HEADLAMP TEST FIXTURE

A device designed to support a headlamp or headlamp assembly in the test position specified in the laboratory tests and whose mounting hardware and components are those necessary to operate the headlamp as installed in a motor vehicle.

HIGH-MOUNTED STOP LAMP

A lamp mounted high and possibly forward of the tail, stop, and rear turn signal lamps intended to give a steady stop warning through intervening vehicles to operators of following vehicles.

IDENTIFICATION LAMPS

Lamps used in groups of three, in a horizontal row, which show to the front or rear or both, having lamp centers spaced not less than [6 in.] 15.2 mm. nor more than [12 in.] 30.4 mm. apart, mounted on the permanent structure as near as practicable to the vertical centerline and the top of the vehicle to identify certain types of vehicles.

INTEGRAL BEAM HEADLAMP

A headlamp (other than a standardized sealed beam headlamp designed to conform to paragraph S10.13 or a replaceable bulb headlamp designed to conform to paragraph S10.15 of FMVSS No. 108) comprising an integral and indivisible optical assembly including lens, reflector, and light source, except that a headlamp conforming to paragraph S10.18.8 or paragraph S10.18.9 of FMVSS No. 108 may have a lens designed to be replaceable.

LEFT (AND RIGHT)

Left (and right) as viewed looking in the direction of the emanating light beam.

LICENSE PLATE LAMP

A lamp used to illuminate the license plate on the rear of a vehicle.

LOWER BEAM

A beam intended to illuminate the road and its environs ahead of the vehicle when meeting or closely following another vehicle.

MATERIAL

The type and grade of plastics, composition, and manufacturer's designation number and color.

MECHANICALLY AIMABLE HEADLAMP

A headlamp having three pads on the lens, forming an aiming plane used for laboratory photometric testing and for adjusting and inspecting the aim of the headlamp when installed on the vehicle.

MOTOR DRIVEN CYCLE

Every motorcycle, including every motor scooter, with a motor which produces not more than 5 horsepower, and every bicycle with motor attached.

MOTORCYCLE OR MOTOR DRIVEN CYCLE HEADLAMP

A major lighting device used to produce general illumination ahead of the vehicle.

MOUNTING RING

The adjustable ring upon which a sealed beam unit is mounted.

MOUNTING RING (TYPE F SEALED BEAM)

The adjustable ring upon which a sealed beam unit is mounted and which forces the sealed beam unit to seat against the aiming ring when assembled into a sealed beam assembly.

MULTIPLE COMPARTMENT LAMP

A device which gives its indication by two or more separately lighted areas which are joined by one or more common parts, such as a housing or lens.

MULTIPLE LAMP ARRANGEMENT

An array of two or more separate lamps on each side of the vehicle which operate together to give a signal.

OPTICALLY COMBINED

A lamp having a single or two filament light source or two or more separate light sources that operate in different ways, and has its optically functional lens area wholly or partially common to two or more lamp functions.

OVERALL WIDTH

The nominal design dimension of the widest part of the vehicle, exclusive of signal lamps, marker lamps, outside rearview mirrors, flexible fender extensions, mud flaps, and outside door handles determined with doors and windows closed, and the wheels in the straight-ahead position. Running boards may also be excluded from the determination of overall width if they do not extend beyond the width as determined by the other items excluded by this definition.

PARKING LAMPS

Lamps on both the left and right of the vehicle which show to the front and are intended to mark the vehicle when parked or serve as a reserve front position indicating system in the event of headlamp failure.

PROTECTED

Material used in inner lenses for optical devices where such lenses are protected from exposure to the sun by an outer lens made of materials meeting the requirements for exposed plastics.

RATED VOLTAGE

The nominal circuit or vehicle electrical system voltage classification.

REFLEX REFLECTORS

Devices used on vehicles to give an indication to approaching drivers using reflected light from the lamps of the approaching vehicle.

REMOTE READING INDICATOR

A device that is not mounted in its entirety on a headlamp or headlamp aiming or headlamp mounting equipment, but otherwise meets the definition of a direct reading indicator.

REPLACEABLE BULB HEADLAMP

A headlamp comprising a bonded lens and reflector assembly and one or two replaceable light sources, except that a headlamp conforming to paragraph S10.18.8 or paragraph S10.18.9 of FMVSS No. 108 may have a lens designed to be replaceable.

REPLACEABLE LIGHT SOURCE

An assembly of a capsule, base, and terminals that is designed to conform to the requirements of Appendix A or Appendix B of 49 CFR part 564 Replaceable Light Source Information of this Chapter.

RETAINING RING

The clamping ring that holds a sealed beam unit against a mounting ring.

RETAINING RING (TYPE F SEALED BEAM)

The clamping ring that holds a sealed beam unit against a mounting ring, and that provides an interface between the unit's aiming/seating pads and the headlamp aimer adapter (locating plate).

RIGHT (AND LEFT)

Right (and left) as viewed looking in the direction of the emanating light beam.

SCHOOL BUS SIGNAL LAMPS

Alternately flashing lamps mounted horizontally both front and rear, intended to identify a vehicle as a school bus and to inform other users of the highway that such vehicle is stopped on the highway to take on or discharge school children.

SEALED BEAM HEADLAMP

An integral and indivisible optical assembly including the light source with "SEALED BEAM" molded in the lens.

SEALED BEAM HEADLAMP ASSEMBLY

A major lighting assembly which includes one or more sealed beam units used to provide general illumination ahead of the vehicle.

SEASONING

The process of energizing the filament of a headlamp at design voltage for a period of time equal to 1% of design life, or other equivalent method.

SEMIAUTOMATIC HEADLAMP BEAM SWITCHING DEVICE

A device which provides either automatic or manual control of beam switching at the option of the driver. When the control is automatic the headlamps switch from the upper beam to the lower beam when illuminated by the headlamps on an approaching vehicle and switch back to the upper beam when the road ahead is dark. When the control is manual, the driver may obtain either beam manually regardless of the conditions ahead of the vehicle.

SIDE MARKER LAMPS

Lamps which show to the side of the vehicle, mounted on the permanent structure of the vehicle as near as practicable to the front and rear edges to indicate the overall length of the vehicle. Additional lamps may also be mounted at intermediate locations on the sides of the vehicle.

STOP LAMPS

Lamps giving a steady light to the rear of a vehicle to indicate a vehicle is stopping or diminishing speed by braking.

TAILLAMPS

Steady burning low intensity lamps used to designate the rear of a vehicle.

TEST VOLTAGE

The specified voltage and tolerance to be used when conducting a test.

TURN SIGNAL LAMPS

The signaling element of a turn signal system which indicates the intention to turn or change direction by giving a flashing light on the side toward which the turn will be made.

TURN SIGNAL FLASHER

A device which causes a turn signal lamp to flash as long as it is turned on.

TURN SIGNAL OPERATING UNIT

An operating unit that is part of a turn signal system by which the operator of a vehicle causes the signal units to function.

UPPER BEAM

A beam intended primarily for distance illumination and for use when not meeting or closely following other vehicles.

VEHICLE HEADLAMP AIMING DEVICE OR VHAD

Motor vehicle equipment, installed either on a vehicle or headlamp, which is used for determining the horizontal or vertical aim, or both the vertical and horizontal aim of the headlamp.

VEHICULAR HAZARD WARNING SIGNAL FLASHER

A device which, as long as it is turned on, causes all the required turn signal lamps to flash.

VEHICULAR HAZARD WARNING SIGNAL OPERATING UNIT

A driver controlled device which causes all required turn signal lamps to flash simultaneously to indicate to approaching drivers the presence of a vehicular hazard.

VISUALLY/OPTICALLY AIMABLE HEADLAMP

A headlamp which is designed to be visually/optically aimable in accordance with the requirements of paragraph S10.18.9 of FMVSS No. 108.

VEHICLE HAZARD WARNING SIGNAL FLASHER

A device that when activated causes all the required signal lights to flash.

VEHICLE HAZARD WARNING SIGNAL OPERATING UNIT

A driver controlled device which causes all turn signals to flash simultaneously to indicate to the approaching drivers the presence of a vehicular hazard.

VISUALLY/OPTICALLY AIMABLE HEADLAMP

A headlamp which is designed to be visually/optically aimable in accordance with the requirements of paragraph S10.18.9 of FMVSS No. 108.

VEHICLE HEADLAMP AIMING DEVICE (VHAD)

An aiming device incorporated in the headlamp system which allows for inspection and adjustment of headlamp aim in both vertical and horizontal axes without the use of aim measuring equipment external to the vehicle.

11. PRETEST REQUIREMENTS

IN-HOUSE TEST PROCEDURE

Prior to conducting a compliance test, the contractor shall:

1. Verify COTR approval of contractor's In-house Test Procedure,

2. Verify the training of technicians for performance of this test,

3. Verify the calibration status of test equipment,

4. Review applicable revision of FMVSS XXX,

5. Review vehicle Owner's Manual (or equipment mfg. instructions), and

6. Set cold tire pressures according to the vehicle manufacturer's recommendations (where applicable).

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 will include the cost of the replacement equipment and all costs associated with conducting the retest.

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.

TEST CONDITIONS

Unless otherwise specified, all tests and measurements shall be conducted under the following environmental conditions:

A.	Temperature	75^{O} F ± 15^{O} F
B.	Relative Humidity	50% ± 10%
C.	Atmospheric Pressure	28 to 32 inches of mercury

Continuous recording of environmental temperature and relative humidity of the testing area shall be available during all tests. Test samples, unless otherwise specified, shall be stabilized at test room conditions for a period of at least 24 hours immediately prior to testing.

TEST PERSONNEL PERFORMANCE

Personnel supervising and/or performing the compliance test program shall be thoroughly familiar with the requirements, test conditions, equipment for the test to be conducted, and safety requirements.

RECORDING OF TEST DATA

Environmental data and test data shall be recorded on permanent strip charts, circular recording charts, or other acceptable print-out media. Where permanent trace recording is not required, data will be recorded on standard report forms. Changes or corrections shall be made by drawing a line through the original entry, which must still remain legible, and adding the change alongside.

Test data will be submitted on the standard form Test Data Sheets specified for use in the final test report and shown in Section 15. Data will be typed before the sheets are submitted. If stroking test is conducted, Data Sheet No. 3 shall be used.

The following tests will require permanent trace recordings.

TEST	PARAMETERS
1. Corrosion	Temperature vs time
2. Flasher	Temperature vs time
	Voltage vs time

TEST SCHEDULE

A weekly test summary including current test status, test started and completion dates, and a brief description of any failures must be mailed to the COTR on each Wednesday summarizing the previous week's activity. The following format will be used:

STATUS OF WORK ON FMVSS 108 FOR NHTSA

Date: _____

CONTRACT NO.: _____

TEST NO.	MAKE & MODEL	SAE FUNC.	COMPS. AVAIL.	TEST STAND AVAIL.	TECH. INFO. AVAIL.	TEST START	TEST COMPL.
1							
2							
3							
4							
etc.							

DATE REPORT SUBMITTED: _____

REMARKS: (Number Failed, Failure Type, etc.)

12. COMPLIANCE TEST EXECUTION

See the following paragraphs for individual test procedures:

12.1) Turn Signal Lamps
  12.1.1) Front turn signal lamps
  12.1.2) Rear turn signal lamps
12.2) Taillamps
12.3) Stop lamps
12.4) Side marker lamps
12.5) Clearance and identification lamps
12.6) Backup lamps
12.7) License plate lamps
12.8) Parking lamps
12.9) High-mounted stop lamps
12.10) Daytime running lamps
12.11) School bus signal lamps
12.12) Reflex reflectors
12.13) Conspicuity systems
12.14) Turn signal operating unit
12.15) Turn signal flasher
12.16) Turn signal pilot indicator
12.17) Headlamp beam switching device
12.18) Upper beam headlamp indicator
12.19) Vehicular hazard warning signal operating unit
12.20) Vehicular hazard warning signal flasher
12.21) Vehicular hazard warning signal pilot indicator
12.22) Sealed beam headlighting systems
12.23) Integral beam headlighting systems
12.24) Replaceable bulb headlighting systems
12.25) Combination headlighting systems
12.26) Motorcycle headlighting systems
12.27) Motorcycle headlamp modulation systems
12.28) Headlamp aimability
12.29) Replaceable light sources
12.30) Headlamp concealment devices
12.31) Replaceable headlamp lens requirements

12.1) TURN SIGNAL LAMPS

12.1.1) FRONT TURN SIGNAL LAMPS

12.1.1.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.1.1.2) NUMBER

Each vehicle must be equipped with at least the following number of front turn signal lamps:

<table>
<tr><th colspan="2">Vehicle type/size</th><th>Number of lamps</th></tr>
<tr><td colspan="2">Passenger cars</td><td rowspan="4">2</td></tr>
<tr><td colspan="2">MPV</td></tr>
<tr><td colspan="2">Trucks</td></tr>
<tr><td colspan="2">Buses</td></tr>
<tr><td colspan="2">Trailers</td><td rowspan="2">Not required.</td></tr>
<tr><td rowspan="2">Motorcycles</td><td>Motor driven cycle whose speed attainable in 1 mile is 30 mph or less</td></tr>
<tr><td>All other motorcycles</td><td>2</td></tr>
</table>

12.1.1.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulous method may be used. The color of the device shall be amber as specified in the procedure.

12.1.1.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

<table>
<tr><th rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">At or near the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="4">Not less than 15 inches, nor more than 83 inches.</td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td>Trailers</td><td>Not applicable.</td><td></td></tr>
<tr><td>Motorcycles</td><td>At or near the front, at the same height, symmetrically about the vertical centerline, and having a minimum horizontal separation distance (centerline of lamps) of 16 inches.

Minimum edge to edge separation distance between a turn signal lamp and headlamp is 4 inches.</td><td>Not less than 15 inches, nor more than 83 inches.</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight.

12.1.1.5) ACTIVATION

See activation requirements in Table(s) I-a and I-c, as applicable, in FMVSS No.-108.

12.1.1.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

Each lamp must meet the minimum effective projected luminous lens area requirements for the applicable vehicle type/size as indicated in the following table. The area consists of the effective light-emitting surface of each lamp or compartment measured on a plane normal to the axis of the vehicle excluding reflex reflector which is not obstructed by an opaque object such as mounting screw, mounting ring or an ornamental bezel or trim. This includes the area of rings or other configuration (raised portions) molded in the lens as part of the total effective area even if this area does not contribute significantly to total light output. The effective projected luminous lens area of each lamp or compartment shall be determined by the projection or graphical method.

MINIMUM EFFECTIVE PROJECTED LUMINOUS LENS AREA (sq. mm.) (see Table IV-a of FMVSS No. 108)				
PASSENGER CARS, MPV, TRUCKS, AND BUSES OF LESS THAN 2032 MM. IN OVERALL WIDTH			MPV, TRUCKS, AND BUSES 2032 MM. OR MORE IN OVERALL WIDTH	MOTORCYCLES
SINGLE COMPARTMENT LAMP	MULTIPLE COMPARTMENT LAMP OR MULTIPLE LAMPS			
	EACH COMPARTMENT OR LAMP	COMBINED COMPARTMENTS OR LAMPS		
2200	No requirement	2200	7500	2258

12.1.1.7) VISIBILITY

As specified in paragraph S6.4.3 of FMVSS No. 108, the visibility of a lamp shall be determined by the lens area or luminous intensity option (as specified by the manufacturer). The visibility shall be at least 1,250 square millimeters for the lens area method or emit 0.05 candela throughout the designated pattern. If the test sample fails to meet the minimum requirements for visibility, refer to paragraph S6.4.4 of FMVSS No. 108 to determine if the sample can be tested in accordance with the legacy visibility alternative.

12.1.1.8) INDICATOR

GENERAL

Each vehicle equipped with a turn signal operating unit where any turn signal lamp is not visible to the driver must also have an illuminated pilot indicator to provide a clear and unmistakable indication that the turn signal system is activated.

The indicator must consist of one or more lights flashing at the same frequency as the turn signal lamps.

The indicator must function satisfactorily under all test conditions imposed on the turn signal flasher in S14.9 of FMVSS No. 108.

INDICATOR SIZE AND COLOR

If the indicator is located inside the vehicle it should emit a green colored light and have a minimum area equivalent to a 3/16 in. diameter circle.

If the indicator is located outside of the vehicle it should emit a yellow light and have a minimum projected illuminated area of 0.1 sq. in.

The minimum required illuminated area of the indicator must be visible to any tangent on the 95th eyellipse as defined in SAE J941 *(what revision?)* with the steering wheel turned to a straight ahead driving position and in the design location for an adjustable wheel or column.

TURN SIGNAL LAMP FAILURE

Failure of one or more turn signal lamps such that the minimum photometric performance specified in Tables VI or VII of FMVSS No. 108 is not being met must be indicated by the turn signal pilot indicator by a “steady on”, “steady off”, or by a significant change in the flashing rate., except when a variable-load turn signal flasher is used on a multipurpose passenger vehicle, truck, or bus 2032 mm. or more in overall width, on a truck that is capable of accommodating a slide in camper, or on any vehicle equipped to tow trailers.

12.1.1.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.1.1.10) SPACING TO OTHER LAMPS

Each front turn signal lamp must also be designed to comply to any additional photometry requirements based on its installed spacing to other lamps as specified by in S7.1.1.10 of FMVSS No. 108. Where more than one spacing relationship exists for a turn signal lamp the requirement must be the one that specifies the highest luminous intensity multiplier of Table VI.

Spacing measurement for non- reflector lamps. For any front turn signal lamp that does not employ a reflector to meet photometric requirements, the spacing must be measured from the light source of the turn signal lamp to the lighted edge of any lower beam headlamp, or any lamp such as an auxiliary lower beam headlamp or fog lamp used to supplement the lower beam headlamp.

Spacing measurement for lamps with reflectors. For any front turn signal lamp which employs a reflector, such as a parabolic reflector, to meet photometric requirements, the spacing must be measured from the geometric centroid of the turn signal lamp effective projected luminous lens area to the lighted edge of any lower beam headlamp, or any lamp such as an auxiliary lower beam headlamp or fog lamp used to supplement the lower beam headlamp.

Spacing based photometric multipliers. Where the spacing measurement of S7.1.1.10.2 or S7.1.1.10.3 of FMVSS No. 108 between a turn signal lamp and

the lighted edge of any lamp such as an auxiliary lower beam headlamp or fog lamp used to supplement the lower beam headlamp is at least 75 mm. but less than 100 mm. the photometric multiplier of Table VI must be 1.5.; where the spacing measurement is at least 60 mm. but less than 75 mm. the photometric multiplier must be 2.0.; where the spacing measurement is less than 60 mm. the photometric multiplier must be 2.5. Where the spacing measurement of S7.1.1.10.2 or S7.1.1.10.3 of FMVSS No. 108 between a turn signal lamp and the lighted edge of any lower beam headlamp is less than 100 mm. the photometric multiplier must be 2.5.

12.1.1.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

See applicable requirements in S7.1.1.11 of FMVSS No. 108.

12.1.1.12) RATIO

When a parking lamp, or a clearance lamp on a multipurpose passenger vehicle, truck, trailer, or bus of 2032 mm. or more in overall width, is combined with a front turn signal lamp, the luminous intensity of the front turn signal lamp at each identified test point must not be less than the luminous intensity of the parking lamp or clearance lamp at that same test point times the multiplier shown for that test point in Table VI of FMVSS No. 108.

If a multiple compartment or multiple lamp arrangement is used on a passenger car or on a multipurpose passenger vehicle, truck, bus, or trailer of less than 2032 mm. in overall width, and the distance between the optical axes for both the parking lamp and turn signal lamp is within 560 mm. for two compartment or lamp arrangements or 410 mm. for three compartment or lamp arrangements, then the ratio must be computed with all compartments or lamps lighted.

If a multiple compartment or multiple lamp arrangement is used and the distance between optical axes for one of the functions exceeds 560 mm. for two compartment or lamp arrangements or 410 mm. for three compartments or lamp arrangements, then the ratio must be computed for only those compartments or lamps where the parking lamp and turn signal lamp are optically combined.

Where the clearance lamp is combined with the turn signal lamp, and the maximum luminous intensity of the clearance lamp is located below horizontal and within an area generated by a 1.0º radius around a test point, the ratio for the test point may be computed using the lowest value of the clearance lamp luminous intensity within the generated area.

12.1.1.13) PHOTOMETRY

The lamp shall be photometry tested as outlined in Appendix G for the number of lamp compartments and the type of vehicle for which it is designed.

The photometer element shall be located at a distance of 100 feet from the test device. A calibrated bulb(s) will be operated at rated mean spherical candlepower.

If the lamp is tested as part of a combination lamp, the appropriate data sheet shall be completed including minimum ratios as determined in the previous section (RATIO) of this procedure.

The test devices shall meet the candlepower specifications listed in the following table.

FRONT TURN SIGNAL LAMP PHOTOMETRY REQUIREMENTS (Table 1 of 2)(see TABLE VI of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	BASE REQUIREMENTS						2.5X BASE REQUIREMENTS					
					MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)			GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)			MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)			GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)		
					Lighted Sections			Lighted Sections			Lighted Sections			Lighted Sections		
					1	2	3	1	2	3	1	2	3	1	2	3
1	20L	5U	3	3	25	30	35	130	155	180	62.5	75	87.5	325	387.5	450
		5D	-	3	25	30	35				62.5	75	87.5			
	5L	10U	3	3	40	48	55				100	120	137.5			
		10D[3]	-	3	40	48	55				100	120	137.5			
2	10L	5U	3	3	75	88	100	250	295	340	187.5	220	250	625	737.5	850
		H	3	3	100	120	140				250	300	350			
		5D	-	3	75	88	100				187.5	220	250			
3	V	5U	5	5	175	205	235	950	1130	1295	437.5	512.5	587.5	2375	2825	3237.5
	5L	H	5	5	200	240	275				500	600	687.5			
	V		5	5	200	240	275				500	600	687.5			
	5R		5	5	200	240	275				500	600	687.5			
	V	5D	-	3	175	205	235				437.5	512.5	587.5			
4	10R	5U	3	3	75	88	100	250	295	340	187.5	220	250	625	737.5	850
		H	3	3	100	120	140				250	300	350			
		5D	-	3	75	88	100				187.5	220	250			
5	5R	10U	3	3	40	48	55	130	155	180	100	120	137.5	325	387.5	450
		10D[3]	-	3	40	48	55				100	120	137.5			
	20R	5U	3	3	25	30	35				62.5	75	87.5			
		5D	-	3	25	30	35				62.5	75	87.5			

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

FRONT TURN SIGNAL LAMP PHOTOMETRY REQUIREMENTS (Table 2 of 2)(see TABLE VI of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	2 X BASE REQUIREMENTS						1.5X BASE REQUIREMENTS					
					MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)			GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)			MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)			GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)		
					Lighted Sections			Lighted Sections			Lighted Sections			Lighted Sections		
					1	2	3	1	2	3	1	2	3	1	2	3
1	20L	5U	3	3	50	60	70	260	310	360	37.5	45	52.5	195	232.5	270
		5D	-	3	50	60	70				37.5	45	52.5			
	5L	10U	3	3	80	96	110				60	72	82.5			
		10D[3]	-	3	80	96	110				60	72	82.5			
2	10L	5U	3	3	150	176	200	500	590	680	112.5	132	150	375	442.5	510
		H	3	3	200	240	280				150	180	210			
		5D	-	3	150	176	200				112.5	132	150			
3	V	5U	5	5	350	410	470	1900	2260	2590	262.5	307.5	352.5	1425	1695	1942.5
	5L	H	5	5	400	480	550				300	360	412.5			
	V		5	5	400	480	550				300	360	412.5			
	5R		5	5	400	480	550				300	360	412.5			
	V	5D	-	3	350	410	470				262.5	307.5	352.5			
4	10R	5U	3	3	150	176	200	500	590	680	112.5	132	150	375	442.5	510
		H	3	3	200	240	280				150	180	210			
		5D	-	3	150	176	200				112.5	132	150			
5	5R	10U	3	3	80	96	110	260	310	360	60	72	82.5	195	232.5	270
		10D[3]	-	3	80	96	110				60	72	82.5			
	20R	5U	3	3	50	60	70				37.5	45	52.5			
		5D	-	3	50	60	70				37.5	45	52.5			

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY (continued…)

As an alternative to FMVSS No. 108 Table VI photometry requirements, a front turn signal lamp installed on a motorcycle may be designed to conform to the photometry requirements of Table XIII of FMVSS No. 108 as specified in the table below**.**

MOTORCYCLE TURN SIGNAL LAMP OPTIONAL PHOTOMETRY REQUIREMENTS (see TABLE XIII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd) MOTORCYCLE TURN SIGNAL LAMP			GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) MOTORCYCLE TURN SIGNAL LAMP		
			Lighted Sections			Lighted Sections		
			1	2	3	1	2	3
1	**20L**	**5U**	12.5	15	17.5	65	77.5	90
		5D	12.5	15	17.5			
	5L	**10U**	20	24	27.5			
		10D[4]	20	24	27.5			
2	**10L**	**5U**	37.5	44	50	125	147.5	170
		H	50	60	70			
		5D	37.5	44	50			
3	**V**	**5U**	87.5	102.5	117.5	475	565	647.5
	5L	**H**	100	120	137.5			
	V		100	120	137.5			
	5R		100	120	137.5			
	V	**5D**	87.5	102.5	117.5			
4	**10R**	**5U**	37.5	44	50	125	147.5	170
		H	50	60	70			
		5D	37.5	44	50			
5	**5R**	**10U**	20	24	27.5	65	77.5	90
		10D[4]	20	24	27.5			
	20R	**5U**	12.5	15	17.5			
		5D	12.5	15	17.5			
MAXIMUM PHOTOMETRIC INTENSITY [3]			300	360	420			

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range.

(4) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

12.1.1.14) PHYSICAL TESTS

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be re-photometered to determine if the cp requirements are still met.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

HEAT TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the Heat Test procedure as outlined in Appendix H.

12.1.1.15) FRONT TURN SIGNAL LAMP PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH ONE LIGHTED SECTION (BASE)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH ONE LIGHTED SECTION *- BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)										
GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					1	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	25	-			130	
		5D	-	3	25	-				
	5L	10U	3	3	40	-				
		10D[3]	-	3	40	-				
2	10L	5U	3	3	75	-			250	
		H	3	3	100	-				
		5D	-	3	75	-				
3	V	5U	5	5	175	-			950	
	5L	H	5	5	200	-				
	V		5	5	200	-				
	5R		5	5	200	-				
	V	5D	-	3	175	-				
4	10R	5U	3	3	75	-			250	
		H	3	3	100	-				
		5D	-	3	75	-				
5	5R	10U	3	3	40	-			130	
		10D[3]	-	3	40	-				
	20R	5U	3	3	25	-				
		5D	-	3	25	-				

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH ONE LIGHTED SECTION (1.5X)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH ONE LIGHTED SECTION
***- 1.5X BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)**

GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					1	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	37.5				195	
		5D	-	3	37.5					
	5L	10U	3	3	60					
		10D[3]	-	3	60					
2	10L	5U	3	3	112.5				375	
		H	3	3	150					
		5D	-	3	112.5					
3	V	5U	5	5	262.5				1425	
	5L	H	5	5	300					
	V		5	5	300					
	5R		5	5	300					
	V	5D	-	3	262.5					
4	10R	5U	3	3	112.5				375	
		H	3	3	150					
		5D	-	3	112.5					
5	5R	10U	3	3	60				195	
		10D[3]	-	3	60					
	20R	5U	3	3	37.5					
		5D	-	3	37.5					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.
(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH ONE LIGHTED SECTION (2.0X)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH ONE LIGHTED SECTION *- 2.0X BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)										
GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					1	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	50				260	
		5D	-	3	50					
	5L	10U	3	3	80					
		10D[3]	-	3	80					
2	10L	5U	3	3	150				500	
		H	3	3	200					
		5D	-	3	150					
3	V	5U	5	5	350				1900	
	5L	H	5	5	400					
	V		5	5	400					
	5R		5	5	400					
	V	5D	-	3	350					
4	10R	5U	3	3	150				500	
		H	3	3	200					
		5D	-	3	150					
5	5R	10U	3	3	80				260	
		10D[3]	-	3	80					
	20R	5U	3	3	50					
		5D	-	3	50					

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH ONE LIGHTED SECTION (2.5X)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH ONE LIGHTED SECTION
***- 2.5X BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)**

GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					1	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	62.5				325	
		5D	-	3	62.5					
	5L	10U	3	3	100					
		10D[3]	-	3	100					
2	10L	5U	3	3	187.5				625	
		H	3	3	250					
		5D	-	3	187.5					
3	V	5U	5	5	437.5				2375	
	5L	H	5	5	500					
	V		5	5	500					
	5R		5	5	500					
	V	5D	-	3	437.5					
4	10R	5U	3	3	187.5				625	
		H	3	3	250					
		5D	-	3	187.5					
5	5R	10U	3	3	100				325	
		10D[3]	-	3	100					
	20R	5U	3	3	62.5					
		5D	-	3	62.5					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.
(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS (BASE)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS *- BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)										
GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					2	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	30				155	
		5D	-	3	30					
	5L	10U	3	3	48					
		10D[3]	-	3	48					
2	10L	5U	3	3	88				295	
		H	3	3	120					
		5D	-	3	88					
3	V	5U	5	5	205				1130	
	5L	H	5	5	240					
	V		5	5	240					
	5R		5	5	240					
	V	5D	-	3	205					
4	10R	5U	3	3	88				295	
		H	3	3	120					
		5D	-	3	88					
5	5R	10U	3	3	48				155	
		10D[3]	-	3	48					
	20R	5U	3	3	30					
		5D	-	3	30					

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS (1.5X)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS
***- 1.5X BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)**

GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					2	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	45				232.5	
		5D	-	3	45					
	5L	10U	3	3	72					
		10D[3]	-	3	72					
2	10L	5U	3	3	132				442.5	
		H	3	3	180					
		5D	-	3	132					
3	V	5U	5	5	307.5				1695	
	5L	H	5	5	360					
	V		5	5	360					
	5R		5	5	360					
	V	5D	-	3	307.5					
4	10R	5U	3	3	132				442.5	
		H	3	3	180					
		5D	-	3	132					
5	5R	10U	3	3	72				232.5	
		10D[3]	-	3	72					
	20R	5U	3	3	45					
		5D	-	3	45					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.
(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS (2.0X)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS
***- 2.0X BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)**

GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					2	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	60				310	
		5D	-	3	60					
	5L	10U	3	3	96					
		10D[3]	-	3	96					
2	10L	5U	3	3	176				590	
		H	3	3	240					
		5D	-	3	176					
3	V	5U	5	5	410				2260	
	5L	H	5	5	480					
	V		5	5	480					
	5R		5	5	480					
	V	5D	-	3	410					
4	10R	5U	3	3	176				590	
		H	3	3	240					
		5D	-	3	176					
5	5R	10U	3	3	96				310	
		10D[3]	-	3	96					
	20R	5U	3	3	60					
		5D	-	3	60					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.
(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS (2.5X)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS
***- 2.5X BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)**

GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					2	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	75				387.5	
		5D	-	3	75					
	5L	10U	3	3	120					
		10D[3]	-	3	120					
2	10L	5U	3	3	220				737.5	
		H	3	3	300					
		5D	-	3	220					
3	V	5U	5	5	512.5				2825	
	5L	H	5	5	600					
	V		5	5	600					
	5R		5	5	600					
	V	5D	-	3	512.5					
4	10R	5U	3	3	220				737.5	
		H	3	3	300					
		5D	-	3	220					
5	5R	10U	3	3	120				387.5	
		10D[3]	-	3	120					
	20R	5U	3	3	75					
		5D	-	3	75					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.
(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS (BASE)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS - *BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)										
GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					3	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	35				180	
		5D	-	3	35					
	5L	10U	3	3	55					
		10D[3]	-	3	55					
2	10L	5U	3	3	100				340	
		H	3	3	140					
		5D	-	3	100					
3	V	5U	5	5	235				1295	
	5L	H	5	5	275					
	V		5	5	275					
	5R		5	5	275					
	V	5D	-	3	235					
4	10R	5U	3	3	100				340	
		H	3	3	140					
		5D	-	3	100					
5	5R	10U	3	3	55				180	
		10D[3]	-	3	55					
	20R	5U	3	3	35					
		5D	-	3	35					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.
(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS (1.5X)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS *- 1.5X BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)										
GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					3	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	52.5				270	
		5D	-	3	52.5					
	5L	10U	3	3	82.5					
		10D[3]	-	3	82.5					
2	10L	5U	3	3	150				510	
		H	3	3	210					
		5D	-	3	150					
3	V	5U	5	5	352.5				1942.5	
	5L	H	5	5	412.5					
	V		5	5	412.5					
	5R		5	5	412.5					
	V	5D	-	3	352.5					
4	10R	5U	3	3	150				510	
		H	3	3	210					
		5D	-	3	150					
5	5R	10U	3	3	82.5				270	
		10D[3]	-	3	82.5					
	20R	5U	3	3	52.5					
		5D	-	3	52.5					

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS (2.0X)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS
***- 2.0X BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)**

GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					3	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	70				360	
		5D	-	3	70					
	5L	10U	3	3	110					
		10D[3]	-	3	110					
2	10L	5U	3	3	200				680	
		H	3	3	280					
		5D	-	3	200					
3	V	5U	5	5	470				2590	
	5L	H	5	5	550					
	V		5	5	550					
	5R		5	5	550					
	V	5D	-	3	470					
4	10R	5U	3	3	200				680	
		H	3	3	280					
		5D	-	3	200					
5	5R	10U	3	3	110				360	
		10D[3]	-	3	110					
	20R	5U	3	3	70					
		5D	-	3	70					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.
(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST– TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS (2.5X)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - FRONT TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS
***- 2.5X BASE REQUIREMENTS* - (see Table VI of FMVSS No. 108)**

GROUP NUMBER	TEST POINT (degrees)		MIN. RATIO COMBINED W/PARKING LAMP	MIN. RATIO COMBINED W/ CLEARANCE LAMP[4]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Lighted Sections	Measurements				
					3	Location	Measured	Reaim	Required minimum	measured
1	20L	5U	3	3	87.5				450	
		5D	-	3	87.5					
	5L	10U	3	3	137.5					
		10D[3]	-	3	137.5					
2	10L	5U	3	3	250				850	
		H	3	3	350					
		5D	-	3	250					
3	V	5U	5	5	587.5				3237.5	
	5L	H	5	5	687.5					
	V		5	5	687.5					
	5R		5	5	687.5					
	V	5D	-	3	587.5					
4	10R	5U	3	3	250				850	
		H	3	3	350					
		5D	-	3	250					
5	5R	10U	3	3	137.5				450	
		10D[3]	-	3	137.5					
	20R	5U	3	3	87.5					
		5D	-	3	87.5					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.
(4) When a clearance lamp on a vehicle 2032 mm. or more in overall width is combined with a front turn signal lamp and the maximum luminous intensity of the clearance lamp is located below horizontal and within a 1.0º radius around the test point, the ratio for the test point may be computed by using the lowest value of the clearance lamp luminous intensity within the generated area.

PHOTOMETRY TEST – MOTORCYCLE FRONT TURN SIGNAL LAMP WITH ONE LIGHTED SECTION (OPTIONAL)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

MOTORCYCLE FRONT TURN SIGNAL LAMP OPTIONAL PHOTOMETRY REQUIREMENTS
(see TABLE XIII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
			Lighted Sections	Measurements			Required Minimum	Measured
			1	Location	Measured	Reaim		
1	20L	5U	12.5				65	
		5D	12.5					
	5L	10U	20					
		10D[4]	20					
2	10L	5U	37.5				125	
		H	50					
		5D	37.5					
3	V	5U	87.5				475	
	5L	H	100					
	V		100					
	5R		100					
	V	5D	87.5					
4	10R	5U	37.5				125	
		H	50					
		5D	37.5					
5	5R	10U	20				65	
		10D[4]	20					
	20R	5U	12.5					
		5D	12.5					
MAXIMUM PHOTOMETRIC INTENSITY [3]			300					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range.
(4) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

PHOTOMETRY TEST – MOTORCYCLE FRONT TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS (OPTIONAL)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

MOTORCYCLE FRONT TURN SIGNAL LAMP OPTIONAL PHOTOMETRY REQUIREMENTS (see TABLE XIII of FMVSS No. 108)									
GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)		
			Lighted Sections	Measurements			Required Minimum	Measured	
			2	Location	Measured	Reaim			
1	**20L**	**5U**	15				77.5		
		5D	15						
	5L	**10U**	24						
		10D[4]	24						
2	**10L**	**5U**	44				147.5		
		H	60						
		5D	44						
3	**V**	**5U**	102.5				565		
	5L	**H**	120						
	V		120						
	5R		120						
	V	**5D**	102.5						
4	**10R**	**5U**	44				147.5		
		H	60						
		5D	44						
5	**5R**	**10U**	24				77.5		
		10D[4]	24						
	20R	**5U**	15						
		5D	15						
MAXIMUM PHOTOMETRIC INTENSITY [3]			360						

[1] The measured values at each test point must not be less than 60% of the minimum value.
[2] The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
[3] The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range.
[4] Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

PHOTOMETRY TEST – MOTORCYCLE FRONT TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS (OPTIONAL)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

MOTORCYCLE FRONT TURN SIGNAL LAMP OPTIONAL PHOTOMETRY REQUIREMENTS
(see TABLE XIII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
			Lighted Sections	Measurements			Required Minimum	Measured
			3	Location	Measured	Reaim		
1	20L	5U	17.5				90	
		5D	17.5					
	5L	10U	27.5					
		10D[4]	27.5					
2	10L	5U	50				170	
		H	70					
		5D	50					
3	V	5U	117.5				647.5	
	5L	H	137.5					
	V		137.5					
	5R		137.5					
	V	5D	117.5					
4	10R	5U	50				170	
		H	70					
		5D	50					
5	5R	10U	27.5				90	
		10D[4]	27.5					
	20R	5U	17.5					
		5D	17.5					
MAXIMUM PHOTOMETRIC INTENSITY [3]			420					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range.
(4) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

12.1.2) REAR TURN SIGNAL LAMP

12.1.2.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.1.2.2) NUMBER

Each vehicle must be equipped with at least the following number of rear turn signal lamps:

<table>
<tr><th colspan="2">Vehicle type/size</th><th>Number of lamps</th></tr>
<tr><td colspan="2">Passenger cars</td><td rowspan="5">2</td></tr>
<tr><td colspan="2">MPV</td></tr>
<tr><td colspan="2">Trucks</td></tr>
<tr><td colspan="2">Buses</td></tr>
<tr><td colspan="2">Trailers</td></tr>
<tr><td rowspan="2">Motorcycles</td><td>Motor driven cycles whose speed attainable in 1 mile is 30 mph or less.</td><td>Not required.</td></tr>
<tr><td>All other motorcycles.</td><td>2</td></tr>
</table>

12.1.2.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulous method may be used. The color of the device shall be amber or red as specified in the procedure.

12.1.2.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

<table>
<tr><th rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="5">On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="6">Not less than 15 inches, nor more than 83 inches.</td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td>Trailers</td></tr>
<tr><td>Motorcycles</td><td>At or near the rear, at the same height, symmetrically about the vertical centerline, and having a minimum horizontal separation distance (centerline to centerline of lamps) of 9 inches.

Minimum edge to edge separation distance between the turn signal lamp and the taillamp or stop lamp is 4 inches, when a single stop and taillamp is installed on the vertical centerline and the turn signal lamps are red.</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight.

12.1.2.5) ACTIVATION

See activation requirements in Table(s) I-a, I-b and I-c, as applicable, in FMVSS No. 108.

12.1.2.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

Each lamp must meet the minimum effective projected luminous lens area requirements for the applicable vehicle type/size as indicated in the following table. The area consists of the effective light-emitting surface of each lamp or compartment measured on a plane normal to the axis of the vehicle excluding reflex reflector which is not obstructed by an opaque object such as mounting screw, mounting ring or an ornamental bezel or trim. This includes the area of rings or other configuration (raised portions) molded in the lens as part of the total effective area even if this area does not contribute significantly to total light output. The effective projected luminous lens area of each lamp or compartment shall be determined by the projection or graphical method.

MINIMUM EFFECTIVE PROJECTED LUMINOUS LENS AREA (sq. mm.) (see Table IV-a of FMVSS No. 108)				
PASSENGER CARS, MPV, TRUCKS, AND BUSES OF LESS THAN 2032 MM. IN OVERALL WIDTH			MPV, TRUCKS, AND BUSES 2032 MM. OR MORE IN OVERALL WIDTH	MOTORCYCLES
SINGLE COMPARTMENT LAMP	MULTIPLE COMPARTMENT LAMP OR MULTIPLE LAMPS			
	EACH COMPARTMENT OR LAMP	COMBINED COMPARTMENTS OR LAMPS		
5000	2200	2200	7500	2258

12.1.2.7) VISIBILITY

As specified in paragraph S6.4.3 of FMVSS No. 108, the visibility of a lamp shall be determined by the lens area or luminous intensity option (as specified by the manufacturer). The visibility shall be at least 1,250 square millimeters for the lens area method or emit 0.05 candela throughout the designated pattern. If the test sample fails to meet the minimum requirements for visibility, refer to paragraph S6.4.4 to determine if the sample can be tested in accordance with the legacy visibility alternative.

12.1.2.8) INDICATOR

GENERAL

Each vehicle equipped with a turn signal operating unit where any turn signal lamp is not visible to the driver must also have an illuminated pilot indicator to provide a clear and unmistakable indication that the turn signal system is activated.

The indicator must consist of one or more lights flashing at the same frequency as the turn signal lamps.

The indicator must function satisfactorily under all test conditions imposed on the turn signal flasher in S14.9 of FMVSS No. 108.

INDICATOR SIZE AND COLOR

If the indicator is located inside the vehicle it should emit a green colored light and have a minimum area equivalent to a 3/16 in. diameter circle.

If the indicator is located outside of the vehicle it should emit a yellow light and have a minimum projected illuminated area of 0.1 sq. in.

The minimum required illuminated area of the indicator must be visible to any tangent on the 95th eyellipse as defined in SAE J941 *(what revision?)* with the steering wheel turned to a straight ahead driving position and in the design location for an adjustable wheel or column.

TURN SIGNAL LAMP FAILURE

Failure of one or more turn signal lamps such that the minimum photometric performance specified in Tables VI or VII of FMVSS No. 108 is not being met must be indicated by the turn signal pilot indicator by a “steady on”, “steady off”, or by a significant change in the flashing rate., except when a variable-load turn signal flasher is used on a multipurpose passenger vehicle, truck, or bus 2032 mm. or more in overall width, on a truck that is capable of accommodating a slide in camper, or on any vehicle equipped to tow trailers.

12.1.2.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.1.2.10) SPACING TO OTHER LAMPS

No requirement.

12.1.2.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

See applicable requirements in S7.1.2.11 of FMVSS No. 108.

12.1.2.12) RATIO

When a taillamp, or a clearance lamp on a multipurpose passenger vehicle, truck, trailer, or bus of 2032 mm. or more in overall width, is combined with a rear turn signal lamp, the luminous intensity of the rear turn signal lamp at each identified test point must not be less than the luminous intensity of the taillamp or clearance lamp at that same test point times the multiplier shown for that test point in Table VII of FMVSS No. 108.

If a multiple compartment or multiple lamp arrangement is used on a passenger car or on a multipurpose passenger vehicle, truck, bus, or trailer of less than 2032 mm. in overall width, and the distance between the optical axes for both the taillamp and turn signal lamp is within 560 mm. for two compartment or lamp arrangement or 410 mm. for three compartments or lamp arrangements, then the ratio must be computed with all compartments or lamps lighted.

If a multiple compartment or multiple lamp arrangement is used and the distance between optical axes for one of the functions exceeds 560 mm. for two compartment or lamp arrangements or 410 mm. for three compartment or lamp arrangements, then the ratio must be computed for only those compartments or lamps where the taillamp and turn signal lamp are optically combined.

Where the taillamp or clearance lamp is combined with the turn signal lamp, and the maximum luminous intensity of the taillamp or clearance lamp is located below horizontal and within an area generated by a 0.5º radius around a test point for a taillamp on a passenger car or on a multipurpose passenger vehicle, truck, bus, or trailer of less than 2032 mm. in overall width, or by a 1.0º radius around a test point for a taillamp or clearance lamp on a vehicle 2032 mm. or more in overall width, the ratio for the test point may be computed using the lowest value of the taillamp or clearance lamp luminous intensity within the generated area.

12.1.2.13) PHOTOMETRY

The lamp shall be photometry tested as outlined in Appendix G for the number of lamp compartments and the type of vehicle for which it is designed.

The photometer element shall be located at a distance of 100 feet from the test device. A calibrated bulb(s) will be operated at rated mean spherical candlepower.

If the lamp is tested as part of a combination lamp, the appropriate data sheet shall be completed including minimum ratios as determined in the previous section (RATIO) of this procedure.

The test devices shall meet the candlepower specifications listed in the following table.

REAR TURN SIGNAL LAMP PHOTOMETRY REQUIREMENTS[5] (see TABLE VII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAIL LAMP OR CLEARANCE LAMP[7][8]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd) RED LAMPS			GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) RED LAMPS			MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd) AMBER LAMPS			GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) AMBER LAMPS		
				Lighted Sections			Lighted Sections			Lighted Sections			Lighted Sections		
				1	2	3	1	2	3	1	2	3	1	2	3
1	20L[6]	5U	3	10	12	15	50	60	70	15	20	25	80/84	100	120
		5D	3	10	12	15				15	20	25			
	5L[6]	10U	3	16	19	22				26/27	30	35			
		10D[3]	3	16	19	22				26/27	30	35			
2	10L[6]	5U	3	30	35	40	100	115	135	50	55	65	165	185	220
		H	3	40	47	55				65	75	90			
		5D	3	30	35	40				50	55	65			
3	V	5U	5	70	82	95	380	445	520	110	130	150	610/590	710	825
	5L[6]	H	5	80	95	110				130/120	150	175			
	V		5	80	95	110				130	150	175			
	5R[6]		5	80	95	110				130/120	150	175			
	V	5D	3	70	82	95				110	130	150			
4	10R[6]	5U	3	30	35	40	100	115	135	50	55	65	165	185	220
		H	3	40	47	55				65	75	90			
		5D	3	30	35	40				50	55	65			
5	5R[6]	10U	3	16	19	22	50	60	70	26/27	30	35	80/84	100	120
		10D[3]	3	16	19	22				26/27	30	35			
	20R[6]	5U	3	10	12	15				15	20	25			
		5D	3	10	12	15				15	20	25			
MAXIMUM PHOTOMETRIC INTENSITY[4]				300	360	420				750	900	900			

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the required downward angle.

(4) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range

(5) Values preceded by a slash (/) apply only to multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm. or more in overall width.

(6) A double faced turn signal lamp installed as described in S6.1.1.3 on a truck tractor need only meet the photometric requirements to the left of the V-V axis for a left hand lamp and to the right of the V-V axis for a right hand lamp.

(7) Required only when combined turn signal lamp and clearance lamp is installed on a vehicle 2032 mm. or more in overall width.

(8) When a taillamp (or clearance lamp on a vehicle 2032 mm. or more in overall width) is combined with a rear turn signal lamp and the maximum luminous intensity of the taillamp (or clearance lamp) is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp (or clearance lamp) luminous intensity within the generated area.

PHOTOMETRY (continued…)

As an alternative to FMVSS No. 108 Table VII photometry requirements, a rear turn signal lamp installed on a motorcycle may be designed to conform to the photometry requirements of Table XIII of FMVSS No. 108 as specified in the table below**.**

MOTORCYCLE TURN SIGNAL LAMP OPTIONAL PHOTOMETRY REQUIREMENTS (see TABLE XIII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE A MOTORCYCLE REAR TURN SIGNAL LAMP IS COMBINED WITH A TAILLAMP[6]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd) MOTORCYCLE TURN SIGNAL LAMP			GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) MOTORCYCLE TURN SIGNAL LAMP		
				Lighted Sections			Lighted Sections		
				1	2	3	1	2	3
1	20L	5U	3	12.5	15	17.5	65	77.5	90
		5D	3	12.5	15	17.5			
	5L	10U	3	20	24	27.5			
		10D[4]	3	20	24	27.5			
2	10L	5U	3	37.5	44	50	125	147.5	170
		H	3	50	60	70			
		5D	3	37.5	44	50			
3	V	5U	5	87.5	102.5	117.5	475	565	647.5
	5L	H	5	100	120	137.5			
	V		5	100	120	137.5			
	5R		5	100	120	137.5			
	V	5D	3	87.5	102.5	117.5			
4	10R	5U	3	37.5	44	50	125	147.5	170
		H	3	50	60	70			
		5D	3	37.5	44	50			
5	5R	10U	3	20	24	27.5	65	77.5	90
		10D[4]	3	20	24	27.5			
	20R	5U	3	12.5	15	17.5			
		5D	3	12.5	15	17.5			
MAXIMUM PHOTOMETRIC INTENSITY [3]				300	360	420			

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range.

(4) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(5) (Reserved)

(6) When a taillamp is combined with a rear turn signal lamp and the maximum luminous intensity of the taillamp is located below horizontal and within an area generated by a 0.5° radius around a test point the ratio for the test point may be computed by using the lowest value of the taillamp luminous intensity within the generated area.

12.1.2.14) PHYSICAL TESTS

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

HEAT TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the Heat Test procedure as outlined in Appendix H.

12.1.2.15) TURN SIGNAL PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST– REAR TURN SIGNAL LAMP WITH ONE LIGHTED SECTION (RED)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - (RED) REAR TURN SIGNAL LAMP WITH ONE LIGHTED SECTION[5] (see TABLE VII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAIL LAMP OR CLEARANCE LAMP[7][8]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd) RED LAMPS				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) RED LAMPS	
				Required Minimum	Measurements			Required Minimum	Measurements
					Location	Measured	Reaim		Measured
1	20L[6]	5U	3	10				50	
		5D	3	10					
	5L[6]	10U	3	16					
		10D[3]	3	16					
2	10L[6]	5U	3	30				100	
		H	3	40					
		5D	3	30					
3	V	5U	5	70				380	
	5L[6]	H	5	80					
	V		5	80					
	5R[6]		5	80					
	V	5D	3	70					
4	10R[6]	5U	3	30				100	
		H	3	40					
		5D	3	30					
5	5R[6]	10U	3	16				50	
		10D[3]	3	16					
	20R[6]	5U	3	10					
		5D	3	10					
MAXIMUM PHOTOMETRIC INTENSITY[4]				300					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the required downward angle.
(4) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range
(5) Values preceded by a slash (/) apply only to multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm. or more in overall width.
(6) A double faced turn signal lamp installed as described in S6.1.1.3 on a truck tractor need only meet the photometric requirements to the left of the V-V axis for a left hand lamp and to the right of the V-V axis for a right hand lamp.
(7) Required only when combined turn signal lamp and clearance lamp is installed on a vehicle 2032 mm. or more in overall width.
(8) When a taillamp (or clearance lamp on a vehicle 2032 mm. or more in overall width) is combined with a rear turn signal lamp and the maximum luminous intensity of the taillamp (or clearance lamp) is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp (or clearance lamp) luminous intensity within the generated area.

PHOTOMETRY TEST– REAR TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS (RED)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - (RED) REAR TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS[5] (see TABLE VII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAIL LAMP OR CLEARANCE LAMP[7][8]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd) RED LAMPS				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) RED LAMPS	
				Required Minimum	Measurements			Required Minimum	Measurements
					Location	Measured	Reaim		Measured
1	20L[6]	5U	3	12				60	
		5D	3	12					
	5L[6]	10U	3	19					
		10D[3]	3	19					
2	10L[6]	5U	3	35				115	
		H	3	47					
		5D	3	35					
3	V	5U	5	82				445	
	5L[6]	H	5	95					
	V		5	95					
	5R[6]		5	95					
	V	5D	3	82					
4	10R[6]	5U	3	35				115	
		H	3	47					
		5D	3	35					
5	5R[6]	10U	3	19				60	
		10D[3]	3	19					
	20R[6]	5U	3	12					
		5D	3	12					
MAXIMUM PHOTOMETRIC INTENSITY[4]				360					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the required downward angle.
(4) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range
(5) Values preceded by a slash (/) apply only to multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm. or more in overall width.
(6) A double faced turn signal lamp installed as described in S6.1.1.3 on a truck tractor need only meet the photometric requirements to the left of the V-V axis for a left hand lamp and to the right of the V-V axis for a right hand lamp.
(7) Required only when combined turn signal lamp and clearance lamp is installed on a vehicle 2032 mm. or more in overall width.
(8) When a taillamp (or clearance lamp on a vehicle 2032 mm. or more in overall width) is combined with a rear turn signal lamp and the maximum luminous intensity of the taillamp (or clearance lamp) is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp (or clearance lamp) luminous intensity within the generated area.

PHOTOMETRY TEST– REAR TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS (RED)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - (RED) REAR TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS[5] (see TABLE VII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAIL LAMP OR CLEARANCE LAMP[7][8]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd) RED LAMPS				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) RED LAMPS	
				Required Minimum	Measurements			Required Minimum	Measurements
					Location	Measured	Reaim		Measured
1	20L[6]	5U	3	15				70	
		5D	3	15					
	5L[6]	10U	3	22					
		10D[3]	3	22					
2	10L[6]	5U	3	40				135	
		H	3	55					
		5D	3	40					
3	V	5U	5	95				520	
	5L[6]	H	5	110					
	V		5	110					
	5R[6]		5	110					
	V	5D	3	95					
4	10R[6]	5U	3	40				135	
		H	3	55					
		5D	3	40					
5	5R[6]	10U	3	22				70	
		10D[3]	3	22					
	20R[6]	5U	3	15					
		5D	3	15					
MAXIMUM PHOTOMETRIC INTENSITY[4]				420					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the required downward angle.
(4) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range
(5) Values preceded by a slash (/) apply only to multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm. or more in overall width.
(6) A double faced turn signal lamp installed as described in S6.1.1.3 on a truck tractor need only meet the photometric requirements to the left of the V-V axis for a left hand lamp and to the right of the V-V axis for a right hand lamp.
(7) Required only when combined turn signal lamp and clearance lamp is installed on a vehicle 2032 mm. or more in overall width.
(8) When a taillamp (or clearance lamp on a vehicle 2032 mm. or more in overall width) is combined with a rear turn signal lamp and the maximum luminous intensity of the taillamp (or clearance lamp) is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp (or clearance lamp) luminous intensity within the generated area.

PHOTOMETRY TEST– REAR TURN SIGNAL LAMP WITH ONE LIGHTED SECTION (AMBER)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - (AMBER) REAR TURN SIGNAL LAMP WITH ONE LIGHTED SECTION[5]
(see TABLE VII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAIL LAMP OR CLEARANCE LAMP[7][8]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd) AMBER LAMPS				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) AMBER LAMPS	
				Required Minimum	Measurements			Required Minimum	Measurements
					Location	Measured	Reaim		Measured
1	20L[6]	5U	3	15				80/84	
		5D	3	15					
	5L[6]	10U	3	26/27					
		10D[3]	3	26/27					
2	10L[6]	5U	3	50				165	
		H	3	65					
		5D	3	50					
3	V	5U	5	110				610/590	
	5L[6]	H	5	130/120					
	V		5	130					
	5R[6]		5	130/120					
	V	5D	3	110					
4	10R[6]	5U	3	50				165	
		H	3	65					
		5D	3	50					
5	5R[6]	10U	3	26/27				80/84	
		10D[3]	3	26/27					
	20R[6]	5U	3	15					
		5D	3	15					
MAXIMUM PHOTOMETRIC INTENSITY[4]				750					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the required downward angle.
(4) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range
(5) Values preceded by a slash (/) apply only to multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm. or more in overall width.
(6) A double faced turn signal lamp installed as described in S6.1.1.3 on a truck tractor need only meet the photometric requirements to the left of the V-V axis for a left hand lamp and to the right of the V-V axis for a right hand lamp.
(7) Required only when combined turn signal lamp and clearance lamp is installed on a vehicle 2032 mm. or more in overall width.
(8) When a taillamp (or clearance lamp on a vehicle 2032 mm. or more in overall width) is combined with a rear turn signal lamp and the maximum luminous intensity of the taillamp (or clearance lamp) is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp (or clearance lamp) luminous intensity within the generated area.

PHOTOMETRY TEST– REAR TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS (AMBER)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - (AMBER) REAR TURN SIGNAL LAMP WITH TWO LIGHTED SECTIONS[5] (see TABLE VII of FMVSS No. 108)									
GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAIL LAMP OR CLEARANCE LAMP[7][8]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd) AMBER LAMPS				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) AMBER LAMPS	
				Required Minimum	Measurements			Required Minimum	Measurements
					Location	Measured	Reaim		Measured
1	20L[6]	5U	3	20				100	
		5D	3	20					
	5L[6]	10U	3	30					
		10D[3]	3	30					
2	10L[6]	5U	3	55				185	
		H	3	75					
		5D	3	55					
3	V	5U	5	130				710	
	5L[6]	H	5	150					
	V		5	150					
	5R[6]		5	150					
	V	5D	3	130					
4	10R[6]	5U	3	55				185	
		H	3	75					
		5D	3	55					
5	5R[6]	10U	3	30				100	
		10D[3]	3	30					
	20R[6]	5U	3	20					
		5D	3	20					
MAXIMUM PHOTOMETRIC INTENSITY[4]				900					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the required downward angle.
(4) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range
(5) Values preceded by a slash (/) apply only to multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm. or more in overall width.
(6) A double faced turn signal lamp installed as described in S6.1.1.3 on a truck tractor need only meet the photometric requirements to the left of the V-V axis for a left hand lamp and to the right of the V-V axis for a right hand lamp.
(7) Required only when combined turn signal lamp and clearance lamp is installed on a vehicle 2032 mm. or more in overall width.
(8) When a taillamp (or clearance lamp on a vehicle 2032 mm. or more in overall width) is combined with a rear turn signal lamp and the maximum luminous intensity of the taillamp (or clearance lamp) is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp (or clearance lamp) luminous intensity within the generated area.

PHOTOMETRY TEST– REAR TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS (AMBER)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PHOTOMETRY TEST - (AMBER) REAR TURN SIGNAL LAMP WITH THREE LIGHTED SECTIONS[5] (see TABLE VII of FMVSS No. 108)									
GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAIL LAMP OR CLEARANCE LAMP[7][8]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd) AMBER LAMPS				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) AMBER LAMPS	
				Required Minimum	Measurements			Required Minimum	Measurements
					Location	Measured	Reaim		Measured
1	20L[6]	5U	3	25				120	
		5D	3	25					
	5L[6]	10U	3	35					
		10D[3]	3	35					
2	10L[6]	5U	3	65				220	
		H	3	90					
		5D	3	65					
3	V	5U	5	150				825	
	5L[6]	H	5	175					
	V		5	175					
	5R[6]		5	175					
	V	5D	3	150					
4	10R[6]	5U	3	65				220	
		H	3	90					
		5D	3	65					
5	5R[6]	10U	3	35				120	
		10D[3]	3	35					
	20R[6]	5U	3	25					
		5D	3	25					
MAXIMUM PHOTOMETRIC INTENSITY[4]				900					

(1) The measured values at each test point must not be less than 60% of the minimum value.
(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.
(3) Where turn signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the required downward angle.
(4) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range
(5) Values preceded by a slash (/) apply only to multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm. or more in overall width.
(6) A double faced turn signal lamp installed as described in S6.1.1.3 on a truck tractor need only meet the photometric requirements to the left of the V-V axis for a left hand lamp and to the right of the V-V axis for a right hand lamp.
(7) Required only when combined turn signal lamp and clearance lamp is installed on a vehicle 2032 mm. or more in overall width.
(8) When a taillamp (or clearance lamp on a vehicle 2032 mm. or more in overall width) is combined with a rear turn signal lamp and the maximum luminous intensity of the taillamp (or clearance lamp) is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp (or clearance lamp) luminous intensity within the generated area.

12.2) TAILLAMP TEST PROCEDURE

12.2.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.2.2) NUMBER

Each vehicle must be equipped with at least the following number of taillamps:

<table>
<tr><th colspan="2">Vehicle type/size</th><th>Number of lamps</th></tr>
<tr><td colspan="2">Passenger cars</td><td rowspan="4">2</td></tr>
<tr><td colspan="2">MPV</td></tr>
<tr><td colspan="2">Trucks</td></tr>
<tr><td colspan="2">Buses</td></tr>
<tr><td rowspan="2">Trailers</td><td>Less than or equal to 30 inches in overall width</td><td>1</td></tr>
<tr><td>Over 30 inches in overall width</td><td>2</td></tr>
<tr><td colspan="2">Motorcycles</td><td>1</td></tr>
</table>

12.2.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the device shall be red as specified in the procedure.

12.2.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

When multiple lamp arrangements of or multiple compartment taillamps are used, with only a portion of the compartments or lamps installed on a rigid part of the vehicle, that portion must meet at least the photometric requirements for the appropriate single compartment lamp.

<table>
<tr><th colspan="2" rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td colspan="2">Passenger cars</td><td rowspan="4">On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="6">Not less than 15 inches, nor more than 72 inches.</td></tr>
<tr><td colspan="2">MPV</td></tr>
<tr><td colspan="2">Trucks</td></tr>
<tr><td colspan="2">Buses</td></tr>
<tr><td rowspan="2">Trailers</td><td>Less than or equal to 30 inches in overall width</td><td>When a single lamp is installed it must be mounted at or near the vertical centerline.</td></tr>
<tr><td>Over 30 inches in overall width</td><td>On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td></tr>
<tr><td colspan="2">Motorcycles</td><td>On the rear, on the vertical centerline except that if two are used, they must be symmetrically disposed about the vertical centerline.</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

12.2.5) ACTIVATION

See activation requirements in Table(s) I-a, I-b, and I-c, as applicable, in FMVSS No. 108.

12.2.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.2.7) VISIBILITY

As specified in paragraph S6.4.3 of FMVSS No. 108, the visibility of a lamp shall be determined by the lens area or luminous intensity option (as specified by the manufacturer). The visibility shall be at least 1,250 square millimeters for the lens area method or emit 0.05 candela throughout the designated pattern. If the test sample fails to meet the minimum requirements for visibility, refer to paragraph S6.4.4 to determine if the sample can be tested in accordance with the legacy visibility alternative.

12.2.8) INDICATOR

No requirement.

12.2.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.2.10) SPACING TO OTHER LAMPS

No requirement.

12.2.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

See applicable requirements in S7.2.11 of FMVSS No. 108.

12.2.12) RATIO

When a taillamp is combined with a rear turn signal lamp and/or a stop lamp, see FMVSS No. 108 paragraphs S7.1.2.12 (rear turn signal lamps) and S7.3.12 (stop lamps) for additional requirements.

12.2.13) PHOTOMETRY

The device shall be photometry tested as outlined in Appendix G. The photometer element shall be located at a distance of 100 feet from the test device. A calibrated bulb(s) will be operated at rated mean spherical candlepower. The test devices shall meet the cp specifications listed in the following table.

If the lamp is tested as part of a combination lamp, the appropriate data sheet shall be completed including minimum ratios required between taillamp and signal lamp.

TAILLAMP PHOTOMETRY REQUIREMENTS (see TABLE VIII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		PHOTOMETRIC INTENSITY[1][2][4] (cd)						GROUP MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)		
			Lighted Sections						Lighted Sections		
			1		2		3 (or more)		1	2	3 (or more)
			MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM			
1	20L	5U	0.3	18	0.5	20	0.7	25	1.4	2.4	3.5
		5D	0.3	-	0.5	-	0.7	-			
	5L	10U	0.4	18	0.7	20	1.0	25			
		10D[3]	0.4	-	0.7	-	1.0	-			
2	10L	5U	0.8	18	1.4	20	2.0	25	2.4	4.2	6.0
		H	0.8	18	1.4	20	2.0	25			
		5D	0.8	-	1.4	-	2.0	-			
3	V	5U	1.8	18	3.1	20	4.5	25	9.6	16.8	24.0
	5L	H	2.0	18	3.5	20	5.0	25			
	V		2.0	18	3.5	20	5.0	25			
	5R		2.0	18	3.5	20	5.0	25			
	V	5D	1.8	-	3.1	-	4.5	-			
4	10R	5U	0.8	18	1.4	20	2.0	25	2.4	4.2	6.0
		H	0.8	18	1.4	20	2.0	25			
		5D	0.8	-	1.4	-	2.0	-			
5	5R	10U	0.4	18	0.7	20	1.0	25	1.4	2.4	3.5
		10D[3]	0.4	-	0.7	-	1.0	-			
	20R	5U	0.3	18	0.5	20	0.7	25			
		5D	0.3	-	0.5	-	0.7	-			

(1) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(2) If the sum of intensity values for all points in the zone is not less than the specified total value for the zone, the measured intensity value for each individual test point is not required to meet the minimum value.

(3) Where taillamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(4) A taillamp shall not exceed the maximum intensity over any area larger than that generated by a 0.25º radius, within a solid cone angle from 20ºL to 20ºR and from H to 10ºU.

12.2.14) PHYSICAL TEST

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

HEAT TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the Heat Test procedure as outlined in Appendix H.

12.2.15) TAILLAMP PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST– TAILLAMP WITH ONE LIGHTED SECTION

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

TAILLAMP PHOTOMETRY REQUIREMENTS – ONE LIGHTED SECTION

(see TABLE VIII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		PHOTOMETRIC INTENSITY (cd)					GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
			Lighted Sections		Measurements				
			1		Location	Measured	Reaim	Required minimum	Measured
			MINIMUM	MAXIMUM					
1	20L	5U	0.3	18				1.4	
		5D	0.3	-					
	5L	10U	0.4	18					
		10D	0.4	-					
2	10L	5U	0.8	18				2.4	
		H	0.8	18					
		5D	0.8	-					
3	V	5U	1.8	18				9.6	
	5L	H	2.0	18					
	V		2.0	18					
	5R		2.0	18					
	V	5D	1.8	-					
4	10R	5U	0.8	18				2.4	
		H	0.8	18					
		5D	0.8	-					
5	5R	10U	0.4	18				1.4	
		10D	0.4	-					
	20R	5U	0.3	18					
		5D	0.3	-					

* Denotes failure.

PHOTOMETRY TEST– TAILLAMP WITH TWO LIGHTED SECTIONS

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

TAILLAMP PHOTOMETRY REQUIREMENTS – TWO LIGHTED SECTIONS

(see TABLE VIII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		PHOTOMETRIC INTENSITY (cd)					GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
			Lighted Sections		Measurements				
			2		Location	Measured	Reaim	Required minimum	Measured
			MINIMUM	MAXIMUM					
1	20L	5U	0.5	20				2.4	
		5D	0.5	-					
	5L	10U	0.7	20					
		10D	0.7	-					
2	10L	5U	1.4	20				4.2	
		H	1.4	20					
		5D	1.4	-					
3	V	5U	3.1	20				16.8	
	5L	H	3.5	20					
	V		3.5	20					
	5R		3.5	20					
	V	5D	3.1	-					
4	10R	5U	1.4	20				4.2	
		H	1.4	20					
		5D	1.4	-					
5	5R	10U	0.7	20				2.4	
		10D	0.7	-					
	20R	5U	0.5	20					
		5D	0.5	-					

* Denotes failure.

PHOTOMETRY TEST– TAILLAMP WITH THREE OR MORE LIGHTED SECTIONS

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

TAILLAMP PHOTOMETRY REQUIREMENTS – THREE OR MORE LIGHTED SECTIONS

(see TABLE VIII of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		PHOTOMETRIC INTENSITY (cd)					GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
			Lighted Sections		Measurements				
			3 or More		Location	Measured	Reaim	Required minimum	Measured
			MINIMUM	MAXIMUM					
1	20L	5U	0.7	25				3.5	
		5D	0.7	-					
	5L	10U	1.0	25					
		10D	1.0	-					
2	10L	5U	2.0	25				6.0	
		H	2.0	25					
		5D	2.0	-					
3	V	5U	4.5	25				24.0	
	5L	H	5.0	25					
	V		5.0	25					
	5R		5.0	25					
	V	5D	4.5	-					
4	10R	5U	2.0	25				6.0	
		H	2.0	25					
		5D	2.0	-					
5	5R	10U	1.0	25				3.5	
		10D	1.0	-					
	20R	5U	0.7	25					
		5D	0.7	-					

* Denotes failure.

12.3) STOP LAMP TEST PROCEDURE

12.3.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.3.2) NUMBER

Each vehicle must be equipped with at least the following number of stop lamps:

<table>
<tr><th colspan="2">Vehicle type/size</th><th>Number of lamps</th></tr>
<tr><td colspan="2">Passenger cars</td><td rowspan="4">2</td></tr>
<tr><td colspan="2">MPV</td></tr>
<tr><td colspan="2">Trucks</td></tr>
<tr><td colspan="2">Buses</td></tr>
<tr><td rowspan="2">Trailers</td><td>Trailers less than 30 inches wide.</td><td>1</td></tr>
<tr><td>All other trailers.</td><td>2</td></tr>
<tr><td colspan="2">Motorcycles</td><td>1</td></tr>
</table>

12.3.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the device shall be red, as specified in the procedure.

12.3.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

<table>
<tr><th rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="4">Not less than 15 inches, nor more than 72 inches.</td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td>Trailers</td><td>On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable. When a single lamp is installed it must be mounted at or near the vertical centerline.</td></tr>
<tr><td>Motorcycles</td><td>On the rear, on the vertical centerline except that if two are used, they must be symmetrically disposed about the vertical centerline.</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

12.3.5) ACTIVATION

See activation requirements in Table(s) I-a, I-b, and I-c, as applicable, in FMVSS No. 108.

12.3.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

Each lamp must meet the minimum effective projected luminous lens area requirements for the applicable vehicle type/size as indicated in the following table. The area consists of the effective light-emitting surface of each lamp or compartment measured on a plane normal to the axis of the vehicle excluding reflex reflector which is not obstructed by an opaque object such as mounting screw, mounting ring or an ornamental bezel or trim. This includes the area of rings or other configuration (raised portions) molded in the lens as part of the total effective area even if this area does not contribute significantly to total light output. The effective projected luminous lens area of each lamp or compartment shall be determined by the projection or graphical method.

TABLE IV-a. EFFECTIVE PROJECTED LUMINOUS LENS AREA REQUIREMENTS

LIGHTING DEVICE	**PASSENGER CARS, MULTIPURPOSE PASSENGER VEHICLES, TRUCKS, TRAILERS, AND BUSES OF LESS THAN 2032 MM. IN OVERALL WIDTH** MINIMUM EFFECTIVE PROJECTED LUMINOUS LENS AREA (sq. mm.)			**MULTIPURPOSE PASSENGER VEHICLES, TRUCKS, TRAILERS, AND BUSES 2032 MM. OR MORE IN OVERALL WIDTH** MINIMUM EFFECTIVE PROJECTED LUMINOUS LENS AREA EACH LAMP (sq. mm.)	**MOTORCYCLES** MINIMUM EFFECTIVE PROJECTED LUMINOUS LENS AREA (sq. mm.)
	SINGLE COMPARTMENT LAMP	**MULTIPLE COMPARTMENT LAMP OR MULTIPLE LAMPS**			
		EACH COMPARTMENT OR LAMP	**COMBINED COMPARTMENTS OR LAMPS**		
Stop lamp	5000	2200	5000	7500	5000[1]

(1) A motor driven cycle whose speed attainable in 1 mile is 30 mph or less may be equipped with a stop lamp whose minimum effective projected luminous lens area is not less than 2258 sq. mm.

12.3.7) VISIBILITY

See visibility requirements in Table(s) V-a, V-b, V-c, and V-d as applicable, in FMVSS No. 108.

12.3.8) INDICATOR

No requirement.

12.3.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.3.10) SPACING TO OTHER LAMPS

No requirement.

12.3.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

As specified in paragraph S7.3.11 of FMVSS No. 108, a multiple compartment lamp or multiple lamps may be used to meet the photometric requirements of a stop lamp provided the requirements of paragraph S6.1.3.2 of FMVSS No. 108 are met.

If a multiple compartment lamp or multiple lamps are used on a passenger car or on a multipurpose passenger vehicle, truck, bus, or trailer of less than 2032 mm in overall width, and the distance between adjacent light sources does not exceed 560 mm for two compartment or lamp arrangements and does not exceed 410 mm for three compartment or lamp arrangements, then the combination of the compartments or lamps must be used to meet the photometric requirements for the corresponding number of lighted sections specified in the table below.

If the distance between adjacent light sources exceeds the previously stated dimensions, each compartment or lamp must comply with the photometric requirements for one lighted section specified in the table below.

Multiple compartment stop lamps installed on multipurpose passenger vehicles, trucks, and buses 2032 mm or more in overall width require measurement of the photometrics for the entire lamp and not for individual compartments.

12.3.12) RATIO TO TAILLAMP

When a taillamp is combined with a stop lamp, the luminous intensity of the stop lamp at each identified test point must not be less than the luminous intensity of the taillamp at that same test point times the multiplier shown for that test point in the above table.

If a multiple compartment or multiple lamp arrangement is used on a passenger car or on a multipurpose passenger vehicle, truck, bus, or trailer of less than 2032 mm in overall width, and the distance between the optical axes for both the taillamp and stop lamp is within 560 mm for two compartment or lamp arrangements or 410 mm for three compartment or lamp arrangements, then the ratio must be computed with all compartments or lamps lighted.

If a multiple compartment or multiple lamp arrangement is used and the distance between optical axes for one of the functions exceeds 560 mm for two compartment or lamp arrangements or 410 mm for three compartments or lamp arrangements, then the ratio must be computed for only those compartments or lamps where the taillamp and stop lamp are optically combined.

Where the taillamp is combined with the stop lamp, and the maximum luminous intensity of the is located below horizontal and within an area generated by a 0.5º radius around a test point for a taillamp on a passenger car or on a multipurpose passenger vehicle, truck, bus, or trailer of less than 2032 mm in overall width, or by a 1.0º radius around a test point for a taillamp on a vehicle 2032 mm or more in overall width, the ratio for the test point may be computed using the lowest value of the taillamp luminous intensity within the generated area.

12.3.13) PHOTOMETRY

Each stop lamp must be designed to conform to the photometry requirements of the following table, when tested according to the procedure of Appendix G, for the number of lamp compartments or individual lamps and the type of vehicle it is installed on. A stop lamp installed on a motor driven cycle may be designed to conform to the optional photometry requirements when tested according to the procedure of Appendix G.

The photometer shall be located at a distance of 100 feet from the test device. If the lamp is tested in combination with a taillamp, the appropriate data sheet shall be completed, including minimum ratios required between the signal lamp and the taillamp.

STOP LAMP PHOTOMETRY REQUIREMENTS (see TABLE IX of FMVSS No. 108)									
GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAIL LAMP[5]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)			GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)		
				Lighted Sections			Lighted Sections		
				1	2	3	1	2	3
1	20L	5U	3	10	12	15	50	60	70
		5D	3	10	12	15			
	5L	10U	3	16	19	22			
		10D[4]	3	16	19	22			
2	10L	5U	3	30	35	40	100	115	135
		H	3	40	47	55			
		5D	3	30	35	40			
3	V	5U	5	70	82	95	380	445	520
	5L	H	3/5[6]	80	95	110			
	V		5	80	95	110			
	5R		5	80	95	110			
	V	5D	3	70	82	95			
4	10R	5U	3	30	35	40	100	115	135
		H	3	40	47	55			
		5D	3	30	35	40			
5	5R	10U	3	16	19	22	50	60	70
		10D[4]	3	16	19	22			
	20R	5U	3	10	12	15			
		5D	3	10	12	15			
MAXIMUM PHOTOMETRIC INTENSITY[3]				300	360	420			

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range.

(4) Where stop lamps are mounted with their axis of reference less than 750 mm above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(5) When a taillamp is combined with a stop lamp and the maximum luminous intensity of the taillamp is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 mm or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp luminous intensity within the generated area.

(6) Values preceded by a slash (/) apply only to lamps installed on multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm or more in overall width.

MOTOR DRIVEN CYCLE STOP LAMP OPTIONAL PHOTOMETRY REQUIREMENTS (see TABLE XIII of FMVSS No. 108)					
GROUP NUMBER	TEST POINT (degrees)		GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) MOTOR DRIVEN CYCLE[5] STOP LAMP		
			Lighted Sections		
			1	2	3
1	20L	5U	26	31	36
		5D			
	5L	10U			
		10D[4]			
2	10L	5U	50	59	69
		H			
		5D			
3	V	5U	190	226	261
	5L	H			
	V				
	5R				
	V	5D			
4	10R	5U	50	59	69
		H			
		5D			
5	5R	10U	26	31	36
		10D[4]			
	20R	5U			
		5D			

(4) Where turn signal lamps or stop lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(5) Requirements for a motor-driven cycle whose speed attainable in 1 mile is 30 mph or less.

12.3.14) PHYSICAL TESTS

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

12.3.15) COMBINED LAMP BULB INDEXING

Each stop lamp optically combined with a taillamp where a two-filament bulb is used must have a bulb with an indexing base and a socket designed so that bulbs with non-indexing bases cannot be used. Removable sockets must have an indexing feature so that they cannot be re-inserted into lamp housings in random positions, unless the lamp will perform its intended function with random light source orientation.

12.3.16) STOP LAMP PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST– STOP LAMP WITH ONE LIGHTED SECTION

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

STOP LAMP PHOTOMETRY REQUIREMENTS (see TABLE IX of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAILLAMP[5]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
				Lighted Sections	Measurements			Lighted Sections	
				1	Location	Measured	Reaim	Required minimum	Measured
1	20L	5U	3	10				50	
		5D	3	10					
	5L	10U	3	16					
		10D[4]	3	16					
2	10L	5U	3	30				100	
		H	3	40					
		5D	3	30					
3	V	5U	5	70				380	
	5L	H	3/5[6]	80					
	V		5	80					
	5R		5	80					
	V	5D	3	70					
4	10R	5U	3	30				100	
		H	3	40					
		5D	3	30					
5	5R	10U	3	16				50	
		10D[4]	3	16					
	20R	5U	3	10					
		5D	3	10					
MAXIMUM PHOTOMETRIC INTENSITY[3]				300					

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range.

(4) Where stop lamps are mounted with their axis of reference less than 750 mm above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(5) When a taillamp is combined with a stop lamp and the maximum luminous intensity of the taillamp is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 mm or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp luminous intensity within the generated area.

(6) Values preceded by a slash (/) apply only to lamps installed on multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm or more in overall width.

PHOTOMETRY TEST– STOP LAMP WITH TWO LIGHTED SECTIONS

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

STOP LAMP PHOTOMETRY REQUIREMENTS (see TABLE IX of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAILLAMP[5]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
				Lighted Sections	Measurements			Lighted Sections	
				2	Location	Measured	Reaim	Required minimum	Measured
1	20L	5U	3	12				60	
		5D	3	12					
	5L	10U	3	19					
		10D[4]	3	19					
2	10L	5U	3	35				115	
		H	3	47					
		5D	3	35					
3	V	5U	5	82				445	
	5L	H	3/5[6]	95					
	V		5	95					
	5R		5	95					
	V	5D	3	82					
4	10R	5U	3	35				115	
		H	3	47					
		5D	3	35					
5	5R	10U	3	19				60	
		10D[4]	3	19					
	20R	5U	3	12					
		5D	3	12					
MAXIMUM PHOTOMETRIC INTENSITY[3]				360					

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range.

(4) Where stop lamps are mounted with their axis of reference less than 750 mm above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(5) When a taillamp is combined with a stop lamp and the maximum luminous intensity of the taillamp is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 mm or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp luminous intensity within the generated area.

(6) Values preceded by a slash (/) apply only to lamps installed on multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm or more in overall width.

PHOTOMETRY TEST– STOP LAMP WITH THREE LIGHTED SECTIONS

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

STOP LAMP PHOTOMETRY REQUIREMENTS (see TABLE IX of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY RATIO WHERE COMBINED WITH A TAILLAMP[5]	MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
				Lighted Sections	Measurements			Lighted Sections	
				3	Location	Measured	Reaim	Required minimum	Measured
1	20L	5U	3	15				70	
		5D	3	15					
	5L	10U	3	22					
		10D[4]	3	22					
2	10L	5U	3	40				135	
		H	3	55					
		5D	3	40					
3	V	5U	5	95				520	
	5L	H	3/5[6]	110					
	V		5	110					
	5R		5	110					
	V	5D	3	95					
4	10R	5U	3	40				135	
		H	3	55					
		5D	3	40					
5	5R	10U	3	22				70	
		10D[4]	3	22					
	20R	5U	3	15					
		5D	3	15					
MAXIMUM PHOTOMETRIC INTENSITY[3]				420					

(1) The measured values at each test point must not be less than 60% of the minimum value.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) The maximum photometric intensity must not occur over any area larger than that generated by a 0.5º radius within a solid angle defined by the test point range.

(4) Where stop lamps are mounted with their axis of reference less than 750 mm above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(5) When a taillamp is combined with a stop lamp and the maximum luminous intensity of the taillamp is located below horizontal and within an area generated by a 0.5° radius around a test point (1.0° radius on lamps installed on vehicle 2032 mm or more in overall width), the ratio for the test point may be computed by using the lowest value of the taillamp luminous intensity within the generated area.

(6) Values preceded by a slash (/) apply only to lamps installed on multipurpose passenger vehicles, trucks, trailers, and buses of 2032 mm or more in overall width.

PHOTOMETRY TEST– MOTOR DRIVEN CYCLE STOP LAMP WITH LIGHTED SECTIONS

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

MOTOR DRIVEN CYCLE STOP LAMP OPTIONAL PHOTOMETRY REQUIREMENTS (see TABLE XIII of FMVSS No. 108)								
GROUP NUMBER	TEST POINT (degrees)		GROUP MINIMUM PHOTOMETRIC INTENSITY (cd) MOTOR DRIVEN CYCLE[5] STOP LAMP					
			Lighted Sections					
			1		2		3	
			Required Minimum	Measured	Required Minimum	Measured	Required Minimum	Measured
1	20L	5U	26		31		36	
		5D						
	5L	10U						
		10D[4]						
2	10L	5U	50		59		69	
		H						
		5D						
3	V	5U	190		226		261	
	5L	H						
	V							
	5R							
	V	5D						
4	10R	5U	50		59		69	
		H						
		5D						
5	5R	10U	26		31		36	
		10D[4]						
	20R	5U						
		5D						

(4) Where turn signal lamps or stop lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(5) Requirements for a motor-driven cycle whose speed attainable in 1 mile is 30 mph or less.

12.4) SIDE MARKER LAMP TEST PROCEDURE

12.4.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.4.2) NUMBER

Each vehicle must be equipped with at least the following number of side marker lamps:

Vehicle type/size		Number of lamps
Passenger cars		4
MPV		
Trucks	Truck Tractors	2
	All other trucks	4
Buses		4
Trailers	Trailers less than 1829 mm [6 ft] in overall length including the trailer tongue.	2
	All other trailers	4
Motorcycles		Not required.

12.4.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the device shall be amber or red, as applicable, as specified in the procedure.

12.4.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

<table>
<tr><th colspan="2" rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td colspan="2">Passenger cars</td><td rowspan="4">Amber lamps: On each side, as far to the front as practicable.

Red lamps: On each side, as far to the rear as practicable.
(Not required on truck tractors.)</td><td rowspan="4">Not less than 15 inches.</td></tr>
<tr><td colspan="2">MPV</td></tr>
<tr><td colspan="2">Trucks</td></tr>
<tr><td colspan="2">Buses</td></tr>
<tr><td rowspan="2">Trailers</td><td>Less than 1829 mm [6 ft] in overall length including the trailer tongue.</td><td>On each side, as far to the front as practicable exclusive of the trailer tongue.</td><td>Not less than 15 inches.</td></tr>
<tr><td>Over or equal to 1829 mm [6 ft] in overall length including the trailer tongue</td><td>On each side, as far to the rear as practicable.</td><td>Not less than 15 inches. Not more than 60 inches on trailers 2032 mm or more in overall width.</td></tr>
<tr><td colspan="2">Motorcycles</td><td>No requirement.</td><td>No requirement.</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

12.4.5) ACTIVATION

See activation requirements in Table(s) I-a, I-b, and I-c, as applicable, in FMVSS No. 108.

12.4.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.4.7) VISIBILITY

No requirement.

12.4.8) INDICATOR

No requirement.

12.4.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.4.10) SPACING TO OTHER LAMPS

No requirement.

12.4.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.4.12) RATIO

No requirement.

12.4.13) PHOTOMETRY

The device shall be photometry tested as outlined in Appendix G. The photometer shall be located at a distance of 100 feet from the test device. The test devices shall meet the cp specifications listed in the following table.

As specified in FMVSS No. 108 paragraph S7.4.13.2, for each motor vehicle less than 30 feet in overall length and less than 2032 mm. in overall width, the minimum photometric intensity requirements for a side marker lamp may be met for all inboard test points at a distance of 15 feet from the vehicle and on a vertical plane that is perpendicular to the longitudinal axis of the vehicle and located midway between the front and rear side marker lamps.

TABLE X: SIDE MARKER LAMP PHOTOMETRY REQUIREMENTS			
TEST POINT (degrees)		**MINIMUM PHOTOMETRIC INTENSITY (cd)[2] RED LAMPS**	**MINIMUM PHOTOMETRIC INTENSITY (cd)[2] AMBER LAMPS**
10U	45L[1]	0.25	0.62
	V	0.25	0.62
	45R[1]	0.25	0.62
H	45L[1]	0.25	0.62
	V	0.25	0.62
	45R[1]	0.25	0.62
10D[3]	45L[1]	0.25	0.62
	V	0.25	0.62
	45R[1]	0.25	0.62

(1) Where a side marker lamp installed on a motor vehicle less than 30 feet in overall length and less than 80 inches (2 m) in overall width has the lateral angle nearest the other required side marker lamp on the same side of the vehicle reduced from 45º by design as specified by paragraph S7.4.13.2 in FMVSS No.108, the photometric intensity measurement may be met at the lesser angle.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where side marker lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

12.4.14) PHYSICAL TESTS

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

12.4.15) SIDE MARKER LAMP PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST– SIDE MARKER LAMP (RED)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

SIDE MARKER LAMP PHOTOMETRY REQUIREMENTS (see TABLE X of FMVSS No. 108)					
TEST POINT (degrees)		**MINIMUM PHOTOMETRIC INTENSITY (cd)[2] RED LAMPS**	**Measurements**		
			Location	**Measured**	**Reaim**
10U	45L[1]	0.25			
	V	0.25			
	45R[1]	0.25			
H	45L[1]	0.25			
	V	0.25			
	45R[1]	0.25			
10D[3]	45L[1]	0.25			
	V	0.25			
	45R[1]	0.25			

* Denotes failure.

(1) Where a side marker lamp installed on a motor vehicle less than 30 feet in overall length and less than 80 inches (2 m) in overall width has the lateral angle nearest the other required side marker lamp on the same side of the vehicle reduced from 45º by design as specified by paragraph S7.4.13.2 in FMVSS No.108, the photometric intensity measurement may be met at the lesser angle.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where side marker lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

PHOTOMETRY TEST– SIDE MARKER LAMP (AMBER)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

SIDE MARKER LAMP PHOTOMETRY REQUIREMENTS (see TABLE X of FMVSS No. 108)					
TEST POINT (degrees)		**MINIMUM PHOTOMETRIC INTENSITY (cd)[2] AMBER LAMPS**	**Measurements**		
			Location	**Measured**	**Reaim**
10U	45L[1]	0.62			
	V	0.62			
	45R[1]	0.62			
H	45L[1]	0.62			
	V	0.62			
	45R[1]	0.62			
10D[3]	45L[1]	0.62			
	V	0.62			
	45R[1]	0.62			

* Denotes failure.

(1) Where a side marker lamp installed on a motor vehicle less than 30 feet in overall length and less than 80 inches (2 m) in overall width has the lateral angle nearest the other required side marker lamp on the same side of the vehicle reduced from 45º by design as specified by paragraph S7.4.13.2 in FMVSS No.108, the photometric intensity measurement may be met at the lesser angle.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) Where side marker lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

12.5) CLEARANCE AND ID LAMP TEST PROCEDURE

12.5.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.5.2) NUMBER

See quantity requirements in Table(s) I-a, I-b, and I-c, as applicable, in FMVSS No. 108.

12.5.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the device shall be amber or red, as applicable, as specified in the procedure.

12.5.4) MOUNTING LOCATION/HEIGHT

See mounting location requirements in Table(s) I-a, I-b, and I-c, as applicable, in FMVSS No. 108.

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

12.5.5) ACTIVATION

Steady burning.

12.5.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.5.7) VISIBILITY

No requirement.

12.5.8) INDICATOR

No requirement.

12.5.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.5.10) SPACING TO OTHER LAMPS

No requirement.

12.5.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.5.12) RATIO

For clearance lamps see ratio requirements in paragraphs S7.1.1.12 for front turn signal lamps and S7.1.2.12 for rear turn signal lamps as applicable, in FMVSS No. 108.

For identification lamps there is no requirement.

12.5.13) PHOTOMETRY

The device shall be photometry tested as outlined in Appendix G. The test devices shall meet the cp specifications listed in the following table.

TABLE XI: CLEARANCE AND IDENTIFICATION LAMPS PHOTOMETRY REQUIREMENTS			
TEST POINT (degrees)		**MINIMUM PHOTOMETRIC INTENSITY (cd)[2] RED LAMPS**	**MINIMUM PHOTOMETRIC INTENSITY (cd)[2] AMBER LAMPS**
10U	45L[4]	0.25	0.62
	V	0.25	0.62
	45R[4]	0.25	0.62
H	45L[4]	0.25	0.62
	V	0.25	0.62
	45R[4]	0.25	0.62
10D[1]	45L[4]	0.25	0.62
	V	0.25	0.62
	45R[4]	0.25	0.62
MAXIMUM PHOTOMETRIC INTENSITY[3] (cd) RED LAMPS		15	

(1) Where clearance lamps or identification lamps are mounted with their axis of reference less than 750mm above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) When optically combined with a stop lamp or turn signal lamp, this maximum applies on or above the horizontal.

(4) Where clearance lamps are installed at locations other than on the front and rear due to the necessity to indicate the overall width of the vehicle, or for protection from damage during normal operation of the vehicle, they need not meet the photometric intensity requirement at any test point that is 45º inboard.

12.5.14) PHYSICAL TESTS

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

12.5.15) CLEARANCE AND IDENTIFICATION LAMP PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST– CLEARANCE AND ID LAMP (RED)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

CLEARANCE AND ID LAMP PHOTOMETRY REQUIREMENTS (see TABLE X of FMVSS No. 108)					
TEST POINT (degrees)		**MINIMUM PHOTOMETRIC INTENSITY (cd)[2] RED LAMPS**	**Measurements**		
			Location	**Measured**	**Reaim**
10U	45L[1]	0.25			
	V	0.25			
	45R[1]	0.25			
H	45L[1]	0.25			
	V	0.25			
	45R[1]	0.25			
10D[3]	45L[1]	0.25			
	V	0.25			
	45R[1]	0.25			
MAXIMUM PHOTOMETRIC INTENSITY[3] (cd) RED LAMPS		15			

* Denotes failure.

(1) Where clearance lamps or identification lamps are mounted with their axis of reference less than 750mm above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) When optically combined with a stop lamp or turn signal lamp, this maximum applies on or above the horizontal.

(4) Where clearance lamps are installed at locations other than on the front and rear due to the necessity to indicate the overall width of the vehicle, or for protection from damage during normal operation of the vehicle, they need not meet the photometric intensity requirement at any test point that is 45º inboard.

PHOTOMETRY TEST– CLEARANCE AND ID LAMP (AMBER)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

CLEARANCE AND ID LAMP PHOTOMETRY REQUIREMENTS (see TABLE X of FMVSS No. 108)					
TEST POINT (degrees)		**MINIMUM PHOTOMETRIC INTENSITY (cd)[2] AMBER LAMPS**	**Measurements**		
			Location	**Measured**	**Reaim**
10U	45L[1]	0.62			
	V	0.62			
	45R[1]	0.62			
H	45L[1]	0.62			
	V	0.62			
	45R[1]	0.62			
10D[3]	45L[1]	0.62			
	V	0.62			
	45R[1]	0.62			

* Denotes failure.

(1) Where clearance lamps or identification lamps are mounted with their axis of reference less than 750mm above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(2) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(3) When optically combined with a stop lamp or turn signal lamp, this maximum applies on or above the horizontal.

(4) Where clearance lamps are installed at locations other than on the front and rear due to the necessity to indicate the overall width of the vehicle, or for protection from damage during normal operation of the vehicle, they need not meet the photometric intensity requirement at any test point that is 45º inboard.

12.6) BACKUP LAMP TEST PROCEDURE

12.6.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.6.2) NUMBER

Each vehicle must be equipped with at least the following number of side marker lamps:

Vehicle type/size	Number of lamps
Passenger cars	1 Additional lamps allowed to meet requirements.
MPV	
Trucks	
Buses	
Trailers	No requirement.
Motorcycles	

12.6.3) COLOR OF LIGHT

The devices shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the device shall be white, as defined in that procedure. A backup lamp may project incidental red, yellow, or white light through reflectors or lenses that are adjacent close to or part of the lamp assembly.

12.6.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

<table>
<tr><th rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">On the rear.</td><td rowspan="4">No requirement.</td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td>Trailers</td><td rowspan="2">No requirement.</td><td rowspan="2">No requirement.</td></tr>
<tr><td>Motorcycles</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

12.6.5) ACTIVATION

See activation requirements in Table(s) I-a, I-b, and I-c, as applicable, in FMVSS No. 108.

12.6.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.6.7) VISIBILITY

Lamps must be mounted so that the optical center of at least one lamp is visible from any eye point elevation from at least 1828 mm to 610 mm above the horizontal plane on which the vehicle is standing; and from any position in the area, rearward of a vertical plane perpendicular to the longitudinal axis of the vehicle, 914 mm to the rear of the vehicle and extending 914 mm beyond each side of the vehicle.

12.6.8) INDICATOR

No requirement.

12.6.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.6.10) SPACING TO OTHER LAMPS

No requirement.

12.6.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.6.12) RATIO

No requirement.

12.6.13) PHOTOMETRY

The device shall be photometry tested as outlined in Appendix G. The test devices shall meet the cp specifications listed in the following table.

TABLE XII: BACKUP LAMP PHOTOMETRY REQUIREMENTS							
GROUP NUMBER	**TEST POINT (degrees)**		**MAXIMUM PHOTOMETRIC INTENSITY (cd) ANY SINGLE LAMP**	**TWO LAMP SYSTEM – EACH LAMP**		**SINGLE LAMP SYSTEM**	
				MINIMUM PHOTOMETRIC INTENSITY (cd)[(1)(4)]	**GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)**	**MINIMUM PHOTOMETRIC INTENSITY (cd)[(1)(4)]**	**GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)**
1[(2)(3)]	45L	5U	300	15	45	30	90
		H	300	15		30	
		5D	-	15		30	
2[(2)(3)]	30L	H	300	25	50	50	100
		5D	-	25		50	
3	10L	10U	300	10	100	20	200
		5U	300	20		40	
	V	10U	300	15		30	
		5U	300	25		50	
	10R	10U	300	10		20	
		5U	300	20		40	
4	10L	H	300	50	360	100	720
		5D	-	50		100	
	V	H	300	80		160	
		5D	-	80		160	
	10R	H	300	50		100	
		5D	-	50		100	
5[(2)(3)]	30R	H	300	25	50	50	100
		5D	-	25		50	
6[(2)(3)]	45R	5U	300	15	45	30	90
		H	300	15		30	
		5D	-	15		30	

(1) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(2) When two lamps of the same or symmetrically opposite design are used, the tested photometric values along the vertical axis and the averages of the tested photometric values for the same horizontal test point left and right of vertical for one lamp must be used to determine compliance with the requirements.

(3) When two lamps of differing designs are used, they must be tested individually and the tested photometric values added to determine the combined units compliance with twice the stated requirements.

(4) If the sum of intensity values for all points in the zone is not less than the specified total value for the zone, the measured intensity value for each individual test point is not required to meet the minimum value.

12.6.14) PHYSICAL TESTS

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

COLOR TEST

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. The color of the device shall be red or yellow as defined in the procedure.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

12.6.15) BACKUP LAMP PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST – BACKUP LAMP WITH TWO LAMP SYSTEM

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

BACKUP LAMP PHOTOMETRY REQUIREMENTS (See Table XII of FMVSS No. 108)									
GROUP NUMBER	TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd) ANY SINGLE LAMP	TWO LAMP SYSTEM – EACH LAMP					
				MINIMUM PHOTOMETRIC INTENSITY (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
				Required Minimum	Measurements			Required Minimum	Measured
					Location	Measured	Reaim		
1	45L	5U	300	15				45	
		H	300	15					
		5D	-	15					
2	30L	H	300	25				50	
		5D	-	25					
3	10L	10U	300	10				100	
		5U	300	20					
	V	10U	300	15					
		5U	300	25					
	10R	10U	300	10					
		5U	300	20					
4	10L	H	300	50				360	
		5D	-	50					
	V	H	300	80					
		5D	-	80					
	10R	H	300	50					
		5D	-	50					
5	30R	H	300	25				50	
		5D	-	25					
6	45R	5U	300	15				45	
		H	300	15					
		5D	-	15					

PHOTOMETRY TEST – BACKUP LAMP WITH SINGLE LAMP SYSTEM

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

BACKUP LAMP PHOTOMETRY REQUIREMENTS (See Table XII of FMVSS No. 108)									
GROUP NUMBER	TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd) ANY SINGLE LAMP	SINGLE LAMP SYSTEM – EACH LAMP					
				MINIMUM PHOTOMETRIC INTENSITY (cd)				GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
				Required Minimum	Measurements			Required Minimum	Measured
					Location	Measured	Reaim		
1	45L	5U	300	30				90	
		H	300	30					
		5D	-	30					
2	30L	H	300	50				100	
		5D	-	50					
3	10L	10U	300	20				200	
		5U	300	40					
	V	10U	300	30					
		5U	300	50					
	10R	10U	300	20					
		5U	300	40					
4	10L	H	300	100				720	
		5D	-	100					
	V	H	300	160					
		5D	-	160					
	10R	H	300	100					
		5D	-	100					
5	30R	H	300	50				100	
		5D	-	50					
6	45R	5U	300	30				90	
		H	300	30					
		5D	-	30					

12.7) LICENSE PLATE LAMP TEST PROCEDURE

12.7.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.7.2) NUMBER

Each vehicle must be equipped with at least the following number of license plate lamps:

Vehicle type/size	Number of lamps
Passenger cars	1 Additional lamps allowed to meet requirements.
MPV	
Trucks	
Buses	
Trailers	
Motorcycles	

12.7.3) COLOR OF LIGHT

The devices shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the device shall be white, as defined in that procedure.

12.7.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

Vehicle type/size	Mounting	
	Location	Height*
Passenger cars	On the rear to illuminate license plate from top or sides.	No requirement.
MPV		
Trucks		
Buses		
Trailers		
Motorcycles		

* Height above road surface measured from center of device with vehicle at curb weight

12.7.5) ACTIVATION

Steady burning.

12.7.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.7.7) VISIBILITY

No requirement.

12.7.8) INDICATOR

No requirement.

12.7.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.7.10) SPACING TO OTHER LAMPS

No requirement.

12.7.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.7.12) RATIO

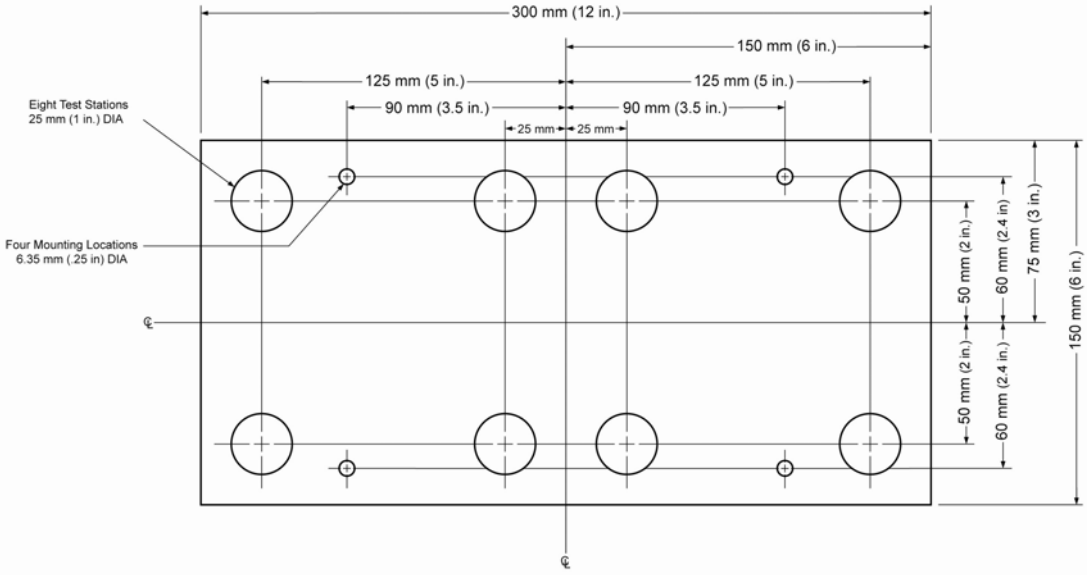
No requirement.

12.7.13) PHOTOMETRY

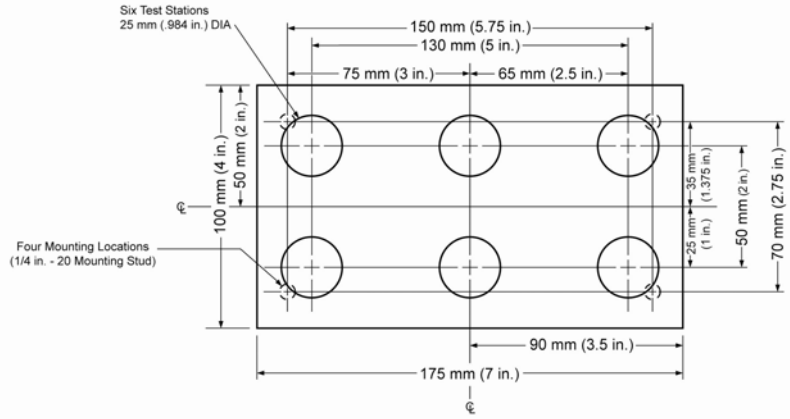
The device shall be photometry tested as outlined in Appendix G. The test devices shall meet the cp specifications listed in the following table.

As specified in FMVSS No. 108 paragraph S7.7.13, an illumination value of no less than 8 lx [0.75 fc.] must be met at each test station target location shown in the following figure. The ratio of the average of the two highest illumination values divided by the average of the two lowest illumination values must not exceed 20:1 for vehicles other than motorcycles and motor driven cycles. The ratio of the highest illumination value divided by the average of the two lowest illumination values must not exceed 15:1 for motorcycles and motor driven cycles.

LICENSE PLATE LAMP TARGET LOCATIONS



Test Plate for Vehicles other than Motorcycles and Motor Driven Cycles



Test Plate for Motorcycles and Motor Driven Cycles

12.7.14) PHYSICAL TESTS

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

COLOR TEST

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. The color of the device shall be red or yellow as defined in the procedure.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

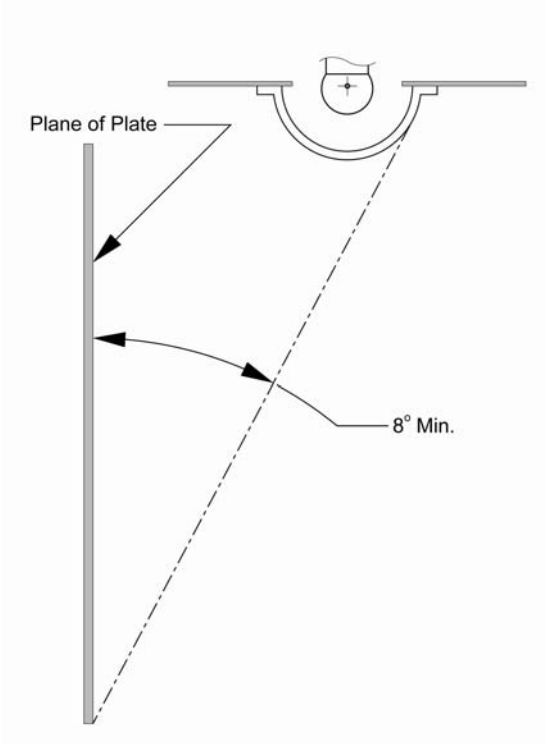
12.7.15) INSTALLATION

As specified in FMVSS No. 108 paragraph S7.7.15, each license plate lamp installed on a vehicle other than a motorcycle or motor driven cycle must be of such size and design as to provide illumination on all parts of a 150 mm by 300 mm test plate. Each license plate lamp installed on a motorcycle or motor driven cycle must be of such size and design as to provide illumination on all parts of a 100 mm by 175 mm test plate. The light rays must reach all portions of an imaginary plate of the same size at least 25 mm. ahead of the actual plate measured perpendicular to the plane of the plate.

When a single lamp as shown in the following figure is used to illuminate the license plate, the lamp and license plate holder must bear such relation to each other that at no point on the plate must the incident light make an angle of less than 8° to the plane of the plate, this angle being measured from the edge of the light emitting surface of the lamp farthest from the surface of the plate.

When two or more lamps are used to illuminate the license plate, the minimum 8° incident light angle must apply only to that portion of the plate which the particular lamp is designed to illuminate. The angle must be measured in the same manner as directed above.

MEASUREMENT OF INCIDENT LIGHT ANGLE



12.7.16) LICENSE PLATE LAMP PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST – LICENSE PLATE LAMP

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

LICENSE PLATE LAMP PHOTOMETRY REQUIREMENTS					
Required Minimum	**Location**	**Measurement**	**Reaim**	**Average of Two Highest Values**	**Ratio* High Avg / Low Avg**
8 lx [0.75 fc]	1				
	2				
	3				
	4			**Average of Two Lowest Values**	
	5				
	6				
	7				
	8				

* The ratio of the average of the two highest illumination values divided by the average of the two lowest illumination values must not exceed 20:1 for vehicles other than motorcycles and motor driven cycles and 15:1 for motorcycles and motor driven cycles.

12.8) PARKING LAMP TEST PROCEDURE

12.8.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.8.2) NUMBER

Each vehicle must be equipped with at least the following number of parking lamps:

<table>
<tr><th colspan="2">Vehicle type/size</th><th>Number of lamps</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">Less than 2032 mm in overall width.</td><td rowspan="4">2</td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td colspan="2">Trailers</td><td rowspan="2">No requirement.</td></tr>
<tr><td colspan="2">Motorcycles</td></tr>
</table>

12.8.3) COLOR OF LIGHT

The devices shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the device shall be amber or white, as defined in that procedure.

12.8.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

<table>
<tr><th colspan="2" rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">Less than 2032 mm in overall width.</td><td rowspan="4">On the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="4">Not less than 15 inches, nor more than 72 inches.</td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td colspan="2">Trailers</td><td rowspan="2">No requirement.</td><td rowspan="2">No requirement.</td></tr>
<tr><td colspan="2">Motorcycles</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

12.8.5) ACTIVATION

Steady burning. Must be activated when the headlamps are activated in a steady burning state.

12.8.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.8.7) VISIBILITY

LIGHTING DEVICE	CORNER POINTS[1][2]		REQUIRED VISIBILITY
Parking lamp	15º UP - 45º IB	15º UP - 45º OB	Unobstructed minimum effective projected luminous lens area of 1250 sq. mm. in any direction throughout the pattern defined by the specified corner points.
	15º DOWN - 45º IB	15º DOWN - 45º OB	

[1] IB indicates an inboard direction (toward the vehicle's longitudinal centerline) and OB indicates an outboard direction

[2] Where a lamp is mounted with its axis of reference less than 750 mm. above the road surface the vertical test point angles located below the horizontal plane subject to visibility requirements may be reduced to 5º down.

12.8.8) INDICATOR

No requirement.

12.8.9) MARKINGS

Each lamp may be marked with the symbol "DOT" which constitutes a certification that it conforms to the requirements of this standard.

12.8.10) SPACING TO OTHER LAMPS

No requirement.

12.8.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.8.12) RATIO

When a parking lamp on a multipurpose passenger vehicle, truck, trailer, or bus of 2032 mm or more in overall width, is combined with a front turn signal lamp, the luminous intensity of the front turn signal lamp at each identified test point must not be less than the luminous intensity of the parking lamp or clearance lamp at that same test point times the multiplier shown for that test point in Table VI of FMVSS No. 108.

12.8.13) PHOTOMETRY

The device shall be photometry tested as outlined in Appendix G. The photometer shall be located at a distance of 100 feet from the test device. The test devices shall meet the cp specifications listed in the following table.

If the lamp is tested as part of a combination lamp, the appropriate data sheet shall be completed including minimum ratios required between the parking and the turn signal lamp.

TABLE XIV: PARKING LAMP PHOTOMETRY REQUIREMENTS

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY[1][2] (cd)	MAXIMUM PHOTOMETRIC INTENSITY (cd)	GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)
1	20L	5U	0.4	125	2.4
		5D	0.4	250	
	5L	10U	0.8	125	
		10D[3]	0.8	250	
2	10L	5U	0.8	125	3.0
		H	1.4	125	
		5D	0.8	250	
3	V	5U	2.8	125	16.8
	5L	H	3.6	125	
	V		4.0	125	
	5R		3.6	125	
	V	5D	2.8	250	
4	10R	5U	0.8	125	3.0
		H	1.4	125	
		5D	0.8	250	
5	5R	10U	0.8	125	2.4
		10D[3]	0.8	250	
	20R	5U	0.4	125	
		5D	0.4	250	

(1) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(2) If the sum of intensity values for all points in the zone is not less than the specified total value for the zone, the measured intensity value for each individual test point is not required to meet the minimum value.

(3) Where parking lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

12.8.14) PHYSICAL TESTS

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

COLOR TEST

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. The color of the device shall be red or yellow as defined in the procedure.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

12.8.15) PARKING LAMP PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST – PARKING LAMP

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

PARKING LAMP PHOTOMETRY REQUIREMENTS
(see TABLE XIV of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY (cd)	MAXIMUM PHOTOMETRIC INTENSITY (cd)	Measurements			GROUP MINIMUM PHOTOMETRIC INTENSITY (cd)	
					Location	Measured	Reaim	Required Minimum	Measured
1	20L	5U	0.4	125				2.4	
		5D	0.4	250					
	5L	10U	0.8	125					
		10D	0.8	250					
2	10L	5U	0.8	125				3.0	
		H	1.4	125					
		5D	0.8	250					
3	V	5U	2.8	125				16.8	
	5L	H	3.6	125					
	V		4.0	125					
	5R		3.6	125					
	V	5D	2.8	250					
4	10R	5U	0.8	125				3.0	
		H	1.4	125					
		5D	0.8	250					
5	5R	10U	0.8	125				2.4	
		10D	0.8	250					
	20R	5U	0.4	125					
		5D	0.4	250					

12.9) HIGH MOUNTED STOP LAMP TEST PROCEDURE

12.9.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.9.2) NUMBER

Each vehicle must be equipped with at least the following number of high mounted stop lamps:

<table>
<tr><th colspan="2">Vehicle type/size</th><th>Number of lamps</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">Less than 2032 mm in overall width and with a GVWR of 10,000 lbs or less.</td><td rowspan="4">1, or 2 where exceptions apply. (See paragraph S6.1.1.2 of FMVSS No. 108 for exceptions.)</td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td colspan="2">Trailers</td><td rowspan="2">No requirement.</td></tr>
<tr><td colspan="2">Motorcycles</td></tr>
</table>

12.9.3) COLOR OF LIGHT

The devices shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the device shall be red, as defined in that procedure.

12.9.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

A high-mounted stop lamp mounted inside the vehicle must have means provided to minimize reflections from the light of the lamp upon the rear window glazing that might be visible to the driver when viewed directly, or indirectly in the rearview mirror.

Each high-mounted stop lamp must provide access for convenient replacement of bulbs without special tools.

A high-mounted stop lamp mounted below the rear window must have no lens portion lower than 153 mm. [6 in.] below the lower edge of the rear glazing on convertibles, or 77 mm. [3 in.] on other passenger cars.

<table>
<tr><th colspan="2" rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">Less than 2032 mm in overall width and with a GVWR of 10,000 lbs or less.</td><td rowspan="4">On the rear including glazing, with the lamp center on the vertical centerline as viewed from the rear.</td><td rowspan="4">Not less than 34 inches except for passenger cars.</td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td colspan="2">Trailers</td><td rowspan="2">No requirement.</td><td rowspan="2">No requirement.</td></tr>
<tr><td colspan="2">Motorcycles</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

12.9.5) ACTIVATION

Steady burning. Must only be activated upon application of the service brakes or by a device designed to retard the motion of the vehicle.

12.9.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

TABLE IV-b. EFFECTIVE PROJECTED LUMINOUS LENS AREA REQUIREMENTS		
LIGHTING DEVICE	**PASSENGER CARS, MULTIPURPOSE PASSENGER VEHICLES, TRUCKS, AND BUSES OF LESS THAN 2032 MM. IN OVERALL WIDTH AND WITH A GVWR OF 10,000 LBS OR LESS USING A SINGLE LAMP** MINIMUM EFFECTIVE PROJECTED LUMINOUS LENS AREA (sq. mm.)	**MULTIPURPOSE PASSENGER VEHICLES, TRUCKS, AND BUSES OF LESS THAN 2032 MM. IN OVERALL WIDTH AND WITH A GVWR OF 10,000 LBS OR LESS USING DUAL LAMPS OF IDENTICAL SIZE AND SHAPE** MINIMUM EFFECTIVE PROJECTED LUMINOUS LENS AREA EACH LAMP (sq. mm.)
High-mounted stop lamp	2903	1452

12.9.7) VISIBILITY

Signal must be visible to the rear through a horizontal angle from 45º to the left to 45º to the right of the longitudinal axis of the vehicle. (Single lamp or two lamps together where required by paragraph S6.1.1.2 of FMVSS No. 108)

12.9.8) INDICATOR

No requirement.

12.9.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.9.10) SPACING TO OTHER LAMPS

No high-mounted stop lamp is permitted to be combined with any other lamp or reflective device, other than with a cargo lamp.

No high-mounted stop lamp is permitted to be combined optically with any cargo lamp.

12.9.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.9.12) RATIO

No requirement.

12.9.13) PHOTOMETRY

The device shall be photometry tested as outlined in Appendix G. The test devices shall meet the cp specifications listed in the following table.

Testing for photometric performance of high-mounted stop lamps which are installed inside vehicles shall be made with glazing from the same vehicle in place, at the angular relationship to the lamp which exists in the vehicle.

TABLE XV: HIGH-MOUNTED STOP LAMP PHOTOMETRY REQUIREMENTS				
GROUP NUMBER	**TEST POINT (degrees)**		**MINIMUM PHOTOMETRIC INTENSITY(1)(2)(3) (cd)**	**GROUP MINIMUM PHOTOMETRIC INTENSITY(3) (cd)**
1	5U	V	25	125
	H	5L	25	
	H	V	25	
	H	5R	25	
	5D	V	25	
2	5U	5R	25	98
	5U	10R	16	
	H	10R	16	
	5D	10R	16	
	5D	5R	25	
3	5U	5L	25	98
	5U	10L	16	
	H	10L	16	
	5D	10L	16	
	5D	5L	25	
4	10U	10L	8	32
	10U	V	16	
	10U	10R	8	
MAXIMUM PHOTOMETRIC INTENSITY(4)			160	

(1) The photometric intensity values between test points must not be less than the lower specified minimum value of the two closest adjacent test points on a horizontal or vertical line.

(2) The photometric intensity at each test point must not be less than 60%of the specified minimum value when considering overall group or zone photometry tables.

(3) Where a pair of lamps identical in size and shape are used due to vehicle construction, they together must meet photometric requirements.

(4) The maximum photometric intensity must not occur over any area larger than that generated by a 0.25º radius within a solid cone angle within the rectangle bounded by test points 10U-10L, 10U-10R, 5D-10L, and 5D-10R.

12.9.14) PHYSICAL TESTS

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

COLOR TEST

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. The color of the device shall be red or yellow as defined in the procedure.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

MOISTURE TEST*

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST*

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST*

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

* These tests do not apply to high-mounted stop lamps that are mounted inside the vehicle.

12.9.15) HIGH MOUNTED STOP LAMP PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST – HIGH-MOUNTED STOP LAMP

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HIGH-MOUNTED STOP LAMP PHOTOMETRY REQUIREMENTS (see TABLE XV of FMVSS No. 108)

GROUP NUMBER	TEST POINT (degrees)		MINIMUM PHOTOMETRIC INTENSITY[1][2][3] (cd)	Measurements			GROUP MINIMUM PHOTOMETRIC INTENSITY[3] (cd)	
				Location	Measured	Reaim	Required Minimum	Measured
1	5U	V	25				125	
	H	5L	25					
	H	V	25					
	H	5R	25					
	5D	V	25					
2	5U	5R	25				98	
	5U	10R	16					
	H	10R	16					
	5D	10R	16					
	5D	5R	25					
3	5U	5L	25				98	
	5U	10L	16					
	H	10L	16					
	5D	10L	16					
	5D	5L	25					
4	10U	10L	8				32	
	10U	V	16					
	10U	10R	8					
MAXIMUM PHOTOMETRIC INTENSITY[4]			160					

12.10) DAYTIME RUNNING LAMP TEST PROCEDURE

12.10.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.10.2) NUMBER

Each vehicle is allowed to be equipped with at least the following number of daytime running lamps:

Vehicle type/size	Number of lamps
Passenger cars	2
MPV	
Trucks	
Buses	
Trailers	No requirement.
Motorcycles	

12.10.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the two identically colored devices shall be either white, white to yellow, white to selective yellow, selective yellow, or yellow, as specified in the procedure.

12.10.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

<table>
<tr><th rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">On the front, symmetrically disposed about the vertical centerline if not a pair of lamps required by this standard or if not optically combined with a pair of lamps required by this standard.</td><td rowspan="4">Not more than 1.067 meters above the road surface if not a pair of lamps required by this standard or if not optically combined with a pair of lamps required by this standard. See paragraph S7.10.13(b) in FMVSS No. 108 for additional height limitation.</td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td>Trailers</td><td rowspan="2">No requirement.</td><td rowspan="2">No requirement.</td></tr>
<tr><td>Motorcycles</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

12.10.5) ACTIVATION

Steady burning. Automatically activated as determined by the vehicle manufacturer and automatically deactivated when the headlamp control is in any “on” position. Each DRL optically combined with a turn signal lamp must be automatically deactivated as a DRL when the turn signal lamp or hazard warning lamp is activated, and automatically reactivated as a DRL when the turn signal lamp or hazard warning lamp is deactivated. See paragraph S7.10.10.1(c) in FMVSS No. 108 for additional activation requirements when mounted close to, or combined with, a turn signal lamp.

12.10.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.10.7) VISIBILITY

No requirement.

12.10.8) INDICATOR

No requirement.

12.10.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.10.10) SPACING TO OTHER LAMPS

Each DRL not optically combined with a turn signal lamp must be located on the vehicle so that the distance from its lighted edge to the optical center of the nearest turn signal lamp is not less than 100 mm. unless,

(a) The luminous intensity of the DRL is not more than 2,600 cd. at any location in the beam and the turn signal lamp meets 2.5 times the base front turn signal photometric requirements: or,

(b) The DRL is optically combined with a lower beam headlamp and the turn signal lamp meets 2.5 times the base front turn signal photometric requirements: or,

(c) The DRL is deactivated when the turn signal or hazard warning signal lamp is activated.

12.10.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.10.12) RATIO

No requirement.

12.10.13) PHOTOMETRY

Each DRL must have a luminous intensity not less than 500 cd at test point H-V, nor more than 3,000 cd at any location in the beam when tested according to the procedure in Appendix G, unless it is:

(a) A lower beam headlamp intended to operate as a DRL at full voltage, or a voltage lower than used to operate it as a lower beam; or

(b) An upper beam headlamp intended to operate as a DRL, whose luminous intensity at test point H-V is not more than 7,000 cd., and whose mounting height is not higher than 864 mm

12.10.14) PHYSICAL TESTS

COLOR TEST

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. The color of the device shall be red or yellow as defined in the procedure.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

12.10.15) DAYTIME RUNNING LAMP PHOTOMETRY DATA SHEET SAMPLES

PHOTOMETRY TEST – DAYTIME RUNNING LAMP

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

DAYTIME RUNNING LAMP PHOTOMETRY REQUIREMENTS						
TEST POINT (degrees)		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	MEASUREMENTS		
				Location	Measured	Reaim
(1) 10U to 90U	(1) 90L to 90R	3000 (at any location in the beam)	-			
4U	8L & 8R		-			
2U	4L		-			
1.5U	1R to 3R		-			
1.5U	1R to R		-			
1U	1.5L to L		-			
0.5U	1.5L to L		-			
0.5U	1R to 3R		-			
H	V		500			
H	4L		-			
H	8L		-			
0.5D	1.5L to L		-			
0.5D	1.5R		-			
0.6D	1.3R		-			
0.86D	V		-			
0.86D	3.5L		-			
1D	6L		-			
1.5D	2R		-			
1.5D	9L & 9R		-			
2D	9L & 9R		-			
2D	15L & 15R		-			
2.5D	V		-			
2.5D	12L & 12R		-			
4D	V		-			
4D	4R		-			
4D	20L & 20R		-			

PHOTOMETRY TEST – DAYTIME RUNNING LAMP
(Upper Beam intended to operate as DRL)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		UPPER BEAM #5 (UB5)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	-			
1U	3L &3R	-	-			
H	V	7,000	-			
H	3L & 3R	-	-			
H	6L & 6R	-	-			
H	9L & 9R	-	-			
H	12L & 12R	-	-			
1.5D	V	-	-			
1.5D	9L & 9R	-	-			
2.5D	V	-	-			
2.5D	12L & 12R	-	-			
4D	V	-	-			

12.11) SCHOOL BUS SIGNAL LAMPS TEST PROCEDURE

12.11.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.11.2) NUMBER

Each school bus, except multifunction school activity buses, must be equipped with the following number of school bus signal lamps:

Location	Number of lamps
Front	2 red; or 2 red plus 2 amber
Rear	2 red; or 2 red plus 2 amber

12.11.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the device shall be red or amber, as applicable, as specified in the procedure.

12.11.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

Location	Mounting	
	Location	Height*
Front	On the front of the cab as far apart as practicable, but in no case shall the spacing between lamps be less than 40 inches. Amber lamps, when installed, at the same height as and just inboard of the red lamp.	As high as practicable but at least above the windshield.
Rear	On the rear cab as far apart as practicable, but in no case shall the spacing between lamps be less than 40 inches. Amber lamps, when installed, at the same height as and just inboard of the red lamp.	As high as practicable but at least above the top of any side window opening.

* Height above road surface measured from center of device with vehicle at curb weight

12.11.5) ACTIVATION

Location	Activation
Front	Flashing alternately between 60 to 120 cycles per minute, with an activation period sufficient to allow the lamp to reach full brightness, when actuated by a manual switch. Amber lamps, when installed, may only be activated by manual or foot operation, and must be automatically deactivated and the red lamps must be automatically activated when the bus entrance door is opened.
Rear	Flashing alternately between 60 to 120 cycles per minute, with an activation period sufficient to allow the lamp to reach full brightness, when actuated by a manual switch. Amber lamps, when installed, may only be activated by manual or foot operation, and must be automatically deactivated and the red lamps must be automatically activated when the bus entrance door is opened.

12.11.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

Minimum of 12,258 sq. mm.

12.11.7) VISIBILITY

Signal of front lamps to the front and rear lamps to the rear must be unobstructed within area bounded by 5º up to 10º down and 30º left to 30º right.

12.11.8) INDICATOR

No requirement.

12.11.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.11.10) SPACING TO OTHER LAMPS

No requirement.

12.11.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.11.12) RATIO

No requirement.

12.11.13) PHOTOMETRY

Each school bus signal lamp must be designed to conform to the photometry requirements shown in the below table, when tested according to the procedure of Appendix G, for the applicable lamp color.

TABLE XVII: SCHOOL BUS SIGNAL LAMP PHOTOMETRY REQUIREMENTS			
TEST POINT (degrees)		**MINIMUM PHOTOMETRIC INTENSITY (cd)[2] RED LAMPS**	**MINIMUM PHOTOMETRIC INTENSITY (cd) AMBER LAMPS**
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[1]	5L	40	100
	V	40	100
	5R	40	100

(1) Where school bus signal lamps are mounted with their axis of reference less than 750 mm. above the road surface photometry, requirements below 5º down may be met at 5º down rather than at the specified required downward angle.

(2) The photometric intensity values between test points must not be less than the lower specified Minimum value of the two closest adjacent test points on a horizontal or vertical line.

12.11.14) PHYSICAL TESTS

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

COLOR TEST

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. The color of the device shall be red or yellow as defined in the procedure.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

12.11.15) SCHOOL BUS SIGNAL LAMP DATA SHEET SAMPLES

PHOTOMETRY TEST – SCHOOL BUS SIGNAL LAMP (RED LAMPS)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

SCHOOL BUS SIGNAL LAMP PHOTOMETRY REQUIREMENTS (RED LAMPS) **(See Table XVII of FMVSS No. 108)**					
TEST POINT (degrees)		**MINIMUM PHOTOMETRIC INTENSITY (cd) RED LAMPS**	**MEASUREMENTS**		
			Location	**Measured**	**Reaim**
5U	20L	150			
	10L	300			
	5L	300			
	V	300			
	5R	300			
	10R	300			
	20R	150			
H	30L	30			
	20L	180			
	10L	400			
	5L	500			
	V	600			
	5R	500			
	10R	400			
	20R	180			
	30R	30			
5D	30L	30			
	20L	200			
	10L	300			
	5L	450			
	V	450			
	5R	450			
	10R	300			
	20R	200			
	30R	30			
10D	5L	40			
	V	40			
	5R	40			

PHOTOMETRY TEST – SCHOOL BUS SIGNAL LAMP (AMBER LAMPS)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

SCHOOL BUS SIGNAL LAMP PHOTOMETRY REQUIREMENTS (AMBER LAMPS) **(See Table XVII of FMVSS No. 108)**					
TEST POINT (degrees)		**MINIMUM PHOTOMETRIC INTENSITY (cd) AMBER LAMPS**	**MEASUREMENTS**		
			Location	**Measured**	**Reaim**
5U	20L	375			
	10L	750			
	5L	750			
	V	750			
	5R	750			
	10R	750			
	20R	375			
H	30L	75			
	20L	450			
	10L	1000			
	5L	1250			
	V	1500			
	5R	1250			
	10R	1000			
	20R	450			
	30R	75			
5D	30L	75			
	20L	500			
	10L	750			
	5L	1125			
	V	1125			
	5R	1125			
	10R	750			
	20R	500			
	30R	75			
10D	5L	100			
	V	100			
	5R	100			

12.12) REFLEX REFLECTORS TEST PROCEDURE

12.12.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

The device shall be physically inspected. Record all markings.

Describe the method of mounting the device to the vehicle.

12.12.2) NUMBER

Each vehicle must be equipped with at least the following number of reflex reflectors:

Vehicle type/size	Number of lamps
Passenger cars MPV Trucks Buses	**2 Amber** (side/front) **2 Red** (side/rear)(*not required on truck tractors*) **2 Red** (rear)
Trailers* * *A trailer equipped with a conspicuity treatment in conformance with S8.2 of FMVSS No. 108 need not be equipped with reflex reflectors if the conspicuity material is placed at the locations of the required reflex reflectors.*	**2 Amber** (side/front)(*not required on trailers less than 1829 mm [6 ft] in overall length including the trailer tongue*) **2 Red** (side/rear) **2 Red** (rear)(*may use 1 Red on trailers less than 30 inches wide*)
Motorcycles	**2 Amber** (side/front) **2 Red** (side/rear)(*not required on truck tractors*) **1 Red** (rear)

12.12.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulus method may be used. The color of the device shall be red or amber, as applicable, as specified in the procedure.

12.12.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

<table>
<tr><th rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">Amber (side/front): On each side, as far to the front as practicable.

Red (side/rear): On each side, as far to the rear as practicable.

Red (rear): On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable.
(On a truck tractor, may be mounted on the back of the cab not less than 4 inches above the height of the rear tires)</td><td rowspan="3">Not less than 15 inches nor more than 60 inches.</td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td>Trailers</td><td>Amber (side/front): On each side, as far to the front as practicable exclusive of the trailer tongue..

Red (side/rear): On each side, as far to the rear as practicable.

Red (rear): On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable. When a single reflector is installed it must be mounted at or near the vertical centerline.</td></tr>
<tr><td>Motorcycles</td><td>Amber (side/front): On each side, as far to the front as practicable.

Red (side/rear): On each side, as far to the rear as practicable.

Red (rear): On the rear, on the vertical centerline except that, if two are used on the rear, they must be symmetrically disposed about the vertical centerline.</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

12.12.5) ACTIVATION

No requirement.

12.12.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.12.7) VISIBILITY

No requirement.

12.12.8) INDICATOR

No requirement.

12.12.9) MARKINGS

Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

12.12.10) SPACING TO OTHER LAMPS

No requirement.

12.12.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.12.12) RATIO

No requirement.

12.12.14) PHOTOMETRY

Each reflex reflector must be designed to conform to the photometry requirements below when tested according to the procedure of Appendix G for the applicable reflex reflector color.

REFLEX REFLECTOR PHOTOMETRY REQUIREMENTS

(see TABLE XVI-a of FMVSS No. 108)

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE					
		RED REFLECTORS		AMBER REFLECTORS		WHITE REFLECTORS	
		(cd/incident ft-c)	(mcd/lux)	(cd/incident ft-c)	(mcd/lux)	(cd/incident ft-c)	(mcd/lux)
0.2	0	4.5	420	11.25	1050	18	1680
	10U	3.0	280	7.5	700	12	1120
	10D(1)	3.0	280	7.5	700	12	1120
	20L	1.5	140	3.75	350	6	560
	20R	1.5	140	3.75	350	6	560
1.5	0	0.07	6	0.175	15	0.28	24
	10U	0.05	5	0.125	12.5	0.2	20
	10D(1)	0.05	5	0.125	12.5	0.2	20
	20L	0.03	3	0.075	7.5	0.12	12
	20R	0.03	3	0.075	7.5	0.12	12

(1) Where reflex reflectors are mounted with their axis of reference less than 750 mm. above the road surface photometry requirements below 5º down may be met at 5º down rather than at the required specified downward angle.

12.12.14) PHYSICAL TESTS

Each reflex reflector must be designed to conform to the following performance requirements:

VIBRATION TEST

The device shall be tested for vibration in accordance with the general Vibration Test procedure as outlined in Appendix B.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested for dust in accordance with the general Dust Test procedure as outlined in Appendix D. At the completion of the test, the maximum cp of the device must be within 10 percent of the cp recorded prior to the test.

CORROSION TEST

The device shall be tested for corrosion in accordance with the general Corrosion Test procedure as outlined in Appendix E. At the completion of the test, there shall be no evidence of corrosion which impairs the optical performance of the device. If it is suspected that any corrosion present would impair light output, the device shall be rephotometered to determine if the cp requirements are still met.

COLOR TEST

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. The color of the device shall be red or yellow as defined in the procedure.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

12.12.15) REFLEX REFLECTOR DATA SHEET SAMPLES

PHOTOMETRY TEST – REFLEX REFLECTOR (RED REFLECTORS)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

REFLEX REFLECTOR PHOTOMETRY REQUIREMENTS
(see TABLE XVI-a of FMVSS No. 108)

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE RED REFLECTORS		MEASUREMENTS		
		(cd/incident ft-c)	(mcd/lux)	Location	Measured	Reaim
0.2	0	4.5	420			
	10U	3.0	280			
	10D	3.0	280			
	20L	1.5	140			
	20R	1.5	140			
1.5	0	0.07	6			
	10U	0.05	5			
	10D	0.05	5			
	20L	0.03	3			
	20R	0.03	3			

PHOTOMETRY TEST – REFLEX REFLECTOR (AMBER REFLECTORS)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

REFLEX REFLECTOR PHOTOMETRY REQUIREMENTS
(see TABLE XVI-a of FMVSS No. 108)

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE AMBER REFLECTORS		MEASUREMENTS		
		(cd/incident ft-c)	(mcd/lux)	Location	Measured	Reaim
0.2	0	11.25	1050			
	10U	7.5	700			
	10D	7.5	700			
	20L	3.75	350			
	20R	3.75	350			
1.5	0	0.175	15			
	10U	0.125	12.5			
	10D	0.125	12.5			
	20L	0.075	7.5			
	20R	0.075	7.5			

PHOTOMETRY TEST – REFLEX REFLECTOR (WHITE REFLECTORS)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

REFLEX REFLECTOR PHOTOMETRY REQUIREMENTS
(see TABLE XVI-a of FMVSS No. 108)

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE WHITE REFLECTORS		MEASUREMENTS		
		(cd/incident ft-c)	(mcd/lux)	Location	Measured	Reaim
0.2	0	18	1680			
	10U	12	1120			
	10D	12	1120			
	20L	6	560			
	20R	6	560			
1.5	0	0.28	24			
	10U	0.2	20			
	10D	0.2	20			
	20L	0.12	12			
	20R	0.12	12			

12.13) CONSPICUITY SYSTEMS TEST PROCEDURE

The requirement for conspicuity systems may be met with retroreflective sheeting, conspicuity reflex reflectors, or a combination of retroreflective sheeting and conspicuity reflex reflectors.

12.13.1) RETROREFLECTIVE SHEETING

Retroreflective sheeting must consist of a smooth, flat, transparent exterior film with retroreflective elements embedded or suspended beneath the film so as to form a non-exposed retroreflective optical system.

12.13.1.1) RETROREFLECTIVE SHEETING MATERIAL

Retroreflective sheeting must meet the requirements, except photometry, of ASTM D 4956-90, Standard for Retroreflective Sheeting for Traffic Control, for Type V Sheeting. Sheeting of Grade DOT-C2 of no less than 50 mm. wide, Grade DOT-C3 of no less than 75 mm. wide, or Grade DOT-C4 of no less than 100 mm. wide may be used.

12.13.1.2) CERTIFICATION MARKING

The letters DOT-C2, DOT-C3, or DOT-C4, as appropriate, constituting a certification that the retroflective sheeting conforms to the requirements of this standard, must appear at least once on the exposed surface of each white or red segment of retroreflective sheeting, and at least once every 300 mm. on retroreflective sheeting that is white only. The characters must be not less than 3 mm. high, and must be permanently stamped, etched, molded, or printed in indelible ink.

12.13.1.3) APPLICATION PATTERN

ALTERNATING RED AND WHITE MATERIAL

As shown in Figure 12-1 of FMVSS No. 108, where alternating material is installed, except for a segment that is trimmed to clear obstructions, or lengthened to provide red sheeting near red lamps, alternating material must be installed with each white and red segment having a length of 300 $\pm$ 150 mm.

Neither white nor red sheeting must represent more than two thirds the aggregate of any continuous strip marking the width of a trailer, or any continuous or broken strip marking its length.

12.13.1.4) APPLICATION LOCATION

Need not, as illustrated in Figure 12-2 of FMVSS No. 108, be installed on discontinuous surfaces such as outside ribs, stake post pickets on platform trailers, and external protruding beams, or to items of equipment such as door hinges and

lamp bodies on trailers and body joints, stiffening beads, drip rails, and rolled surfaces on truck tractors.

12.13.1.5) APPLICATION SPACING

As illustrated in Figure 12-2 of FMVSS No. 108, the edge of any white sheeting must not be located closer than 75 mm. to the edge of the luminous lens area of any red or amber lamp that is required by this standard.

The edge of any red sheeting must not be located closer than 75 mm. to the edge of the luminous lens area of any amber lamp that is required by this standard.

12.13.1.6) PHOTOMETRY

Retroreflective sheeting must be designed to conform to the photometry requirements shown in the following table when tested according to the retroreflective sheeting photometry procedure of Appendix G for the applicable color and grade.

RETROREFLECTIVE SHEETING PHOTOMETRY REQUIREMENTS
(see TABLE XVI-c of FMVSS No. 108)

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE					
		GRADE DOT-C2		GRADE DOT-C3		GRADE DOT-C4	
		WHITE	RED	WHITE	RED	WHITE	RED
		(cd/lux/sq.m.)	(cd/lux/sq.m.)	(cd/lux/sq.m.)	(cd/lux/sq.m.)	(cd/lux/sq.m.)	(cd/lux/sq.m.)
0.2	-4	250	60	165	40	125	30
	30	250	60	165	40	125	30
	45	60	15	40	10	30	8
0.5	-4	65	15	43	10	33	8
	30	65	15	43	10	33	8
	45	15	4	10	3	8	2

12.13.2) CONSPICUITY REFLEX REFLECTORS

12.13.2.1) CERTIFICATION MARKING

The exposed surface of each reflex reflector must be marked with the letters DOT-C which constitutes a certification that the reflector conforms to the conspicuity requirements of this standard. The certification must be not less than 3 mm. high, and must be permanently stamped, etched, molded, or printed in indelible ink.

12.13.2.1) APPLICATION PATTERN

ALTERNATING RED AND WHITE MATERIAL

Reflex reflectors must be installed in a repetitive pattern of two or three white reflectors alternating with two or three red reflectors, with the center of each reflector not more than 100 mm. from the center of each adjacent reflector.

White material. White reflex reflectors must be installed with the center of each reflector not more than 100 mm. from the center of each adjacent reflector.

12.13.2.3) PHOTOMETRY

Each red conspicuity reflex reflector must be designed to conform to the photometry requirements for red reflectors shown in the table below when tested according to the reflex reflector photometry procedure of Appendix G.

Each white conspicuity reflex reflector installed in only a horizontal orientation must be designed to conform to the photometry requirements for white reflectors/horizontal orientation shown in the table below when tested according to the reflex reflector photometry procedure of Appendix G.

Each white conspicuity reflex reflector installed in a vertical orientation must be designed to conform to the photometry requirements for white reflectors/vertical orientation shown in the table below when tested according to the reflex reflector photometry procedure of Appendix G.

CONSPICUITY REFLEX REFLECTOR PHOTOMETRY REQUIREMENTS

(see Tables XVI-a and XVI-b of FMVSS No. 108)

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE					
		RED REFLECTORS		WHITE REFLECTORS			
				Horizontal Orientation		Vertical Orientation	
		(cd/incident ft-c)	(mcd/lux)	(cd/incident ft-c)	(mcd/lux)	(cd/incident ft-c)	(mcd/lux)
0.2	0	4.5	420	18	1680	18	1680
	10U	3.0	280	12	1120	12	1120
	10D[(1)]	3.0	280	12	1120	12	1120
	10U TO 10D	-	-	-	-	-	1120
	20L	1.5	140	6	560	6	560
	20R	1.5	140	6	560	6	560
	20L TO 20 R	-	-	-	-	-	560
	30L TO 30 R	-	300	-	1250	-	-
	45L TO 45R	-	75	-	300	-	-
1.5	0	0.07	6	0.28	24	0.28	24
	10U	0.05	5	0.2	20	0.2	20
	10D[(1)]	0.05	5	0.2	20	0.2	20
	20L	0.03	3	0.12	12	0.12	12
	20R	0.03	3	0.12	12	0.12	12

12.13.3) CONSPICUITY SYSTEM INSTALLATION ON TRAILERS

12.13.3.1) TRAILER REAR

ELEMENT 1-ALTERNATING COLORS

As shown in Figure 11 of FMVSS No. 108, a strip of sheeting or reflectors, as horizontal as practicable, across the full width of the trailer, as close to the extreme edges as practicable, and as close as practicable to not less than 375 mm. and not more than 1525 mm. above the road surface at the stripe centerline with the trailer at curb weight.

ELEMENT 2-WHITE

Element 2 is not required for container chassis or for platform trailers without bulkheads.

As shown in Figure 11 of FMVSS No. 108, two pairs of strips of sheeting or reflectors, each pair consisting of strips 300 mm. long of Grade DOT-C2, DOT-C3, or DOT-C4, applied horizontally and vertically to the right and left upper contours of the body, as viewed from the rear, as close to the top of the trailer and as far apart as practicable.

If the perimeter of the body, as viewed from the rear, is other than rectangular, the strips may be applied along the perimeter, as close as practicable to the uppermost and outermost areas of the rear of the body on the left and right sides.

ELEMENT3- ALTERNATING COLORS

(Element 3 is not required for trailers without underride protection devices).

As shown in Figure 11 of FMVSS No. 108, a strip of Grade DOT-C2 sheeting no less than 38 mm. wide or reflectors applied across the full width of the horizontal member of the rear underride protection device.

12.13.3.2) TRAILER SIDE-ALTERNATING COLORS

As shown in Figure 11 of FMVSS No. 108, a strip of sheeting or reflectors applied to each side, as horizontal as practicable, originating and terminating as close to the front and rear as practicable, as close as practicable to not less than 375 mm. and not more than 1525 mm. above the road surface at the stripe centerline at curb weight, except that at the location chosen the strip must not be obscured in whole or in part by other motor vehicle equipment or trailer cargo.

The strip need not be continuous as long as not less than half the length of the trailer is covered and the spaces are distributed as evenly as practicable.

If necessary to clear rivet heads or other similar obstructions, Grade DOT-C2 sheeting may be separated into two 25 mm. wide strips of the same length and color, separated by a space of not more than 25 mm. and used in place of the retroreflective sheeting that would otherwise be applied.

12.13.4) CONSPICUITY SYSTEM INSTALLATION ON TRUCK TRACTORS

12.13.4.1) ELEMENT 1- ALTERNATING COLORS

As shown in Figure 13 of FMVSS No. 108, two strips of sheeting or reflectors, each not less than 600mm. long, located as close as practicable to the edges of the rear fenders, mudflaps, or the mudflap support brackets, to mark the width of the truck tractor.

The strips must be mounted as horizontal as practicable, in a vertical plane facing the rear, on the rear fenders, on the mudflap support brackets, on plates attached to the mudflap support brackets, or on the mudflaps.

Strips on mudflaps must be mounted not lower than 300 mm. below the upper horizontal edge of the mudflap. If the vehicle is certified with temporary mudflap support brackets, the strips must be mounted on the mudflaps or on plates transferable to permanent mudflap support brackets.

For a truck tractor without mudflaps, the strips may be mounted outboard of the frame on brackets behind the rear axle or on brackets ahead of the rear axle and above the top of the rear tires at unladen vehicle height, or they may be mounted directly or indirectly to the back of the cab as close to the outer edges as practicable, above the top of the tires, and not more than 1525 mm. above the road surface at unladen vehicle height.

If the strips are mounted on the back of the cab, no more than 25% of their cumulative area may be obscured by vehicle equipment as determined in a rear orthogonal view.

12.13.4.2) ELEMENT 2-WHITE

As shown in Figure 13 of FMVSS No. 108, two pairs of strips of sheeting or reflectors, each pair consisting of strips 300 mm. long, applied horizontally and vertically as practicable to the right and left upper contours of the cab, as close to the top of the cab and as far apart as practicable.

No more than 25% of their cumulative area may be obscured by vehicle equipment as determined in a rear orthogonal view.

If one pair must be relocated to avoid obscuration by vehicle equipment, the other pair may be relocated in order to be mounted symmetrically.

If the rear window is so large as to occupy all the practicable space, the material may be attached to the edge of the window itself.

12.13.5) CONSPICUITY SYSTEMS DATA SHEET SAMPLES

PHOTOMETRY TEST – RETROFLECTIVE SHEETING (GRADE DOT-C2)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

TABLE XVI-c: RETROREFLECTIVE SHEETING PHOTOMETRY REQUIREMENTS

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE				
		GRADE DOT-C2		MEASUREMENTS		
		WHITE (cd/lux/sq.m.)	RED (cd/lux/sq.m.)	Location	Measured	Reaim
0.2	-4	250	60			
	30	250	60			
	45	60	15			
0.5	-4	65	15			
	30	65	15			
	45	15	4			

PHOTOMETRY TEST – RETROFLECTIVE SHEETING (GRADE DOT-C3)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

TABLE XVI-c: RETROREFLECTIVE SHEETING PHOTOMETRY REQUIREMENTS

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE				
		GRADE DOT-C3		MEASUREMENTS		
		WHITE (cd/lux/sq.m.)	RED (cd/lux/sq.m.)	Location	Measured	Reaim
0.2	-4	165	40			
	30	165	40			
	45	40	10			
0.5	-4	43	10			
	30	43	10			
	45	10	3			

PHOTOMETRY TEST – RETROFLECTIVE SHEETING (GRADE DOT-C4)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

TABLE XVI-c: RETROREFLECTIVE SHEETING PHOTOMETRY REQUIREMENTS

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE				
		GRADE DOT-C4		MEASUREMENTS		
		WHITE (cd/lux/sq.m.)	RED (cd/lux/sq.m.)	Location	Measured	Reaim
0.2	-4	125	30			
	30	125	30			
	45	30	8			
0.5	-4	33	8			
	30	33	8			
	45	8	2			

PHOTOMETRY TEST – CONSPICUITY REFLEX REFLECTOR (RED REFLECTORS)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

CONSPICUITY REFLEX REFLECTOR PHOTOMETRY REQUIREMENTS
(see Tables XVI-a and XVI-b of FMVSS No. 108)

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE RED REFLECTORS (cd/incident ft-c)	MINIMUM PERFORMANCE RED REFLECTORS (mcd/lux)	MEASUREMENTS Location	MEASUREMENTS Measured	MEASUREMENTS Reaim
0.2	0	4.5	420			
	10U	3.0	280			
	10D[1]	3.0	280			
	10U TO 10D	-	-			
	20L	1.5	140			
	20R	1.5	140			
	20L TO 20 R	-	-			
	30L TO 30 R	-	300			
	45L TO 45R	-	75			
1.5	0	0.07	6			
	10U	0.05	5			
	10D[1]	0.05	5			
	20L	0.03	3			
	20R	0.03	3			

PHOTOMETRY TEST – CONSPICUITY REFLEX REFLECTOR (WHITE REFLECTORS)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

CONSPICUITY REFLEX REFLECTOR PHOTOMETRY REQUIREMENTS
(see Tables XVI-a and XVI-b of FMVSS No. 108)

OBSERVATION ANGLE (degrees)	ENTRANCE ANGLE (degrees)	MINIMUM PERFORMANCE WHITE REFLECTORS				MEASUREMENTS		
		Horizontal Orientation		Vertical Orientation				
		(cd/incident ft-c)	(mcd/lux)	(cd/incident ft-c)	(mcd/lux)	Location	Measured	Reaim
0.2	0	18	1680	18	1680			
	10U	12	1120	12	1120			
	10D	12	1120	12	1120			
	10U TO 10D	-	-	-	1120			
	20L	6	560	6	560			
	20R	6	560	6	560			
	20L TO 20 R	-	-	-	560			
	30L TO 30 R	-	1250	-	-			
	45L TO 45R	-	300	-	-			
1.5	0	0.28	24	0.28	24			
	10U	0.2	20	0.2	20			
	10D	0.2	20	0.2	20			
	20L	0.12	12	0.12	12			
	20R	0.12	12	0.12	12			

12.14) TURN SIGNAL OPERATING UNIT TEST PROCEDURE

The turn signal operating unit installed on passenger cars, multipurpose passenger vehicles, trucks, and buses less than 2032 mm. in overall width must be self-canceling by steering wheel rotation and capable of cancellation by a manually operated control.

Each turn signal operating unit must be designed to conform to all applicable performance requirements when tested in accordance with the following:

12.14.1) PHYSICAL INSPECTION

The device shall be physically inspected. Record all markings on the appropriate data sheet.

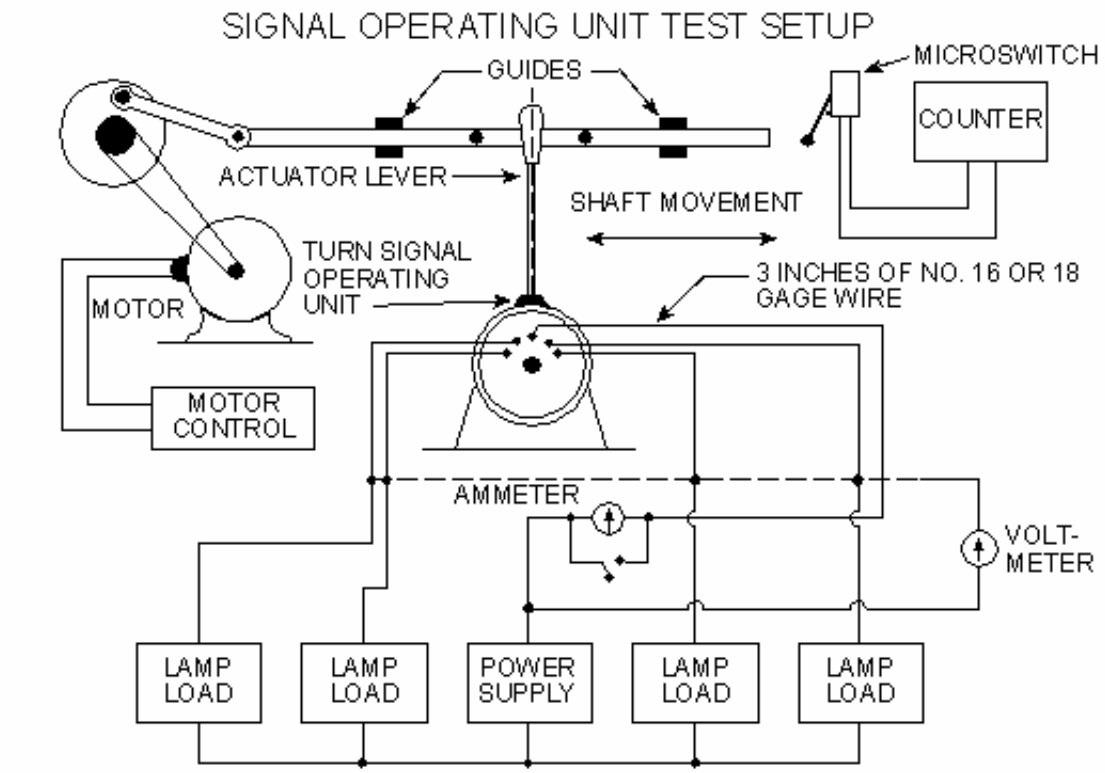
12.14.2) PHYSICAL TESTS

12.14.2.1) TURN SIGNAL OPERATING UNIT DURABILITY TEST

EQUIPMENT

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

ITEM	RANGE	ACCURACY
Cycling Stand	12 - 15 cpm	N/A
Stop Watch	0 - 30 minutes	± 1 second
Counter	0 - 25,000 cycles	± 1 count
Load Lamp	N/A	N/A
Voltmeter	0 - 20 volts DC	± 0.05 volts
Millivoltmeter	0 - 500 mv	± 5.0 millivolts
Ammeter	0 - 15 amps DC	± 0.05 amps
Power supply	6.4/12.8 volts DC	± 0.05 volts



NOTE: For operating units which are activated by a different type of actuator lever motion, changes in the actuator arm.

12.14.2.2) POWER SUPPLY SPECIFICATIONS

During the test, the unit is operated at 6.4 volts for 6 volt systems or 12.8 volts for 12 volt systems from a power supply meeting the following requirements;

(a) an output current that is at least 10 times the load current,
(b) voltage regulation that allows a voltage change of less than 5%,
(c) ripple voltage of not more than 5%,
(d) a response time of not more than 25 milliseconds rise time from 0 to rated current at rated voltage in a pure resistance circuit,
(e) and an output impedance of not more than 0.005 ohms dc.

12.14.2.3) PROCEDURE

The sample unit is operated with the maximum bulb load it will experience on the vehicle on which it will be installed. Bulbs that fail during the test are replaced. The turn signal flasher is not to be included in the test circuit. When the unit includes a self-canceling means, the test equipment is arranged so that the unit will be turned “off” in its normal operating manner.

The test is conducted at a rate of 12 to 15 complete cycles per minute. One complete cycle consists of the following sequence: off, left turn, off, right turn, and return to off.

The voltage drop from the input terminal of the device to each lamp output terminal, including 3 in. of 16 or 18 gage wire, is measured at the start of the test, at intervals of not more than 25,000 cycles during the test, and at the completion of the test.

12.14.2.4) PERFORMANCE REQUIREMENTS

A turn signal operating unit is considered to have met the requirements of the durability test if it remains operational after completing at least 100,000 cycles, and the voltage drop between the input contact and any output contact, including required length of wire, does not exceed 0.25 volts.

A turn signal operating unit is considered to have met the requirements of the durability test if it remains operational after completing at least 175,000 cycles for a unit installed on a multipurpose passenger vehicle, truck, or bus 2032 mm. or more in overall width, and the voltage drop between the input contact and any output contact, including required length of wire, does not exceed 0.25 volts.

If stop signals also operate through the turn signal operating unit, the voltage drop of any additional switch contacts must meet the same requirements as the turn signal contacts.

12.14.3) TURN SIGNAL OPERATING UNIT DATA SHEET SAMPLES

See test report samples.

12.15) TURN SIGNAL FLASHER TEST PROCEDURE

The means of producing the turn signal pilot indicator signal may be incorporated in the flasher. A means of producing an audible signal may be incorporated in the flasher.

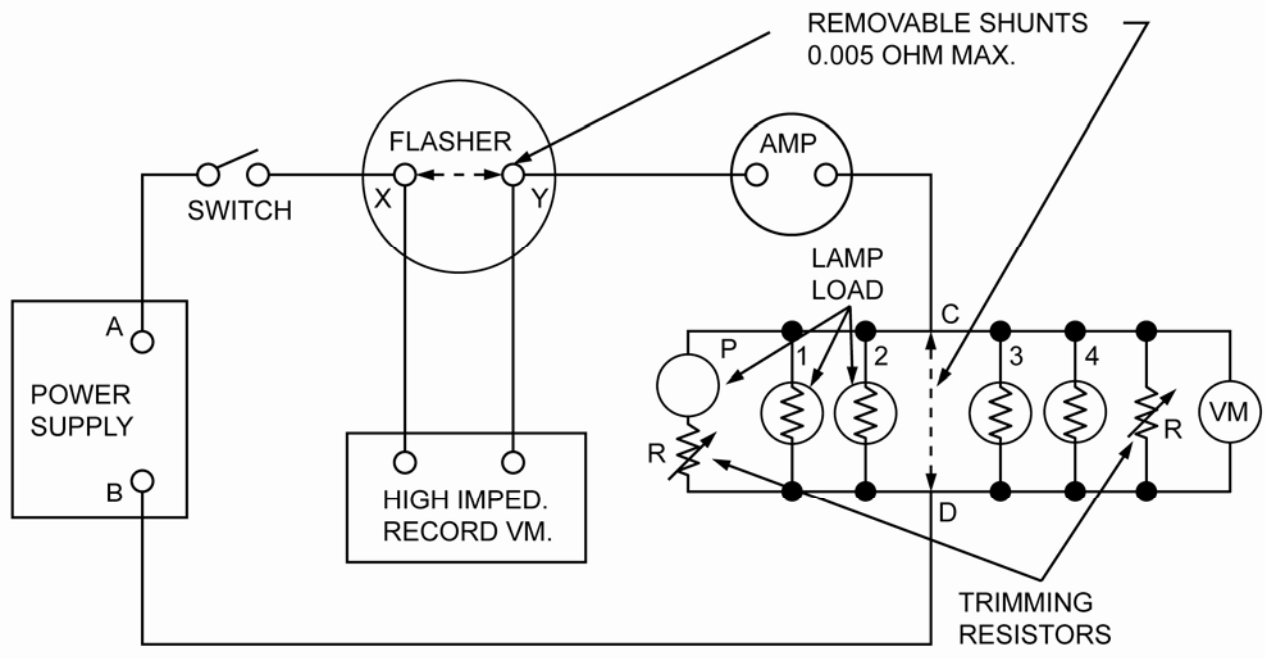
Each turn signal flasher must be designed to conform to all applicable performance requirements when tested in accordance with the following:

12.15.1) PHYSICAL INSPECTION

All devices shall be physically inspected. Record the external appearance and all markings.

12.15.2) STANDARD TEST CIRCUIT.

All turn signal flasher tests use the standard test circuit of Figure 22 of FMVSS No. 108.



FLASHER STANDARD TEST CIRCUIT

12.15.3) TEST CIRCUIT SETUP

The effective series resistance in the total circuit between the power supply and the bulb sockets (excluding the flasher and bulb load(s) using shorting bars) is 0.10 ± 0.01 ohm.

The circuit resistance at A-B of Figure 22 of FMVSS No. 108 is measured with flasher and bulb load(s) each shorted out with an effective shunt resistance not to exceed 0.005 ohms.

The voltage to the bulbs at C-D of Figure 22 of FMVSS No. 108 is adjusted to 12.8 volts (or 6.4 volts) with the flasher shorted out by an effective shunt resistance not to exceed 0.005 ohms. The load current is adjusted by simultaneously adjusting trimmer resistors, R.

For testing fixed-load flashers at other required voltages, adjust the power supply to provide required voltages, at the required temperatures, at C-D of Figure 22 of FMVSS No. 108, without readjustment of trimming resistors, R.

For variable-load flashers, the circuit is first adjusted for 12.8 volts (or 6.4 volts) at C-D of Figure 22 of FMVSS No. 108, with the minimum required load, and the power supply is adjusted to provide other required test voltages, at required temperatures, at C-D of Figure 22 of FMVSS No. 108, without readjustment of trimming resistors, R (each such required voltage being set with the minimum required load in place). The required voltage tests with the maximum load are conducted without readjusting each corresponding power supply voltage, previously set with minimum bulb load.

A suitable high impedance measuring device connected to points X-Y in Figure 22 of FMVSS No. 108 are used for measuring flash rate, percent current “on” time, and voltage drop across the flasher. The measurement of these quantities does not affect the circuit.

12.15.4) POWER SUPPLY SPECIFICATIONS

The power supply used in the standard test circuit for conducting the starting time, the voltage drop, and the flash rate and percent current “on” time tests must comply with the following specifications;

(a) must not generate any adverse transients not present in motor vehicles,

(b) be capable of supplying 11-16 vdc for 12 volt flashers and 5-9 vdc for 6 volt flashers to the input terminals of the standard test circuit,

(c) be capable of supplying required design current(s) continuously and inrush currents as required by the design bulb load complement,

(d) be capable of supplying an output voltage that does not deviate more than 2% with changes in the static load from 0 to maximum (not including inrush current) nor for static input line voltage variations,

(e) be capable of supplying an output voltage that does not deviate more than 1.0 vdc from 0 to maximum load (including inrush current) and must recover 63% of its maximum excursion within 100 µsec,

(f) have a ripple voltage of 75mv, peak to peak.

12.15.5) DURABILITY TESTS

The power supply used in the standard test circuit for conducting durability tests must comply with the following specifications;

(a) must not generate any adverse transients not present in motor vehicles,

(b) be capable of supplying 13 vdc and 14 vdc for 12 volt flashers and 6.5 vdc and 7 vdc for 6 volt flashers to the input terminals of the standard test circuit,

(c) be capable of supplying a continuous output current of the design load for one flasher times the number of flashers and inrush currents as required by the design bulb load complement,

(d) be capable of supplying an output voltage that does not deviate more than 2% with changes in the static load from 0 to maximum (not including inrush current) and means must be provided to compensate for static input line voltage variations,

(e) be capable of supplying an output voltage that does not deviate more than 1.0 vdc from 0 to maximum load (including inrush current) and must recover 63% of its maximum excursion within 5 μsec,

(f) have a ripple voltage of 300mv, peak to peak.

12.15.6) TURN SIGNAL FLASHER STARTING TIME TEST.

12.15.6.1) SAMPLES

Twenty sample flashers chosen from random from fifty representative samples are subjected to a starting time test using the standard test circuit.

12.15.6.2) PROCEDURE

The test is conducted in an ambient temperature of 75° ± 10° F with the design load (variable load flashers are tested with their minimum and their maximum design load) connected and the power source for the test circuit adjusted to apply design voltage at the bulbs.

The time measurement starts when the voltage is initially applied. Compliance is based on an average of three starts for each sample separated by a cooling interval of 5 minutes.

12.15.6.3) PERFORMANCE REQUIREMENTS

The requirements of the starting time test are considered to have been met if 17 of 20 samples comply with the following:

(a) A flasher having normally closed contacts must open (turn off) within 1.0 sec. for a device designed to operate two signal lamps, or within 1.25 sec. for a device designed to operate more than two lamps, or

(b) A flasher having normally open contacts must complete the first cycle (close the contacts and then open the contacts) within 1.5 sec.

12.15.7) TURN SIGNAL FLASHER VOLTAGE DROP TEST

12.15.7.1) SAMPLES

The same twenty sample flashers used in the starting time test are subjected to a voltage drop test using the standard test circuit.

12.15.7.2) PROCEDURE

The test is conducted in an ambient temperature of 75° ± 10° F with the design load (variable load flashers are tested with their maximum design load) connected and the power source for the standard test circuit adjusted to apply 12.8 volts or 6.4 volts at the bulbs according to the flasher rating.

The voltage drop is measured between the input and load terminals of the flasher during the “on” period after the flashers have completed at least five consecutive cycles.

12.15.7.3) PERFORMANCE REQUIREMENTS

The requirements of the voltage drop test are considered to have been met if 17 of 20 samples comply with the lowest voltage drop across any flasher not exceeding 0.80 volt.

12.15.8) TURN SIGNAL FLASHER FLASH RATE AND PERCENT CURRENT “ON” TIME TEST

12.15.8.1) SAMPLES

The same twenty sample flashers used in the voltage drop test are subjected to a flash rate and percent of current “on” time test.

12.15.8.2) PROCEDURE

The test is conducted using the standard test circuit with the design load (variable load flashers are tested with their minimum and their maximum design load) connected and design voltage applied to the bulbs.

Compliance is determined using the following combinations of ambient temperature and bulb voltage;

(a) 12.8 volts (or 6.4 volts) and 75° ± 10° F,
(b) 12.0 volts (or 6.0 volts) and 0° ± 5° F,
(c) 15.0 volts (or 7.5 volts) and 0° ± 5° F,
(d) 11.0 volts (or 5.5 volts) and 125° ± 5° F, and
(e) 14.0 volts (or 7.0 volts) and 125° ± 5° F.

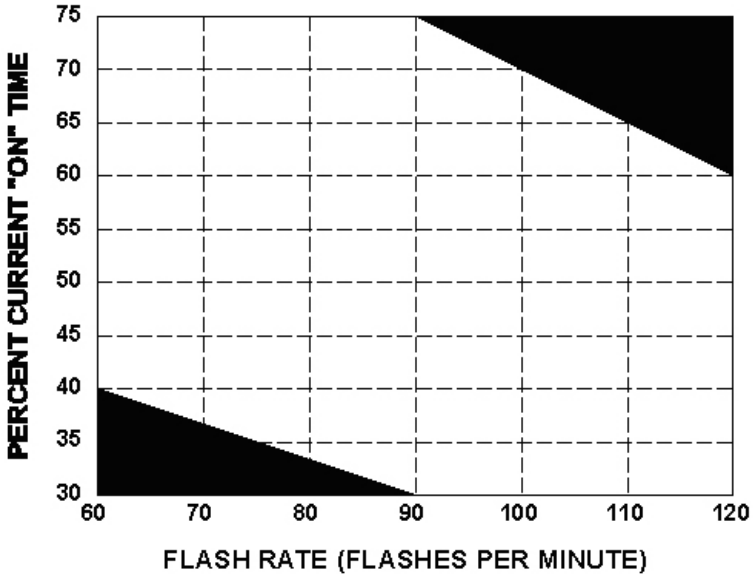
Flash rate and percent current “on” time are measured after the flashers have completed five consecutive cycles and are determined by an average of at least three consecutive cycles.

12.15.8.3) PERFORMANCE REQUIREMENTS

The requirements of the flash rate and percent current “on” time test are considered to have been met if 17 of 20 samples comply with the following;

(a) The performance of a normally closed type flasher must be within the unshaded portion of the polygon shown in Figure 2 of FMVSS No. 108, or

(b) The performance of a normally open type flasher must be within the entire rectangle including the shaded areas shown in Figure 2 of FMVSS No. 108.



12.15.9) TURN SIGNAL FLASHER DURABILITY TEST

12.15.9.1) SAMPLES

Twenty sample flashers chosen from random from the thirty samples not used in the previous tests are subjected to a durability test.

12.15.9.2) PROCEDURE

Conformance of the samples to the starting time, voltage drop, and flash rate and percent of current “on” time tests (limited to the 12.8 volts or 6.4 volts and 75° ± 10° F test condition only) is established.

The test is conducted on each sample with the design load (variable load flashers are tested with their maximum design load) connected and 14 volts or 7.0 volts, according to the flasher rating, applied to the input terminals of the standard test circuit.

The test cycle consists of 15 sec. on followed by 15 sec. off for a total time of 200 hours in an ambient temperature of 75° ± 10° F.

12.15.9.3) PERFORMANCE REQUIREMENTS

The requirements of the durability test are considered to have been met if, after completion, 17 of 20 samples comply with the performance requirements of the starting time, voltage drop, and flash rate and percent of current “on” time tests (limited to the 12.8 volts or 6.4 volts and 75° ± 10° F test condition only) when tested in the standard test circuit with design load and 12.8 volts (or 6.4 volts) applied to the bulbs.

12.15.10) VARIABLE LOAD TURN SIGNAL FLASHERS

Variable load turn signal flashers shall comply with voltage drop and durability requirements with the maximum design load connected and shall comply with starting time, flash rate, and percent current "ON" time requirements both with the minimum and with the maximum design load connected.

12.15.10.1) EQUIPMENT

12.15.10.1.1) The power supply for the Performance Test shall comply with the following specifications:

(1) Output Voltage - Capable of supplying to the input terminals of the Standard Circuit 11V to 16V d-c for 12V flashers or 5V to 9V d-c for 6V flashers.

(2) Output Current - Capable of supplying rated flasher current continuously and approximately 10 times rated flasher current for 50 milliseconds duration.

(3) Regulation -

(A) Dynamic - The output voltage shall not deviate more than 1.0V from 0 to maximum load (including transient) and shall recover 63 percent of its maximum excursion within 100 microseconds.

B) Static - The output voltage shall not deviate more than 2% with changes in static load from zero to maximum (not including transient current).

(4) Ripple Voltage - Maximum 75mv peak to peak.

12.15.10.1.2) The power supply for the Endurance Test shall comply with the following specifications:

(1) Output Voltage - Capable of supplying 14V d-c or 7V d-c according to the flasher rating to the input terminals of the standard test circuit.

(2) Output Current - Capable of supplying a continuous output current of the rated load for one flasher times the number of flashers operating in the same "ON" period of the Life Test. In addition, the power supply shall be capable of supplying a transient current of approximately 10 times the rated current for 1 flasher times the number of flashers started on their flashing cycle at the same instant.

(3) Regulation

(A) Dynamic - The output voltage shall not deviate more than 1.0V from zero to maximum load (including transient current) and should recover 63% of its maximum excursion within 5 milliseconds.

(B) Static - The output voltage shall not deviate more than two percent with changes in static load from zero to maximum (not including transient).

(4) Ripple Voltage - Maximum 300mv peak to peak.

ITEM	RANGE	ACCURACY
Temperature Chamber(s)	-10°F to 150°F	± 5°F
Power Supply	0 - 16 volts dc	As described above
Recorder	Voltage as Required Frequency > 10 Hertz	± 10 millivolts
Ammeter	0 - 20 amps DC	± 0.5 percent
Thermocouple and Recorder	-10°F to 150°F	± 1°F
Timer	15 seconds "on" 15 seconds "off"	± 3 percent
Timer	0 - 250 hours	± 1 minute

12.15.11) TURN SIGNAL FLASHER DATA SHEET SAMPLES

See test report samples.

12.16) TURN SIGNAL PILOT INDICATOR TEST PROCEDURE

Each vehicle equipped with a turn signal operating unit where any turn signal lamp is not visible to the driver must also have an illuminated pilot indicator to provide a clear and unmistakable indication that the turn signal system is activated.

The indicator must consist of one or more lights flashing at the same frequency as the turn signal lamps.

The indicator must function satisfactorily under all test conditions imposed on the turn signal flasher in S14.9 of FMVSS No. 108.

12.16.1) INDICATOR SIZE AND COLOR

If the indicator is located inside the vehicle it should emit a green colored light and have a minimum area equivalent to a 3/16 inch diameter circle.

If the indicator is located outside of the vehicle it should emit a yellow light and have a minimum projected illuminated area of 0.1 sq. inch.

The minimum required illuminated area of the indicator must be visible to any tangent on the 95th eyellipse as defined in SAE J941 with the steering wheel turned to a straight ahead driving position and in the design location for an adjustable wheel or column.

12.16.2) TURN SIGNAL LAMP FAILURE

Failure of one or more turn signal lamps such that the minimum photometric performance specified in Tables VI or VII of FMVSS No. 108 is not being met must be indicated by the turn signal pilot indicator by a “steady on”, “steady off”, or by a significant change in the flashing rate, except when a variable-load turn signal flasher is used on a multipurpose passenger vehicle, truck, or bus 2032 mm. or more in overall width, on a truck that is capable of accommodating a slide in camper, or on any vehicle equipped to tow trailers.

12.16.3) TURN SIGNAL PILOT INDICATOR DATA SHEET SAMPLES

See test report samples.

12.17) HEADLAMP BEAM SWITCHING DEVICE TEST PROCEDURE

Each vehicle must have a means of switching between lower and upper beams designed and located so that it may be operated conveniently by a simple movement of the driver's hand or foot. The switch should have no dead point and, except as provided by S6.1.5.2 of FMVSS No. 108, the lower and upper beams must not be energized simultaneously except momentarily for temporary signaling purposes or during switching between beams.

12.17.1) SEMI-AUTOMATIC HEADLAMP BEAM SWITCHING DEVICE

As an alternative to S9.4 of FMVSS No. 108, a vehicle may be equipped with a semi-automatic means of switching between lower and upper beams.

12.17.1.1) OPERATING INSTRUCTIONS

Each semi-automatic headlamp switching device must include operating instructions to permit a driver to operate the device correctly including; how to turn the automatic control on and off, how to adjust the provided sensitivity control, and any other specific instructions applicable to the particular device.

12.17.1.2) MANUAL OVERRIDE

The device must include a means convenient to the driver for switching to the opposite beam from the one provided.

12.17.1.3) FAIL SAFE OPERATION

A failure of the automatic control portion of the device must not result in the loss of manual operation of both upper and lower beams.

12.17.1.4) AUTOMATIC DIMMING INDICATOR

There must be a convenient means of informing the driver when the device is controlling the headlamps automatically. The device shall not affect the function of the upper beam indicator light.

12.17.1.5) LENS ACCESSIBILITY

The device lens must be accessible for cleaning when the device is installed on a vehicle.

12.17.1.6) MOUNTING HEIGHT

The center of the device lens must be mounted no less than 24 in. above the road surface.

12.17.1.7) PHYSICAL TESTS

Each semi-automatic headlamp beam switching device must be designed to conform to all applicable performance requirements when tested in accordance with the following:

12.17.1.7.1) TEST CONDITIONS

All tests are conducted with 13 volts input to the device unless otherwise specified.

12.17.1.7.2) SENSITIVITY TEST

SAMPLES

The sample device is mounted in and operated in the laboratory in the same environment as that encountered on the vehicle, that is tinted glass, grille work, etc.

PROCEDURE

The sample device is adjusted for sensitivity in accordance with the manufacturer's instructions. It is exposed to a light source capable of providing a variable intensity of at least 1.5 cd. to 150 cd. at 100 feet from the sample device.

The device is switched to the lower beam mode in accordance with the "dim" limits specified and switched back to the upper beam mode in accordance with the "hold" limits specified for the specified test positions.

To provide more complete information on sensitivity throughout the required vertical and horizontal angles, a set of constant footcandle curves are made at "dim" sensitivities of 17, 25, and 100 cd. at 100 ft.

PERFORMANCE REQUIREMENTS

OPERATING LIMITS

Test position (degrees)		Dim (cd at 100 ft.)	Hold (cd. at 100 ft.)
H	V	Adjust to 15	1.5 min. to 3.75 max.
H	2L	25 max.	1.5 min.
H	4L	40 max.	1.5 min.
H	6L	75 max.	1.5 min.
H	2R	25 max.	1.5 min.
H	5R	150 max. to 40 min.	1.5 min.
1D	V	30 max.	1.5 min.
1U	V	30 max.	1.5 min.

There must be no sensitivity voids shown in the constant footcandle curves within the area limited by the test positions.

12.17.1.7.3) VOLTAGE REGULATION TEST

PROCEDURE

The sensitivity of the sample device is adjusted so that it complies with the sensitivity test.

The “dim” sensitivity is measured at the H-V test position at 11 volts input to the device and at 15 volts input to the device.

PERFORMANCE REQUIREMENTS

The device must switch to the lower beam mode at between 8 (cd. at 100 ft.) and 25 (cd. at 100 ft.) with the input voltage at 11 volts and at 15 volts.

12.17.1.7.4) MANUAL OVERRIDE TEST

PROCEDURE

The sensitivity of the sample device is adjusted so that it complies with the sensitivity test.

The device is exposed to a test light that causes it to switch to the lower beam mode.

The manufacturer's instructions are followed to cause the device to override the test light and switch to upper beam.

In a similar manner, the test light is extinguished to cause the device to switch to the upper beam mode.

Again the manufacturer's instructions are followed to cause the device to switch to lower beam.

PERFORMANCE REQUIREMENTS

The device, when operated in accordance with the manufacturer's instructions, must switch to the opposite beam with the test light energized and with the test light extinguished.

12.17.1.7.5) WARMUP TEST

PROCEDURE

The sensitivity of the sample device is adjusted so that it complies with the sensitivity test and the test lamp extinguished.

The test lamp will then be energized at a level of 25 (cd. at 100 ft.) at the H-V position of the device and the time for the device to switch to lower beam is measured.

PERFORMANCE REQUIREMENTS

If the warmup time of the device exceeds 10 seconds it should maintain the headlamps on lower beam during warmup.

12.17.1.7.6) TEMPERATURE TEST

PROCEDURE

The sample device is exposed for 1 hour in a temperature corresponding to that at the device mounting location.

For a device mounted in the passenger compartment or the engine compartment, this temperature is 210° F; mounted elsewhere, the temperature is 150° F.

After this exposure the H-V "dim" sensitivity of the sample device is measured over the temperature range of -30° F to +100° F.

PERFORMANCE REQUIREMENTS

The device must switch to the lower beam mode between 8 (cd. at 100 ft.) and 25 (cd. at 100 ft.) over the temperature range of -30° F to +100° F.

12.17.1.7.7) DUST TEST

PROCEDURE

The sensitivity of the sample device is adjusted so that it complies with the sensitivity test.

The device is then subjected to the dust test of S14.5.3. of FMVSS No. 108

At the conclusion of the dust exposure the lens of the device must be wiped clean and the H-V "dim" sensitivity of the sample device is measured.

PERFORMANCE REQUIREMENTS

The device must switch to the lower beam mode between 8 (cd. at 100 ft.) and 25 (cd. at 100 ft.).

12.17.1.7.8) CORROSION TEST

PROCEDURE

The sensitivity of the sample device is adjusted so that it complies with the sensitivity test.

All system components located outside the passenger compartment must be subjected to the corrosion test of S14.5.4 of FMVSS No. 108 with the device not operating.

Water should not be allowed to accumulate on any connector socket.

At the conclusion of the test the H-V “dim” sensitivity of the sample device must be measured.

PERFORMANCE REQUIREMENTS

The sample device must switch to the lower beam mode between 8 (cd. at 100 ft.) and 25 (cd. at 100 ft.).

12.17.1.7.9) VIBRATION TEST

PROCEDURE

The sensitivity of the sample device is adjusted so that it complies with the sensitivity test and the mechanical aim of the photounit determined.

The sample device must be mounted in proper vehicle position and subjected to vibration of 5g constant acceleration for ½ hour in each of three directions; vertical, horizontal and parallel to the vehicle longitudinal axis, and horizontal and normal to the vehicle longitudinal axis.

The vibration frequency must be varied from 30 to 200 and back to 30 cycles per second over a period of approximately 1 minute.

The device must be operating during the test.

At the conclusion of the test the H-V “dim” sensitivity of the sample device and the mechanical aim of the photounit must be measured.

PERFORMANCE REQUIREMENTS

The sample device must switch to the lower beam mode between 8 (cd. at 100 ft.) and 25 (cd. at 100 ft.).

The mechanical aim of the device photounit must not have changed by more than 0.25° from the initial value.

12.17.1.7.10) SUNLIGHT TEST

PROCEDURE.

The sample device must be exposed for 1 hour in bright noonday sunlight (5000 fc. minimum illumination with a clear sky) with the photounit aimed as it would be in service and facing an unobstructed portion of the horizon in the direction of the sun.

The device must then be rested for 1 hour in normal room light at room temperature and the H-V “dim” sensitivity of the sample device is measured.

PERFORMANCE REQUIREMENTS

The sample device must switch to the lower beam mode between 8 (cd. at 100 ft.) and 25 (cd. at 100 ft.).

12.17.1.7.11) DURABILITY TEST

PROCEDURE

The sensitivity of the sample device is adjusted so that it complies with the sensitivity test.

The device photounit operated at a 13.0 input voltage on a cycle of 90 minutes on and 30 minutes off must be activated by a 60 cd. light source at 100 ft., or equivalent, which is cycled on and off 4 times per minute for a period of 200 hours.

The device must then rest for 2 hours in a lighted area of 50 to 150 fc. after which the H-V “dim” sensitivity must be measured.

PERFORMANCE REQUIREMENTS

The sample device must switch to the lower beam mode between 8 (cd. at 100 ft.) and 25 (cd. at 100 ft.).

12.17.1.7.12) RETURN TO UPPER BEAM TEST

PROCEDURE

The sensitivity of the sample device is adjusted so that it complies with the sensitivity test.

The lens of the photounit must be exposed to light of 100 fc. for 10 seconds.

PERFORMANCE REQUIREMENTS

The sample device must switch to upper beam mode within 2 sec. after the 100 fc light is extinguished.

12.17.1.8) HEADLAMP BEAM SWITCHING DEVICE DATA SHEET SAMPLES

See test report samples.

12.18) UPPER BEAM HEADLAMP INDICATOR TEST PROCEDURE

Each vehicle must have a means for indicating to the driver when the upper beams of the headlighting system are on.

INDICATOR SIZE AND LOCATION

The upper beam headlamp indicator must have a minimum area equivalent to that of a 3/16 in. diameter circle, and be plainly visible to drivers of all heights under normal driving conditions when headlamps are required.

12.18.1) UPPER BEAM HEADLAMP INDICATOR DATA SHEET SAMPLES

See test report samples.

12.19) VEHICULAR HAZARD WARNING SIGNAL OPERATING UNIT TEST PROCEDURE

The unit may be an independent device or it may be combined with the turn signal operating unit. If combined with the turn signal operating unit, the actuating motion of the hazard function must differ from the actuating motion of the turn signal function.

The unit must operate independently of the ignition or equivalent switch. If the actuation of the hazard function requires the operation of more than one switch, a means must be provided for actuating all switches simultaneously by a single driver action.

Each vehicular hazard warning signal operating unit must be designed to conform to all applicable performance requirements when tested in accordance with the following:

12.19.1) PHYSICAL INSPECTION

The device shall be physically inspected. Record all markings on the appropriate data sheet.

12.19.2) VEHICULAR HAZARD WARNING SIGNAL OPERATING UNIT DURABILITY TEST

12.19.2.1) PROCEDURE

The sample unit is operated at its rated voltage with the maximum bulb load it will experience on the vehicle on which it will be installed. Bulbs that fail during the test are replaced. The hazard warning signal flasher is not to be included in the test circuit.

The unit is turned “on” and “off” in its normal operating manner at a rate between 12 and 15 complete cycles per minute. One complete cycle consists of the sequence: off, on, and return to off. The test consists of 10,000 cycles at an ambient temperature of 75°±10° F followed by 1 hour constant “on” at the same temperature.

The voltage drop from the input terminal of the device to each lamp output terminal, including 3 in. of 16 or 18 gage wire, is measured at the start of the test and at the completion of the test.

12.19.2.2) PERFORMANCE REQUIREMENTS

A hazard warning signal operating unit is considered to have met the requirements of the durability test if it remains operational after completing 10,000 cycles and the 1 hour constant “on” and the voltage drop between the input contact and any output contact, including required length of wire, does not exceed 0.3 volts for either 6.4 or 12.8 line voltage both at the start and completion of the test.

12.19.2.3) TEST EQUIPMENT

ITEM	RANGE	ACCURACY
Cycling Stand	12 - 15 CPM	N/A
Stop Watch	0 - 30 Minutes	± 1 Second
	0 - 10K Cycles	± 1 Count
Load Lamp	N/A	N/A
Ammeter	0 - 15 AMPS DC	± 0.5 percent
Power Supply	6.4/12.8 Volts DC	± 0.005 volts
Voltmeter	0 - 20 Volts DC	± 0.05 percent
Millivoltmeter	0 - 500 Millivolts	± 5.0 millivolts

12.19.3) VEHICULAR HAZARD WARNING SIGNAL OPERATING UNIT DATA SHEET SAMPLES

See test report samples.

12.20) VEHICULAR HAZARD WARNING SIGNAL FLASHER TEST PROCEDURE

The means of producing the hazard warning signal pilot indicator signal may be incorporated in the flasher. A means of producing an audible signal may be incorporated in the flasher.

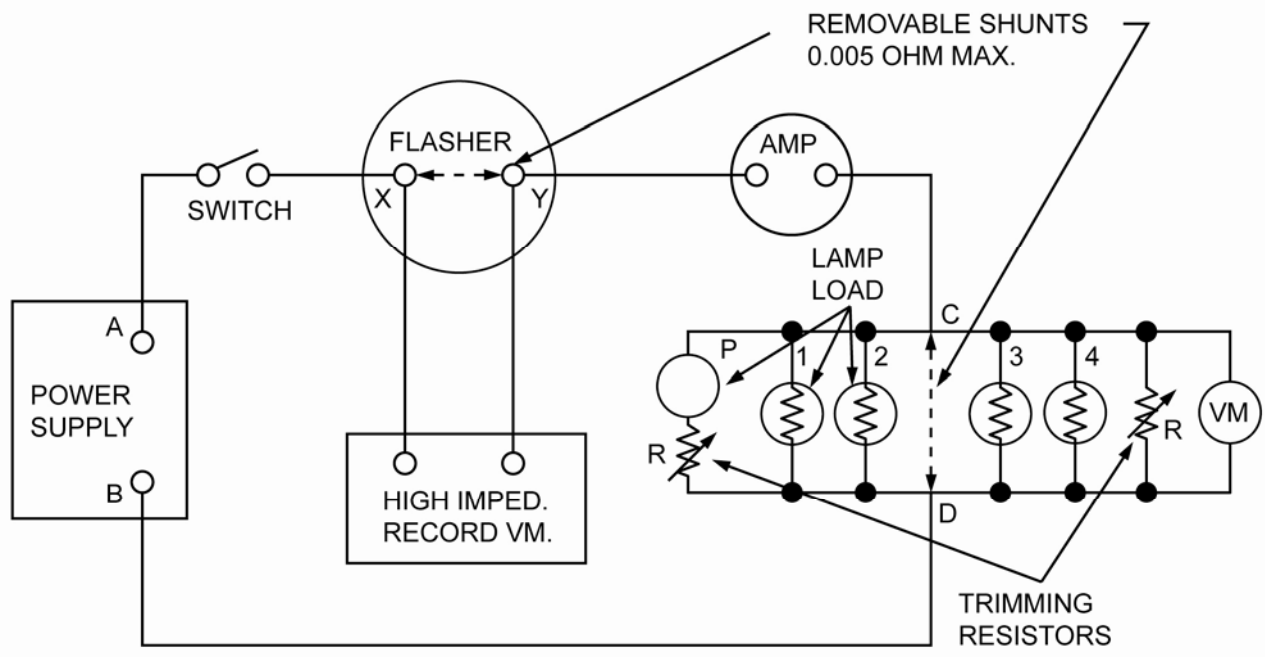
Each vehicular hazard warning signal flasher must be designed to conform to all applicable performance requirements when tested in accordance with the following:

12.20.1) PHYSICAL INSPECTION

All devices shall be physically inspected. Record the external appearance and all markings.

12.20.2) STANDARD TEST CIRCUIT.

All vehicular hazard warning signal flasher tests use the standard test circuit of Figure 22 of FMVSS No. 108.



FLASHER STANDARD TEST CIRCUIT

12.20.2.1) TEST CIRCUIT SETUP

The effective series resistance in the total circuit between the power supply and the bulb sockets (excluding the flasher and bulb load(s) using shorting bars) is 0.10 ± 0.01 ohm.

The circuit resistance at A-B of Figure 22 of FMVSS No. 108 is measured with flasher and bulb load(s) each shorted out with an effective shunt resistance not to exceed 0.005 ohms.

The voltage to the bulbs at C-D of Figure 22 of FMVSS No. 108 is adjusted to 12.8 volts (or 6.4 volts) with the flasher shorted out by an effective shunt resistance not to exceed 0.005 ohms. The load current is adjusted by simultaneously adjusting trimmer resistors, R.

For testing fixed-load flashers at other required voltages, adjust the power supply to provide required voltages, at the required temperatures, at C-D of Figure 22 of FMVSS No. 108, without readjustment of trimming resistors, R.

For variable-load flashers, the circuit is first adjusted for 12.8 volts (or 6.4 volts) at C-D of Figure 22 of FMVSS No. 108, with the minimum required load, and the power supply is adjusted to provide other required test voltages, at required temperatures, at C-D of Figure 22 of FMVSS No. 108, without readjustment of trimming resistors, R (each such required voltage being set with the minimum required load in place). The required voltage tests with the maximum load are conducted without readjusting each corresponding power supply voltage, previously set with minimum bulb load.

A suitable high impedance measuring device connected to points X-Y in Figure 22 of FMVSS No. 108 are used for measuring flash rate, percent current “on” time, and voltage drop across the flasher. The measurement of these quantities does not affect the circuit.

12.20.2.2) POWER SUPPLY SPECIFICATIONS

12.20.2.2.1) The power supply used in the standard test circuit for conducting the starting time, the voltage drop, and the flash rate and percent current “on” time tests must comply with the following specifications;

(a) must not generate any adverse transients not present in motor vehicles,

(b) be capable of supplying 11-16 vdc for 12 volt flashers and 5-9 vdc for 6 volt flashers to the input terminals of the standard test circuit,

(c) be capable of supplying required design current(s) continuously and inrush currents as required by the design bulb load complement,

(d) be capable of supplying an output voltage that does not deviate more than 2% with changes in the static load from 0 to maximum (not including inrush current) nor for static input line voltage variations,

(e) be capable of supplying an output voltage that does not deviate more than 1.0 vdc from 0 to maximum load (including inrush current) and must recover 63% of its maximum excursion within 100 μsec,

(f) have a ripple voltage of 75mv, peak to peak.

12.20.2.2.2) DURABILITY TESTS

The power supply used in the standard test circuit for conducting durability tests must comply with the following specifications;

(a) must not generate any adverse transients not present in motor vehicles,

(b) be capable of supplying 13 vdc and 14 vdc for 12 volt flashers and 6.5 vdc and 7 vdc for 6 volt flashers to the input terminals of the standard test circuit,

(c) be capable of supplying a continuous output current of the design load for one flasher times the number of flashers and inrush currents as required by the design bulb load complement,

(d) be capable of supplying an output voltage that does not deviate more than 2% with changes in the static load from 0 to maximum (not including inrush current) and means must be provided to compensate for static input line voltage variations,

(e) be capable of supplying an output voltage that does not deviate more than 1.0 vdc from 0 to maximum load (including inrush current) and must recover 63% of its maximum excursion within 5 μsec,

(f) have a ripple voltage of 300mv, peak to peak.

12.20.3) VEHICULAR HAZARD WARNING SIGNAL FLASHER STARTING TIME TEST

12.20.3.1) SAMPLES

Twenty sample flashers chosen at random from fifty representative samples are subjected to a starting time test using the standard test circuit.

12.20.3.2) PROCEDURE

The test is conducted test in an ambient temperature of 75° ± 10° F with the minimum and maximum load connected and the power source for the test circuit adjusted to apply design voltage at the bulbs.

The time measurement starts when the voltage is initially applied.

12.20.3.3) PERFORMANCE REQUIREMENTS

The requirements of the starting time test are considered to have been met if 17 of 20 samples comply with the following:

(a) A flasher having normally closed contacts must open (turn off) within 1.5 sec. after the voltage is applied, or

(b) A flasher having normally open contacts must complete the first cycle (close the contacts and then open the contacts) within 1.5 sec. after the voltage is applied.

12.20.4) VEHICULAR HAZARD WARNING SIGNAL FLASHER VOLTAGE DROP TEST

12.20.4.1) SAMPLES

The same twenty sample flashers used in the starting time test are subjected to a voltage drop test using the standard test circuit

12.20.4.2) PROCEDURE

The test is conducted in an ambient temperature of 75° ± 10° F with the maximum design load connected and the power source for the test circuit adjusted to apply design voltage at the bulbs.

The voltage drop is measured between the input and load terminals of the flasher during the “on” period after the flashers have completed at least five consecutive cycles.

12.20.4.3) PERFORMANCE REQUIREMENTS

The requirements of the voltage drop test are considered to have been met if 17 of 20 samples comply with the lowest voltage drop across any flasher must not exceed 0.8 volt.

12.20.5) VEHICULAR HAZARD WARNING SIGNAL FLASHER FLASH RATE AND PERCENT “ON” TIME TEST

12.20.5.1) SAMPLES

The same twenty sample flashers used in the voltage drop test are subjected to a flash rate and percent of current “on” time test.

12.20.5.2) PROCEDURE

The test is conducted using the standard test circuit by and applying loads of from two signal lamps to the maximum design loading including pilot indicator.

Compliance is determined using the following combinations of ambient temperature and bulb voltage;

(a) 12.8 volts (or 6.4 volts) and 75° ± 10° F,
(b) 11.0 volts (or 5.5 volts) and 125° ± 5° F,
(c) 11.0 volts (or 5.5 volts) and 0° ± 5° F,
(d) 13.0 volts (or 6.5 volts) and 125° ± 5° F, and
(e) 13.0 volts (or 6.5 volts) and 0° ± 5° F.

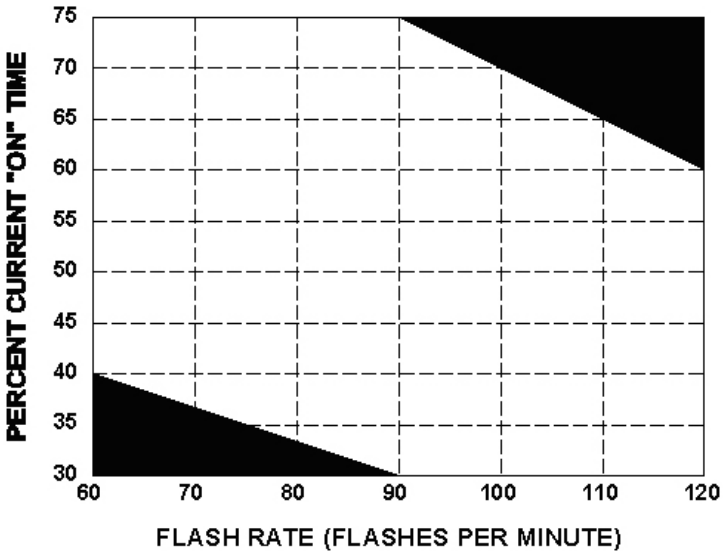
Flash rate and percent current “on” time are measured after the flashers have completed five consecutive cycles and are determined by an average of at least three consecutive cycles.

PERFORMANCE REQUIREMENTS

The requirements of the flash rate and percent current “on” time test are considered to have been met if 17 of 20 samples comply with the following;

(a) The performance of a normally closed type flasher must be within the unshaded portion of the polygon shown in Figure 2 of FMVSS No. 108, or

(b) The performance of a normally open type flasher must be within the entire rectangle including the shaded areas shown in Figure 2 of FMVSS No. 108.



12.20.6) VEHICULAR HAZARD WARNING SIGNAL FLASHER DURABILITY TEST

12.20.6.1) SAMPLES

Twenty sample flashers chosen from random from the thirty samples not used in the previous tests are subjected to a durability test

12.20.6.2) PROCEDURE

Conformance of the samples to the starting time, voltage drop, and flash rate and percent of current “on” time tests (limited to the 12.8 volts or 6.4 volts and 75° ± 10° F test condition only) is established.

The test is conducted on each sample with the maximum design load connected and 13.0 volts (or 6.5 volts) applied to the input terminals of the standard test circuit.

The flasher is subjected to continuous flashing for a total time of 36 hours in an ambient temperature of 75° ± 10° F.

12.20.6.3) PERFORMANCE REQUIREMENTS

The requirements of the durability test are considered to have been met if, after completion, 17 of 20 samples comply with the performance requirements of the starting time, voltage drop, and flash rate and percent of current “on” time tests (limited to the 12.8 volts or 6.4 volts and 75° ± 10° F test condition only) when tested in the standard test circuit with the power source adjusted to provide design voltage to the bulbs and with a minimum load of two signal lamp bulbs and the maximum design load, including pilot lamps, as specified by the manufacturer at an ambient temperature of 75° ± 10° F.

12.20.7) VEHICULAR HAZARD WARNING SIGNAL FLASHER DATA SHEET SAMPLES

See test report samples.

12.21) VEHICULAR HAZARD WARNING SIGNAL PILOT INDICATOR TEST PROCEDURE

In vehicles equipped with right hand and left hand turn signal pilot indicators, both pilot indicators and /or a separate pilot indicator must flash simultaneously while the vehicle hazard warning signal operating unit is turned on.

In vehicles equipped with a single turn signal pilot indicator, a separate vehicular hazard warning signal pilot indicator must flash and the turn signal pilot indicator may flash while the vehicle hazard warning signal operating unit is turned on.

The indicator must function satisfactorily under all test conditions imposed on the vehicular hazard warning signal flasher in S14.9 of FMVSS No. 108.

12.21.1) INDICATOR SIZE AND COLOR

If a separate vehicular hazard warning pilot indicator is used, it must emit a red color and have a minimum area equivalent to a 0.5 inch diameter circle.

12.21.2) VEHICULAR HAZARD WARNING SIGNAL PILOT INDICATOR DATA SHEET SAMPLES

See test report samples.

12.22) SEALED BEAM HEADLIGHTING SYSTEMS TEST PROCEDURE (for passenger cars, MPVs, trucks, and buses)

12.22.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

12.22.2) NUMBER

Each passenger car, MPV, truck, and bus, must be equipped with a headlighting system specified in Table II of FMVSS No. 108. As specified in Table II, each system must consist of 2 or 4 headlamps, that provide two upper beams and two lower beams.

12.22.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulous method may be used. The color of the device shall be white as specified in the procedure.

12.22.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

<table>
<tr><th rowspan="2">Vehicle type/size</th><th rowspan="2">Beam</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td rowspan="2">Passenger cars, MPV, Trucks, Buses</td><td>Upper</td><td rowspan="2">On the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="2">Not less than 55.9 cm. nor more than 137.2 cm.</td></tr>
<tr><td>Lower</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

12.22.5) ACTIVATION

See activation requirements in Table(s) I-a and I-c, as applicable, in FMVSS No. 108.

12.22.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.22.7) VISIBILITY

No requirement.

12.22.8) INDICATOR

Upper beam headlamp indicator

Each vehicle must have a means for indicating to the driver when the upper beams of the headlighting system are activated.

Indicator size and location

The upper beam headlamp indicator must have a minimum area equivalent to that of a 3/16 in. diameter circle, and be plainly visible to drivers of all heights under normal driving conditions when headlamps are required.

12.22.9) MARKINGS

DOT marking

The lens of each original equipment and replacement headlamp, and of each original equipment and replacement beam contributor, and each replacement headlamp lens for an integral beam or replaceable bulb headlamp, must be marked with the symbol “DOT” either horizontally or vertically to indicate certification under 49 U.S.C. 30115.

Trademark

The lens of each original and replacement equipment headlamp, and of each original and replacement equipment beam contributor must be marked with the name and/or trademark registered with the U.S. Patent and Trademark Office of the manufacturer of such headlamp or beam contributor, of its importer, or any manufacturer of a vehicle equipped with such headlamp or beam contributor. Nothing in this standard authorizes the marking of any such name and/or trademark by one who is not the owner, unless the owner has consented to it.

Voltage and trade number

Each original and replacement equipment headlamp, and each original and replacement equipment beam contributor must be marked with its voltage and with its part or trade number.

12.22.10) SPACING TO OTHER LAMPS

Vertical headlamp arrangement

Where multiple headlamps with single light sources are installed in a vertical orientation the lower beam must be provided by the uppermost headlamp.

Where headlamps with two vertically oriented light sources are installed the lower beam must be provided by the uppermost light source or by all light sources.

Horizontal headlamp arrangement

Where multiple headlamps with single light sources are installed in a horizontal orientation the lower beam must be provided by the most outboard headlamp.

Where headlamps with two horizontally oriented light sources are installed the lower beam must be provided by the outboard light source or by all light sources.

12.22.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.22.12) RATIO

No requirement.

12.22.13) INSTALLATION

All sealed beam headlighting systems must be of a type designated in Table II-a of FMVSS No. 108. Each sealed beam headlamp must be designed to conform to the specifications furnished with respect to it pursuant to Appendix C of 49 C.F.R. §564 and Table II-a. The dimensions applicable to the design of a specific type are those identified with an “I” for interchangeability shown on the applicable drawing(s) filed in Docket No. NHTSA 98-3397. Using suitable measuring equipment, measure the dimensions specified by the COTR for conformance with the applicable drawing(s) filed in Docket No NHTSA 98-3397.

A sealed beam headlighting system must consist of the correct number of designated headlamp units shown for the specific system in Table II-a. The units must have their beams activated as indicated in the “DEVICE ACTIVATION” column of Table II-a.

12.22.14) SIMULTANEOUS AIM

Type F sealed beam headlamps may be mounted on common or parallel seating and aiming planes to permit simultaneous aiming of both headlamps provided that there must be no provision for adjustment between the common or parallel aiming and seating planes of the two lamps, and when tested with any conforming Type UF and LF headlamps in accordance with Appendix G the assembly (consisting of the Type UF and LF headlamps, mounting rings, the aiming/seating rings, and aim adjustment mechanism) must be designed to conform to the appropriate photometric requirements.

12.22.15) PHOTOMETRY

Each sealed beam headlamp must be designed to conform to the photometry requirements of Table XVIII for upper beam and Table XIX for lower beam as specified in Table II-a for the specific headlamp unit and aiming method, when tested according to the procedure of Appendix G**.**

The device shall be photometry tested as outlined in Appendix G. The photometer element shall be located at a distance of 100 feet from the test device. A calibrated bulb(s) will be operated at rated mean spherical candlepower. The test devices shall meet the cp specifications listed in the following table.

The device shall meet the candlepower specifications for the applicable table in Appendix I as determined using the following table.

HEADLIGHTING SYSTEMS-SEALED BEAMS (see TABLE II-a of FMVSS No. 108)							
SYSTEM DESIGNATION	NUMBER OF HEADLAMPS	HEADLAMP DESIGNATION	APPENDIX I PHOTOMETRY REQUIREMENTS REFERENCE			MAXIMUM FILAMENT POWER AT 12.8 V	
			Appendix I (see TABLE XVIII of FMVSS No. 108)	Appendix I (see TABLE XIX of FMVSS No. 108)			
			UPPER BEAM MECHANICAL AND VISUAL AIM	LOWER BEAM MECH AIM	LOWER BEAM VISUAL AIM	UPPER BEAM	LOWER BEAM
TYPE A	2	1A1	UB4	N.A.	N.A.	55	N.A.
	2	2A1	UB5	LB4M	LB2V	43	65
TYPE B	2	2B1	UB3	LB3M	LB3V	70	60
TYPE C	2	1C1	UB4	N.A.	N.A.	55	N.A.
	2	2C1	UB5	LB4M	LB2V	43	65
TYPE D	2	2D1	UB3	LB3M	LB3V	65	55
TYPE E	2	2E1	UB3	LB3M	LB3V	70	60
TYPE F[2]	2	UF	UB1	N.A.	N.A.	70	N.A.
	2	LF	N.A	LB1M[1]	LB1V[1]	N.A.	60
TYPE G	2	1G1	UB4	N.A.	N.A.	55	N.A.
	2	2G1	UB5	LB4M	LB2V	43	65
TYPE H	2	2H1	UB3	LB3M	LB3V	70	60

[1] Headlamps marked “LF” may remain activated when headlamps marked “UF” are activated.

[2] Type F headlamps may be mounted on common or parallel seating and aiming planes to permit simultaneous aiming with restrictions. See S10.13.2 of FMVSS No. 108.

12.22.16) PHYSICAL TESTS

CORROSION TEST

The device shall be tested for corrosion in accordance with the Corrosion Test procedure as outlined in Appendix J.

VIBRATION TEST

The device shall be tested for vibration in accordance with the Vibration Test procedure as outlined in Appendix J.

INWARD FORCE TEST

The device shall be tested in accordance with the Inward Force Test procedure as outlined in Appendix J.

TORQUE DEFLECTION TEST

The device shall be tested in accordance with the Torque Deflection Test procedure as outlined in Appendix J.

HEADLAMP CONNECTOR TEST

The device shall be tested in accordance with the Headlamp Connector Test procedure as outlined in Appendix J.

HEADLAMP WATTAGE TEST

The device shall be tested in accordance with the Headlamp Wattage Test procedure as outlined in Appendix J.

AIMING ADJUSTMENT TEST

The device shall be tested in accordance with the Aiming Adjustment Test procedure as outlined in Appendix J.

RETAINING RING TEST

Each sample Type G and Type H sealed beam headlamp shall be tested in accordance with the Aiming Adjustment Test procedure as outlined in Appendix J.

PLASTIC OPTICAL MATERIAL TEST

Each device that incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the Plastic Optical Material Test as outlined in Appendix H.

12.22.17) HEADLAMP PHOTOMETRY DATA SHEET SAMPLES

Headlamp photometry data sheets can be found at the end of Appendix I.

12.23) INTEGRAL BEAM HEADLIGHTING SYSTEMS TEST PROCEDURE (for passenger cars, MPVs, trucks, and buses)

12.23.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

12.23.2) NUMBER

Each passenger car, MPV, truck, and bus, must be equipped with a headlighting system specified in Table II of FMVSS No. 108. As specified in Table II, each system must consist of 2 or 4 headlamps, that provide two upper beams and two lower beams.

12.23.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulous method may be used. The color of the device shall be white as specified in the procedure.

12.23.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

<table>
<tr><th rowspan="2">Vehicle type/size</th><th rowspan="2">Beam</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td rowspan="2">Passenger cars, MPV, Trucks, Buses</td><td>Upper</td><td rowspan="2">On the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="2">Not less than 55.9 cm. nor more than 137.2 cm.</td></tr>
<tr><td>Lower</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

12.23.5) ACTIVATION

See activation requirements in Table(s) I-a and I-c, as applicable, in FMVSS No. 108.

12.23.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.23.7) VISIBILITY

No requirement.

12.23.8) INDICATOR

Upper beam headlamp indicator

Each vehicle must have a means for indicating to the driver when the upper beams of the headlighting system are activated.

Indicator size and location

The upper beam headlamp indicator must have a minimum area equivalent to that of a 3/16 in. diameter circle, and be plainly visible to drivers of all heights under normal driving conditions when headlamps are required.

12.23.9) MARKINGS

DOT marking

The lens of each original equipment and replacement headlamp, and of each original equipment and replacement beam contributor, and each replacement headlamp lens for an integral beam or replaceable bulb headlamp, must be marked with the symbol “DOT” either horizontally or vertically to indicate certification under 49 U.S.C. 30115.

Trademark

The lens of each original and replacement equipment headlamp, and of each original and replacement equipment beam contributor must be marked with the name and/or trademark registered with the U.S. Patent and Trademark Office of the manufacturer of such headlamp or beam contributor, of its importer, or any manufacturer of a vehicle equipped with such headlamp or beam contributor. Nothing in this standard authorizes the marking of any such name and/or trademark by one who is not the owner, unless the owner has consented to it.

Voltage and trade number

Each original and replacement equipment headlamp, and each original and replacement equipment beam contributor must be marked with its voltage and with its part or trade number.

Beam(s)

An integral beam headlamp with a single light source providing lower beam must have its lens permanently marked with “L”. An integral beam headlamp with a single light source providing upper beam must have its lens permanently marked with “U”.

12.23.10) SPACING TO OTHER LAMPS

Vertical headlamp arrangement

Where multiple headlamps with single light sources are installed in a vertical orientation the lower beam must be provided by the uppermost headlamp.

Where headlamps with two vertically oriented light sources are installed the lower beam must be provided by the uppermost light source or by all light sources.

Horizontal headlamp arrangement

Where multiple headlamps with single light sources are installed in a horizontal orientation the lower beam must be provided by the most outboard headlamp.

Where headlamps with two horizontally oriented light sources are installed the lower beam must be provided by the outboard light source or by all light sources.

12.23.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.23.12) RATIO

No requirement.

12.23.13) INSTALLATION

All integral beam headlighting systems must be of a type designated in Table II-c of FMVSS No. 108.

An integral beam headlighting system must consist of the correct number of

designated headlamp units shown for the specific system in Table II-c. The units must have their beams activated as indicated in the "DEVICE ACTIVATION" column of Table II-c. A system must provide in total not more than two upper beams and two lower beams.

12.23.14) AIMABILITY

An integral beam headlighting system must be aimable in accordance with the requirements of S10.18 of FMVSS No. 108.

A system that incorporates any headlamp or beam contributor that does not have a VHAD as an integral and indivisible part of the headlamp or beam contributor must be designed so that the appropriate photometric requirements are met when any correctly aimed and photometrically conforming headlamp or beam contributor is removed from its mounting and aiming mechanism, and is replaced without reaim by any conforming headlamp or beam contributor of the same type.

A system that incorporates more than one beam contributor providing a lower beam, and/or more than one beam contributor providing an upper beam, shall be designed to use the Vehicle Headlamp Aiming Device (VHAD) as specified in S10.18.8 of FMVSS No. 108.

12.23.15) SIMULTANEOUS AIM

An integral beam headlighting system consisting of four individual headlamps or beam contributors may have the headlamp units mounted in an assembly to permit simultaneous aiming of the beam(s) contributors, providing that with any complying contributor the assembly complete with all lamps meets the appropriate photometric requirements when tested in accordance with Appendix G**.**

12.23.16) ADDITIONAL LIGHT SOURCES

An integral beam headlamp may incorporate light sources that are used for purposes other than headlighting and that are capable of being replaced.

12.23.17) PHOTOMETRY

Each integral beam headlamp must be designed to conform to the photometry requirements of Table XVIII of FMVSS No. 108 for upper beam and Table XIX of FMVSS No. 108 for lower beam as specified in Table II-c of FMVSS No. 108 for the specific headlamp unit and aiming method, when tested according to the procedure of Appendix G**.**

The photometer element shall be located at a distance of 100 feet from the test device. A calibrated bulb(s) will be operated at rated mean spherical candlepower.

The device shall meet the candlepower specifications for the applicable table in Appendix I as determined using the following table.

HEADLIGHTING SYSTEMS-INTEGRAL BEAMS (see TABLE II-c of FMVSS No. 108)				
SYSTEM DESIGNATION	BEAM COMPOSITION	Appendix I PHOTOMETRY REQUIREMENTS REFERENCE		
		Appendix I (see TABLE XVIII of FMVSS No. 108)	Appendix I (see TABLE XIX of FMVSS No. 108)	
		UPPER BEAM MECHANICAL AND VISUAL AIM	LOWER BEAM MECH AIM	LOWER BEAM VISUAL AIM
2 LAMP SYSTEM	UPPER BEAM & LOWER BEAM	UB2[3] OR UB3	LB2M[3] OR LB3M	LB2V[3] OR LB3V
4 LAMP SYSTEM	UPPER BEAM	UB4	N.A.	N.A.
	UPPER BEAM & LOWER BEAM	UB5	LB4M	LB2V
4 LAMP SYSTEM	UPPER BEAM (U)	UB1	N.A.	N.A.
	LOWER BEAM (L)	N.A.[4]	LB1M[4]	LB1V[4]
4 LAMP SYSTEM	UPPER BEAM	UB6	N.A.	N.A.
	LOWER BEAM	N.A.[5]	LB5M[5]	LB4V[5]
BEAM CONTRIBUTOR	UPPER BEAM & LOWER BEAM	UB1[6]	LB1M[4][6]	LB1V[4][6]

[3] Headlamps designed to conform to the photometry requirements of UB2 and LB2M or LB2V may allow the lower beam light source(s) to remain activated when an upper beam light source is activated if the lower beam light source(s) contribute to upper beam photometric compliance.

[4] Lower beams may remain activated when upper beams are activated.

[5] Lower beams must remain activated when upper beams are activated.

[6] Beam contributor photometric allocation formula of S14.2.5.9 of FMVSS No. 108 applies.

12.23.18) PHYSICAL TESTS

Except where noted, each integral beam headlamp must be designed to conform to the performance requirements of the following tests:

CORROSION TEST

The device shall be tested for corrosion in accordance with the Corrosion Test procedure as outlined in Appendix J.

TEMPERATURE CYCLE TEST

The device shall be tested for vibration in accordance with the Temperature Cycle Test procedure as outlined in Appendix J.

VIBRATION TEST

The device shall be tested for vibration in accordance with the Vibration Test procedure as outlined in Appendix J.

INWARD FORCE TEST

The device shall be tested in accordance with the Inward Force Test procedure as outlined in Appendix J.

HEADLAMP CONNECTOR TEST

The device shall be tested in accordance with the Headlamp Connector Test procedure as outlined in Appendix J.

AIMING ADJUSTMENT TEST

The device shall be tested in accordance with the Aiming Adjustment Test procedure as outlined in Appendix J.

ABRASION TEST

The device, except those with a glass lens, shall be tested in accordance with the Abrasion Test as outlined in Appendix J.

CHEMICAL RESISTANCE TEST

The device, except those with a nonreplaceable glass lens, shall be tested in accordance with the Chemical Resistance Test as outlined in Appendix J.

INTERNAL HEAT TEST

The device, except those with a glass lens and a non-plastic reflector, shall be tested in accordance with the Internal Heat Test as outlined in Appendix J.

TORQUE DEFLECTION TEST

Each device that is capable of being mechanically aimed by externally applied headlamp aiming devices specified in SAE J602 OCT80, *Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units,* shall be tested in accordance with the Torque Deflection Test as outlined in Appendix J.

PLASTIC OPTICAL MATERIAL TEST

If the device incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

Each integral beam headlamp that is not designed to conform to the performance requirements of the sealing test of Appendix J must be designed to conform to the performance requirements of the following:

CONNECTOR CORROSION TEST

The device shall be tested in accordance with the Connector Corrosion Test procedure as outlined in Appendix J.

DUST TEST

The device shall be tested in accordance with the Dust Test procedure as outlined in Appendix J.

HUMIDITY TEST

The device shall be tested in accordance with the Humidity Test procedure as outlined in Appendix J.

Each integral beam headlamp incorporating a replaceable lens must be designed to conform to the performance requirements of the following:

CHEMICAL RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

The device shall be tested in accordance with the Chemical Resistance of Reflectors of Replaceable Lens Headlamps Test as outlined in Appendix J.

CORROSION RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

The device shall be tested in accordance with the Corrosion Resistance of Reflectors of Replaceable Lens Headlamps Test as outlined in Appendix J.

12.23.19) HEADLAMP PHOTOMETRY DATA SHEET SAMPLES

Headlamp photometry data sheets can be found at the end of Appendix I.

12.24) REPLACEABLE BULB HEADLIGHTING SYSTEMS TEST PROCEDURE (for passenger cars, MPVs, trucks, and buses)

12.24.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.24.2) NUMBER

Each passenger car, MPV, truck, and bus, must be equipped with a headlighting system specified in Table II of FMVSS No. 108. As specified in Table II, each system must consist of 2 or 4 headlamps, that provide two upper beams and two lower beams.

12.24.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulous method may be used. The color of the device shall be white as specified in the procedure.

12.24.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

Vehicle type/size	Beam	Mounting	
		Location	Height*
Passenger cars, MPV, Trucks, Buses	Upper	On the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.	Not less than 55.9 cm. nor more than 137.2 cm.
	Lower		

* Height above road surface measured from center of device with vehicle at curb weight

12.24.5) ACTIVATION

See activation requirements in Table(s) I-a, I-b, and I-c, as applicable, in FMVSS No. 108.

12.24.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.24.7) VISIBILITY

No requirement.

12.24.8) INDICATOR

Upper beam headlamp indicator

Each vehicle must have a means for indicating to the driver when the upper beams of the headlighting system are activated.

Indicator size and location

The upper beam headlamp indicator must have a minimum area equivalent to that of a 3/16 in. diameter circle, and be plainly visible to drivers of all heights under normal driving conditions when headlamps are required.

12.24.9) MARKINGS

DOT marking

The lens of each original equipment and replacement headlamp, and of each original equipment and replacement beam contributor, and each replacement headlamp lens for an integral beam or replaceable bulb headlamp, must be marked with the symbol “DOT” either horizontally or vertically to indicate certification under 49 U.S.C. 30115.

Trademark

The lens of each original and replacement equipment headlamp, and of each original and replacement equipment beam contributor must be marked with the name and/or trademark registered with the U.S. Patent and Trademark Office of the manufacturer of such headlamp or beam contributor, of its importer, or any manufacturer of a vehicle equipped with such headlamp or beam contributor. Nothing in this standard authorizes the marking of any such name and/or trademark by one who is not the owner, unless the owner has consented to it.

Voltage and trade number

Each original and replacement equipment headlamp, and each original and replacement equipment beam contributor must be marked with its voltage and with its part or trade number.

Light source(s)

The lens of each replaceable bulb headlamp must bear permanent marking in front of each replaceable light source with which it is equipped that states either: The HB Type, if the light source conforms to S11 of FMVSS No. 108 for filament light sources, or the bulb marking/designation provided in compliance with Section VIII of Appendix A of part 564 (if the light source conforms to S11 of FMVSS No. 108 for discharge light sources). No marking need be provided if the only replaceable light source in the headlamp is type HB1.

Beam(s)

A replaceable bulb headlamp in a four headlamp system providing lower beam must have its lens permanently marked with “L”. A replaceable bulb headlamp in a four headlamp system providing upper beam must have its lens permanently marked with “U”. No such markings are required if the light sources in the headlamp are any combination of dual filament light sources other than HB2.

12.24.10) SPACING TO OTHER LAMPS

Vertical headlamp arrangement

Where multiple headlamps with single light sources are installed in a vertical orientation the lower beam must be provided by the uppermost headlamp.

Where headlamps with two vertically oriented light sources are installed the lower beam must be provided by the uppermost light source or by all light sources.

Horizontal headlamp arrangement

Where multiple headlamps with single light sources are installed in a horizontal orientation the lower beam must be provided by the most outboard headlamp.

Where headlamps with two horizontally oriented light sources are installed the lower beam must be provided by the outboard light source or by all light sources.

12.24.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.24.12) RATIO

No requirement.

12.24.13) INSTALLATION

All replaceable bulb headlighting systems must be of a type designated in Table II-d of FMVSS No. 108.

A replaceable bulb headlighting system must consist of either two or four headlamps shown for the specific system in Table II-d of FMVSS No. 108. The headlamps must have their beams activated as indicated in the “DEVICE ACTIVATION” column of Table II-d. A system must provide in total not more than two upper beams and two lower beams and must incorporate not more than two replaceable light sources in each headlamp.

12.24.14) AIMABILITY

A replaceable bulb headlighting system must be aimable in accordance with the requirements of S10.18 of FMVSS No. 108.

AIMING RESTRICTIONS

Each replaceable bulb headlamp conforming to the external mechanical aim requirements of S10.18.7 of FMVSS No. 108 must have no mechanism that allows adjustment of an individual light source, or if there are two light sources, independent adjustments of each reflector.

12.24.15) REPLACEMENT EQUIPMENT

Each lens reflector unit manufactured as replacement equipment must be designed to conform to applicable photometry requirements when any replaceable light source appropriate for such unit is inserted in it.

12.24.16) ADDITIONAL LIGHT SOURCES

An replaceable bulb headlamp may incorporate light sources that are used for purposes other than headlighting.

12.24.17) PHOTOMETRY

Each replaceable bulb headlamp must be designed to conform to the photometry requirements of Table XVIII of FMVSS No. 108 for upper beam and Table XIX of FMVSS No. 108 for lower beam as specified in Table II-d of FMVSS No. 108 for the specific headlamp unit and aiming method, when tested according to the procedure of Appendix G using any replaceable light source intended for use in the system under test.

The photometer element shall be located at a distance of 100 feet from the test device. The lamp will be operated at 12.8V.

The device shall meet the candlepower specifications for the applicable table in Appendix I as determined using the following table.

HEADLIGHTING SYSTEMS-REPLACEABLE BULB (see TABLE II-d of FMVSS No. 108)				
SYSTEM DESIGNATION	LIGHT SOURCE COMPOSITION	APPENDIX I PHOTOMETRY REQUIREMENTS REFERENCE		
		APPENDIX I (see TABLE XVIII of FMVSS No. 108	APPENDIX I (see TABLE XIX of FMVSS No. 108)	
		UPPER BEAM MECHANICAL AND VISUAL AIM	LOWER BEAM MECH AIM	LOWER BEAM VISUAL AIM
2 LAMP SYSTEM	ANY DUAL FILAMENT TYPE, OTHER THAN HB2, USED ALONE OR WITH ANOTHER DUAL FILAMENT TYPE OTHER THAN HB2.	UB2(3) OR UB3	LB2M(3) OR LB3M	LB2V(3) OR LB3V
2 LAMP SYSTEM	HB2 OR ANY SINGLE FILAMENT TYPE USED ALONE OR WITH ANY OTHER SINGLE OR DUAL FILAMENT TYPE.	UB2(3) OR UB3	LB2M(3)	LB2V(3)
4 LAMP SYSTEM	ANY DUAL FILAMENT TYPE, OTHER THAN HB2, USED ALONE OR WITH ANOTHER DUAL FILAMENT TYPE OTHER THAN HB2.	UB1(4) OR UB3	LB1M(4) OR LB3M	LB1V(4) OR LB3V
4 LAMP SYSTEM	HB2 OR ANY SINGLE FILAMENT TYPE USED ALONE OR WITH ANY OTHER SINGLE OR DUAL FILAMENT TYPE. (U & L)	UB1(4)	LB1M(4)	LB1V(4)

(3) Headlamps designed to conform to the photometry requirements of UB2 and LB2M or LB2V may be allow the lower beam light source(s) to remain activated when an upper beam light source is activated if the lower beam light source(s) contribute to upper beam photometric compliance.

(4) Lower beams may remain activated when upper beams are activated.

12.24.18) PHYSICAL TESTS

Except where noted, each replaceable bulb headlamp must be designed to conform to the performance requirements of the following tests:

CORROSION TEST

The device shall be tested for corrosion in accordance with the Corrosion Test procedure as outlined in Appendix J.

CORROSION-CONNECTOR TEST

The device shall be tested in accordance with the Corrosion-Connector Test procedure as outlined in Appendix J.

DUST TEST

The device shall be tested in accordance with the Dust Test procedure as outlined in Appendix J.

TEMPERATURE CYCLE TEST

The device shall be tested for vibration in accordance with the Temperature Cycle Test procedure as outlined in Appendix J.

HUMIDITY TEST

The device shall be tested in accordance with the Humidity Test procedure as outlined in Appendix J.

VIBRATION TEST

The device shall be tested for vibration in accordance with the Vibration Test procedure as outlined in Appendix J.

INWARD FORCE TEST

The device shall be tested in accordance with the Inward Force Test procedure as outlined in Appendix J.

HEADLAMP CONNECTOR TEST

The device shall be tested in accordance with the Headlamp Connector Test procedure as outlined in Appendix J.

AIMING ADJUSTMENT TEST

The device shall be tested in accordance with the Aiming Adjustment Test procedure as outlined in Appendix J.

ABRASION TEST

The device, except those with a glass lens, shall be tested in accordance with the Abrasion Test as outlined in Appendix J.

CHEMICAL RESISTANCE TEST

The device, headlamp except those with a nonreplaceable glass lens, shall be tested in accordance with the Chemical Resistance Test as outlined in Appendix J.

INTERNAL HEAT TEST

The device, except those with a glass lens and a non-plastic reflector, shall be tested in accordance with the Internal Heat Test as outlined in Appendix J.

CHEMICAL RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

Each device incorporating a replaceable lens shall be tested in accordance with the Chemical Resistance of Reflectors of Replaceable Lens Headlamps Test as outlined in Appendix J.

CORROSION RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

Each device incorporating a replaceable lens shall be tested in accordance with the Corrosion Resistance of Reflectors of Replaceable Lens Headlamps Test as outlined in Appendix J.

TORQUE DEFLECTION TEST

Each device capable of being mechanically aimed by externally applied headlamp aiming devices specified in SAE J602 OCT80, *Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units,* shall be tested in accordance with the Torque Deflection Test as outlined in Appendix J.

PLASTIC OPTICAL MATERIAL TEST

Each device that incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

12.24.19) HEADLAMP PHOTOMETRY DATA SHEET SAMPLES

Headlamp photometry data sheets can be found at the end of Appendix I.

12.25) COMBINATION HEADLIGHTING SYSTEMS TEST PROCEDURE (for passenger cars, MPVs, trucks, and buses)

12.25.1) PHYSICAL INSPECTION

Perform the tests below and record data on the appropriate data sheet.

Disassemble the lamp assembly, inspect the housing and lens, and record all markings.

Describe the method of mounting the housing to the vehicle.

Inspect the lamp bulb in the lighting device, and transcribe the trade number designation for that particular type of lamp bulb on the data sheet. If no bulb is supplied, refer to data submission sheet.

Remove the lamp bulb or bulbs from the socket of the lamp, and perform the test listed in Appendix A and record the applicable test data on the data sheet.

12.25.2) NUMBER

Each passenger car, MPV, truck, and bus, must be equipped with a headlighting system specified in Table II of FMVSS No. 108. As specified in Table II, each system must consist of 2 or 4 headlamps that provide two upper beams and two lower beams.

12.25.3) COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulous method may be used. The color of the device shall be white as specified in the procedure.

12.25.4) MOUNTING LOCATION/HEIGHT

Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits listed in the below table, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered.

Vehicle type/size	Beam	Mounting	
		Location	Height*
Passenger cars, MPV, Trucks, Buses	Upper	On the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.	Not less than 55.9 cm. nor more than 137.2 cm.
	Lower		

* Height above road surface measured from center of device with vehicle at curb weight

12.25.5) ACTIVATION

See activation requirements in Table I-a of FMVSS No. 108, as applicable.

12.25.6) EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

12.25.7) VISIBILITY

No requirement.

12.25.8) INDICATOR

Upper beam headlamp indicator

Each vehicle must have a means for indicating to the driver when the upper beams of the headlighting system are activated.

Indicator size and location

The upper beam headlamp indicator must have a minimum area equivalent to that of a 3/16 in. diameter circle, and be plainly visible to drivers of all heights under normal driving conditions when headlamps are required.

12.25.9) MARKINGS

DOT marking

The lens of each original equipment and replacement headlamp, and of each original equipment and replacement beam contributor, and each replacement headlamp lens for an integral beam or replaceable bulb headlamp, must be marked with the symbol “DOT” either horizontally or vertically to indicate certification under 49 U.S.C. 30115.

Trademark

The lens of each original and replacement equipment headlamp, and of each original and replacement equipment beam contributor must be marked with the name and/or trademark registered with the U.S. Patent and Trademark Office of the manufacturer of such headlamp or beam contributor, of its importer, or any manufacturer of a vehicle equipped with such headlamp or beam contributor. Nothing in this standard authorizes the marking of any such name and/or trademark by one who is not the owner, unless the owner has consented to it.

Voltage and trade number

Each original and replacement equipment headlamp, and each original and replacement equipment beam contributor must be marked with its voltage and with its part or trade number.

Replaceable bulb headlamp

If the combination lamp incorporates a replaceable bulb headlamp, the combination headlamp must contain all markings applicable to a replaceable bulb headlamp.

Integral beam headlamp

If the combination headlamp incorporates an integral beam headlamp, the combination headlamp must contain all markings applicable to an integral beam headlamp.

12.25.10) SPACING TO OTHER LAMPS

Vertical headlamp arrangement

Where multiple headlamps with single light sources are installed in a vertical orientation the lower beam must be provided by the uppermost headlamp.

Where headlamps with two vertically oriented light sources are installed the lower beam must be provided by the uppermost light source or by all light sources.

Horizontal headlamp arrangement

Where multiple headlamps with single light sources are installed in a horizontal orientation the lower beam must be provided by the most outboard headlamp.

Where headlamps with two horizontally oriented light sources are installed the lower beam must be provided by the outboard light source or by all light sources.

12.25.11) MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

12.25.12) RATIO

No requirement.

12.25.13) AIMABILITY

A combination headlighting system must be aimable in accordance with the requirements of S10.18 of FMVSS No. 108.

12.25.14) PHOTOMETRY

Each combination headlamp must be designed to conform to the photometry requirements of Table XVIII of FMVSS No. 108 for upper beam and Table XIX of FMVSS No. 108 for lower beam as specified in Table II-b of FMVSS No. 108 for the specific headlamp unit and aiming method, when tested according to the procedure of Appendix G using any replaceable light source, as applicable, intended for use in the system under test.

The photometer element shall be located at a distance of 100 feet from the test device. The lamp will be operated at 12.8V.

The device shall meet the candlepower specifications for the applicable table in Appendix I as determined using the following table.

HEADLIGHTING SYSTEMS - COMBINATION (see TABLE II-b of FMVSS No. 108)				
SYSTEM DESIGNATION	LIGHT SOURCE COMPOSITION	APPENDIX I PHOTOMETRY REQUIREMENTS REFERENCE		
		APPENDIX I (see TABLE XVIII of FMVSS No. 108	APPENDIX I (see TABLE XIX of FMVSS No. 108)	
		UPPER BEAM MECHANICAL AND VISUAL AIM	LOWER BEAM MECH AIM	LOWER BEAM VISUAL AIM
2 LAMP SYSTEM	A COMBINATION OF TWO DIFFERENT HEADLAMPS CHOSEN FROM: TYPE F, AN INTEGRAL BEAM HEADLAMP, OR A REPLACEABLE BULB HEADLAMP.	UB2(3)	LB2M(3)	LB2V(3)
4 LAMP SYSTEM	ANY COMBINATION OF FOUR DIFFERENT HEADLAMPS CHOSEN FROM: TYPE F, AN INTEGRAL BEAM HEADLAMP(7), OR A REPLACEABLE BULB HEADLAMP.	UB1	LB1M(4)	LB1V(4)

(3) Headlamps designed to conform to the photometry requirements of UB2 and LB2M or LB2V may allow the lower beam light source(s) to remain activated when an upper beam light source is activated if the lower beam light source(s) contribute to upper beam photometric compliance.

(4) Lower beams may remain activated when upper beams are activated.

(7) Beam contributor photometric allocation formula of S14.2.5.9 of FMVSS No. 108 may apply.

12.25.15) PHYSICAL TESTS

Any component headlamp of a combination headlighting system that is a Type F sealed beam headlamp must be designed to conform to the performance requirements of S10.13.4 of FMVSS No. 108.

Any component headlamp of a combination headlighting system that is an integral beam headlamp must be designed to conform to the performance requirements of S10.14.7 of FMVSS No. 108.

Any component headlamp of a combination headlighting system that is a replaceable bulb headlamp must be designed to conform to the performance requirements of S10.15.7 of FMVSS No. 108.

12.25.16) HEADLAMP PHOTOMETRY DATA SHEET SAMPLES

Headlamp photometry data sheets can be found at the end of Appendix I.

12.26) MOTORCYCLE HEADLIGHTING SYSTEMS TEST PROCEDURE

A motorcycle headlighting system may consist of:

(a) One half of any headlighting system of Table II which provides both a full upper beam and full lower beam, and conforms to the requirements for that headlamp type. Where more than one lamp must be used, the lamps shall be mounted vertically, with the lower beam as high as practicable, or

(b) A headlighting system conforming to the requirements of S10.17 of FMVSS No. 108.

INSTALLATION

The headlamp system installed on a motorcycle must be located on the front.

COLOR OF LIGHT

The device shall be tested for color in accordance with the general Color Test procedure as outlined in Appendix F. Either the visual or tristimulous method may be used. The color of the device shall be white as specified in the procedure.

SINGLE HEADLAMP

If the system consists of a single headlamp, it must be mounted on the vertical centerline of the motorcycle.

If the headlamp contains more than one light source, each light source must be mounted on the vertical centerline with the upper beam no higher than the lower beam, or horizontally disposed about the vertical centerline and mounted at the same height.

If the light sources are horizontally disposed about the vertical centerline, the distance between the closest edges of the effective projected luminous lens area in front of the light sources must not be greater than 200 mm.

TWO HEADLAMPS WITH BOTH BEAMS

If the system consists of two headlamps, each of which provides both an upper and lower beam, the headlamps must be mounted either at the same height and symmetrically disposed about the vertical centerline or mounted on the vertical centerline.

If the headlamps are horizontally disposed about the vertical centerline, the distance between the closest edges of their effective projected luminous lens areas must not be greater than 200 mm.

TWO HEADLAMPS, UPPER BEAM AND LOWER BEAM

If the system consists of two headlamps, one of which provides an upper beam and one of which provides the lower beam, the headlamps must be located on the vertical centerline with the upper beam no higher than the lower beam, or horizontally disposed about the vertical centerline and mounted at the same height.

If the headlamps are horizontally disposed about the vertical centerline, the distance between the closest edges of their effective projected luminous lens areas must not be greater than 200 mm.

MOTORCYCLE REPLACEABLE BULB HEADLAMP MARKING

Each replaceable bulb headlamp that is designed to conform to S10.17(b) of FMVSS No. 108 and that is equipped with a light source other than a replaceable light source meeting the requirements of S11 of FMVSS No. 108, must have the word “motorcycle” permanently marked on the lens in characters not less than 3 mm in height.

PHOTOMETRY

Each motorcycle headlamp that is not one half of a headlighting system listed in Table II, must be designed to conform to the photometry requirements of Table XX when tested according to the procedure of S14.2.5.

PHYSICAL TESTS

Each motorcycle headlamp that is not one half of a headlighting system listed in Table II, must be designed to conform to the performance requirements of the following tests:

VIBRATION TEST

The device shall be tested for vibration in accordance with the Vibration Test procedure as outlined in Appendix J.

MOISTURE TEST

The device shall be tested for moisture in accordance with the general Moisture Test procedure as outlined in Appendix C. At the completion of the spray and drain periods, the unit should not contain moisture accumulation in excess of 2 cc.

DUST TEST

The device shall be tested in accordance with the Dust Test procedure as outlined in Appendix J.

CORROSION TEST

The device shall be tested for corrosion in accordance with the Corrosion Test procedure as outlined in Appendix J.

PLASTIC OPTICAL MATERIAL TEST

Each device that incorporates plastic materials for optical parts such as lenses and reflectors shall be tested in accordance with the plastic optical material test as outlined in Appendix H.

MOTORCYCLE HEADLAMP OUT OF FOCUS TEST

The sample device must be tested for photometry using bulbs having each of four out-of-focus filament positions.

Where conventional bulbs with two pin bayonet bases are used, tests must be made with the light source 0.060 in. above, below, ahead, and behind the designated position.

If prefocused bulbs are used, the limiting positions at which tests are made must be 0.020 in. above, below, ahead, and behind the designated position.

The sample device may be reaimed for each of the out-of-focus positions of the light source.

The minimum photometric values for the out-of-design position must be 80% of the in-design position.

12.26.1) MOTORCYCLE HEADLIGHTING DATA SHEET SAMPLES

PHOTOMETRY TEST – MOTORCYCLE HEADLAMP

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

MOTORCYCLE HEADLAMP PHOTOMETRY REQUIREMENTS
(See Table XX of FMVSS No. 108)

LOWER BEAM

TEST POINT (degrees)		MOTORCYCLE		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
1.5U	1R to R	1,400	-			
1.5U	1R to 3R	-	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	-			
1.5D	9L and 9R	-	700			
2D	V	-	7,000			
2D	3L and 3R	-	4,000			
2D	6L and 6R	-	1,500			
2D	12L and 12R	-	700			
3D	6L and 6R	-	800			
4D	V	-	2,000			
4D	4R	12,500	-			

UPPER BEAM

TEST POINT (degrees)		MOTORCYCLE		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,000			
1U	3L and 3R	-	2,000			
H	V	-	12,500			
0.5D	V	-	20,000			
0.5D	3L and 3R	-	10,000			
0.5D	6L and 6R	-	3,300			
0.5D	9L and 9R	-	1,500			
0.5D	12L and 12R	-	800			
1D	V	-	17,500			
2D	V	-	5,000			
3D	V	-	2,500			
3D	6L and 6R	-	-			
3D	9L and 9R	-	1,500			
3D	12L and 12R	-	300			
4D	V	-	1,500			
4D	V	7,500	-			
ANYWHERE IN BEAM		75,000	-			

PHOTOMETRY TEST – MOTOR DRIVEN CYCLE HEADLAMP

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

MOTOR DRIVEN CYCLE HEADLAMP PHOTOMETRY REQUIREMENTS
(See Table XX of FMVSS No. 108)

LOWER BEAM

TEST POINT (degrees)		MOTOR DRIVEN CYCLE		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
1.5U	1R to R	1,400	-			
1.5U	1R to 3R	-	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	-			
1.5D	9L and 9R	-	-			
2D	V	-	5,000			
2D	3L and 3R	-	3,000			
2D	6L and 6R	-	1,500			
2D	12L and 12R	-	-			
3D	6L and 6R	-	800			
4D	V	-	2,000			
4D	4R	12,500	-			

UPPER BEAM

TEST POINT (degrees)		MOTOR DRIVEN CYCLE		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	-			
1U	3L and 3R	-	2,000			
H	V	-	10,000			
0.5D	V	-	20,000			
0.5D	3L and 3R	-	5,000			
0.5D	6L and 6R	-	2,000			
0.5D	9L and 9R	-	-			
0.5D	12L and 12R	-	-			
1D	V	-	15,000			
2D	V	-	5,000			
3D	V	-	2,500			
3D	6L and 6R	-	800			
3D	9L and 9R	-	-			
3D	12L and 12R	-	-			
4D	V	-	-			
4D	V	7,500	-			
ANYWHERE IN BEAM		75,000	75,000	-		

PHOTOMETRY TEST – MOTOR DRIVEN CYCLE HEADLAMP (SINGLE LAMP SYSTEM)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

MOTOR DRIVEN CYCLE HEADLAMP (SINGLE LAMP SYSTEM) PHOTOMETRY REQUIREMENTS (See Table XX of FMVSS No. 108)						
LOWER BEAM						
TEST POINT (degrees)		**MOTOR DRIVEN CYCLE (SINGLE LAMP SYSTEM)**		**MEASUREMENTS**		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	**MINIMUM PHOTOMETRIC INTENSITY (cd)**	**Location**	**Measured**	**Reaim**
1.5U	1R to R	-	-			
1.5U	1R to 3R	1,400	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	-			
1.5D	9L and 9R	-	-			
2D	V	-	4,000			
2D	3L and 3R	-	3,000			
2D	6L and 6R	-	1,500			
2D	12L and 12R	-	-			
3D	6L and 6R	-	-			
4D	V	-	1,000			
4D	4R	12,500	-			

12.27) MOTORCYCLE HEADLAMP MODULATION SYSTEMS TEST PROCEDURE

A headlamp on a motorcycle may be activated to modulate either the upper beam or the lower beam from its maximum intensity to a lesser intensity, provided that;

MODULATION

(a) The rate of modulation must be 240 ± 40 cycles per minute.

(b) The headlamp must be operated at maximum power for 50 to 70 percent of each cycle.

(c) The lowest intensity at any test point must be not less than 17 percent of the maximum intensity measured at the same point.

(d) The modulator switch must be wired in the power lead of the beam filament being modulated and not in the ground side of the circuit.

(e) Means must be provided so that both the lower beam and upper beam remain operable in the event of a modulator failure.

(f) The system must include a sensor mounted with the axis of its sensing element perpendicular to a horizontal plane. Headlamp modulation must cease whenever the level of light emitted by a tungsten filament light operating at 3000° Kelvin is either less than 270 lux of direct light for upward pointing sensors or less than 60 lux of reflected light for downward pointing sensors. The light is measured by a silicon cell type light meter that is located at the sensor and pointing in the same direction as the sensor. A Kodak Gray Card (Kodak R–27) is placed at ground level to simulate the road surface in testing downward pointing sensors.

(g) When tested in accordance with the test profile shown in Figure 9 of FMVSS No. 108, the voltage drop across the modulator when the lamp is on at all test conditions for 12 volt systems and 6 volt systems must not be greater than 0 .45 volt. The modulator must meet all the provisions of the standard after completion of the test profile shown in Figure 9 of FMVSS No. 108.

(h) Means must be provided so that both the lower and upper beam function at design voltage when the headlamp control switch is in either the lower or upper beam position when the modulator is off.

REPLACEMENT MODULATORS

Each modulator not intended as original equipment, or its container, must be labeled with the maximum wattage, and the minimum wattage appropriate for its use.

PERFORMANCE

Each modulator, not intended as original equipment, must comply with S10.17.5.1(a) through (g) of FMVSS No. 108 when connected to a headlamp of the maximum rated power and a headlamp of the minimum rated power, and must provide means so that the modulated beam functions at design voltage when the modulator is off.

INSTRUCTIONS

Instructions, with a diagram, must be provided for mounting the light sensor including location on the motorcycle, distance above the road surface, and orientation with respect to the light.

12.27.1) MOTORCYCLE HEADLAMP MODULATIONS SYSTEMS DATA SHEET SAMPLES

See test report samples.

12.28) HEADLAMP AIMABILITY TEST PROCEDURE

HEADLAMP MOUNTING AND AIMING

Except as provided in this paragraph, each headlamp must be installed on a motor vehicle with a mounting and aiming mechanism that allows aim inspection and adjustment of both vertical and horizontal aim, and is accessible for those purposes without removal of any vehicle parts, except for protective covers removable without the use of tools.

HEADLAMP AIMING SYSTEMS

When a headlamp system is installed on a motor vehicle, it must be aimable with at least one of the following: An externally applied aiming device, as specified in S10.18.7 of FMVSS No. 108; an on-vehicle headlamp aiming device installed by the vehicle or lamp manufacturer, as specified in S10.18.8 of FMVSS No. 108; or by visual/optical means, as specified in S10.18.9 of FMVSS No. 108.

AIM ADJUSTMENT INTERACTION

When installed on the vehicle, adjustment of one aim axis through its full on-vehicle range must not cause the aim of the other axis to deviate more than ±0.76°. If the performance specified is not achievable, the requirements of S10.18.3.1 of FMVSS No. 108 apply, except that if the aiming mechanism is not a VHAD, the requirements specific to VHADs are not applicable, and the instruction must be specific to the aiming mechanism installed.

Should the mechanism not meet the requirements above, a cautionary label must be placed adjacent to the mechanism stating the caution and including either the reason for the caution or the corrective action necessary. Each such label must also refer the reader to the vehicle operator’s manual for complete instructions. Each such vehicle must be equipped with an operator’s manual containing the complete instructions appropriate for the mechanism installed.

HORIZONTAL ADJUSTMENT-VISUALLY AIMED HEADLAMP

A visually/optically aimable headlamp that has a lower beam must not have a horizontal adjustment mechanism unless such mechanism meets the requirements of this standard for a VHAD.

OPTICAL AXIS MARKING

OPTICAL AXIS MARKING-VEHICLE

Each motor vehicle must be equipped with headlamps or beam contributors which have a mark or markings that are visible from the front of the headlamp when installed on the vehicle to identify the optical axis of the headlamp to assure proper horizontal and vertical alignment of the aiming screen or optical aiming equipment. The manufacturer is free to choose the design of the mark or markings. The mark or markings may be on the interior or exterior of the lens or indicated by a mark or central

structure on the interior or exterior of the headlamp.

OPTICAL AXIS MARKING-LAMP

Each headlamp or beam contributor that is not visually/optically aimable in accordance with S10.18.9 of FMVSS No. 108 must be equipped with fiducial marks, aiming pads, or similar references of sufficient detail and accuracy, for determination of an appropriate vehicle plane to be used with the photometric procedures of S14.2.5 of FMVSS No. 108 for correct alignment with the photometer axis when being tested for photometric compliance, and to serve for the aiming reference when the headlamp or beam contributor is installed on a motor vehicle. The fiducial marks, aiming pads, or similar references are protrusions, bubble vials, holes, indentations, ridges, scribed lines, or other readily identifiable marks established and described by the vehicle or headlamp manufacturer.

OPTICAL AXIS MARKING-VISUAL AIM HEADLAMP

There must be a mark or markings identifying the optical axis of the headlamp visible from the front of the headlamp when installed on the vehicle, to assure proper horizontal and vertical alignment of the aiming screen or optical aiming equipment with the headlamp being aimed. The manufacturer is free to choose the design of the mark or markings. The mark or markings may be on the interior or exterior of the lens or indicated by a mark or central structure on the interior or exterior of the headlamp.

MOVEABLE REFLECTORS

Each headlamp aimed by moving the reflector relative to the lens and headlamp housing, or vice versa, must conform with the photometric requirements applicable to it when tested according to the procedure of S14.2.5 of FMVSS No. 108 with the lens at any position relative to the reflector within the full range of vertical pitch on the vehicle on which the headlamp system is installed and a horizontal range of ± 2.5°. Additionally it must comply with the aiming adjustment requirements of S14.6 of FMVSS No. 108.

EXTERNAL AIMING

Each headlamp system that is capable of being mechanically aimed by externally applied headlamp aiming devices must be mechanically aimable using the equipment specified in SAE J602, Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units, October 1980, without the removal of any ornamental trim rings, covers,
wipers or other vehicle parts.

HEADLAMP AIMING DEVICE LOCATING PLATES

Each headlamp system which is designed to use the Headlamp Aiming Device Locating Plates with adjustable legs for the 100x165 mm unit and the 142x200 mm unit, and which has adjustable length legs, must meet the following requirements.

The lens must have three aiming pads which meet the requirements of Figure 3, Dimensional Specifications for Location of Aiming Pads on Replaceable Bulb Headlamp Units. The aiming pads need not be centered at the geometric center of the

lens, or on the optical axis. Except as provided in S10.18.7.1.2 of FMVSS No. 108, a whole number, which represents the distance in tenths of an inch (i.e. 0.3 inch=3) from the aiming reference plane to the respective aiming pads which are not in contact with that plane, must be inscribed adjacent to each respective aiming pad on the lens. The height of these numbers must be not less than .157 inch (4 mm). If there is interference between the plane and the area of the lens between the aiming pads, the whole number represents the distance to a secondary plane. The secondary plane must be located parallel to the aiming reference plane and as close to the lens as possible without causing interference.

If the most forward aiming pad is the lower inboard aiming pad, then the dimensions may be placed anywhere on the lens. The dimension for the outboard aiming pad (Dimension F in Figure 3 of FMVSS No. 108) must be followed by the letter “H” and the dimension for the center aiming pad must be followed by the letter “V.” The dimensions must be expressed in tenths of an inch.

NONADJUSTABLE HEADLAMP AIMING DEVICE LOCATING PLATES

Each headlamp may be designed to use the nonadjustable Headlamp Aiming Device Locating Plate for the 100x165 mm unit, the 142x200 mm unit, the 146 mm diameter unit, or the 178 mm diameter unit of SAE J602, or the 92x150 mm Type F unit, and incorporate lens-mounted aiming pads as specified for those units in Appendix C of part 564 of this chapter. If so designed, no additional lens marking is necessary to designate the type of plate or dimensions.

ON-VEHICLE AIMING

Each headlamp system that is capable of being aimed by equipment installed on the vehicle must include a Vehicle Headlamp Aiming Device (VHAD) that conforms to the following requirements:

AIM

The VHAD must provide for headlamp aim inspection and adjustment in both the vertical and horizontal axes.

VERTICAL AIM

The VHAD must include the necessary references and scales relative to the horizontal plane to assure correct vertical aim for photometry and aiming purposes. An off vehicle measurement of the angle of the plane of the ground is permitted. In addition, an equal number of graduations from the ‘‘O’’ position representing angular changes in the axis in the upward and downward directions must be provided.

Each graduation must represent a change in the vertical position of the mechanical axis not larger than 0.19° (1 in. at 25 ft.) to provide for variations in aim at least 1.2° above and below the horizontal, and have an accuracy relative to the zero mark of less than 0.1°.

The VHAD must be marked to indicate headlamp aim movement in the upward and downward directions.

Each graduation must indicate a linear movement of the scale indicator of not less than 0.05 in. (1.27 mm) if a direct reading analog indicator is used. If a remote reading indicator is provided, it must represent the actual aim movement in a clear, understandable format.

The vertical indicator must perform through a minimum range of ±1.2°.

Means must be provided in the VHAD for compensating for deviations in floor slope less than 1.2° from the horizontal that would affect the correct positioning of the headlamp for vertical aim.

The graduations must be legible under an illumination level not greater than 30 foot candles, measured at the top of the graduation, by an observer having 20/20 vision (Snellen), and must permit aim adjustment to within 0.19° (1 in. at 25 ft.).

HORIZONTAL AIM

The VHAD must include references and scales relative to the longitudinal axis of the vehicle necessary to assure correct horizontal aim for photometry and aiming purposes. An ‘‘O’’ mark must be used to indicate alignment of the headlamps relative to the longitudinal axis of the vehicle. In addition, an equal number of graduations from the ‘‘O’’ position representing equal angular changes in the axis relative to the vehicle axis must be provided.

Each graduation must represent a change in the horizontal position of the mechanical axis not greater than 0.38° (2 in. at 25 ft.) to provide for variations in aim at least 0.76° (4in. at 25 ft.) to the left and right of the longitudinal axis of the vehicle, and must have an accuracy relative to the zero mark of less than 0.1°.

The VHAD must be marked to indicate headlamp aim movement in the left and right directions.

The graduations must be legible under an illumination level not greater than 30 foot candles, measured at the top of the graduation, by an observer having 20/20 vision (Snellen), and must permit aim adjustment to within 0.38° (2 in. at 25 ft.).

The horizontal indicator must perform through a minimum range of ±0.76° (4 in. at 25 ft.); however, the indicator itself must be capable of recalibration over a movement of ±2.5° relative to the longitudinal axis of the vehicle to accommodate any adjustment necessary for recalibrating the indicator after vehicle repair from accident damage.

AIMING INSTRUCTIONS

The instructions for properly aiming the headlighting system using the VHAD must be provided on a label permanently affixed to the vehicle adjacent to the VHAD, or in the vehicle operator’s manual. The instructions must advise that the headlighting system is properly aimed if the appropriate vertical plane (as defined by the vehicle manufacturer) is perpendicular to both the longitudinal axis of the vehicle, and a horizontal plane when the vehicle is on a horizontal surface, and the VHAD is set at “0” vertical and “0” horizontal.

Should a remote indicator or a remote indicator and adjuster be provided, the

instructions must be placed in the operator's manual, and may also be placed on a label adjacent to the VHAD.

PERMANENT CALIBRATION

Each headlamp equipped with a VHAD must be manufactured with its calibration permanently fixed by its manufacturer. Calibration in this case means the process of accurately aligning the geometry of the VHAD devices with the beam pattern for the purposes of compliance with the standard.

REPLACEMENT UNITS

When tested according to the procedure of S14.2.5 of FMVSS No. 108 with any replacement headlamp unit(s) or light sources intended for use in the system under test, the VHAD and headlamp system must be designed to conform to the photometric performance requirements appropriate for the system under test.

PHYSICAL TESTS

Each VHAD must be designed to conform with the performance requirements of S14.8 of FMVSS No. 108.

VISUAL/OPTICAL AIMING

Each visually/optically aimable headlamp must be designed to conform to the following requirements:

VERTICAL AIM, LOWER BEAM

Each lower beam headlamp must have a cutoff in the beam pattern. It may be either on the left side or the right side of the optical axis, but once chosen for a particular headlamp system's design, the side chosen for the cutoff must not be changed for any headlamps intended to be used as replacements for those system's headlamps.

VERTICAL POSITION OF THE CUTOFF

The headlamp must be aimed vertically so that the cutoff is on the left side, at 0.4° down from the H–H line, or on the right side, at the H–H line.

VERTICAL GRADIENT

The gradient of the cutoff measured at either 2.5° L or 2.0° R must be not less than 0.13 based on the procedure of S10.18.9.1.5 of FMVSS No. 108.

HORIZONTAL POSITION OF THE CUTOFF

The width must be not less than 2°, with not less than 2° of its actual width centered at either 2.5° L, or 2.0° R.

MAXIMUM INCLINATION OF THE CUTOFF

The vertical location of the highest gradient at the ends of the minimum width must be

within ±0.2° of the vertical location of the maximum gradient measured at the appropriate vertical line (at either 2.5° L for a left side cutoff, or 2.0° R for a right side cutoff.)

MEASURING THE CUTOFF PARAMETER

The headlamp is mounted on a fixture which simulates its actual design location on any vehicle for which the headlamp is intended. The fixture, with the headlamp installed is attached to the goniometer table in such a way that the fixture alignment axes are coincident with the goniometer axes. The headlamp is energized at the specified test voltage. The cutoff parameter must be measured at a distance of 10 m. from a photosensor with a 10 mm. diameter.

The headlamp beam pattern is aimed with the cutoff at the H-H axis. There is no adjustment, shimming, or modification of the horizontal axis of the headlamp or test fixture, unless the headlamp is equipped with a VHAD. In this case the VHAD is adjusted to zero.

A vertical scan of the beam pattern is conducted for a headlamp with a left side gradient by aligning the goniometer on a vertical line at 2.5° L and scanning from 1.5° U to 1.5° D. For a headlamp with a right side gradient, a vertical scan of the beam pattern is conducted by aligning the goniometer on a vertical line at 2.0° R and scanning from 1.5° U to 1.5° D.

Determine the maximum gradient within the range of the scan by using the formula: G = log E(a)-logE(a+0.1), where “G” is the gradient, “E” is illumination and “a” is vertical angular position. The maximum value of the gradient “G” determines the vertical angular location of the cutoff. Perform vertical scans at 1.0° L and R of the measurement point of the maximum gradient to determine the inclination.

HORIZONTAL AIM, LOWER BEAM

There is no adjustment of horizontal aim unless the headlamp is equipped with a horizontal VHAD. If the headlamp has a VHAD, it is set to zero.

VERTICAL AIM, UPPER BEAM

If the upper beam is combined in a headlamp with a lower beam, the vertical aim of the upper beam must not be changed from the aim set using the procedures of S10.18.9.1 and S10.18.9.2 of FMVSS No. 108 used for the lower beam.

If the upper beam is not combined in a headlamp with a lower beam, the vertical aim of the upper beam is adjusted so that the maximum beam intensity is located on the H-H axis.

HORIZONTAL AIM, UPPER BEAM

If the upper beam is combined in a headlamp with a lower beam, the horizontal aim of the upper beam is not be changed from the aim set using the procedures of S14.9.1 and S10.18.9.2 of FMVSS No. 108 used for the lower beam.

If the upper beam is not combined in a headlamp with the lower beam and has fixed

horizontal aim or has a horizontal VHAD, then the headlamp is mounted on a fixture which simulates its actual design location on any vehicle for which the headlamp is intended. The fixture, with the headlamp installed, is attached to the goniometer table in such a way that the fixture alignment axes are coincident with the goniometer axes. The headlamp must be energized at 12.8 ± 0.20 mV. There is no adjustment, shimming, or modification of the horizontal axis of the headlamp or test fixture, unless the headlamp is equipped with a VHAD. In this case the VHAD is adjusted to zero.

If the upper beam is not combined in a headlamp with a lower beam, and it does not have a VHAD, the horizontal aim of the upper beam is adjusted so that the maximum beam intensity is located on the V-V axis.

PHOTOMETRY

A visually/optically aimable headlamp must be designed to conform to the lower beam requirements of columns LB1V, LB2V, LB3V, or LB4V of Table XIX of FMVSS No. 108 when tested according to the procedure of S14.2.5 of FMVSS No. 108.

VISUAL/OPTICAL IDENTIFICATION MARKING

Each letter used in marking according to this paragraph must be not less than 3 mm. high.

The lens of a lower beam headlamp must be marked “VOL” if the headlamp is intended to be visually/optically aimed using the left side of the lower beam pattern. The lens of a lower beam headlamp must be marked “VOR” if the headlamp is intended to be visually/optically aimed using the right side of the lower beam pattern. The lens of a headlamp that is solely an upper beam headlamp and intended to be visually/optically aimed using the upper beam must be marked “VO”.

The lens of each sealed beam or integral beam headlamp must be marked “VOR” if the headlamp is of a type that was manufactured before May 1, 1997, and if such headlamp type has been redesigned since then to be visually/optically aimable.

12.29) REPLACEABLE LIGHT SOURCES TEST PROCEDURE

Each replaceable light source must be designed to conform to the dimensions and electrical specifications furnished with respect to it pursuant to part 564 of this chapter, and must conform to the following requirements:

12.29.1) MARKINGS

The light source must be marked with the bulb marking designation specified for it in compliance with Appendix A or Appendix B of part 564 of this chapter.

Each replaceable light source must be marked with the symbol DOT and with a name or trademark in accordance with S6.5 of FMVSS No. 108.

If a ballast is required for operation, each ballast must bear the following permanent markings:

(a) Name or logo of ballast manufacturer;
(b) Ballast part number or unique identification;
(c) Part number or other unique identification of the light source for which the ballast is designed;
(d) Rated laboratory life of the light source/ballast combination, if the information for the light source has been filed in Appendix B of part 564 of this chapter;
(e) A warning that ballast output voltage presents the potential for severe electrical shock that could lead to permanent injury or death;
(f) Ballast output power in watts and output voltage in rms volts AC or DC; and
(g) The symbol ‘DOT’.

12.29.2) GAS DISCHARGE LABORATORY LIFE

For light sources that use excited gas mixtures as a filament or discharge arc, the ‘‘rated laboratory life’’ is determined in accordance with sections 4.3 and 4.9 of SAE Recommended Practice J2009 FEB93, *Forward Discharge Lighting Systems.*

12.29.3) PHYSICAL TESTS

DEFLECTION TEST PROCEDURE

With the sample light source rigidly mounted in a fixture in a manner indicated in Figure 8 of FMVSS No. 108, a force of 4.0±0.1 pounds (17.8±0.4N) is applied at a distance “A” from the reference plane perpendicular to the longitudinal axis of the glass capsule and parallel to the smallest dimension of the pressed glass capsule seal.

The force is applied (using a rod with a hard rubber tip with a minimum spherical radius of .039 in [1 mm]) radially to the surface of the glass capsule in four locations in a plane parallel to the reference plane and spaced at a distance “A” from that plane. These force applications are spaced 90º apart

starting at the point perpendicular to the smallest dimension of the pressed seal of the glass capsule.

The bulb deflection is measured at the glass capsule surface at 180º opposite to the force application. Distance "A" for a replaceable light source other than an HB Type is the dimension provided in accordance with Appendix A of part 564 of this chapter, section I.A.1 if the light source has a lower beam filament, or as specified in section I.B.1 if the light source has only an upper beam filament.

After completion of the deflection test, a sample light source must have no permanent deflection of the glass envelope exceeding 0.13 mm in the direction of applied force.

PRESSURE TEST FOR REPLACEABLE LIGHT SOURCES

The capsule, lead wires and/or terminals, and seal on each sample Type HB1, Type HB3, Type HB4, and Type HB5 light source, and on any other replaceable light source which uses a seal, is installed in a pressure chamber as shown in Figure 10 of FMVSS No. 108 so as to provide an airtight seal. The diameter of the aperture in Figure 10 FMVSS No. 108 on a replaceable light source must be that dimension furnished for such light source in compliance with Appendix A or Appendix B of part 564 of this chapter.

The light source is immersed in water for one minute while inserted in a cylindrical aperture specified for the light source, and subjected to an air pressure of 70KPa (10 psig) on the glass capsule side.

After completion of the pressure test, the sample light source with an airtight seal on the low pressure (connector side) must show no evidence of air bubbles on that side.

12.29.4) POWER AND FLUX MEASUREMENT

Replaceable light sources must be designed to conform with the requirements of section VII of Appendix A of part 564 of this chapter, or section IV of Appendix B of part 564 of this chapter, for maximum power and luminous flux when tested using the following procedure:

SEASONING

The filament or discharge arc is seasoned before measurement of either maximum power or luminous flux.

RESISTIVE FILAMENT SOURCE

Season the light source at design voltage for 1% of its average design life or 10 hours, whichever is less, before measurement of either maximum power or luminous flux.

DISCHARGE SOURCE

For a light source using excited gas mixtures as a filament or discharge arc, seasoning of the light source system, including any ballast required for its operation, is made in accordance with section 4.0 of SAE Recommended Practice J2009 FEB93, *Discharge Forward Lighting Systems.*

TEST VOLTAGE

Measurements are made with a direct current test voltage of 12.8V regulated within one quarter of one percent.

LUMINOUS FLUX MEASUREMENT

The measurement of luminous flux is made in accordance with the Illuminating Engineering Society of North America, LM 45; *IES Approved Method for Electrical and Photometric Measurements of General Service Incandescent Filament Lamps* (April 1980).

RESISTIVE FILAMENT LIGHT SOURCE SETUP

Luminous flux measurements are made with the black cap installed on Type HB1, Type HB2, Type HB4, and Type HB5, and on any other replaceable light source so designed; and is with the electrical conductor and light source base shrouded with an opaque white cover, except for the portion normally located within the interior of the lamp housing. The measurement of luminous flux for the Types HB3 and HB4 is made with the base covered with a white cover as shown in the drawings for Types HB3 and HB4 filed in Docket No. NHTSA 98–3397. The white covers are used to eliminate the likelihood of incorrect lumen measurement that will occur should the reflectance of the light source base and electrical connector be low.

DISCHARGE LIGHT SOURCE SETUP

With the test voltage applied to the ballast input terminals, the measurement of luminous flux is made with the black cap installed, if so designed, and is made with an opaque white colored cover, except for the portion normally located within the interior of the lamp housing.

12.29.5) REPLACEABLE LIGHT SOURCE DATA SHEET SAMPLES

See test report samples.

12.30) HEADLAMP CONCEALMENT DEVICES TEST PROCEDURE

While the headlamp is illuminated, its fully opened headlamp concealment device must remain fully opened should any loss of power to or within the headlamp concealment device occur.

Whenever any malfunction occurs in a component that controls or conducts power for the actuation of the concealment device, each closed headlamp concealment device must be capable of being fully opened by a means not requiring the use of any tools. Thereafter, the headlamp concealment device must remain fully opened until intentionally closed.

Except for malfunctions covered by S12.2 of FMVSS No. 108, each headlamp concealment device must be capable of being fully opened and the headlamps illuminated by actuation of a single switch, lever, or similar mechanism, including a mechanism that is automatically actuated by a change in ambient light conditions.

Each headlamp concealment device must be installed so that the headlamp may be mounted, aimed, and adjusted without removing any component of the device, other than components of the headlamp assembly.

Except for cases of malfunction covered by S12.2 of FMVSS No. 108, each headlamp concealment device must, within an ambient temperature range of -20° F to +120° F, be capable of being fully opened in not more than 3 seconds after the actuation of a driver-operated control.

As an alternative to complying with the requirements of S12.1 through S12.5, a vehicle with headlamps incorporating VHAD or visual/optical aiming in accordance with this standard may meet the requirements for Concealable lamps in paragraph 5.14 of the following version of the Economic Commission for Europe Regulation 48 ‘‘Uniform Provisions Concerning the Approval of Vehicles With Regard to the Installation of Lighting and Light-Signaling Devices’’: E/ECE/324–E/ECE/ TRANS/505, Rev.1/Add.47/Rev.1/Corr.2, 26 February 1996 (page 17), in the English language version. A copy of paragraph 5.14 may be reviewed at the DOT Docket Management Facility, U.S. Department of Transportation, 1200 New Jersey Avenue SE, Washington, D.C. 20590.

Copies of E/ECE/324–E/ECE/TRANS/505, Rev.1/ Add.47/Rev.1/Corr.2, 26 February 1996 may be obtained from the ECE Internet site: www.unece.org/trans/main/wp29/wp29regs.html or by writing to: United Nations, Conference Services Division, Distribution and Sales Section, Office C.115–1, Palais des Nations, CH–1211, Geneva 10, Switzerland.

CERTIFICATION ELECTION

Manufacturers of vehicles with headlamps incorporating VHAD or visual/optical aiming must elect to certify to S12.1 through S12.5 or to S12.6 of FMVSS No. 108 prior to, or at the time of certification of the vehicle, pursuant to 49 CFR part 567. The selection is irrevocable.

12.31) REPLACEABLE HEADLAMP LENS REQUIREMENTS TEST PROCEDURE

A replacement lens for a replaceable bulb headlamp or integral beam headlamp that is not required to have a bonded lens must be provided with a replacement seal in a package that includes instructions for the removal and replacement of the lens, the cleaning of the reflector, and the sealing of the replacement lens to the reflector assembly.

Each replacement headlamp lens with seal, when installed according to the lens manufacturer's instructions on an integral beam or replaceable bulb headlamp, must not cause the headlamp to fail to comply with any of the requirements of this standard.

Each replacement headlamp lens must be marked with the symbol "DOT" either horizontally or vertically, to constitute certification. Each replacement headlamp lens must also be marked with manufacturer and the part or trade number of the headlamp for which it is intended, and with the name and/or trademark of the lens manufacturer or importer that is registered with the U.S. Patent and Trademark Office. Nothing in this standard authorizes the marking of any such name and/or trademark by one who is not the owner, unless the owner has consented to it.

13. POST TEST REQUIREMENTS

The contractor shall re-verify all instrumentation and check data sheets and photographs. Make sure that data is recorded in all applicable data blocks on every Data Sheet.

14. REPORTS

14.1) MONTHLY STATUS REPORTS

The contractor shall submit a monthly Test Status Report and an Equipment Status Report to the COTR. The Equipment Status Report shall be submitted until all items of equipment are disposed of. Samples of the required Monthly Status Reports are contained in the report forms section.

14.2) TEST FAILURE

Any indication of a test failure shall be communicated by telephone, or FAX at (202) 366-7002, to the COTR within 1 working day with written notification within 2 working days. 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.

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 a test failure, SEVEN copies of the Final Test Report shall be submitted to the COTR for acceptance within three weeks of test completion. The Final Test Report format to be used by all contractors can be found in the attachment.

Where there has been no indication of a test failure, FOUR copies of each Final Test Report shall be submitted to the COTR within three weeks of test completion. Payment of contractor's invoices for completed compliance tests may be withheld until the Final Test Report is accepted by the COTR. Contractors are requested to NOT submit invoices before the COTR is provided copies of the Final Test Report.

Contractors are required to submit the first Final Test Report in typed draft form within two weeks 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.

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 below for the purpose of standardization.

14.3.2.1) 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 108 ABC 0X 001, where –

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

(2) Final Report Title And Subtitle such as

SAFETY COMPLIANCE TESTING FOR FMVSS 108
Lamps, Reflective Devices, and Associated Equipment
* *
ACE Distributors
COMPANY Aftermarket License Plate Lamps

(3) Contractor's Name and Address such as

COMPLIANCE TESTING LABORATORIES, INC.
4335 West Dearborn Street
Detroit, Michigan 48090-1234

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
Enforcement Division
Office of Vehicle Safety Compliance
West Building- 4th Floor
1200 New Jersey Avenue, SE
Washington, DC 20590

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 Admin-istration, 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:

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

108 ABC 0X 001

Block 2 – GOVERNMENT ACCESSION NUMBER

Leave blank

Block 3 – RECIPIENT'S CATALOG NUMBER

Leave blank

Block 4 – TITLE AND SUBTITLE

Final Report of FMVSS 108 Compliance
Testing of COMPANY Aftermarket License Plate Lamps

Block 5 – REPORT DATE

March 1, 200X

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

Block 9 – PERFORMING ORGANIZATION NAME AND ADDRESS

ABC Laboratories
405 Main Street
Detroit, MI 48070-1234

Block 10 – WORK UNIT NUMBER

Leave blank

Block 11 – CONTRACT OR GRANT NUMBER

DTNH22 0X D 12345

Block 12 – SPONSORING AGENCY NAME AND ADDRESS

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement Division
Office of Vehicle Safety Compliance
West Building- 4th Floor
1200 New Jersey Avenue, SE
Washington, DC 20590

Block 13 – TYPE OF REPORT AND PERIOD COVERED

Final Test Report
Feb. 15 to Mar. 15, 200X (Start Date to Completion Date)

Block 14 – SPONSORING AGENCY CODE

NVS-222

Block 15 – SUPPLEMENTARY NOTES

Leave blank

Block 16 – ABSTRACT

The scope of this compliance testing was limited to certain photometry and color tests as indicated. Test failures identified were as follows: VOL Maximum Gradient, Lower Beam, Upper Beam.

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

Compliance Testing
FMVSS
Federal Motor Vehicle Safety Standard 108
Lamps, Reflective Devices, and Associated Equipment

Block 18 – DISTRIBUTION STATEMENT

Copies of this report are available from –

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Technical Information Services (TIS)
West Building- 1st Floor
1200 New Jersey Avenue, SE
Washington, DC 20590
Telephone No. 202-366-4946

Block 19 – SECURITY CLASSIFICATION OF REPORT

Unclassified

Block 20 – SECURITY CLASSIFICATION OF PAGE

Unclassified

Block 21 – NUMBER OF PAGES

Add appropriate number

Block 22 – PRICE

Leave blank

14.3.3) TABLE OF CONTENTS

Final test report Table of Contents shall include the following:

Section 1 Purpose of Compliance Test

Section 2 Compliance Test Data Summary

Section 3 Test Data

Section 4 Test Failure Details (if applicable)

Appendix A - Interpretations or Deviations from FMVSS 108

Appendix B - Test Equipment List and Calibration Information

Appendix C - Photographs

15. SAMPLE TEST REPORTS

15.1) TURN SIGNAL LAMPS TEST REPORT SAMPLES

FRONT TURN SIGNAL LAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) FRONT TURN SIGNAL LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) FRONT TURN SIGNAL LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

<table>
<tr><th colspan="2"></th><th>Required</th><th>Observed</th></tr>
<tr><th colspan="2">Vehicle type/size</th><th>Number of Lamps (Minimum)</th><th>Number of Lamps</th></tr>
<tr><td colspan="2">Passenger cars</td><td rowspan="4">2</td><td rowspan="4"></td></tr>
<tr><td colspan="2">MPV</td></tr>
<tr><td colspan="2">Trucks</td></tr>
<tr><td colspan="2">Buses</td></tr>
<tr><td colspan="2">Trailers</td><td colspan="2" rowspan="2">Not required.</td></tr>
<tr><td rowspan="2">Motorcycles</td><td>Motor driven cycle whose speed attainable in 1 mile is 30 mph or less</td></tr>
<tr><td>All other motorcycles</td><td>2</td><td></td></tr>
</table>

SECTION 3) FRONT TURN SIGNAL LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) FRONT TURN SIGNAL LAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

	REQUIRED		MEASURED	
Vehicle type/size	Mounting		Mounting	
	Location	Height*	Location	Height*
Passenger cars	At or near the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.	Not less than 15 inches, nor more than 83 inches.		
MPV				
Trucks				
Buses				
Trailers	Not applicable			
Motorcycles	At or near the front, at the same height, symmetrically about the vertical centerline, and having a minimum horizontal separation distance (centerline of lamps) of 16 inches. Minimum edge to edge separation distance between a turn signal lamp and headlamp is 4 inches.			

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) FRONT TURN SIGNAL LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) FRONT TURN SIGNAL LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

EPLLA REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 7) FRONT TURN SIGNAL LAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) FRONT TURN SIGNAL LAMP INDICATOR

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

INDICATOR REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 9) FRONT TURN SIGNAL LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) FRONT TURN SIGNAL LAMP SPACING TO OTHER LAMPS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 11) FRONT TURN SIGNAL LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS*

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

TEST PERFORMED BY: _____ DATE: _____

DETERMINATION OF THE NUMBER OF LIGHTED SECTIONS FOR PHOTOMETRY TEST PURPOSES**:

Number of compartments or lamps	Distance between compartments		Is measured distance greater than target distance?	
	Target (mm)	Measured (mm)	Yes/No	Photometry test criteria
1	n/a	n/a	n/a	Test as one, one lighted section lamp
			n/a	
2	560		Yes	Test as two, one lighted section lamps
			No	Test as one, two lighted section lamp
3 (or more)	410		Yes	Test as three (or more), one lighted section lamps
			No	Test as one, three lighted section lamp

RESULTS: _____

REMARKS: _____

* If the test component consists of only one compartment and one lamp, then Section 11 does not apply.
** See S7.2.11.4 of FMVSS No. 108 for additional requirements applicable to vehicles 2032 mm. or more in overall width.

SECTION 12) FRONT TURN SIGNAL LAMP RATIO

Include front turn signal lamp ratio results, as applicable, in photometry test results of section 13.

SECTION 13) FRONT TURN SIGNAL LAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) FRONT TURN SIGNAL LAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

HEAT TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) FRONT TURN SIGNAL LAMP PHOTOGRAPHS

REAR TURN SIGNAL LAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) REAR TURN SIGNAL LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) REAR TURN SIGNAL LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

		Required	Observed
Vehicle type/size		**Number of Lamps (Minimum)**	**Number of Lamps**
Passenger cars		2	
MPV			
Trucks			
Buses			
Trailers			
Motorcycles	Motor driven cycle whose speed attainable in 1 mile is 30 mph or less	Not required	
	All other motorcycles	2	

SECTION 3) REAR TURN SIGNAL LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) REAR TURN SIGNAL LAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

<table>
<tr><th rowspan="3">Vehicle type/size</th><th colspan="2">REQUIRED</th><th colspan="2">MEASURED</th></tr>
<tr><th colspan="2">Mounting</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars
MPV
Trucks
Buses
Trailers</td><td>On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="2">Not less than 15 inches, nor more than 83 inches.</td><td></td><td></td></tr>
<tr><td>Motorcycles</td><td>At or near the rear, at the same height, symmetrically about the vertical centerline, and having a minimum horizontal separation distance (centerline to centerline of lamps) of 9 inches.

Minimum edge to edge separation distance between the turn signal lamp and the taillamp or stop lamp is 4 inches, when a single stop and taillamp is installed on the vertical centerline and the turn signal lamps are red.</td><td></td><td></td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) REAR TURN SIGNAL LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) REAR TURN SIGNAL LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

EPLLA REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 7) REAR TURN SIGNAL LAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) REAR TURN SIGNAL LAMP INDICATOR

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

INDICATOR REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 9) REAR TURN SIGNAL LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) REAR TURN SIGNAL LAMP SPACING TO OTHER LAMPS

No requirements.

SECTION 11) REAR TURN SIGNAL LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS*

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

TEST PERFORMED BY: _____ DATE: _____

DETERMINATION OF THE NUMBER OF LIGHTED SECTIONS FOR PHOTOMETRY TEST PURPOSES**:

Number of compartments or lamps	Distance between compartments		Is measured distance greater than target distance?	
	Target (mm)	Measured (mm)	Yes/No	Photometry test criteria
1	n/a	n/a	n/a	Test as one, one lighted section lamp
			n/a	
2	560		Yes	Test as two, one lighted section lamps
			No	Test as one, two lighted section lamp
3 (or more)	410		Yes	Test as three (or more), one lighted section lamps
			No	Test as one, three lighted section lamp

RESULTS: _____

REMARKS: _____

* If the test component consists of only one compartment and one lamp, then Section 11 does not apply.
** See S7.2.11.4 of FMVSS No. 108 for additional requirements applicable to vehicles 2032 mm. or more in overall width.

SECTION 12) REAR TURN SIGNAL LAMP RATIO

Include rear turn signal lamp ratio results, as applicable, in photometry test results of section 13.

SECTION 13) REAR TURN SIGNAL LAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) REAR TURN SIGNAL LAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

HEAT TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) REAR TURN SIGNAL LAMP PHOTOGRAPHS

15.2) TAILLAMP TEST REPORT SAMPLES

TAILLAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) TAILLAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) TAILLAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

		Required	Observed
Vehicle type/size		**Number of Lamps (Minimum)**	**Number of Lamps**
Passenger cars		2	
MPV			
Trucks			
Buses			
Trailers	Less than or equal to 30 inches in overall width	1	
	Over 30 inches in overall width	2	
Motorcycles		1	

SECTION 3) TAILLAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) TAILLAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

<table>
<tr><th colspan="2" rowspan="3">Vehicle type/size</th><th colspan="2">REQUIRED</th><th colspan="2">MEASURED</th></tr>
<tr><th colspan="2">Mounting</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th><th>Location</th><th>Height*</th></tr>
<tr><td colspan="2">Passenger cars</td><td rowspan="4">On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="7">Not less than 15 inches, nor more than 72 inches.</td><td></td><td rowspan="7"></td></tr>
<tr><td colspan="2">MPV</td><td></td></tr>
<tr><td colspan="2">Trucks</td><td></td></tr>
<tr><td colspan="2">Buses</td><td></td></tr>
<tr><td rowspan="2">Trailers</td><td>Less than or equal to 30 inches in overall width</td><td>When a single lamp is installed it must be mounted at or near the vertical centerline.</td><td></td></tr>
<tr><td>Over 30 inches in overall width</td><td>On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td></td></tr>
<tr><td colspan="2">Motorcycles</td><td>On the rear, on the vertical centerline except that if two are used, they must be symmetrically disposed about the vertical centerline.</td><td></td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) TAILLAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) TAILLAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) TAILLAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) TAILLAMP INDICATOR

No requirement.

SECTION 9) TAILLAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) TAILLAMP SPACING TO OTHER LAMPS

No requirement.

SECTION 11) TAILLAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS*

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

TEST PERFORMED BY: _____ DATE: _____

DETERMINATION OF THE NUMBER OF LIGHTED SECTIONS FOR PHOTOMETRY TEST PURPOSES**:

Number of compartments or lamps	Distance between compartments		Is measured distance greater than target distance?	
	Target (mm)	Measured (mm)	Yes/No	Photometry test criteria
1	n/a	n/a	n/a	Test as one, one lighted section lamp
			n/a	
2	560		Yes	Test as two, one lighted section lamps
			No	Test as one, two lighted section lamp
3 (or more)	410		Yes	Test as three (or more), one lighted section lamps
			No	Test as one, three lighted section lamp

RESULTS: _____

REMARKS: _____

* If the test component consists of only one compartment and one lamp, then Section 11 does not apply.
** See S7.2.11.4 of FMVSS No. 108 for additional requirements applicable to vehicles 2032 mm. or more in overall width.

SECTION 12) TAILLAMP RATIO

No requirement.

SECTION 13) TAILLAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) TAILLAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

HEAT TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) TAILLAMP PHOTOGRAPHS

15.3) STOP LAMP TEST REPORT SAMPLE

STOP LAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) STOP LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) STOP LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

		Required	Observed
Vehicle type/size		**Number of Lamps (Minimum)**	**Number of Lamps**
Passenger cars		2	
MPV			
Trucks			
Buses			
Trailers	Less than or equal to 30 inches in overall width	1	
	Over 30 inches in overall width	2	
Motorcycles		1	

SECTION 3) STOP LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) STOP LAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

<table>
<tr><th rowspan="3">Vehicle type/size</th><th colspan="2">REQUIRED</th><th colspan="2">MEASURED</th></tr>
<tr><th colspan="2">Mounting</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="4">Not less than 15 inches, nor more than 72 inches.</td><td rowspan="4"></td><td rowspan="4"></td></tr>
<tr><td>MPV</td></tr>
<tr><td>Trucks</td></tr>
<tr><td>Buses</td></tr>
<tr><td>Trailers</td><td>On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable. When a single lamp is installed it must be mounted at or near the vertical centerline.</td><td></td><td></td></tr>
<tr><td>Motorcycles</td><td>On the rear, on the vertical centerline except that if two are used, they must be symmetrically disposed about the vertical centerline.</td><td></td><td></td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) STOP LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) STOP LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

EPLLA REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 7) STOP LAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) STOP LAMP INDICATOR

No requirement.

SECTION 9) STOP LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) STOP LAMP SPACING TO OTHER LAMPS

No requirement.

SECTION 11) STOP LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS*

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

TEST PERFORMED BY: _____ DATE: _____

DETERMINATION OF THE NUMBER OF LIGHTED SECTIONS FOR PHOTOMETRY TEST PURPOSES**:

Number of compartments or lamps	Distance between compartments		Is measured distance greater than target distance?	
	Target (mm)	Measured (mm)	Yes/No	Photometry test criteria
1	n/a	n/a	n/a	Test as one, one lighted section lamp
			n/a	
2	560		Yes	Test as two, one lighted section lamps
			No	Test as one, two lighted section lamp
3 (or more)	410		Yes	Test as three (or more), one lighted section lamps
			No	Test as one, three lighted section lamp

RESULTS: _____

REMARKS: _____

* If the test component consists of only one compartment and one lamp, then Section 11 does not apply.
** See S7.2.11.4 of FMVSS No. 108 for additional requirements applicable to vehicles 2032 mm. or more in overall width.

SECTION 12) STOP LAMP RATIO TO TAILLAMP

Include stop lamp ratio to taillamp results, as applicable, in photometry test results of section 13.

SECTION 13) STOP LAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) STOP LAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) STOP LAMP PHOTOGRAPHS

15.4) SIDE MARKER LAMP TEST REPORT SAMPLE

SIDE MARKER LAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) SIDE MARKER LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) SIDE MARKER LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

		Required	Observed
Vehicle type/size		**Number of Lamps (Minimum)**	**Number of Lamps**
Passenger cars		4	
MPV			
Trucks	Truck Tractors	2	
	All other trucks	4	
Buses		4	
Trailers	Trailers less than 1829 mm [6 ft] in overall length including the trailer tongue.	2	
	All other trailers	4	
Motorcycles		Not required	

SECTION 3) SIDE MARKER LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) SIDE MARKER LAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

<table>
<tr><th colspan="2" rowspan="2">Vehicle type/size</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th></tr>
<tr><td colspan="2">Passenger cars</td><td rowspan="4">Amber lamps: On each side, as far to the front as practicable.

Red lamps: On each side, as far to the rear as practicable.
(Not required on truck tractors.)</td><td rowspan="4">Not less than 15 inches.</td></tr>
<tr><td colspan="2">MPV</td></tr>
<tr><td colspan="2">Trucks</td></tr>
<tr><td colspan="2">Buses</td></tr>
<tr><td rowspan="2">Trailers</td><td>Less than 1829 mm [6 ft] in overall length including the trailer tongue.</td><td>On each side, as far to the front as practicable exclusive of the trailer tongue.</td><td>Not less than 15 inches.</td></tr>
<tr><td>Over or equal to 1829 mm [6 ft] in overall length including the trailer tongue</td><td>On each side, as far to the rear as practicable.</td><td>Not less than 15 inches. Not more than 60 inches on trailers 2032 mm or more in overall width.</td></tr>
<tr><td colspan="2">Motorcycles</td><td colspan="2">No requirement</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) SIDE MARKER LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) SIDE MARKER LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) SIDE MARKER LAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) SIDE MARKER LAMP INDICATOR

No requirement.

SECTION 9) SIDE MARKER LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) SIDE MARKER LAMP SPACING TO OTHER LAMPS

No requirement.

SECTION 11) SIDE MARKER LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS*

No requirement.

SECTION 12) SIDE MARKER LAMP RATIO

No requirement.

SECTION 13) SIDE MARKER LAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) SIDE MARKER LAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) SIDE MARKER LAMP PHOTOGRAPHS

15.5) CLEARANCE AND ID LAMP TEST REPORT SAMPLE

CLEARANCE AND ID LAMP TEST REPORT

CLEARANCE LAMP

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		

REMARKS:

ID LAMP

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) CLEARANCE AND ID LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) CLEARANCE AND ID LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

		Clearance Lamps	
		Required	Observed
Vehicle type/size		Number of Lamps (Minimum)	Number of lamps
MPV Trucks Buses Trailers	2032 mm or more in overall width.	2 amber, 2 red (Red ID lamps not required on truck tractor.)	

		Required	Observed
Vehicle type/size		Number of Lamps (minimum)	Number of lamps
MPV Trucks Buses	2032 mm or more in overall width.	3amber, 3 red (Red ID lamps not required on truck tractor.)	
Trailers		3 red	

SECTION 3) CLEARANCE AND ID LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) CLEARANCE AND ID LAMP MOUNTING LOCATION/HEIGHT

CLEARANCE LAMP

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

ID LAMP

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

Vehicle type/size		CLEARANCE LAMP			
		REQUIRED		MEASURED	
		Mounting		Mounting	
		Location	Height*	Location	Height*
MPV Trucks Buses Trailers	2032 mm or more in overall width.	**2 Amber:** On the front to indicate the overall width of the vehicle, or width of cab on truck tractor, at the same height, symmetrically about the vertical centerline. May be located at a location other than the front if necessary to indicate the overall width of the vehicle, or for protection from damage during normal operation of the vehicle. **2 Red:** On the rear to indicate the overall width of the vehicle, at the same height, symmetrically about the vertical centerline. May be located at a location other than the rear if necessary to indicate the overall width of the vehicle, or for protection from damage during normal operation of the vehicle.	**2 Amber:** As near the top as practicable. **2 Red:** As near the top as practicable, except where the rear identification lamps are mounted at the extreme height of the vehicle. Practicability of locating lamps on the vehicle header is presumed when the header extends at least 25 mm. (1 inch) above the rear doors		
Boat Trailers		On a boat trailer the requirement for front and rear clearance lamps may be met by installation at or near the midpoint on each side of a dual facing lamp so as to indicate the extreme width. May be located at a location other than the front and the rear if necessary to indicate the overall width of the vehicle, or for protection from damage during normal operation of the vehicle.	As near the top as practicable.		

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

Vehicle type/size		ID LAMP			
		REQUIRED		MEASURED	
		Mounting		Mounting	
		Location	Height*	Location	Height*
MPV Trucks Buses Trailers	2032 mm or more in overall width.	**3 Amber:** (Not required on trailers.) On the front, at the same height, as close as practicable to the vertical centerline, with lamp centers spaced not less than 6 inches or more than 12 inches apart. **3 Red:** On the rear, at the same height, as close as practicable to the vertical centerline, with lamp centers spaced not less than 6 inches or more than 12 inches apart.	**3 Amber:** (Not required on trailers.) As near the top of the vehicle or top of the cab as practicable. **3 Red:** As near the top as practicable. Practicability of locating lamps on the vehicle header is presumed when the header extends at least 25 mm. (1 inch) above the rear doors.		

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) CLEARANCE AND ID LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) CLEARANCE AND ID LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) CLEARANCE AND ID LAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) CLEARANCE AND ID LAMP INDICATOR

No requirement.

SECTION 9) CLEARANCE AND ID LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) CLEARANCE AND ID LAMP SPACING TO OTHER LAMPS

No requirement.

SECTION 11) CLEARANCE AND ID LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS*

No requirement.

SECTION 12) CLEARANCE AND ID LAMP RATIO

No requirement for ID Lamps.

Include clearance and ID lamp ratio to taillamp results, as applicable, in photometry test results of section 13.

SECTION 13) CLEARANCE AND ID LAMP PHOTOMETRY

CLEARANCE LAMP

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

ID LAMP

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) CLEARANCE AND ID LAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) CLEARANCE AND ID LAMP PHOTOGRAPHS

15.6) BACKUP LAMP TEST REPORT SAMPLE

BACKUP LAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) BACKUP LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) BACKUP LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

	Required	Observed
Vehicle type/size	**Number of Lamps (Minimum)**	**Number of Lamps**
Passenger cars	1 Additional lamps allowed to meet requirements.	
MPV		
Trucks		
Buses		
Trailers	No requirement	
Motorcycles		

SECTION 3) BACKUP LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) BACKUP LAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

Vehicle type/size	Required		Measured	
	Mounting		Mounting	
	Location	Height*	Location	Height*
Passenger cars	On the rear.	No requirement		No requirement
MPV				
Trucks				
Buses				
Trailers	No requirement			
Motorcycles				

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) BACKUP LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) BACKUP LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) BACKUP LAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) BACKUP LAMP INDICATOR

No requirement.

SECTION 9) BACKUP LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) BACKUP LAMP SPACING TO OTHER LAMPS

No requirement.

SECTION 11) BACKUP LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS*

No requirement.

SECTION 12) BACKUP LAMP RATIO TO TAILLAMP

No requirement.

SECTION 13) BACKUP LAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) BACKUP LAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) BACKUP LAMP PHOTOGRAPHS

15.7) LICENSE PLATE LAMP TEST REPORT SAMPLE

LICENSE PLATE LAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) LICENSE PLATE LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) LICENSE PLATE LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

	Required	Observed
Vehicle type/size	**Number of Lamps (Minimum)**	**Number of Lamps**
Passenger cars	1 Additional lamps allowed to meet requirements.	
MPV		
Trucks		
Buses		
Trailers		
Motorcycles		

SECTION 3) LICENSE PLATE LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) LICENSE PLATE LAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

	Required		Observed	
Vehicle type/size	**Mounting**		**Mounting**	
	Location	**Height***	**Location**	**Height***
Passenger cars	On the rear to illuminate license plate from top or sides.	No requirement		No requirement
MPV				
Trucks				
Buses				
Trailers				
Motorcycles				

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) LICENSE PLATE LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) LICENSE PLATE LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) LICENSE PLATE LAMP VISIBILITY

No requirement.

SECTION 8) LICENSE PLATE LAMP INDICATOR

No requirement.

SECTION 9) LICENSE PLATE LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) LICENSE PLATE LAMP SPACING TO OTHER LAMPS

No requirement.

SECTION 11) LICENSE PLATE LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

SECTION 12) LICENSE PLATE LAMP RATIO

No requirement.

SECTION 13) LICENSE PLATE LAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) LICENSE PLATE LAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) LICENSE PLATE LAMP PHOTOGRAPHS

15.8) PARKING LAMP TEST REPORT SAMPLES

PARKING LAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) PARKING LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) PARKING LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

<table>
<tr><th colspan="2" rowspan="2">Vehicle type/size</th><th>Required</th><th>Observed</th></tr>
<tr><th>Number of Lamps (Minimum)</th><th>Number of Lamps</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">Less than 2032 mm in overall width.</td><td rowspan="4">2</td><td></td></tr>
<tr><td>MPV</td><td></td></tr>
<tr><td>Trucks</td><td></td></tr>
<tr><td>Buses</td><td></td></tr>
<tr><td colspan="2">Trailers</td><td colspan="2" rowspan="2">No requirement</td></tr>
<tr><td colspan="2">Motorcycles</td></tr>
</table>

SECTION 3) PARKING LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) PARKING LAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

<table>
<tr><th colspan="2" rowspan="3">Vehicle type/size</th><th colspan="2">Required</th><th colspan="2">Observed</th></tr>
<tr><th colspan="2">Mounting</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">Less than 2032 mm in overall width.</td><td rowspan="4">On the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.</td><td rowspan="4">Not less than 15 inches, nor more than 72 inches.</td><td></td><td></td></tr>
<tr><td>MPV</td><td></td><td></td></tr>
<tr><td>Trucks</td><td></td><td></td></tr>
<tr><td>Buses</td><td></td><td></td></tr>
<tr><td colspan="2">Trailers</td><td colspan="2" rowspan="2">No requirement.</td><td colspan="2" rowspan="2">No requirement.</td></tr>
<tr><td colspan="2">Motorcycles</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight.

REMARKS: _____

SECTION 5) PARKING LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) PARKING LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) PARKING LAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) PARKING LAMP INDICATOR

No requirement.

SECTION 9) PARKING LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) PARKING LAMP SPACING TO OTHER LAMPS

No requirement.

SECTION 11) PARKING LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

SECTION 12) PARKING LAMP RATIO

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

RATIO REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 13) PARKING LAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) TAILLAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) PARKING LAMP PHOTOGRAPHS

15.9) HIGH-MOUNTED STOP LAMP TEST REPORT SAMPLES

HIGH-MOUNTED STOP LAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) HIGH-MOUNTED STOP LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) HIGH-MOUNTED STOP LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

<table>
<tr><th colspan="2" rowspan="2">Vehicle type/size</th><th>Required</th><th>Observed</th></tr>
<tr><th>Number of Lamps (Minimum)</th><th>Number of Lamps</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">Less than 2032 mm in overall width and with a GVWR of 10,000 lbs or less.</td><td rowspan="4">1, or 2 where exceptions apply. (See paragraph S6.1.1.2 of FMVSS No. 108 for exceptions.)</td><td></td></tr>
<tr><td>MPV</td><td></td></tr>
<tr><td>Trucks</td><td></td></tr>
<tr><td>Buses</td><td></td></tr>
<tr><td colspan="2">Trailers</td><td colspan="2" rowspan="2">No requirement.</td></tr>
<tr><td colspan="2">Motorcycles</td></tr>
</table>

SECTION 3) HIGH-MOUNTED STOP LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) HIGH-MOUNTED STOP LAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

<table>
<tr><th colspan="2" rowspan="3">Vehicle type/size</th><th colspan="2">Required</th><th colspan="2">Measured</th></tr>
<tr><th colspan="2">Mounting</th><th colspan="2">Mounting</th></tr>
<tr><th>Location</th><th>Height*</th><th>Location</th><th>Height*</th></tr>
<tr><td>Passenger cars</td><td rowspan="4">Less than 2032 mm in overall width and with a GVWR of 10,000 lbs or less.</td><td rowspan="4">On the rear including glazing, with the lamp center on the vertical centerline as viewed from the rear.</td><td rowspan="4">Not less than 34 inches except for passenger cars.</td><td></td><td></td></tr>
<tr><td>MPV</td><td></td><td></td></tr>
<tr><td>Trucks</td><td></td><td></td></tr>
<tr><td>Buses</td><td></td><td></td></tr>
<tr><td colspan="2">Trailers</td><td colspan="4" rowspan="2">No requirement.</td></tr>
<tr><td colspan="2">Motorcycles</td></tr>
</table>

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) HIGH-MOUNTED STOP LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) HIGH-MOUNTED STOP LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

EPLLA REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 7) HIGH-MOUNTED STOP LAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) HIGH-MOUNTED STOP LAMP INDICATOR

No requirement.

SECTION 9) HIGH-MOUNTED STOP LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) HIGH-MOUNTED STOP LAMP SPACING TO OTHER LAMPS

No high-mounted stop lamp is permitted to be combined with any other lamp or reflective device, other than with a cargo lamp.

No high-mounted stop lamp is permitted to be combined optically with any cargo lamp.

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

SPACING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 11) HIGH-MOUNTED STOP LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

SECTION 12) HIGH-MOUNTED STOP LAMP RATIO

No requirement.

SECTION 13) HIGH-MOUNTED STOP LAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) HIGH-MOUNTED STOP LAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

MOISTURE TEST*

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST*

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST*

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

*These tests do not apply to high-mounted stop lamps that are mounted inside the vehicle.

SECTION 15) HIGH-MOUNTED STOP LAMP PHOTOGRAPHS

15.10) DAYTIME RUNNING LAMP TEST REPORT SAMPLES

DAYTIME RUNNING LAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) DAYTIME RUNNING LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) DAYTIME RUNNING LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

	Allowed	Observed
Vehicle type/size	**Number of Lamps (Minimum)**	**Number of Lamps**
Passenger cars	2	
MPV		
Trucks		
Buses		
Trailers	No requirement	
Motorcycles		

SECTION 3) DAYTIME RUNNING LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) DAYTIME RUNNING LAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

Vehicle type/size	Allowed Mounting		Measured Mounting	
	Location	Height*	Location	Height*
Passenger cars	On the front, symmetrically disposed about the vertical centerline if not a pair of lamps required by this standard or if not optically combined with a pair of lamps required by this standard.	Not more than 1.067 meters above the road surface if not a pair of lamps required by this standard or if not optically combined with a pair of lamps required by this standard. See paragraph S7.10.13(b) in FMVSS No. 108 for additional height limitation.		
MPV				
Trucks				
Buses				
Trailers	No requirement			
Motorcycles				

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) DAYTIME RUNNING LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) DAYTIME RUNNING LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) DAYTIME RUNNING LAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) DAYTIME RUNNING LAMP INDICATOR

No requirement.

SECTION 9) DAYTIME RUNNING LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) DAYTIME RUNNING LAMP SPACING TO OTHER LAMPS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

SPACING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 11) DAYTIME RUNNING LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMP

No requirement.

SECTION 12) DAYTIME RUNNING LAMP RATIO

No requirement.

SECTION 13) DAYTIME RUNNING LAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) DAYTIME RUNNING LAMP PHYSICAL TESTS

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) DAYTIME RUNNING LAMP PHOTOGRAPHS

15.11) SCHOOL BUS SIGNAL LAMP TEST REPORT SAMPLES

SCHOOL BUS SIGNAL LAMP TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) SCHOOL BUS SIGNAL LAMP PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) SCHOOL BUS SIGNAL LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

	Required	Observed
Location	**Number of Lamps (Minimum)**	**Number of Lamps**
Front	2 red; or 2 red plus 2 amber	
Rear	2 red; or 2 red plus 2 amber	

SECTION 3) SCHOOL BUS SIGNAL LAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) SCHOOL BUS SIGNAL LAMP MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

Location	Required		Measured	
	Mounting		Mounting	
	Location	Height*	Location	Height*
Front	On the front of the cab as far apart as practicable, but in no case shall the spacing between lamps be less than 40 inches. Amber lamps, when installed, at the same height as and just inboard of the red lamp.	As high as practicable but at least above the windshield.		
Rear	On the rear cab as far apart as practicable, but in no case shall the spacing between lamps be less than 40 inches. Amber lamps, when installed, at the same height as and just inboard of the red lamp.	As high as practicable but at least above the top of any side window opening.		

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) SCHOOL BUS SIGNAL LAMP ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) SCHOOL BUS SIGNAL LAMP EFFECTIVE PROJECTED LUMINOUS LENS AREA

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

EPLLA REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 7) SCHOOL BUS SIGNAL LAMP VISIBILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

VISIBILITY REQUIREMENT: _____

TEST METHOD USED: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) SCHOOL BUS SIGNAL LAMP INDICATOR

No requirement.

SECTION 9) SCHOOL BUS SIGNAL LAMP MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) SCHOOL BUS SIGNAL LAMP SPACING TO OTHER LAMPS

No requirement.

SECTION 11) SCHOOL BUS SIGNAL LAMP MULTIPLE COMPARTMENTS AND MULTIPLE LAMP

No requirement.

SECTION 12) SCHOOL BUS SIGNAL LAMP RATIO

No requirement.

SECTION 13) SCHOOL BUS SIGNAL LAMP PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) TAILLAMP PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) SCHOOL BUS SIGNAL LAMP PHOTOGRAPHS

15.12) REFLEX REFLECTORS TEST REPORT SAMPLES

REFLEX REFLECTORS TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Dust Test		
Moisture Test		
Corrosion Test		
Vibration Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) REFLEX REFLECTOR PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) REFLEX REFLECTORS LAMP NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

	Required	Observed
Vehicle type/size	**Number of Lamps (Minimum)**	**Number of Lamps**
Passenger cars	**2 Amber** (side/front) **2 Red** (side/rear)(*not required on truck tractors*) **2 Red** (rear)	
MPV		
Trucks		
Buses		
Trailers* ** A trailer equipped with a conspicuity treatment in conformance with S8.2 of FMVSS No. 108 need not be equipped with reflex reflectors if the conspicuity material is placed at the locations of the required reflex reflectors.*	**2 Amber** (side/front)(*not required on trailers less than 1829 mm [6 ft] in overall length including the trailer tongue*) **2 Red** (side/rear) **2 Red** (rear)(*may use 1 Red on trailers less than 30 inches wide*)	
Motorcycles	**2 Amber** (side/front) **2 Red** (side/rear)(*not required on truck tractors*) **1 Red** (rear)	

SECTION 3) REFLEX REFLECTORS COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) REFLEX REFLECTORS MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

Vehicle type/size	Required		Measured	
	Mounting		Mounting	
	Location	Height*	Location	Height*
Passenger cars	Amber (side/front): On each side, as far to the front as practicable. Red (side/rear): On each side, as far to the rear as practicable. Red (rear): On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable. *(On a truck tractor, may be mounted on the back of the cab not less than 4 inches above the height of the rear tires)*	Not less than 15 inches nor more than 60 inches.		
MPV				
Trucks				
Buses				
Trailers	Amber (side/front): On each side, as far to the front as practicable exclusive of the trailer tongue.. Red (side/rear): On each side, as far to the rear as practicable. Red (rear): On the rear, at the same height, symmetrically about the vertical centerline, as far apart as practicable. When a single reflector is installed it must be mounted at or near the vertical centerline.			
Motorcycles	Amber (side/front): On each side, as far to the front as practicable. Red (side/rear): On each side, as far to the rear as practicable. Red (rear): On the rear, on the vertical centerline except that, if two are used on the rear, they must be symmetrically disposed about the vertical centerline.			

SECTION 5) REFLEX REFLECTORS ACTIVATION

No requirement.

SECTION 6) REFLEX REFLECTORS EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) REFLEX REFLECTORS VISIBILITY

No requirement.

SECTION 8) REFLEX REFLECTORS LAMP INDICATOR

No requirement.

SECTION 9) REFLEX REFLECTORS MARKINGS

No requirement. Each lamp may be marked with the symbol “DOT” which constitutes a certification that it conforms to the requirements of this standard.

SECTION 10) REFLEX REFLECTORS LAMP SPACING TO OTHER LAMPS

No requirement.

SECTION 11) REFLEX REFLECTORS MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

SECTION 12) REFLEX REFLECTORS RATIO

No requirement.

SECTION 13) REFLEX REFLECTORS PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 14) REFLEX REFLECTORS PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Devices completed test without evidence of material physical weakness of failure of parts which affects proper function		
No evidence of lens or reflector rotation which affects proper function		
Necessary to rephotometer test		
Additional photometric Data Sheet added to report		

MOISTURE TEST

	YES	NO
Devices accumulated less than 2 cc of Moisture		

DUST TEST

	YES	NO
At completion of test, Max Candlepower Readings of Devices were within 10% of those prior to Dust Test		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

CORROSION TEST

	YES	NO
Device completed test without evidence of Corrosion		
Necessary to rephotometer test		
Additional photometric data sheet added to Test Report		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 15) REFLEX REFLECTORS PHOTOGRAPHS

15.13) CONSPICUITY SYSTEMS TEST REPORT SAMPLES

CONSPICUITY SYSTEMS TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Color Test		
Photometric Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) CONSPICUITY SYSTEMS PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MATERIAL: _____

_____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) CONSPICUITY SYSTEMS MARKINGS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

MARKING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 3) TAILLAMP COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) CONSPICUITY SYSTEMS PATTERN/LOCATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

PATTERN REQUIREMENT: _____

LOCATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 5) CONSPICUITY SYSTEMS PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 6) CONSPICUITY SYSTEMS PHOTOGRAPHS

15.14) TURN SIGNAL OPERATING UNIT TEST REPORT SAMPLES

TURN SIGNAL OPERATING UNIT TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Durability Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) TURN SIGNAL OPERATING UNIT PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MATERIAL: _____

_____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

MARKINGS: _____

_____

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) TURN SIGNAL OPERATING UNIT DURABILITY TEST

TEST COMPONENT: _____

MAXIMUM BULB LOAD: _____

TEST CYCLE RATE: _____

OPERATING VOLTAGE: _____ CURRENT_____

TOTAL # OF CYCLES: _____

	YES	NO
Unit operative at completion of test.		
Voltage drop across operating terminal did not exceed 0.25 volts before, during, or after the test.		

NOTES:

TEST PERFORMED BY: _____ DATE: _____

SECTION 3) TURN SIGNAL OPERATING UNIT PHOTOGRAPHS

15.15) TURN SIGNAL FLASHER TEST REPORT SAMPLES

TURN SIGNAL FLASHER TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Starting Time Test		
Voltage Drop Test		
Flash Rate and Percent Current "ON" Time Test		
Durability Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) TURN SIGNAL FLASHER PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MATERIAL: _____

_____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

MARKINGS: _____

_____

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) TURN SIGNAL FLASHER STARTING TIME TEST

	YES	NO
Flashers meet the specified starting time.		

REMARKS:

TEST PERFORMED BY: _____ DATE: _____

SECTION 3) TURN SIGNAL FLASHER VOLTAGE DROP TEST

	YES	NO
Flashers do not exceed the voltage drop specified.		

REMARKS:

TEST PERFORMED BY: _____ DATE: _____

SECTION 4) TURN SIGNAL FLASHER FLASH RATE AND PERCENT CURRENT "ON" TIME TEST

	YES	NO
Flashers meet Flash Rate and Current "ON" Time requirements.		

REMARKS:

TEST PERFORMED BY: _____ DATE: _____

SECTION 5) TURN SIGNAL FLASHER DURABILITY TEST

	YES	NO
Flashers meet performance requirements at completion of Durability Test.		

REMARKS:

TEST PERFORMED BY: _____ DATE: _____

SECTION 6) TURN SIGNAL FLASHER PHOTOGRAPHS

15.16) TURN SIGNAL PILOT INDICATOR TEST REPORT SAMPLES

TURN SIGNAL PILOT INDICATOR TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Indicator Size and Color Test		
Turn Signal Indicator Lamp Failure Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) TURN SIGNAL PILOT INDICATOR PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MATERIAL: _____

_____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

MARKINGS: _____

_____

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) TURN SIGNAL PILOT INDICATOR PHYSICAL TEST

SIZE AND COLOR TEST

	YES	NO
Turn signal indicator meets specified size and color requirements.		

LAMP FAILURE TEST

	YES	NO
Turn signal indicator meets specified turn signal lamp failure requirements.		

REMARKS:

TEST PERFORMED BY: _____ DATE: _____

SECTION 3) TURN SIGNAL PILOT INDICATOR PHOTOGRAPHS

15.17) SEMI-AUTOMATIC HEADLAMP BEAM SWITCHING DEVISE TEST REPORT SAMPLES

SEMI-AUTOMATIC HEADLAMP BEAM SWITCHING DEVICE TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Sensitivity Test		
Voltage Regulation Test		
Manual Override Test		
Warmup Test		
Temperature Test		
Dust Test		
Corrosion Test		
Vibration Test		
Sunlight Test		
Durability Test		
Return to Upper Beam Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) SEMI-AUTOMATIC HEADLAMP BEAM SWITCHING DEVICE PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MATERIAL: _____

_____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

MARKINGS: _____

_____

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) SEMI-AUTOMATIC HEADLAMP BEAM SWITCHING DEVICE PHYSICAL TESTS

SENSITIVITY TEST

	YES	NO
No sensitivity voids were shown in the constant footcandle curves within the area limited by the test positions.		

VOLTAGE REGULATION TEST

	YES	NO
The device meets specified voltage regulation requirements.		

MANUAL OVERRIDE TEST

	YES	NO
The device switches to the opposite beam with the test light energized and with the test light extinguished.		

WARMUP TEST

	YES	NO
The device meets specified Warmup Test requirements.		

TEMPERATURE TEST

	YES	NO
The device meets specified Temperature Test requirements.		

DUST TEST

	YES	NO
The device meets specified Dust Test requirements.		

CORROSION TEST

	YES	NO
The device meets specified Corrosion Test requirements.		

VIBRATION TEST

	YES	NO
The device meets specified Vibration Test requirements.		

SUNLIGHT TEST

	YES	NO
The device meets specified Sunlight Test requirements.		

DURABILITY TEST

	YES	NO
The device meets specified Durability Test requirements.		

RETURN TO UPPER BEAM TEST

	YES	NO
The device meets specified Return to Upper Beam Test requirements.		

SECTION 3) SEMI-AUTOMATIC HEADLAMP BEAM SWITCHING DEVICE PHOTOGRAPHS

15.18) UPPER BEAM HEADLAMP INDICATOR TEST REPORT SAMPLES

UPPER BEAM HEADLAMP INDICATOR TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Indicator Size and Location Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) UPPER BEAM HEADLAMP INDICATOR PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MATERIAL: _____

_____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

MARKINGS: _____

_____

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) UPPER BEAM HEADLAMP INDICATOR PHYSICAL TEST

SIZE AND LOCATION TEST

	YES	NO
Turn signal indicator meets specified size and location requirements.		

SECTION 3) UPPER BEAM HEADLAMP INDICATOR PHOTOGRAPHS

15.19) VEHICULAR HAZARD WARNING SIGNAL OPERATING UNIT TEST REPORT SAMPLES

VEHICULAR HAZARD WARNING SIGNAL OPERATING UNIT TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Durability Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) VEHICULAR HAZARD WARNING SIGNAL OPERATING UNIT PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MATERIAL: _____

_____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

MARKINGS: _____

_____

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) VEHICULAR HAZARD WARNING SIGNAL OPERATING UNIT DURABILITY TEST

TEST COMPONENT: _____

MAXIMUM BULB LOAD: _____

TEST CYCLE RATE: _____

OPERATING VOLTAGE: _____ CURRENT_____

TOTAL # OF CYCLES: _____

TEMPERATURE: _____

	YES	NO
Unit operative at completion of test.		
Voltage drop across operating terminal did not exceed 0.3 volts before, during, or after the test.		

NOTES:

TEST PERFORMED BY: _____ DATE: _____

SECTION 3) VEHICULAR HAZARD WARNING SIGNAL OPERATING UNIT PHOTOGRAPHS

15.20) VEHICULAR HAZARD WARNING SIGNAL FLASHER TEST REPORT SAMPLES

VEHICULAR HAZARD WARNING SIGNAL FLASHER TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Starting Time Test		
Voltage Drop Test		
Flash Rate and Percent Current “ON” Time Test		
Durability Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) VEHICULAR HAZARD WARNING SIGNAL FLASHER PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MATERIAL: _____

_____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

MARKINGS: _____

_____

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) VEHICULAR HAZARD WARNING SIGNAL FLASHER STARTING TIME TEST

	YES	NO
Flashers meet the specified starting time.		

REMARKS:

TEST PERFORMED BY: _____ DATE: _____

SECTION 3) VEHICULAR HAZARD WARNING SIGNAL FLASHER VOLTAGE DROP TEST

	YES	NO
Flashers do not exceed the voltage drop specified.		

REMARKS:

TEST PERFORMED BY: _____ DATE: _____

SECTION 4) VEHICULAR HAZARD WARNING SIGNAL FLASHER FLASH RATE AND PERCENT CURRENT "ON" TIME TEST

	YES	NO
Flashers meet Flash Rate and Current "ON" Time requirements.		

REMARKS:

TEST PERFORMED BY: _____ DATE: _____

SECTION 5) VEHICULAR HAZARD WARNING SIGNAL FLASHER DURABILITY TEST

	YES	NO
Flashers meet performance requirements at completion of Durability Test.		

REMARKS:

TEST PERFORMED BY: _____ DATE: _____

SECTION 6) VEHICULAR HAZARD WARNING SIGNAL FLASHER PHOTOGRAPHS

15.21) VEHICULAR HAZARD WARNING SIGNAL PILOT INDICATOR TEST REPORT SAMPLES

VEHICULAR HAZARD WARNING SIGNAL PILOT INDICATOR TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Indicator Size and Color Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) VEHICULAR HAZARD WARNING SIGNAL PILOT INDICATOR PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MATERIAL: _____

_____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

MARKINGS: _____

_____

NOTES:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 2) VEHICULAR HAZARD WARNING SIGNAL PILOT INDICATOR PHYSICAL TEST

SIZE AND COLOR TEST

	YES	NO
Turn signal indicator meets specified size and color requirements.		

REMARKS:

TEST PERFORMED BY: _____ DATE: _____

SECTION 3) VEHICULAR HAZARD WARNING SIGNAL PILOT INDICATOR PHOTOGRAPHS

15.22) SEALED BEAM HEADLIGHTING SYSTEMS TEST REPORT SAMPLES

SEALED BEAM HEADLIGHTING SYSTEMS TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Corrosion Test		
Vibration Test		
Inward Force Test		
Torque Deflection Test		
Headlamp Connector Test		
Headlamp Wattage Test		
Aiming Adjustment Test		
Retaining Ring Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) SEALED BEAM HEADLIGHTING SYSTEMS PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) SEALED BEAM HEADLIGHTING SYSTEMS NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 3) SEALED BEAM HEADLIGHTING SYSTEMS COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) SEALED BEAM HEADLIGHTING SYSTEMS MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

		Required		Measured	
Vehicle type/size	**Beam**	**Mounting**		**Mounting**	
		Location	**Height***	**Location**	**Height***
Passenger cars, MPV, Trucks, Buses	Upper	On the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.	Not less than 55.9 cm. nor more than 137.2 cm.		
	Lower				

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) SEALED BEAM HEADLIGHTING SYSTEMS ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) SEALED BEAM HEADLIGHTING SYSTEMS EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) SEALED BEAM HEADLIGHTING SYSTEMS VISIBILITY

No requirement.

SECTION 8) SEALED BEAM HEADLIGHTING SYSTEMS INDICATOR

SIZE AND LOCATION TEST

	YES	NO
Turn signal indicator meets specified size and location requirements.		

REMARKS:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 9) SEALED BEAM HEADLIGHTING SYSTEMS MARKINGS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

MARKING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 10) SEALED BEAM HEADLIGHTING SYSTEMS SPACING TO OTHER LAMPS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

SPACING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 11) SEALED BEAM HEADLIGHTING SYSTEMS MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

SECTION 12) SEALED BEAM HEADLIGHTING SYSTEMS RATIO

No requirement.

SECTION 13) SEALED BEAM HEADLIGHTING SYSTEMS INSTALLATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

INSTALLATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 14) SEALED BEAM HEADLIGHTING SYSTEMS SIMULTANEOUS AIM

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

SIMULTANEOUS AIM REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 15) SEALED BEAM HEADLIGHTING SYSTEMS PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 16) SEALED BEAM HEADLIGHTING SYSTEMS PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

CORROSION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

INWARD FORCE TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

TORQUE DEFLECTION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

HEADLAMP CONNECTOR TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

HEADLAMP WATTAGE TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

AIMING ADJUSTMENT TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

RETAINING RING TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 17) SEALED BEAM HEADLIGHTING SYSTEMS PHOTOGRAPHS

15.23) INTEGRAL BEAM HEADLIGHTING SYSTEMS TEST REPORT SAMPLES

INTEGRAL BEAM HEADLIGHTING SYSTEMS TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Temperature Cycle Test		
Vibration Test		
Inward Force Test		
Headlamp Connector Test		
Aiming Adjustment Test		
Abrasion Test		
Chemical Resistance Test		
Internal Heat Test		
Torque Deflection Test		
Plastic Optical Material Test		
Connector Corrosion Test		
Dust Test		
Humidity Test		
Chemical Resistance of Reflectors of Replaceable Lens Headlamps Test		
Corrosion Resistance of Reflectors of Replaceable Lens Headlamps Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) INTEGRAL BEAM HEADLIGHTING SYSTEMS PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) INTEGRAL BEAM HEADLIGHTING SYSTEMS NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 3) INTEGRAL BEAM HEADLIGHTING SYSTEMS COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) INTEGRAL BEAM HEADLIGHTING SYSTEMS MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

		Required		Measured	
Vehicle type/size	Beam	Mounting		Mounting	
		Location	Height*	Location	Height*
Passenger cars, MPV, Trucks, Buses	Upper	On the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.	Not less than 55.9 cm. nor more than 137.2 cm.		
	Lower				

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) INTEGRAL BEAM HEADLIGHTING SYSTEMS ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) INTEGRAL BEAM HEADLIGHTING SYSTEMS EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) INTEGRAL BEAM HEADLIGHTING SYSTEMS VISIBILITY

No requirement.

SECTION 8) INTEGRAL BEAM HEADLIGHTING SYSTEMS INDICATOR

SIZE AND LOCATION TEST

	YES	NO
Turn signal indicator meets specified size and location requirements.		

REMARKS:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 9) INTEGRAL BEAM HEADLIGHTING SYSTEMS MARKINGS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

MARKING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 10) INTEGRAL BEAM HEADLIGHTING SYSTEMS SPACING TO OTHER LAMPS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

SPACING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 11) INTEGRAL BEAM HEADLIGHTING SYSTEMS MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

SECTION 12) INTEGRAL BEAM HEADLIGHTING SYSTEMS RATIO

No requirement.

SECTION 13) INTEGRAL BEAM HEADLIGHTING SYSTEMS INSTALLATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

INSTALLATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 14) INTEGRAL BEAM HEADLIGHTING SYSTEMS AIMABILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

AMABILITY REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 15) INTEGRAL BEAM HEADLIGHTING SYSTEMS SIMULTANEOUS AIM

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

SIMULTANEOUS AIM REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 16) INTEGRAL BEAM HEADLIGHTING SYSTEMS ADDITIONAL LIGHT SOURCES

	YES	NO
Integral beam headlamp has incorporated additional light sources that are used for purposes other than headlighting.		
Additional light sources are capable of being replaced.		

REMARKS:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 17) INTEGRAL BEAM HEADLIGHTING SYSTEMS PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 18) INTEGRAL BEAM HEADLIGHTING SYSTEMS PHYSICAL TESTS

CORROSION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

TEMPERATURE CYCLE TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

VIBRATION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

INWARD FORCE TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

HEADLAMP CONNECTOR TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

AIMING ADJUSTMENT TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

ABRASION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

CHEMICAL RESISTANCE TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

INTERNAL HEAT TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

TORQUE DEFLECTION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

CONNECTOR CORROSION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

DUST TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

HUMIDITY TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

CHEMICAL RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

CORROSION RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

SECTION 19) INTEGRAL BEAM HEADLIGHTING SYSTEMS PHOTOGRAPHS

15.24) REPLACEABLE BULB HEADLIGHTING SYSTEMS TEST REPORT SAMPLES

REPLACEABLE BULB HEADLIGHTING SYSTEMS TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Corrosion Test		
Corrosion-Connector Test		
Dust Test		
Temperature Cycle Test		
Humidity Test		
Vibration Test		
Inward Force Test		
Headlamp Connector Test		
Aiming Adjustment Test		
Abrasion Test		
Chemical Resistance Test		
Internal Heat Test		
Chemical Resistance of Reflectors of Replaceable Lens Headlamps Test		
Corrosion Resistance of Reflectors of Replaceable Lens Headlamps Test		
Torque Deflection Test		
Plastic Optical Material Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) REPLACEABLE BULB HEADLIGHTING SYSTEMS PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) REPLACEABLE BULB HEADLIGHTING SYSTEMS NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 3) REPLACEABLE BULB HEADLIGHTING SYSTEMS COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) REPLACEABLE BULB HEADLIGHTING SYSTEMS MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

		Required		Measured	
Vehicle type/size	Beam	Mounting		Mounting	
		Location	Height*	Location	Height*
Passenger cars, MPV, Trucks, Buses	Upper	On the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.	Not less than 55.9 cm. nor more than 137.2 cm.		
	Lower				

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) REPLACEABLE BULB HEADLIGHTING SYSTEMS ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) REPLACEABLE BULB HEADLIGHTING SYSTEMS EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) REPLACEABLE BULB HEADLIGHTING SYSTEMS VISIBILITY

No requirement.

SECTION 8) REPLACEABLE BULB HEADLIGHTING SYSTEMS INDICATOR

SIZE AND LOCATION TEST

	YES	NO
Turn signal indicator meets specified size and location requirements.		

REMARKS:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 9) REPLACEABLE BULB HEADLIGHTING SYSTEMS MARKINGS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

MARKING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 10) REPLACEABLE BULB HEADLIGHTING SYSTEMS SPACING TO OTHER LAMPS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

SPACING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 11) REPLACEABLE BULB HEADLIGHTING SYSTEMS MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

SECTION 12) REPLACEABLE BULB HEADLIGHTING SYSTEMS RATIO

No requirement.

SECTION 13) REPLACEABLE BULB HEADLIGHTING SYSTEMS INSTALLATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

INSTALLATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 14) REPLACEABLE BULB HEADLIGHTING SYSTEMS AIMABILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

AMABILITY REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 15) REPLACEABLE BULB HEADLIGHTING SYSTEMS REPLACEMENT EQUIPMENT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

REPLACEMENT EQUIPMENT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 16) REPLACEABLE BULB HEADLIGHTING SYSTEMS ADDITIONAL LIGHT SOURCES

	YES	NO
Replaceable bulb headlamp has incorporated additional light sources that are used for purposes other than headlighting.		

REMARKS:

INSPECTION PERFORMED BY: _____ DATE: _____

SECTION 17) REPLACEABLE BULB HEADLIGHTING SYSTEMS PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 18) REPLACEABLE BULB HEADLIGHTING SYSTEMS PHYSICAL TESTS

CORROSION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

CORROSION-CONNECTOR TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

DUST TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

TEMPERATURE CYCLE TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

HUMIDITY TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

VIBRATION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

INWARD FORCE TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

HEADLAMP CONNECTOR TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

AIMING ADJUSTMENT TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

ABRASION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

CHEMICAL RESISTANCE TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

INTERNAL HEAT TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

CHEMICAL RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

CORROSION RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

TORQUE DEFLECTION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure		

SECTION 19) REPLACEABLE BULB HEADLIGHTING SYSTEMS PHOTOGRAPHS

15.25) COMBINATION HEADLIGHTING SYSTEMS TEST REPORT SAMPLES

COMBINATION HEADLIGHTING SYSTEMS TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Physical Tests		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) COMBINATION HEADLIGHTING SYSTEMS PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) COMBINATION HEADLIGHTING SYSTEMS NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 3) COMBINATION HEADLIGHTING SYSTEMS COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) COMBINATION HEADLIGHTING SYSTEMS MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

		Required		Measured	
Vehicle type/size	Beam	Mounting		Mounting	
		Location	Height*	Location	Height*
Passenger cars, MPV, Trucks, Buses	Upper	On the front, at the same height, symmetrically about the vertical centerline, as far apart as practicable.	Not less than 55.9 cm. nor more than 137.2 cm.		
	Lower				

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 5) COMBINATION HEADLIGHTING SYSTEMS ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) COMBINATION HEADLIGHTING SYSTEMS EFFECTIVE PROJECTED LUMINOUS LENS AREA

No requirement.

SECTION 7) COMBINATION HEADLIGHTING SYSTEMS VISIBILITY

No requirement.

SECTION 8) COMBINATION HEADLIGHTING SYSTEMS INDICATOR

SIZE AND LOCATION TEST

	YES	NO
Turn signal indicator meets specified size and location requirements.		

REMARKS:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 9) COMBINATION HEADLIGHTING SYSTEMS MARKINGS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

MARKING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 10) COMBINATION HEADLIGHTING SYSTEMS SPACING TO OTHER LAMPS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

SPACING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 11) COMBINATION HEADLIGHTING SYSTEMS MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

No requirement.

SECTION 12) COMBINATION HEADLIGHTING SYSTEMS RATIO

No requirement.

SECTION 13) COMBINATION BEAM HEADLIGHTING SYSTEMS AIMABILITY

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

AMABILITY REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 14) COMBINATION BEAM HEADLIGHTING SYSTEMS PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 15) COMBINATION BEAM HEADLIGHTING SYSTEMS PHYSICAL TESTS

COMBINATION TYPE F SEALED BEAM HEADLAMP

	YES	NO
Device completed test and meets applicable performance requirements specified in S10.13.4 of FMVSS No. 108.		

COMBINATION INTEGRAL BEAM HEADLAMP

	YES	NO
Device completed test and meets applicable performance requirements specified in S10.14.7 of FMVSS No. 108.		

COMBINATION REPLACEABLE BULB HEADLAMP

	YES	NO
Device completed test and meets applicable performance requirements specified in S10.15.7 of FMVSS No. 108.		

SECTION 16) COMBINATION BEAM HEADLIGHTING SYSTEMS PHOTOGRAPHS

15.26) MOTORCYCLE HEADLIGHTING SYSTEMS TEST REPORT SAMPLES

MOTORCYCLE HEADLIGHTING SYSTEMS TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Photometric Test		
Color Test		
Vibration Test		
Moisture Test		
Dust Test		
Corrosion Test		
Plastic Optical Material Test		
Out of Focus Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) MOTORCYCLE HEADLIGHTING SYSTEMS PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: LENS: _____

_____

HOUSING: _____

_____

LENS: MATERIAL: _____

COATING: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

HOUSING: MATERIAL: _____

SHAPE/DIMENSIONS: _____

METHOD OF MOUNTING TO VEHICLE: _____

_____

GASKET: _____

LIGHT SOURCES USED:

FUNCTION	QUANTITY	TRADE NO/ DESIGNATION	VOLTAGE

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) MOTORCYCLE HEADLIGHTING SYSTEMS INSTALLATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

INSTALLATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 3) MOTORCYCLE HEADLIGHTING SYSTEMS COLOR OF LIGHT

TEST COMPONENT: _____

COLOR REQUIREMENT: _____

TEST METHOD: _____

TEST PERFORMED BY: _____ DATE: _____

LAMP VOLTAGE: _____

TEST DISTANCE: _____

RESULTS:

SECTION 4) MOTORCYCLE HEADLIGHTING SYSTEMS NUMBER

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 5) MOTORCYCLE HEADLIGHTING SYSTEMS MOUNTING LOCATION/HEIGHT

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

LOCATION REQUIREMENT: _____

HEIGHT* REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

* Height above road surface measured from center of device with vehicle at curb weight

REMARKS: _____

SECTION 6) MOTORCYCLE HEADLIGHTING SYSTEMS ACTIVATION

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

ACTIVATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 7) MOTORCYCLE HEADLIGHTING SYSTEMS MARKINGS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

MARKING REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 8) MOTORCYCLE HEADLIGHTING SYSTEMS MULTIPLE COMPARTMENTS AND MULTIPLE LAMPS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

MULTIPLE COMPARTMENT/LAMP REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 9) MOTORCYCLE HEADLIGHTING SYSTEMS PHOTOMETRY

TEST COMPONENT: _____

SAMPLE No.: _____

FMVSS No. 108 REQUIREMENT: _____

VEHICLE TYPE/SIZE: _____

NUMBER OF COMPARTMENTS: _____

NUMBER OF LAMPS: _____

NUMBER OF LIGHTED SECTIONS: _____

TEST PERFORMED BY: _____ DATE: _____

PHOTOMETRIC TEST DISTANCE: 100 FEET

BULB TRADE NO.:_____

TEST VOLTAGE/CURRENT: _____

AIM NOTES: _____

OTHER NOTES: _____

RESULTS:

(see photometry data sheets in applicable section of TP-108)

SECTION 10) MOTORCYCLE HEADLAMP MODULATION SYSTEMS TESTS

TEST COMPONENT: _____

VEHICLE TYPE/SIZE: _____

MODULATION REQUIREMENT: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 11) MOTORCYCLE HEADLIGHTING SYSTEMS PHYSICAL TESTS

VIBRATION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure.		

MOISTURE TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix C of this test procedure.		

DUST TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure.		

CORROSION TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix J of this test procedure.		

PLASTIC OPTICAL MATERIAL TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in Appendix H of this test procedure.		

OUT OF FOCUS TEST

	YES	NO
Device completed test and meets applicable performance requirements specified in FMVSS No. 108.		

SECTION 12) MOTORCYCLE HEADLIGHTING SYSTEMS PHOTOGRAPHS

15.27) REPLACEABLE LIGHT SOURCE TEST REPORT SAMPLES

REPLACEABLE LIGHT SOURCE TEST REPORT

TEST COMPONENT: _____ MANUFACTURER: _____

TEST LABORATORY: _____ TEST DATE: _____

REPORT NUMBER: _____ NO. OF DEVICES TESTED: _____

LIGHT SOURCE DESIGNATION: _____

SUMMARY

TEST DESCRIPTION	TEST RESULTS	
	NUMBER PASSED	NUMBER FAILED
Physical Inspection		
Markings		
Lumens Test		
Wattage Test		
Dimension Test		
Deflection Test		
Pressure Test		

REMARKS:

_____ _____

Signature of Responsible Laboratory Official Date

_____

Title

SECTION 1) REPLACEABLE LIGHT SOURCE PHYSICAL INSPECTION

TEST COMPONENT: _____

MANUFACTURED BY: _____

MARKINGS: _____

_____

BULB: MATERIAL: _____

COATING: _____

BASE: MATERIAL: _____

NOTES:

INSPECTION PERFORMED BY: _____DATE: _____

SECTION 2) REPLACEABLE LIGHT SOURCE MARKINGS

TEST COMPONENT: _____

MARKING REQUIREMENTS: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 3) REPLACEABLE LIGHT SOURCE ELECTRICAL SPECIFICATIONS

TEST COMPONENT: _____

LIGHT SOURCE TYPE/SIZE: _____

LUMENS REQUIREMENTS: _____

WATTAGE REQUIREMENTS: _____

TEST PERFORMED BY: _____ DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 4) REPLACEABLE LIGHT SOURCE DIMENSIONAL SPECIFICATIONS

TEST COMPONENT: _____

LIGHT SOURCE TYPE/SIZE: _____

DIMENSIONAL REQUIREMENTS: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 5) REPLACEABLE LIGHT SOURCE PHYSICAL TESTS

TEST COMPONENT: _____

LIGHT SOURCE TYPE/SIZE: _____

DEFLECTION REQUIREMENTS: _____

PRESSURE REQUIREMENTS: _____

INSPECTION PERFORMED BY: _____DATE: _____

RESULTS: _____

REMARKS: _____

SECTION 6) REPLACEABLE LIGHT SOURCE PHOTOGRAPHS

APPENDIX A

GENERAL TEST PROCEDURE

SAMPLES FOR TEST

Samples submitted for laboratory test must be new, unused, manufactured from production tooling and assembled by production processes, and representative of the devices as regularly manufactured and marketed.

Each test sample must include not only the device but also accessory equipment necessary to operate in its intended manner. Where necessary a mounting bracket should be provided so that the device may be rigidly bolted in its operating position on the various test equipment.

Dust and photometric tests may be made on a second set of mounted samples, if desired, to expedite completion of the tests.

Laboratory facilities. The laboratory must be equipped to test the sample in accordance with the requirements of the specific device.

PHYSICAL INSPECTION

Physical inspection will be performed on all devices, as required by the COTR, prior to mechanical or photometric testing. This inspection will include general information concerning the device such as lens material, markings, effective projected luminous lens areas, socket dimensions, etc…

The items applicable to each device are shown in that item's specific test procedure.

Bulbs Sockets shall be inspected as follows:

Note:

1. Wedge base type sockets need not be subjected to the test outlined in this section.

2. Other types of sockets may be used as long as the socket does not inhibit the intended function of the lamp.

A. Insert the applicable plug gage shown below into the lamp socket and verify the go no-go characteristics of the socket and plug gage.

SOCKET (TYPE)	GO GAUGE DIA. (in.)	NO-GO GAUGE DIA. (in.)
A-I	0.3665	0.3735
B-1	0.6035	0.6095
B-2	0.6035	0.6095
C-2	0.6035	0.6095

B. With a depth gage, measure the total compression distance from the top of the socket to the fully compressed contact, Dimension "B."

C. Measure the distance, Dimension "A" from the top of the socket to the J-slot as shown in Figure A-1 using a vernier caliper.

D. Insert the applicable minimum gage shown in Figure A-2 into the socket of the lamp, and verify the gage is retained by the J-slot.

FIGURE A-1

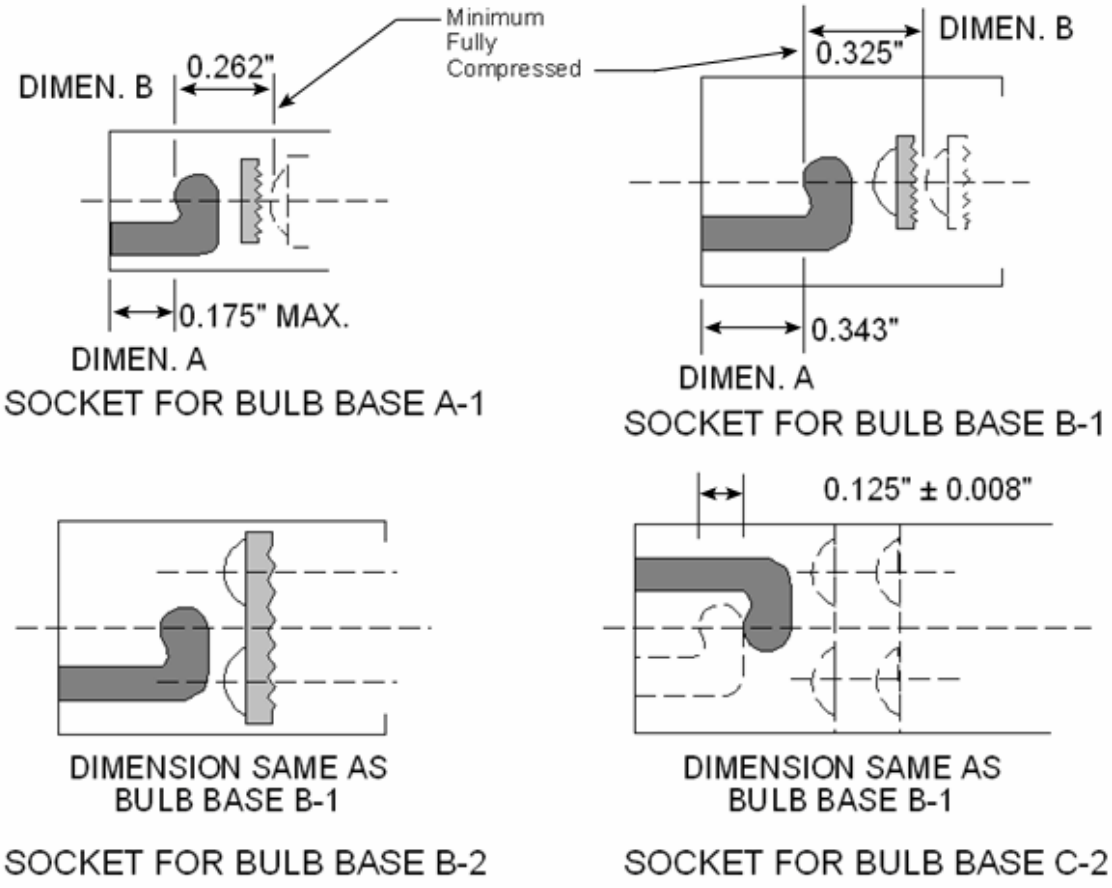
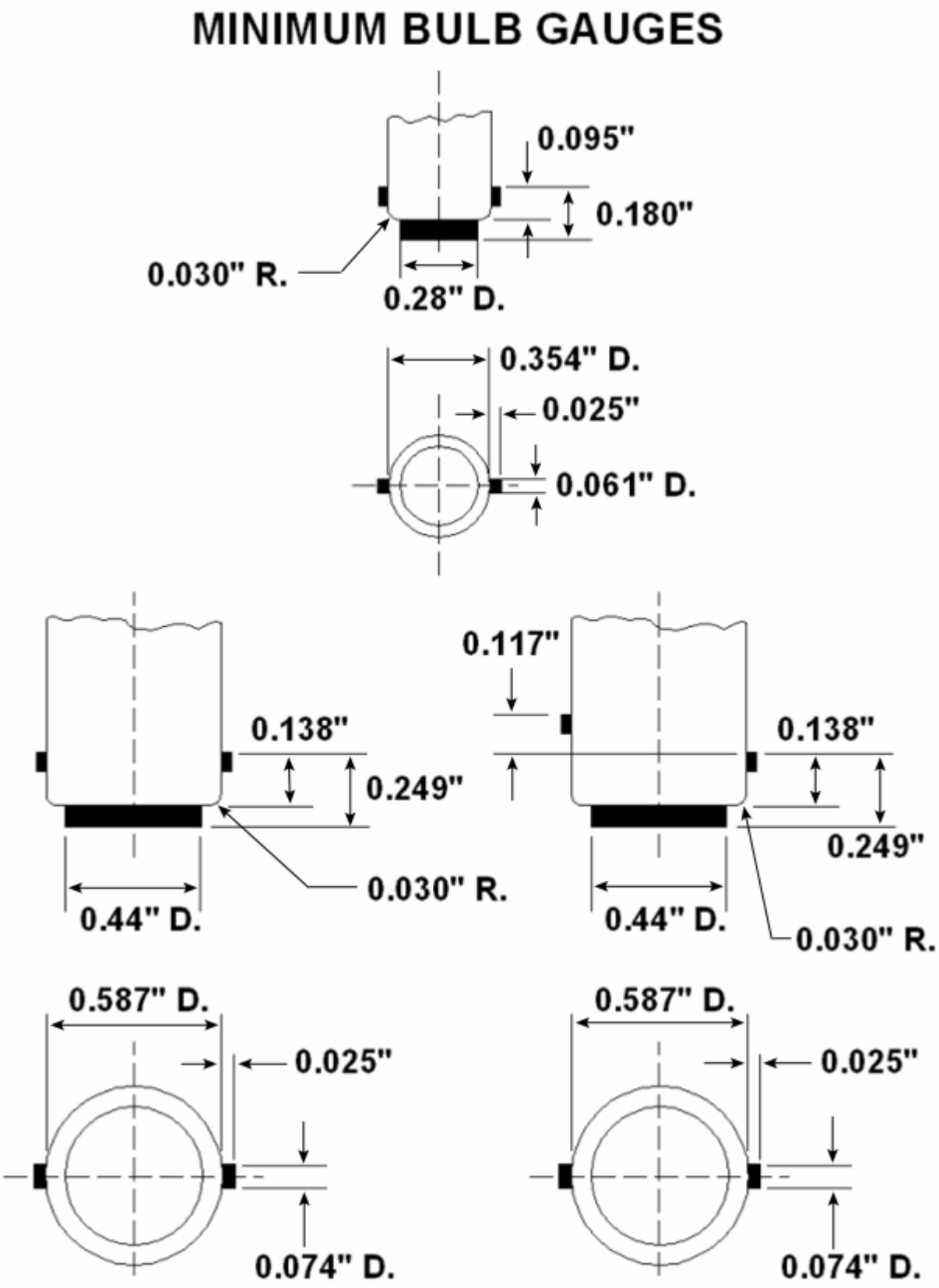

Minimum
Fully
Compressed
DIMEN. B
0.262"
0.175" MAX.
DIMEN. A
SOCKET FOR BULB BASE A-1
0.325"
DIMEN. B
0.343"
DIMEN. A
SOCKET FOR BULB BASE B-1
DIMENSION SAME AS
BULB BASE B-1
SOCKET FOR BULB BASE B-2
0.125" ± 0.008"
DIMENSION SAME AS
BULB BASE B-1
SOCKET FOR BULB BASE C-2

FIGURE A-2


MINIMUM BULB GAUGES
0.095"
0.180"
0.030" R.
0.28" D.
0.354" D.
0.025"
0.061" D.
0.138"
0.249"
0.030" R.
0.44" D.
0.117"
0.138"
0.249"
0.44" D.
0.030" R.
0.587" D.
0.025"
0.074" D.
0.587" D.
0.025"
0.074" D.

EQUIPMENT

The minimum test equipment outlined below shall be utilized for measuring test parameter:

ITEM	RANGE	ACCURACY
Minimum Gage	See Detail Procedure	± 0.003 Tool to measure diam. "B" (±0.001)
Vernier Caliper	0-3 in.	0.001

CALIBRATION PROCEDURE FOR STANDARD LAMPS DEFINITIONS

SECONDARY INTENSITY STANDARD

A lamp calibrated by the National Institute for Standards and Technology (NIST) which specifies voltage, current, horizontal cp and (if necessary) color temperature for each specimen. These standards shall be maintained in groups of a least three units.

SECONDARY STANDARD OF LUMINOUS FLUX

A lamp calibrated by the National Institute for Standards and Technology (NIST) which specifies voltage, current, and Lumens or mean spherical cp for each specimen. These standards shall be maintained in groups of at least 3 units.

WORKING INTENSITY AND LUMINOUS FLUX STANDARDS

These lamps, calibrated against secondary standards, are used to calibrate photometers and integrating spheres. If the test laboratory does not maintain secondary standards, it may purchase working standards from an accredited supplier.

RATED BULBS

Lamps which are calibrated by the test laboratory in an integrating sphere against the working standards of Luminous Flux. Rated bulbs are calibrated to yield the rated mean spherical cp for which they are designed. Voltage and current are specified by the test laboratory for each specimen.

Select bulbs with filament location (light center length and axial alignment) within 0.010 inch and 7.5 degrees of nominal design position. Determine and record the voltage and current associated with rated mean spherical cp. Operate the bulbs under these conditions during tests. Bulbs without a rated mean spherical cp assigned by the manufacturer will be selected to satisfy the required filament location. These bulbs, and those sealed within lamps shall be operated at design voltage for the particular bulbs. Recalibrate rated bulbs after 3 working hours. In case of failure, recalibrate the bulb within 24 hours.

CALIBRATION

SECONDARY INTENSITY AND LUMINOUS FLUX STANDARDS

Secondary standards shall be recalibrated at the NIST after no more than 10 workings hours. The standards shall be used so that the test laboratory can detect deviations in their performance characteristics. The ratio between the specified voltage (measured at the lamp base) and the current shall not be allowed to deviate by more than 0.10 percent from the calibrated ratio of the values as received from the NIST. If this ratio exceeds 1/10 of 1 percent, the lamps shall be recalibrated.

RECORDS

The test laboratory shall maintain appropriate logs showing at least the following information:

1. Standard bulb identification.

2. Elapsed time of usage.

3. Calibration dates.

4. Pertinent calibration values.

APPENDIX B

GENERAL TEST PROCEDURE

VIBRATION TEST

Prior to installing the test specimen on the vibration test machine, verify with a gage block that amplitude of the vibration mechanism is 0.125 inch ± 0.016 inch and that the spring tension is 60 to 70 pounds.

The sample device, as mounted on the support supplied, must be bolted to the anvil end of the table with the axis of the device parallel to the longitudinal axis of the vibration test machine of Figure B-1 (Figure 21 of FMVSS No. 108). The device is vibrated at a rate of 750 ± 25 cpm. The table must be spring mounted at one end and fitted with steel calks on the underside of the other end. The calks are to make contact with the steel anvil once during each cycle at the completion of the fall. The rack must be operated under a spring tension of 60 to 70 lb. The test must be continued for 1 hour.

After completion of the vibration test, remove the device from the machine, and visually and manually inspect the device for evidence of material physical weakness, lens or reflector rotation, and displacement or rupture of parts (except bulb failures). If evidence is found for any of the previously listed items, it will be considered a test failure. In case of lens and/or reflector rotation, the device will be considered not to have failed if subsequent photometry testing indicates compliant performance with the photometric requirements for the device despite such rotation.

Record the results of the visual inspection on the applicable data sheet.

EQUIPMENT

The minimum test equipment outlined below shall be utilized for measuring the test parameters:

ITEM	RANGE	ACCURACY
Tachometer or Similar Device	0 - 1000 cpm	± 1 percent
Gage Block	0.125 ± 0.005	N/A
Spring Scale	0 - 100 pounds	± 2 pounds
Timer	0 - 2 hours	± 1 minute

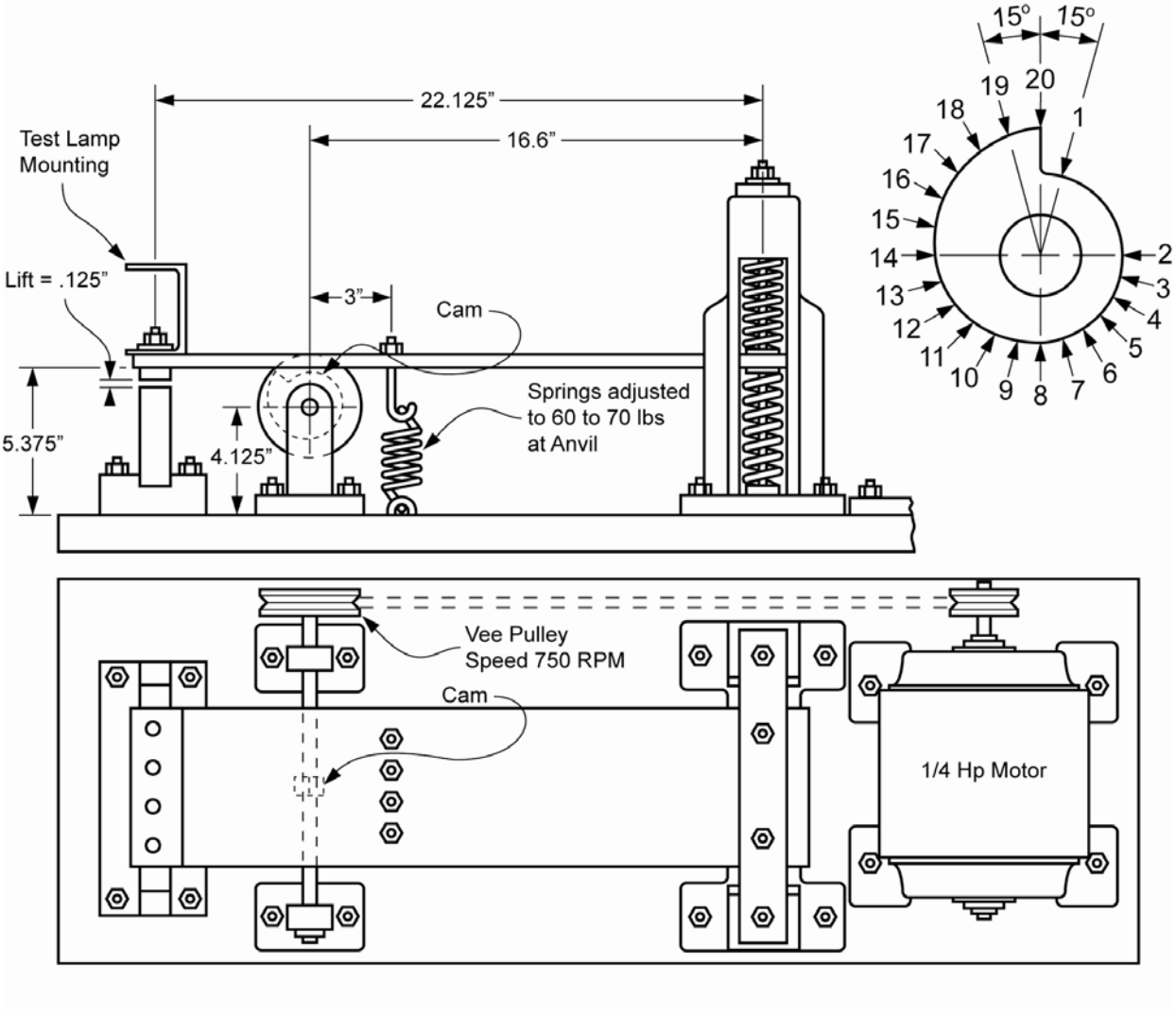
FIGURE B-1

VIBRATION TEST MACHINE

CAM PROFILE RADII*

Point	Radius, in.	Point	Radius, in.	Point	Radius, in.	Point	Radius, in.
1	0.5000	6	0.5504	11	0.6284	16	0.7064
2	0.5000	7	0.5660	12	0.6440	17	0.7220
3	0.5086	8	0.5816	13	0.6596	18	0.7376
4	0.5192	9	0.5972	14	0.6752	19	0.7466
5	0.5348	10	0.6128	15	0.6908	20	0.7500

* The cam width is between 1/2 and 1 in.



APPENDIX C

GENERAL TEST PROCEDURE

MOISTURE TEST

Install the sample device in its supplied support frame with socket and any covering normally part of the assembly, in the moisture test chamber as shown in Figure C-1.

The sample device must be mounted in its normal operating position with all drain holes open and subjected to a precipitation of 0.1 in. of water per minute, delivered at an angle of 45º from a nozzle with a solid cone spray. During the test the device must revolve about its vertical axis at a rate of 4 rpm for a period of 12 hours followed by a one hour drain period where the device does not rotate and the spray stops.

Verify that all drain holes are open, the precipitation rate is 0.1 inch of water per minute and that the specimen rotates about a vertical axis at a rate of 4 rpm. Determine that water flow is at required delivery rate and record every 3 hours during test. Upon completion of the 12-hour test period, discontinue the Moisture Test and, without moving the specimen, allow the specimen to drain for 1 hour.

After the 1-hour drain period, remove the device from the chamber and collect the accumulated water remaining in the device in a graduated vessel. Accumulation of moisture in excess of 2 cc. or any visible moisture in a sealed reflex unit constitutes a failure.

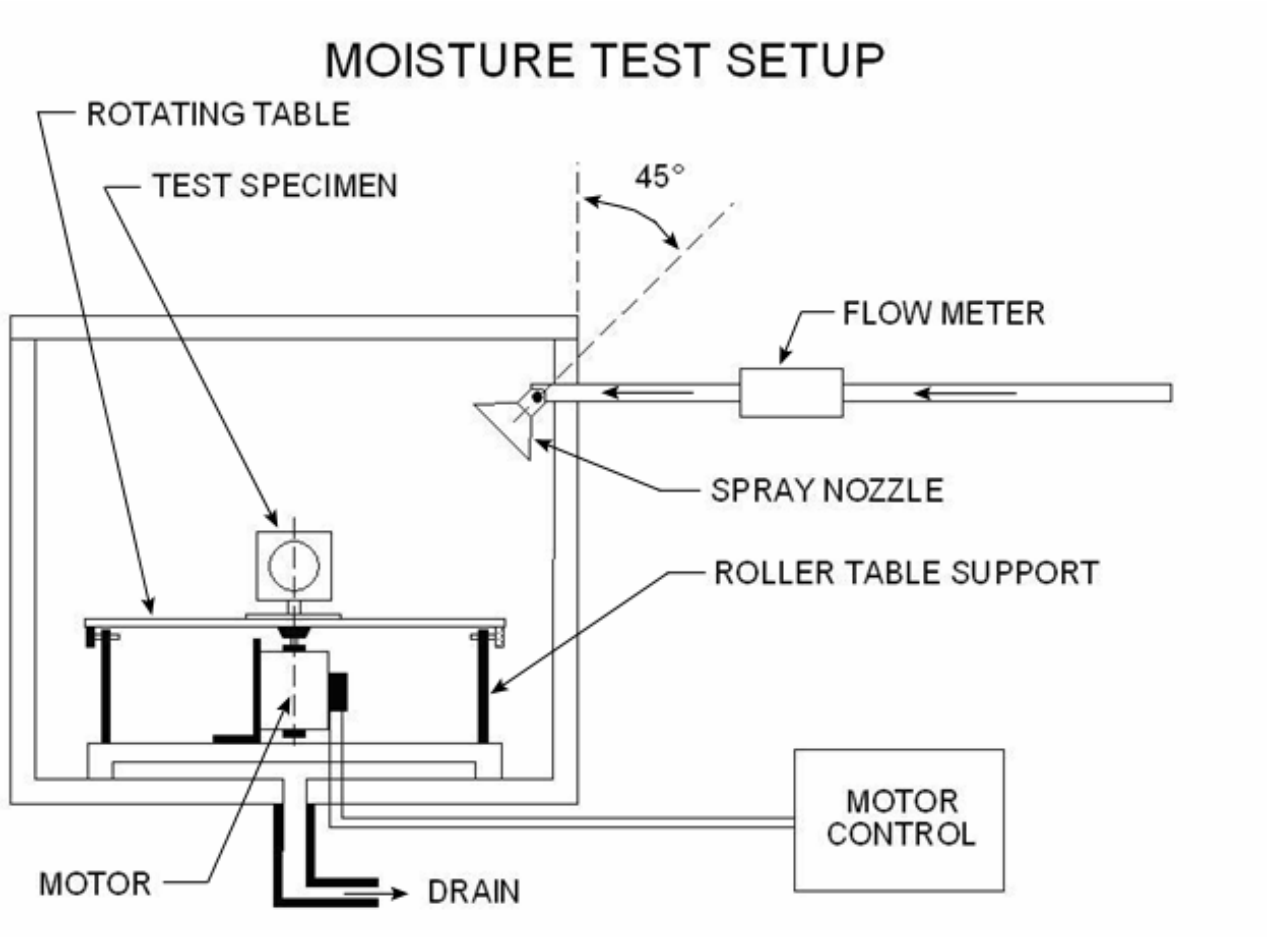
Record the results of the Moisture Test on the appropriate data sheet.

TEST EQUIPMENT

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

ITEM	RANGE	ACCURACY
Moisture Test Chamber	N/A	N/A
Rain Gage	0 - 12 inches	± 0.1 inch
Graduated Cylinder	0 - 10 cc	±0.5 cc
Timer	0 - 24 hours	± minute
Stop Watch	0 - 60 seconds	± 0.1 second
Flow Meter or equivalent	Depend on Nozzle	± 5 percent

FIGURE C-1


MOISTURE TEST SETUP
ROTATING TABLE
TEST SPECIMEN
45°
FLOW METER
SPRAY NOZZLE
ROLLER TABLE SUPPORT
MOTOR CONTROL
MOTOR
DRAIN

APPENDIX D

GENERAL TEST PROCEDURE

DUST TEST

A sealed unit is not required to meet the requirements of this test.

For a full evaluation, the pre-Dust Test photometric performance of the sample device must be known.

Install the sample device mounted in its normal operating position, with socket and any covering normally part of the assembly and all drain holes closed, at least 6 inches from any wall in a cubical box with inside measurements of 3 feet on each side (see Figure D-1). The box shall contain 10 lb of Type I, fine powered cement in accordance with ASTM C 150-56, *Specification for Portland Cement*.

At intervals of 15 minutes during a test period of 5 hours, the dust must be agitated by compressed air or fan blower by projecting blasts of air for a 2 sec. period in a downward direction into the dust in such a way that the dust is completely and uniformly diffused throughout the entire cube and allowed to settle.

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

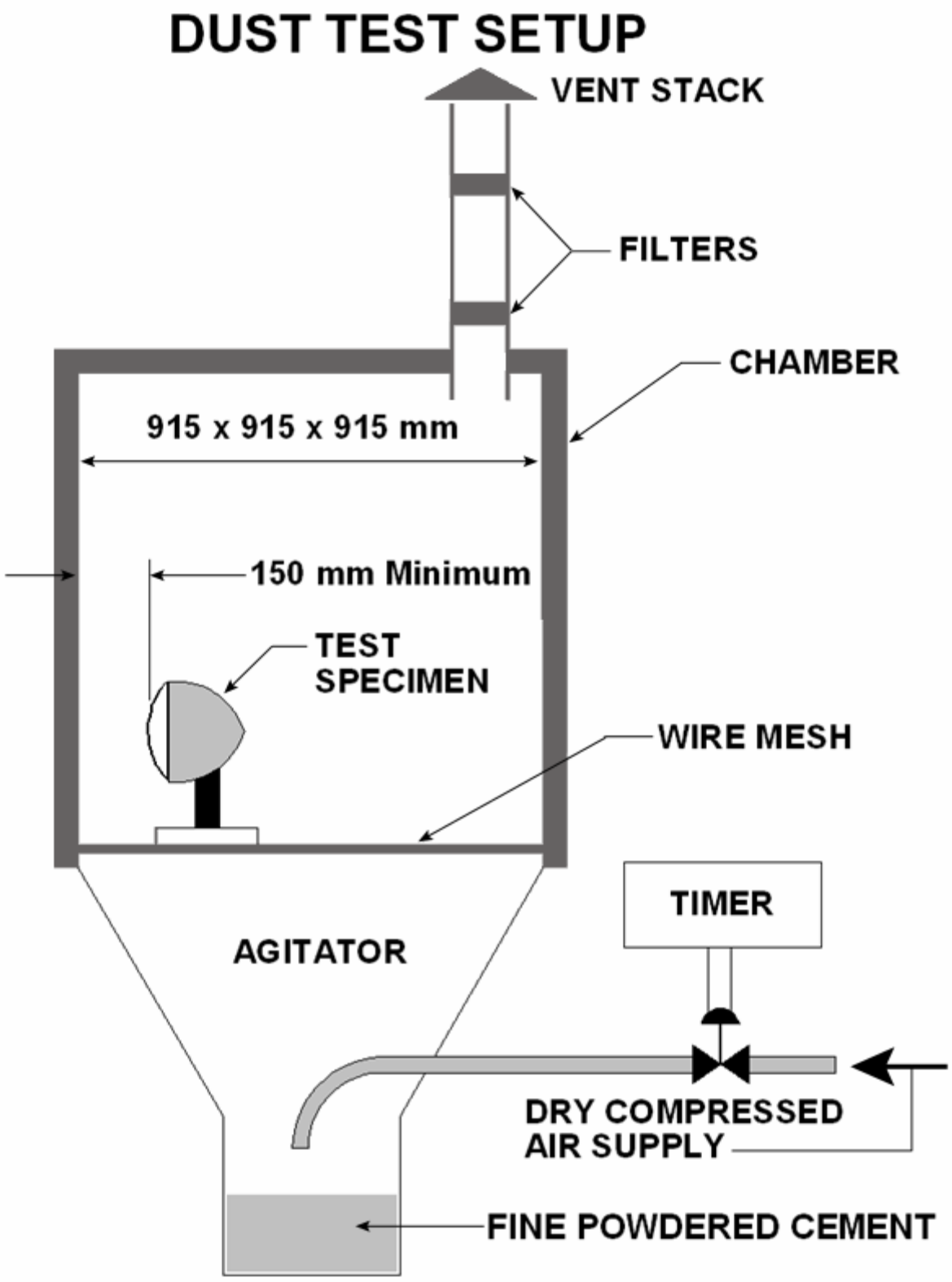
Inspect the test specimen for dust on interior surfaces. If any is found, subject the test specimen to a photometric test to determine if maximum candlepower (cp) is within 10 percent of that recorded prior to the Dust Test. A loss of more than 10 percent in cp at the point of maximum cp shall be considered a failure. Record results of the Dust Test on the appropriate data sheet.

TEST EQUIPMENT

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

ITEM	RANGE	ACCURACY
Dust Chamber	N/A	N/A
Timer	0 - 30 inches	± 0.5 second
Stop Watch	0 - 60 seconds	± 0.1 second

FIGURE D-1


DUST TEST SETUP
VENT STACK
FILTERS
CHAMBER
915 x 915 x 915 mm
150 mm Minimum
TEST SPECIMEN
WIRE MESH
TIMER
AGITATOR
DRY COMPRESSED AIR SUPPLY
FINE POWDERED CEMENT

APPENDIX E

GENERAL TEST PROCEDURE

CORROSION TEST

The analysis and calibration aspects of the salt spray shall be in accordance with ASTM Procedure B117 entitled: Method of Salt Spray (Fog) Testing, dated June 1962.

PROCEDURE

Prepare a salt solution by dissolving 5 parts ± 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 been atomized and stabilized at 95^{o} F + 2-3^{o} F 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 atomizing the salt solution is maintained between 10 and 25 psig.

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

Position the specimen with socket and any cover normally supplied with the assembly in the test chamber, as shown in Figure E-1, at an angle of 15 to 30 degrees from the vertical and parallel to the principal direction of the horizontal flow of salt fog through the chamber based upon the largest plane surface of the test specimen. If multiple specimens are being tested, the specimens shall be positioned to preclude any possibility that surfaces are in contact, overlap or of solution dripping from one specimen onto another. Subject the test specimen to two cycles of 24 hours of salt exposure and 1 hour drying time after each exposure.

Remove the specimen from the test chamber immediately after the test has been completed and wash off the salt residue with tap water, not exceeding 100^{o} F temperature.

There shall be no visible evidence of corrosion which could affect the proper functioning of the test specimen.

If there is any doubt concerning test outcome, the test specimen shall be subjected to a Photometric Test to determine if the Corrosion Test has impaired the proper functioning of the specimen.

Record the results of the corrosion test on the appropriate data sheet.

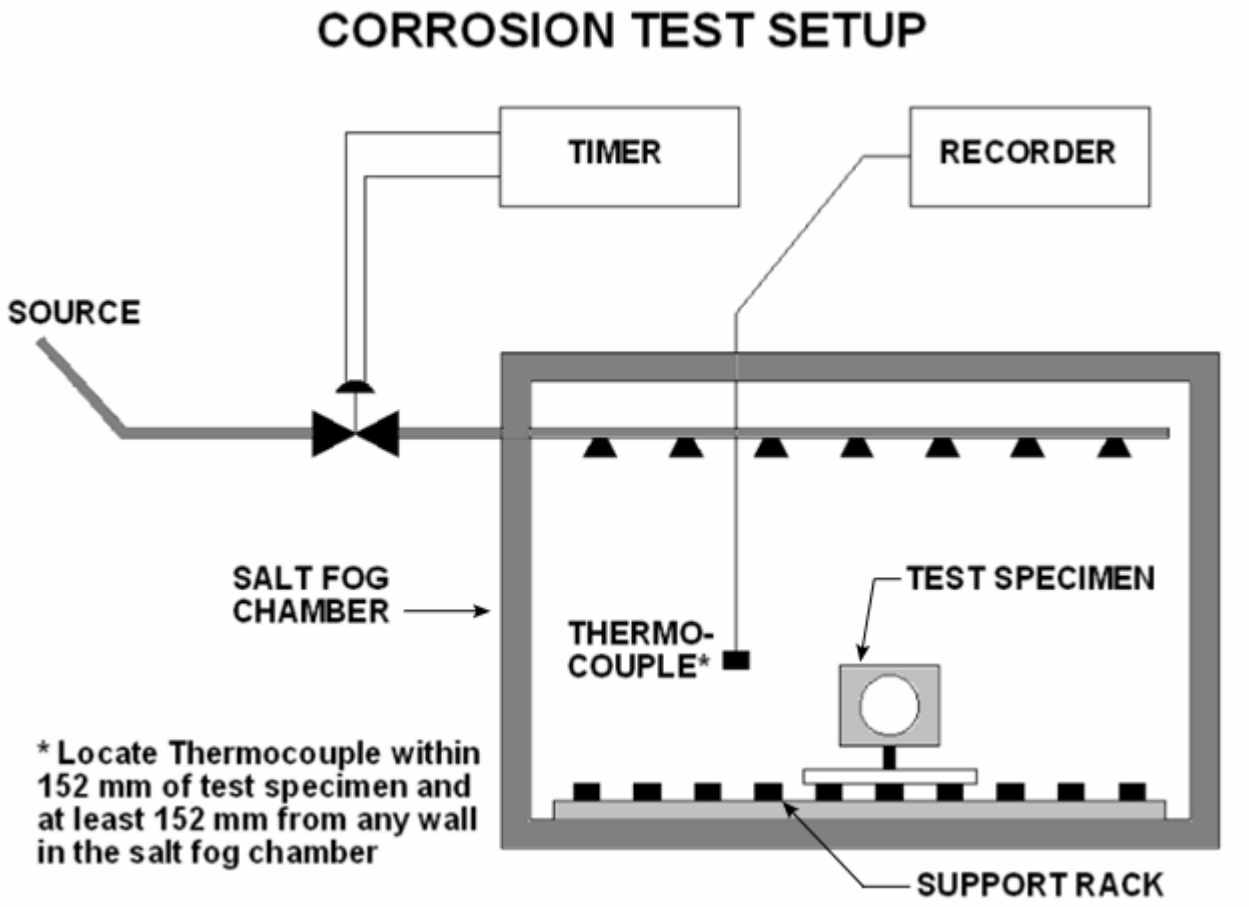
TEST EQUIPMENT

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

ITEM	RANGE	ACCURACY
Salt Spray Chamber	N/A	N/A
Temperature Recorder	0 -100^{o} F	± 1^{o} F
Spring Sale	0 -10 pounds	± 0.1 pounds
Thermometer	0 - 200^{o} F	± 0.5^{o} F
Ph Meter	1 -14 Ph	± 0.3 percent
Pressure Gage	0 - 50 psig	± 1.0 percent

* The Salt Spray Chamber shall be constructed and maintained in accordance with ASTM Procedure B117-62.

FIGURE E-1



APPENDIX F

GENERAL TEST PROCEDURE

COLOR TEST

Fundamental definitions of color are expressed by Chromaticity Coordinates according to the International Commission on Illumination (C.I.E.) 1931 Standard Colorimetric System.

The color of the light emitted or emanating from the sample device will be tested by either the Visual Method, the Tristimulus Method, or both.

The device will be operated at design voltage and the components (bulbs, caps, lenses, and the like) will be tested in a fixture or manner simulating the intended application. The device will be allowed to reach operating temperature before measurements are made. The entire light emitting surface of the sample will be visible from any point on the entrance window of the test instrument. The distance between the test instrument and the sample will be great enough so that further increases in distance will not affect the results.

A test sample for a reflex reflector may be either the reflex reflector or a disc of the same material, technique of fabrication, and dye formulation as the reflex reflector. If a disc is used, the thickness must be twice the thickness of the reflector as measured from the face of the lens to the apexes of the reflecting elements.

Visual method procedure

The color of light from the sample device must be compared visually with the color of the light from a standard. The standard may consist of a filter or limit glass. In the case of white, CIE Source A is used only as a color reference. The chromaticity coordinates of the color standards must be as close as possible to the limits listed. The color of the standard filters is determined spectro-photometrically.

Evaluate all reference color measurements with the appropriate filter with a Standard Illuminant Source "A" operating at a filament color temperature of 2854^{o} K.

Utilizing the test system shown in Figure F-1 or similar comparison equipment mount the lighting device in the proper position. Adjust the voltage of the test specimen to the specified rating. Adjust the visual comparator's lamp voltage level to obtain a color temperature of 2854^{o} K.

The color requirements for the visual method are as follows:

Red – Red is not be acceptable if it is less saturated (paler), yellower, or bluer than the limit standards.

Yellow (Amber) – Yellow is not acceptable if it is less saturated (paler), greener, or redder than the limit standards.

White – White is not acceptable if its color differs materially from that of CIE Source A.

RED COLOR LENS

Insert the red limit filter 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 specimen. Evaluate the color of the red light by determining that the color is not less saturated (paler), yellower or bluer than the limit filter standard. Record the results on the appropriate data sheet.

YELLOW COLOR LENS

Insert the Y = 0.390 limit filter for evaluating apparent yellow colored lenses into the visual comparator, and adjust the moveable diffusing glass to equalize the intensity of the reference standard and the specimen. Evaluate the color of the yellow light by determining that the color is not less saturated, or redder, than the limit filter standard. Record the results on the data sheet. Insert the Y = 0.440 limit filter standard into the visual comparator standard and readjust the moveable diffusing glass to equalize the intensity of the reference standard with the test specimen. Evaluate the color of the yellow light by determining that the color is not less saturated, or greener, than the limit filter standard. Record the results on the data sheet.

WHITE COLOR LENS

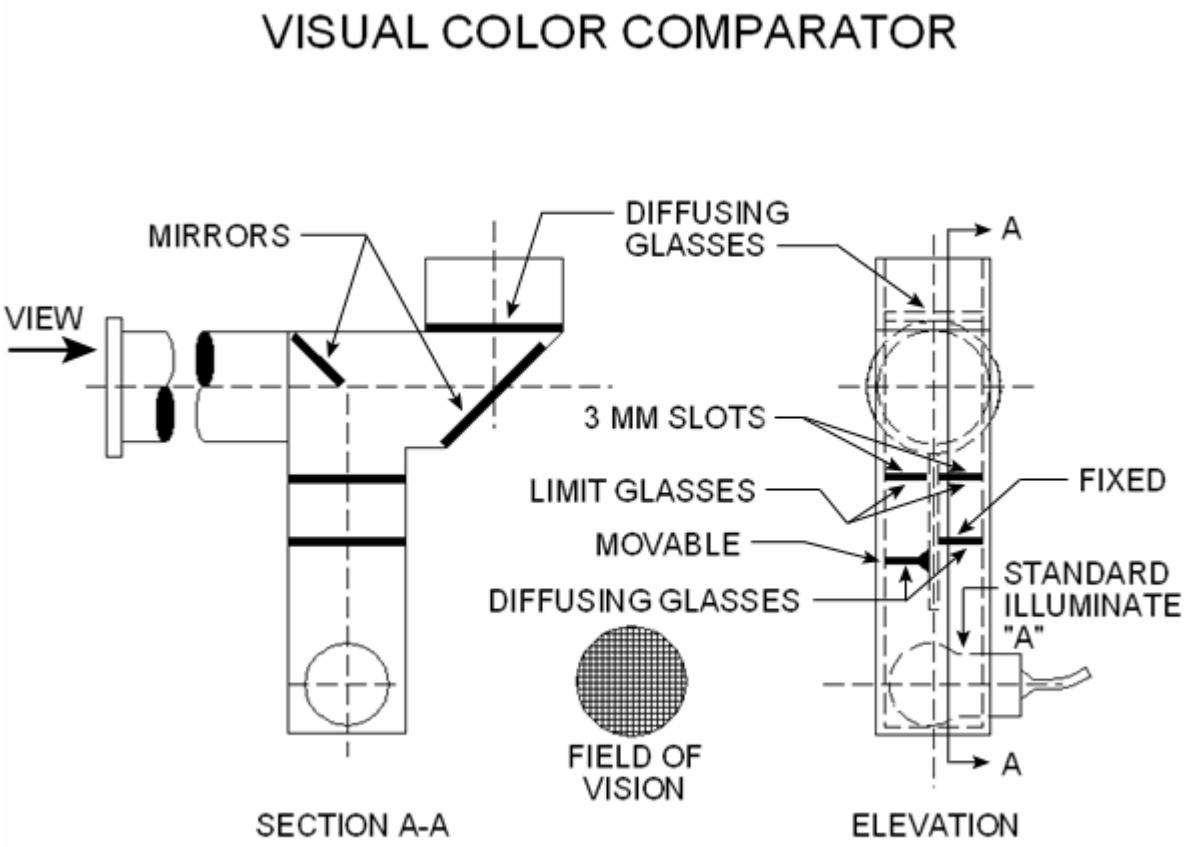
Install the same type of lamp bulb into the comparator as the standardized light source intended for use in the test specimen. No filters are required for this test. If sealed beam headlamps are the designated specimens, use the Standard Illuminant "A" as the reference also without the filter. Adjust the moveable diffusing glass to equalize the intensity of the reference standard with the test specimen. Evaluate the color of the white light by determining that the color is not different from the color of the light permitted from the reference light. Record the results on the appropriate data sheet.

TEST EQUIPMENT

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

ITEM	RANGE	ACCURACY
Red Limit Filter	Y-0.330	1 percent
Yellow Limit Filter	Y-0.390	1 percent
Yellow Limit Filter	Y-0.440	1 percent
Standard Illuminant Source "A"	Color Temperature 2854 ± 50° K	1 percent
Visual Color Comparator	N/A	N/A
Voltmeter	0-20 volts DC	± 0.5 percent
Power Supply	0-20 volts DC	± 1.0 percent

FIGURE F-1



Tristimulus method procedure

The color of light from the H-V point of a sample device must be measured by photoelectric receivers with spectral responses that approximate CIE standard spectral tristimulus valves.

A sphere may be used to integrate light from a colored source provided that the color shift that results from the spectral selectivity of the sphere paint be corrected by the use of a filter, correction factor, or an appropriate calibration.

Where the sample device does not have uniform spectral characteristics in all useful directions, color measurements should be made at as many directions of view as are required to evaluate the color for those directions that apply to the end use of the device.

Tristimulus method performance requirements.

The color must comply with the appropriate requirement.

Red – the color of light emitted must fall within the following boundaries:

y = 0.33 (yellow boundary)
y = 0.98 – x (purple boundary)

Yellow (Amber) – the color of light emitted must fall within the following boundaries:

y= 0.39 (red boundary)
y = x – 0.12 (green boundary)
y = 0.79 – 0.67x (white boundary)

White (achromatic) – the color of light emitted must fall within the following boundaries:

x = 0.31 (blue boundary)
y = 0.44 (green boundary)
x = 0.50 (yellow boundary)
y = 0.38 (red boundary)
y = 0.15 + 0.64x (green boundary)
y = 0.05 + 0.75x (purple boundary)

APPENDIX G

PHOTOMETRIC TEST PROCEDURES

Each lamp and reflective device required or allowed by this standard must be designed to conform to the applicable photometric requirements.

PHOTOMETRY MEASUREMENTS FOR ALL LAMPS EXCEPT LICENSE PLATE LAMPS, HEADLAMPS, AND DRLS

Mounting. Photometry measurements are made with the sample lamp mounted in its normal operating position.

School bus signal lamp aiming. A school bus signal lamp must be aimed with its aiming plane normal to the photometer axis and may be reaimed for photometry by ± 1/2º vertically and ± 1º horizontally.

Measurement distance. Photometric measurements are made at a distance between the light source and the point of measurement of at least 1.2 m. for sidemarker lamps, clearance lamps, identification lamps, and parking lamps, and at least 3 m. for turn signal lamps, stop lamps, taillamps, backup lamps, and school bus signal lamps.

Location of test points. Test point location must comply with the following nomenclature:

The line formed by the intersection of a vertical plane through the light source of the lamp 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”.

Other test points on the test screen are measured in terms of angles from the H and V lines.

Angles to the right (R) and to the left (L) are regarded as being to the right and left of the V line when the observer stands behind the lamp and looks in the direction of its light beam when it is properly aimed for photometry. Similarly, the upward angles designated as U and the downward angles designated as D, refer to light directed at angles above and below the H line, respectively.

MULTIPLE COMPARTMENT AND MULTIPLE LAMP PHOTOMETRY OF TURN SIGNAL LAMPS, STOP LAMPS, AND TAILLAMPS

When compartments of lamps or arrangements of multiple lamps are photometered together, the H-V axis intersects the midpoint between the optical axes.

Luminous intensity measurements of multiple compartment lamp or multiple lamp arrangements are made either by;

Measuring all compartments together, provided that a line from the optical axis of each compartment or lamp to the center of the photometer sensing device does not make an angle more than 0.6º with the H-V axis, or;

Measuring each compartment or lamp separately by aligning its optical axis with the photometer and adding the value at each test point. (Multiple compartment turn signal lamps or stop lamps or multiple lamp arrangements of these lamps installed on multipurpose passenger vehicles, trucks, trailers, or buses 2032 mm. or more in overall width must use this method)

Bulbs

Except for a lamp having a sealed-in bulb, a lamp must meet the applicable requirements of this standard when tested with a bulb whose filament is positioned within ±.010 in. of the nominal design position specified in SAE J573d, *Lamp Bulbs and Sealed Units,* December 1968, or as specified by the bulb manufacturer and operated at the bulb's rated mean spherical candela.

Each lamp designed to use a type of bulb that has not been assigned a mean spherical candela rating by its manufacturer and is not listed in SAE J573d, *Lamp Bulbs and Sealed Units,* December 1968, must meet the applicable requirements of this standard when used with any bulb of the type specified by the lamp manufacturer, operated at the bulb's design voltage. A lamp that contains a sealed-in bulb must meet these requirements with the bulb operated at the bulb's design voltage.

A bulb that is not listed in SAE J573d, *Lamp Bulbs and Sealed Units,* December 1968, is not required to use a socket that conforms to the requirements of SAE J567b, *Bulb Sockets,* April 1964.

License plate lamp photometry

Photometry compliance of license plate lamps is determined by measurement of the illumination falling upon test stations located on a test plate.

Illumination surface. All illumination measurements are made on a rectangular test plate of clean, white blotting paper mounted on the license plate holder in the position normally taken by the license plate. The face of the test plate must be 1.5mm from the face of the license plate holder.

Test stations. Test stations must be located on the face of the test plate as shown in Figure 19 of FMVSS No. 108 according to the type of vehicle on which the license plate lamps are installed. The illumination of each of the stations on the test plate shall be at least 0.75 footcandles. The ratio

of maximum to minimum illumination shall not exceed 20 to 1. The average of the two highest and the two lowest illumination's values recorded at the 8 test stations shall be taken as maximum and minimum values respectively.

The bulb requirements of FMVSS No. 108 paragraph S14.2.1.6 apply to license plate lamp photometry.

Reflex reflector and retroreflective sheeting photometry

Mounting. Each reflex reflector is mounted for photometry with the center of the reflex area at the center of goniometer rotation and at the same horizontal level as the source of illumination.

Illumination source. The source of illumination is a lamp with a 50mm. effective diameter and with a filament operating at 2856ºK.

Measurement distance. The test distance is 30.5 m. [100ft.].

Test setup. The observation point is located directly above the source of illumination. The H-V axis of reflex reflectors is taken as parallel to the longitudinal axis of the vehicle for rear reflectors and perpendicular to a vertical plane passing through the longitudinal axis of the vehicle for side reflectors.

Photodetector. The photodetector has an opening of not more than 13 mm. vertically and 25 mm. horizontally.

Photometry surface. Reflex reflectors may have any linear or area dimensions but must have no more than 7740 sq.mm. projected area contained within a 254 mm. diameter circle exposed for photometry.

Procedure

Photometric measurements of reflex reflectors and retroreflective sheeting must be made at various observation and entrance angles as shown in Table XVI of FMVSS No. 108.

The observation angle is the angle formed by a line from the observation point to the center of the reflector and a second line from the center of the reflector to the source of illumination.

The entrance angle is the angle between the axis of the reflex reflector and a line from the center of the reflector to the source of illumination.

The entrance angle is designated left, right, up, and down in accordance with the position of the source of illumination with respect to the axis of the reflex reflector as viewed from behind the reflector.

Measurements are made of the luminous intensity which the reflex reflector is projecting toward the observation point and the illumination on the reflex reflector from the source of illumination.

Measurements

Reflex reflectors. The required measurement for reflex reflectors at each test point as shown in Table XVI of FMVSS No. 108 is the quotient of the projected luminous intensity divided by the illumination expressed as millicandela per lux or candela per footcandle.

Retroreflective sheeting. The required measurement for retroreflective sheeting reflectors at each test point as shown in Table XVI of FMVSS No. 108 is candela per lux per square meter of area.

Reflex reflector photometry measurement adjustments

Reflex reflectors, which do not have a fixed rotational position on the vehicle, are rotated about their axis through 360º to find the minimum photometric value which must be reported for each test point. If the output falls below the minimum requirement at any test point, the reflector is rotated ± 5º about its axis from the angle where the minimum output occurred, and the maximum value within this angle is reported as a tolerance value.

Reflex reflectors, which by their design or construction, permit mounting on a vehicle in a fixed rotational position, are tested in this position. A visual locator, such as the word *TOP* is not considered adequate to establish a fixed rotational position on the vehicle.

If uncolored reflections from the front surface interfere with photometric readings at any test point, additional readings are taken 1º above, below, right, and left of the test point, and the lowest of these readings and its location is reported provided the minimum test point requirement for the test point is met.

Daytime running lamp (DRL) photometry measurements

Each DRL is tested to the procedure of “headlamp photometry measurements” below, when a test voltage of 12.8 v.± 20 mV. is applied to the input terminals of the lamp switch module or voltage-reducing equipment, whichever is closer to the electrical source on the vehicle.

The test distance from the lamp to the photometer is not less than 18.3 m. if the lamp is optically combined with a headlamp, or is a separate lamp, and not less than 3 m. if the lamp is optically combined with a lamp, other than a headlamp, that is required by this standard.

Bulb requirements of S14.2.1.6 apply to DRL photometry.

HEADLAMP PHOTOMETRY MEASUREMENTS

Mounting. Photometry measurements at the appropriate test points are made with the sample headlamp mounted in its normal operating position. Test points in the area from 10º U to 90º U must be measured from the normally exposed surface of the lens face.

Measurement distance. Photometric measurements are made at a distance between the light source and the photometer sensor of at least 18.3 m.

Seasoning and test voltage. All sealed beam headlamps, integral beam headlamps, beam contributors, and replaceable light sources are seasoned at design voltage for 1% of its average design life or 10 hours, whichever is less prior to a photometry test. A headlamp is tested at 12.8 V ±20 mV, D.C. as measured at the terminals of the lamp.

Aiming. Each headlamp is aimed prior to a photometry test in accordance with the procedure appropriate to its aiming system. A ¼° reaim is permitted in any direction at any test point to allow for variations in readings between laboratories for all headlamps except a Type F upper beam unit not equipped with a VHAD.

Mechanically aimable headlamps using an external aimer. The headlamp is aimed mechanically with the aiming plane at the design angle(s) to the photometer axis and the mechanical axis of the headlamp on the photometer axis.

Mechanically aimable headlamps equipped with a VHAD. The headlamp is aimed mechanically using the VHAD in accordance with the manufacturer's instructions as provided with the vehicle on which the headlamp is intended to be used.

Visually aimable lower beam headlamps-vertical aim

A VOL cutoff headlamp must have the location of the cutoff maximum gradient, as determined by the method of this standard, positioned at 0.4° down from the H-H line.

A VOR cutoff headlamp must have the location of the cutoff maximum gradient, as determined by the method of this standard, positioned at the H-H line.

Visually aimable lower beam headlamps-horizontal aim

There must be no adjustment of horizontal aim unless the headlamp is equipped with a horizontal VHAD. If the headlamp has a VHAD, it must be set to zero.

Visually aimable upper beam headlamps-vertical aim

A headlamp whose upper beam is combined with a lower beam must not have its vertical aim changed from that set for the lower beam.

A headlamp whose upper beam is not combined with a lower beam must have its maximum beam intensity positioned on the H-H axis.

Visually aimable upper beam headlamps-horizontal aim

A headlamp whose upper beam is combined with a lower beam must not have its horizontal aim changed from that set for the lower beam.

A headlamp whose upper beam is not combined with a lower beam and has a fixed horizontal aim or has a horizontal VHAD must be mounted in its normal operating position on a goniometer such that the mounting fixture alignment axes are coincident with the goniometer axes and must be energized at 12.8 V ± 20 mV. There must be no adjustment, shimming, or modification of the horizontal axis of the headlamp or test fixture, unless the headlamp is equipped with a VHAD, in which case the VHAD must be adjusted to zero.

A headlamp whose upper beam is not combined with a lower beam and is not equipped with a horizontal VHAD, the horizontal aim must be adjusted so that the maximum beam intensity is positioned on the V-V axis.

Simultaneous aim Type F sealed beam headlamps and beam contributor integral beam headlamps

A headlamp system allowed to use simultaneous aim of lower beams and upper beams must be aimed mechanically for lower beam photometry by centering the lower beam unit or the geometric center of all lower beam contributors on the photometer axis and aligning the aiming plane, aiming reference plane, or other appropriate vertical plane defined by the manufacturer perpendicular to the photometer axis.

The headlamp must be aimed for upper beam photometry by moving the assembly in a plane parallel to the established lower beam aiming plane until the upper beam unit or the geometric center of all upper beam contributors is centered in the photometric axis.

Motorcycle headlamp-upper beam headlamps designed to comply with Table XX of FMVSS No. 108

The upper beam of a multiple beam headlamp designed to comply with the requirements of Table XX of FMVSS No. 108 must be aimed photoelectrically so that the center of the zone of highest intensity falls 0.4° vertically below the lamp axis and is centered laterally. The center of the zone of highest intensity must be established by the intersection of a horizontal plane passing through the point of maximum intensity, and the vertical plane established by balancing the photometric values at 3°L and 3°R.

Motorcycle headlamp-lower beam headlamps designed to comply with Table XX of FMVSS No. 108

The beam from a single beam headlamp designed to comply with the requirements of Table XX of FMVSS No. 108 must be aimed straight ahead with the top of the beam aimed vertically to obtain 2000 cd at H-V.

Positioner

The goniometer configuration, used to position the sample headlamp when making photometric measurements at specific angular test points, is horizontal rotation over elevation. The vertical axis of the goniometer must correspond to the design position vertical axis of the sample headlamp which is vertical and perpendicular to the longitudinal axis of the vehicle.

Photometer

The photometer must be capable of measuring the luminous intensity of the sample headlamp throughout its illumination range.

Sensor

The maximum effective area of the photometric sensor must fit within a circle whose diameter is equal to 0.009 times the actual test distance from the light source of the sample headlamp to the sensor.

The sensor effective area is defined as the actual area of intercepted light striking the detector surface of the photometer. Sensor systems incorporating lens(es) that change the diameter of the intercepted light beam before it reaches the actual detector surface, the maximum size requirements must apply to the total area of the light actually intercepted by the lens surface.

The sensor must be capable of intercepting all direct illumination from the largest illuminated dimension of the sample lamp at the test distance.

The color response of the photometer must be corrected to that of the 1931 International Commission on Illumination (C.I.E.) Standard Observer (2°) Photopic Response Curve.

Location of test points

Test point positions are defined by the positioner. The following nomenclature applies:

The letters “V” and “H” designate the vertical and horizontal planes intersecting both the headlamp light source and the photometer axis. “H-V” designates the zero test point angle at the intersection of the H and V planes. This intersection is parallel to the longitudinal axis of the vehicle.

The letters “U”, “D”, “L”, and “R”, indicating up, down, left and right respectively, designate the angular position from the H and V planes to the photometer as viewed from the headlamp.

Horizontal angles designated L and R are defined as the plan view angle between the vertical plane and the projection of the light ray from the headlamp onto the horizontal plane.

Vertical angles designated U and D are defined as the true angle between the horizontal plane and the light ray from the headlamp.

Beam contributor photometry measurements.

In a headlighting system where there is more than one beam contributor providing a lower beam, and/or more than one beam contributor providing an upper beam, each beam contributor must be designed to meet only the applicable photometric performance requirements based upon the following mathematical expression: conforming test point value=2(test point value)/total number of lower or upper beam contributors for the vehicle, as appropriate.

Moveable reflector aimed headlamp photometry measurements.

A headlamp aimed by moving the reflector relative to the lens and headlamp housing, or vice versa, must conform to the photometrics applicable to it with the lens at any position relative to the reflector.

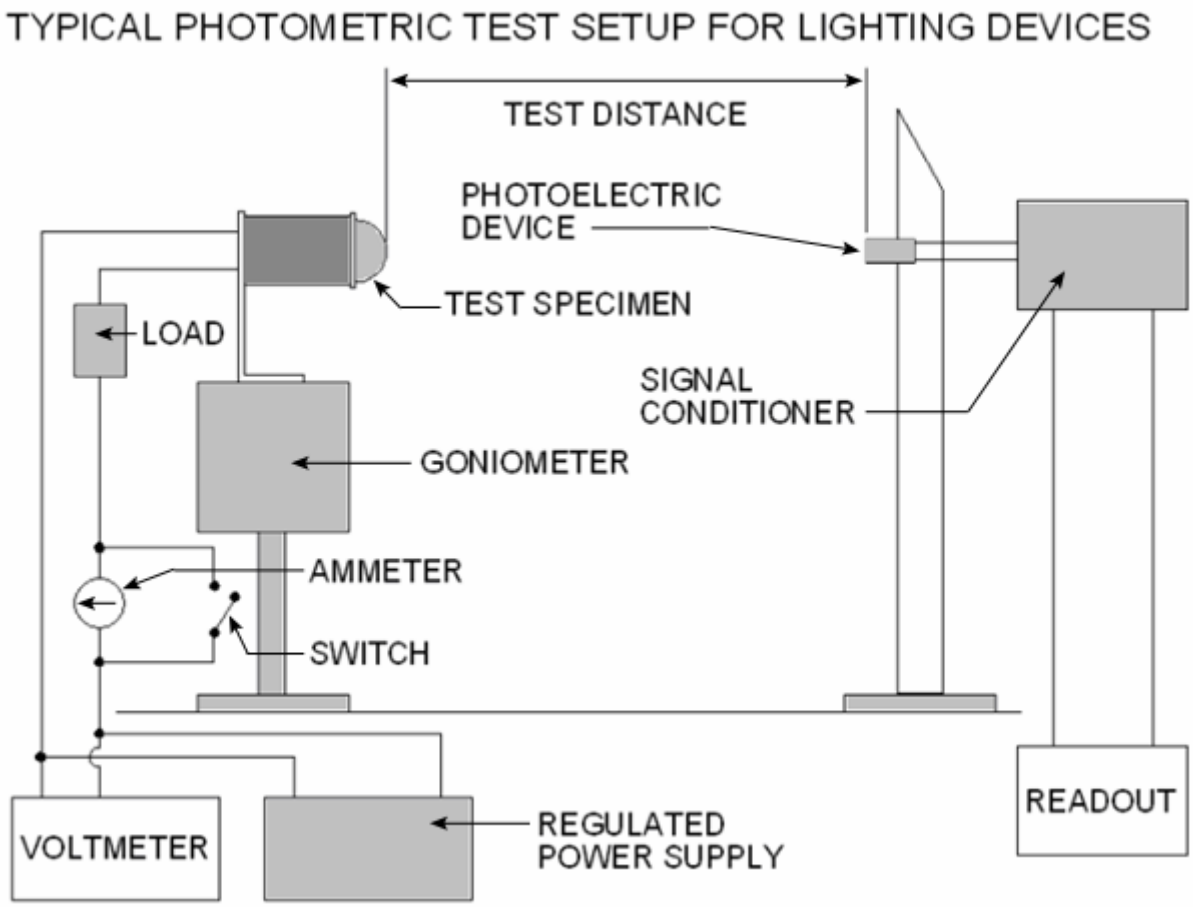
These positions include not less than the full range of vertical pitch of the vehicle on which the headlamp is installed and not less than ±2.5° from the nominal horizontal aim position for the vehicle on which the headlamp is installed unless the headlamp is visually/optically aimed with a fixed horizontal aim.

GENERAL TEST PROCEDURE

PHOTOMETRIC TEST

Install the device with its supplied mounting fixture, if applicable, in the appropriate test setup shown in Figure G-1. The device must be mounted in its normally installed operating position. Test distances shall be as stated in the specific test procedure for that device. 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 only, or with a solution which will not affect the lens surface.

FIGURE G-1



Photometric testing shall be performed as follows:

A. HEADLAMP UNITS

Align the center of the lamp with the center of the photometer by means of a transit or equivalent. Align the mounting plane parallel to the photometer.

1. Seven inch diameter Type 2 and all 5-3/4 inch diameter units-- align and aim the headlamp as above.

2. Motorcycle and motor driven cycle headlamps -- align and aim the upper beam of a multiple beam headlamp by adjusting the goniometer and locating the geometric center of the high intensity zone so that it lies 0.4 degrees vertically below lamp axis. Align and aim a single beam headlamp unit by adjusting the beam vertically to obtain 2,000 cp at the H-V point, and assure that the geometric center of the high intensity zone is below the H-V point on the photometric screen. Photometric readings shall be started at the H-V point and then shall be taken at other specified test points. After all readings are recorded, the value of the H-V point reading shall be verified by returning to that position.

B. ALL OTHER LAMPS (except license lamps)

For single front and rear lamps, distance and angles shall be measured from the incandescent filament. For multicompartment lamps or multiple lamps, distance and angles shall be measured from the geometric center of the assembly. The lamp axis shall be taken as a horizontal line through the light source parallel to the longitudinal axis of the vehicle with the lamp in its normal position.

For side lamps, the lamp axis shall be taken as a horizontal line through the light source perpendicular to the longitudinal axis of the vehicle with the lamp in its normal position.

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.

Set power supply to obtain the required mean spherical cp specified for that calibrated bulb.

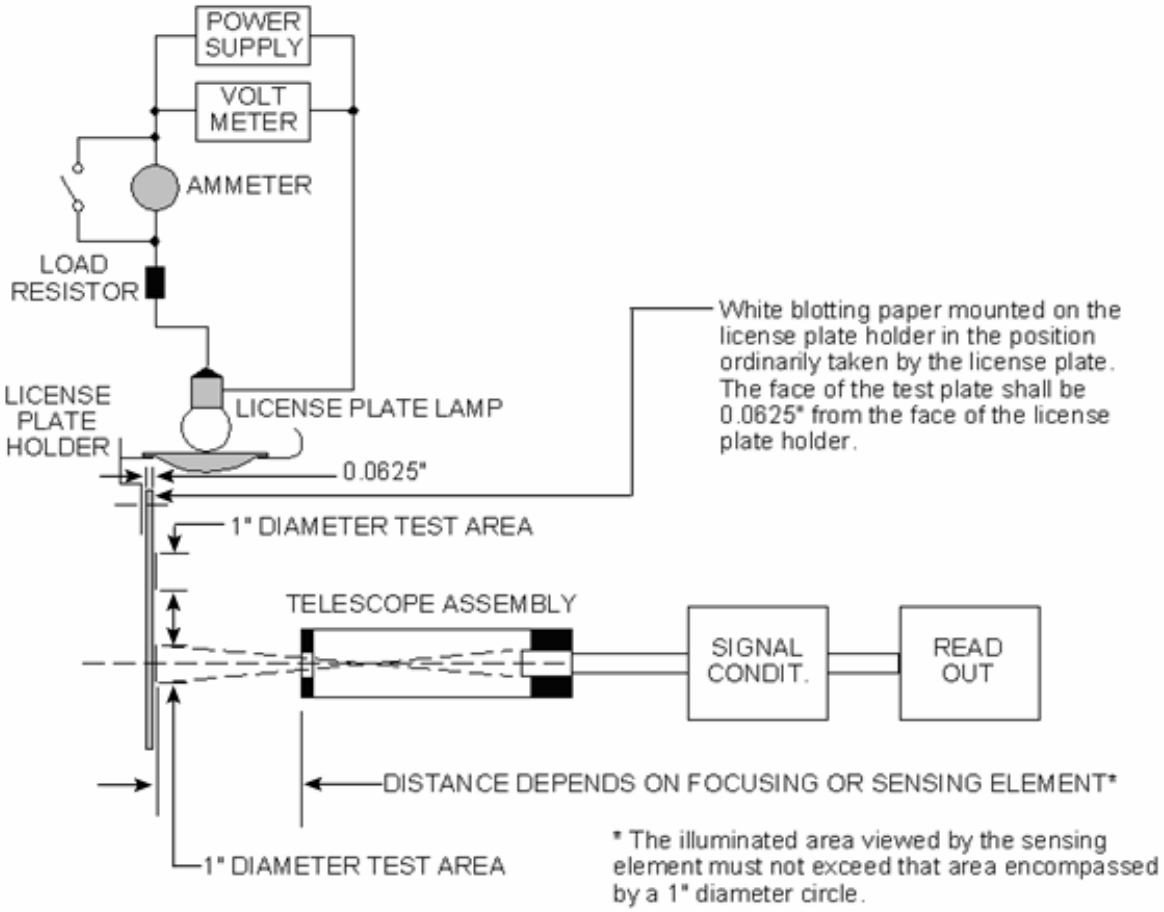
After thermal equilibrium has been reached, photometric readings shall be started at the NV point and then shall be taken, manually, at other specified points. For tail lamps, turn signal lamps and stop lamps, the points in Group 4 (5U-V, H-5L, NV, H-5R and 5D-V), shall be taken after readings for points in Groups I, 2, 3, 5, 6 and 7 have been taken. After all readings are recorded, the value of the NV point reading shall be verified by returning to that position. For provisions relating to rated bulbs, refer to page 152 of this test procedure.

Photometric readings shall be started at the H-V point and then shall be taken at other specified points. After all readings are recorded, the value of the H-V point reading shall be verified by returning to that position.

C. LICENSE PLATE LAMPS

Align and aim the photometer as shown in Figure G-2. The illuminated area viewed by the sensing element shall not exceed that of a 1-inch diameter circle. Connect the power supply to the calibrated bulb which has been installed in the device. Set bulb voltage to obtain the required mean spherical cp specified for that calibrated bulb. Measure the radiated light from the white dummy license card at the locations specified. Measure the angle of incident light to the plate. The angle shall not be less than degrees.

FIGURE G-2



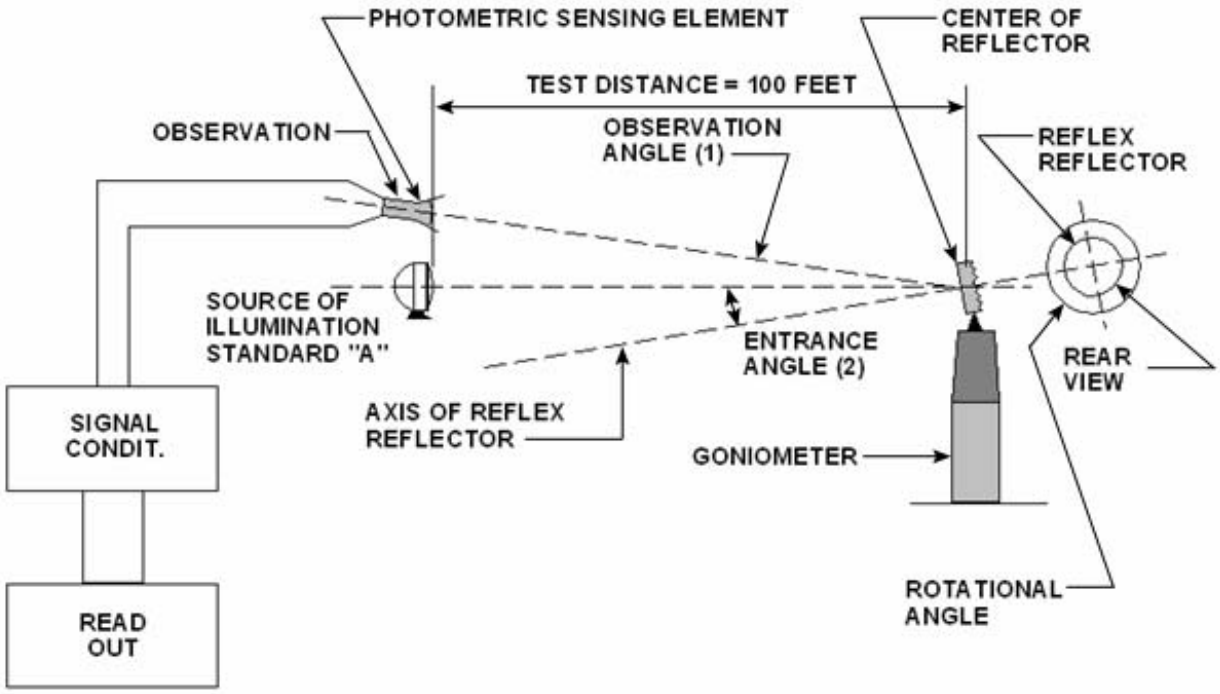
D. REFLEX REFLECTORS

Align the center of the reflector with the center of the Standard Illuminant "A", by means of a transit, or equivalent. Adjust the reflector such that it is normal to collimated light from the Standard Illuminant "A." If the effective reflective area of the reflex is greater than 12 square inches, place a black, nonreflecting tape around the perimeter of the reflector to reduce the reflective area to 12 square inches.

Connect the power supply to the source of illumination and set power supply to obtain the operating color temperature of 2854EK. Position the sensing element in place of the reflex reflector to calibrate the photometer. After the calibration position the sensing element as shown in the Reflex Reflector diagram. Move sensing element to the observation point specified, and measure the incident light at the various observation and entrance angles as shown in Figure G-3.

FIGURE G-3

REFLEX REFLECTOR PHOTOMETRIC TEST SETUP



EQUIPMENT

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

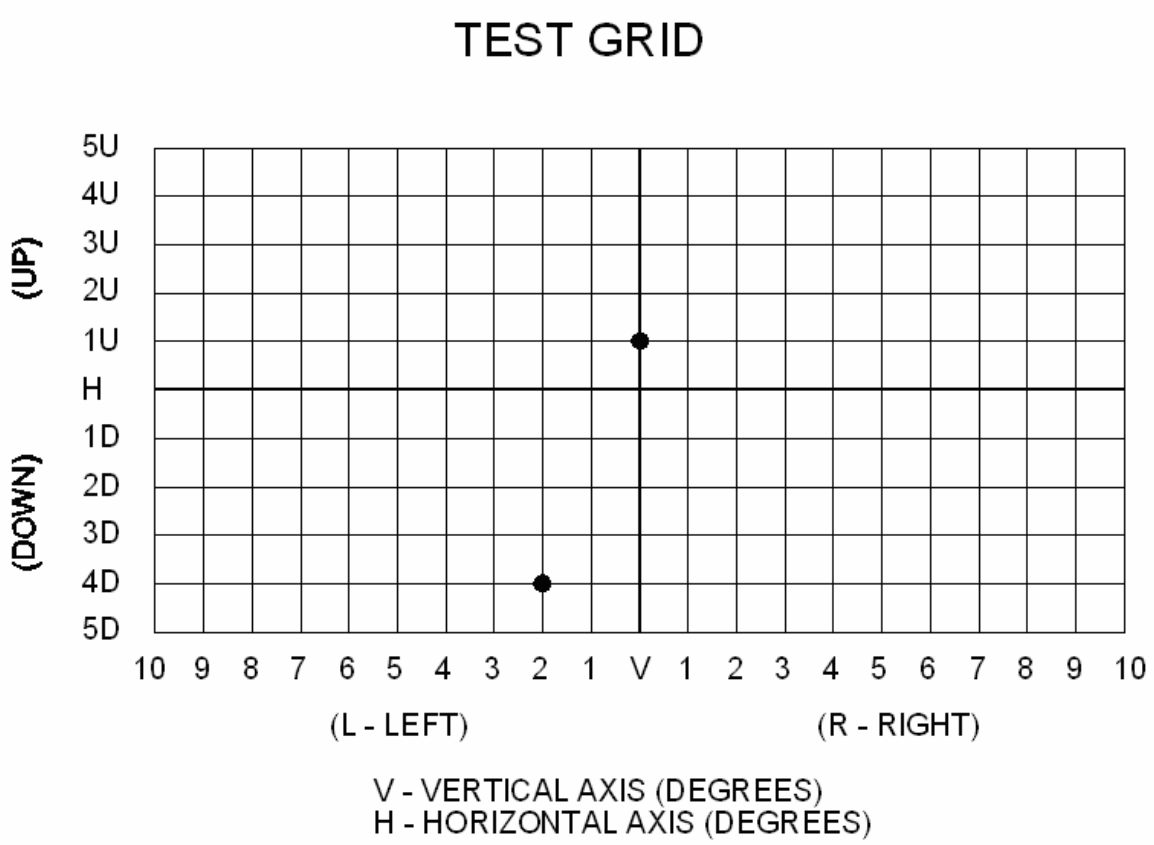
The photoelectric sensing element shall exhibit a minimum sensitivity of 0.003 footcandles. The element shall be color corrected by using a photopic filter such that the system will match the commission Internationale de l'Eclairage (CIE) photopic relative response curve from 500 to 700 manometers within 2 percent of the value being measured.

Prior to each Photometric Test, the complete system shall be single point calibrated with the aid of a Standard Illuminant "A". The Standard Illuminate "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.

EQUIPMENT LIST

ITEM	RANGE	ACCURACY
Goniometer	Vertical ± 4 inches Horizontal ± 4 inches Rotation ± 90 degrees in vertical and horizontal	± 0.1 degrees
Photoelectric System	0.003-10 footcandles	± 5 percent of value being measured
Regulated Power Supply	0-20 volts DC	± 1.0 percent
Ammeter	0-20 Amps DC	± 0.5 percent
Steel Tape	0-100 feet	± 1/8 inch
Transit	Vertical ± 1 inch	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 forms by the, inter section 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".

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 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 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.

EXAMPLE:

(1) 4D-3L is a point 4 degrees below H and 3 degrees to the left of V.

(2) 1U-V is a point 1 degree above H and on the line V.

(A) The observation angle is the angle formed by a line from the observation point to the center of the reflector and a second line from the center of the reflector to the source of illumination.

(B) The entrance angle is the angle between the axis of the reflex reflector and a line from the center of the reflector to the source of illumination. The entrance angle shall be designated left, right, up and down in accordance with the position of the source of illumination with respect to the axis of the reflex reflector.

(C) The photoelectric sensing element used in the reflex reflector photometric test shall not have an opening to the photocell more than 0.5 inch vertical by 1 inch horizontal.

APPENDIX H

GENERAL TEST PROCEDURE

PLASTIC OPTICAL MATERIALS TEST

Accelerated weathering procedures are not permitted.

Samples

Samples of materials should be injection molded into polished metal molds to produce test specimens with two flat and parallel faces. Alternative techniques may be used to produce equivalent specimens.

Test specimens shape may vary, but each exposed surface should contain a minimum uninterrupted area of 32 sq. cm.

Samples must be furnished in thicknesses of; 1.6± 0.25 mm., 2.3 ±0.25 mm., 3.2 ± 0.25 mm., and 6.4± 0.25 mm.

All samples must conform to the appropriate color test requirement of this standard prior to testing.

A control sample, kept properly protected from influences which may change its appearance and properties of each thickness must be retained.

Outdoor exposure test

Outdoor exposure tests of 3 years in duration must be made on samples of all materials, including coated and uncoated versions, used for optical parts of devices covered by this standard. Tests are to be conducted in Florida and Arizona.

Concentrations of polymer components and additives used in plastic materials may be changed without outdoor exposure testing provided the changes are within the limits of composition represented by higher and lower concentrations of these polymer components and additives previously tested to this section and found to meet its requirements.

Procedure

One sample of each thickness of each material must be mounted at each exposure site so that at least a minimum uninterrupted area of 32 sq. cm. of the exposed upper surface of the sample is at an angle of 45º to the horizontal facing south. The sample must be mounted in the open no closer than 30 cm (11.8 in) to its background.

During the exposure time the samples must be cleaned once every three months by washing with mild soap or detergent and water, and then rinsing with distilled water. Rubbing must be avoided.

Performance requirements

Plastic lenses, other than those incorporating reflex reflectors, used for inner lenses or those covered by another material and not exposed directly to sunlight must meet the optical material test requirements when covered by the outer lens or other material.

After completion of the outdoor exposure test the haze and loss of surface luster as measured by ASTM 1003-92, Haze and Luminous Transmittance of Transparent Plastic, must not be greater than;

(a) 30% for materials used for outer lenses, other than those incorporating reflex reflectors,

(b) 7% for materials used for reflex reflectors and lenses used in front of reflex reflectors.

After completion of the outdoor exposure test materials used for headlamp lenses must show no deterioration.

After completion of the outdoor exposure test materials, when compared with the unexposed control samples, must not show physical changes affecting performance such as color bleeding, delamination, crazing, or cracking. Materials used for reflex reflectors and lenses used in front of reflex reflectors must not show surface deterioration or dimensional changes.

After completion of the outdoor exposure test materials, when compared with the unexposed control samples, must not have their luminous transmittance changed by more than 25%when tested in accordance with ASTM E 308-66 (1973) using CIE Illuminant A (2856K).

After completion of the outdoor exposure test materials must conform to the color test of this standard in the range of thickness stated by the material manufacturer.

Heat test

Procedure

Two samples of each thickness of each material must be supported at the bottom, with at least 51 mm. of the sample above the support, in the vertical position in such a manner that, on each side, the minimum uninterrupted area of exposed surface is not less than 3225 sq. mm. The samples are placed in a circulating air oven at 79 ± 3º C for two hours.

Performance requirements

After completion of the heat exposure and cooling to room ambient temperature, a test specimen must; show no change in shape and general appearance discernable to the naked eye when compared with an unexposed specimen, and continue to conform to the appropriate color test requirement of this standard.

APPENDIX I

HEADLAMP PHOTOMETRY TABLES

TABLE XVIII. HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS

TEST POINT (degrees)		UPPER BEAM #1 (UB1)		UPPER BEAM #2 (UB2)		UPPER BEAM #3 (UB3)	
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)
2U	V	-	1,500	-	1,500	-	1,000
1U	3L &3R	-	5,000	-	5,000	-	2,000
H	V	70,000	40,000	75,000	40,000	75,000	20,000
H	3L & 3R	-	15,000	-	15,000	-	10,000
H	6L & 6R	-	5,000	-	5,000	-	3,250
H	9L & 9R	-	3,000	-	3,000	-	1,500
H	12L & 12R	-	1,500	-	1,500	-	750
1.5D	V	-	5,000	-	5,000	-	5,000
1.5D	9L & 9R	-	2,000	-	2,000	-	1,500
2.5D	V	-	2,500	-	2,500	-	2,500
2.5D	12L & 12R	-	1,000	-	1,000	-	750
4D	V	5,000	-	12,000	-	5,000	-

		UPPER BEAM #4 (UB4)		UPPER BEAM #5 (UB5)		UPPER BEAM #6 (UB6)	
2U	V	-	750	-	750	-	1,500
1U	3L &3R	-	3,000	-	2,000	-	5,000
H	V	60,000	18,000	15,000	7,000	70,000	40,000
H	3L & 3R	-	12,000	-	3,000	-	15,000
H	6L & 6R	-	3,000	-	2,000	-	5,000
H	9L & 9R	-	2,000	-	1,000	-	3,000
H	12L & 12R	-	750	-	750	-	1,500
1.5D	V	-	3,000	-	2,000	-	5,000
1.5D	9L & 9R	-	1,250	-	750	-	1,000
2.5D	V	-	1,500	-	1,000	-	-
2.5D	12L & 12R	-	600	-	400	-	-
4D	V	5,000	-	2,500	-	5,000	-

TABLE XIX. HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (Table 1 of 3)									
TEST POINT (degrees)		LOWER BEAM # 1M (LB1M)		LOWER BEAM # 1V (LB1V)		LOWER BEAM # 2M (LB2M)		LOWER BEAM # 2V (LB2V)	
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)
[1] 10U to 90U	[1] 90L to 90R	125	-	125	-	125	-	125	
4U	8L & 8R	-	64	-	64	-	64	--	64
2U	4L	-	135	-	135	-	135	-	135
1.5U	1R to 3R	-	200	-	200	-	200	-	200
1.5U	1R to R	1,400	-	1,400	-	1,400	-	1,400	-
1U	1.5L to L	700	-	700	-	700	-	700	-
0.5U	1.5L to L	1,000	-	1,000	-	1,000	-	1,000	-
0.5U	1R to 3R	2,700	500	2,700	500	2,700	500	2,700	500
H	V	5,000	-	5,000	-	-	-	-	-
H	4L	-	135	-	135	-	135	-	135
H	8L	-	64	-	64	-	64	-	64
0.5D	1.5L to L	3,000	-	-	-	3,000	-	-	-
0.5D	1.5R	20,000	10,000	-	-	20,000	10,000	-	-
0.6D	1.3R	-	-	-	10,000	-	-	-	10,000
0.86D	V	-	-	-	4,500	-	-	-	4,500
0.86D	3.5L	-	-	12,000	1,800	-	-	12,000	1,800
1D	6L	-	1,000	-	-	-	1,000	-	-
1.5D	2R	-	15,000	-	15,000	-	15,000	-	15,000
1.5D	9L & 9R	-	1,000	-	-	-	1,000	-	-
2D	9L & 9R	-	-	-	1,250	-	-	-	1,250
2D	15L & 15R	-	850	-	1,000	-	850	-	1,000
2.5D	V	-	-	-	-	-		-	-
2.5D	12L & 12R	-	-	-	-	-	-	-	-
4D	V	7,000	-	10,000	-	-	-	-	-
4D	4R	12,500	-	12,500	-	12,500	-	12,500	-
4D	20L & 20R	-	-	-	300	-	-	-	300

[1] These test points are boundaries, all test points that fall into the area defined by these points must meet the listed photometry requirement.

TABLE XIX. HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (Table 2 of 3)									
TEST POINT (degrees)		LOWER BEAM #3 M (LB3M)		LOWER BEAM # 3V (LB3V)		LOWER BEAM # 4M (LB4M)		LOWER BEAM # 5M (LB5M)	
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)
[1] 10U to 90U	[1] 90L to 90R	125	-	125	-	125	-	125	-
4U	8L & 8R	-	64	-	64	-	64	-	64
2U	4L	-	135	-	135	-	135	-	135
1.5U	1R to 3R	-	200	-	200	-	200	-	200
1.5U	1R to R	1,400	-	1,400	-	1,400	-	1,400	--
1U	1.5L to L	700	-	700	-	700	-	700	-
0.5U	1.5L to L	1,000	-	1,000	-	1,000	-	1,000	-
0.5U	1R to 3R	2,700	500	2,700	500	2,700	500	2,700	500
H	V	-	-	-	-	-	-	5,000	-
H	4L	-	135	-	135	-	135	-	135
H	8L	-	64	-	64	-	64	-	64
0.5D	1.5L to L	2,500	-	-	-	2500	-	3,000	-
0.5D	1.5R	20,000	8,000	-	-	20,000	8,000	20,000	10,000
0.6D	1.3R	-		-	10,000	-	-	-	-
0.86D	V	-	--	-	4,500	-	-	-	-
0.86D	3.5L	-	-	12,000	1,800	-	-	-	-
1D	6L	-	750	-	-	-	750	-	1,000
1.5D	2R	-	15,000	-	15,000	-	15,000	-	15,000
1.5D	9L & 9R	-	750	-	-	-	750	-	1,000
2D	9L & 9R	-	-	-	1,250	-	-	-	-
2D	15L & 15R	-	700	-	1,000	-	700	-	850
2.5D	V	-	-	-	-	-	-	-	2,500
2.5D	12L & 12R	-	-	-	-	-	-	-	1,000
4D	V	-	-	-	-	-	-	7,000	-
4D	4R	12,500	-	12,500	-	12,500	-	12,500	-
4D	20L & 20R	-	-	-	300	-	-	-	-

[1] These test points are boundaries, all test points that fall into the area defined by these points must meet the listed photometry requirement.

TABLE XIX. HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (Table 3 of 3)			
TEST POINT (degrees)		LOWER BEAM # 4 V (LB4V)	
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)
[1] 10U to 90U	[1] 90L to 90R	125	-
4U	8L & 8R	-	64
2U	4L	-	135
1.5U	1R to 3R	-	200
1.5U	1R to R	1,400	-
1U	1.5L to L	700	-
0.5U	1.5L to L	1,000	-
0.5U	1R to 3R	2,700	500
H	V	5,000	-
H	4L	-	135
H	8L	-	64
0.5D	1.5L to L	-	-
0.5D	1.5R	-	-
0.6D	1.3R	-	10,000
0.86D	V	-	4,500
0.86D	3.5L	12,000	1,800
1D	6L	-	-
1.5D	2R	-	15,000
1.5D	9L & 9R	-	-
2D	9L & 9R	-	1,250
2D	15L & 15R	-	1,000
2.5D	V	-	2,500
2.5D	12L & 12R	-	1,000
4D	V	10,000	-
4D	4R	12,500	-
4D	20L & 20R	-	300

[1] These test points are boundaries, all test points that fall into the area defined by these points must meet the listed photometry requirement.

PHOTOMETRY TEST – HEADLAMP UPPER BEAM #1 (UB1)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		UPPER BEAM #1 (UB1)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,500			
1U	3L &3R	-	5,000			
H	V	70,000	40,000			
H	3L & 3R	-	15,000			
H	6L & 6R	-	5,000			
H	9L & 9R	-	3,000			
H	12L & 12R	-	1,500			
1.5D	V	-	5,000			
1.5D	9L & 9R	-	2,000			
2.5D	V	-	2,500			
2.5D	12L & 12R	-	1,000			
4D	V	5,000	-			

PHOTOMETRY TEST – HEADLAMP UPPER BEAM #2 (UB2)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		UPPER BEAM #2 (UB2)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,500			
1U	3L &3R	-	5,000			
H	V	75,000	40,000			
H	3L & 3R	-	15,000			
H	6L & 6R	-	5,000			
H	9L & 9R	-	3,000			
H	12L & 12R	-	1,500			
1.5D	V	-	5,000			
1.5D	9L & 9R	-	2,000			
2.5D	V	-	2,500			
2.5D	12L & 12R	-	1,000			
4D	V	12,000	-			

PHOTOMETRY TEST – HEADLAMP UPPER BEAM #3 (UB3)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		UPPER BEAM #3 (UB3)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,000			
1U	3L &3R	-	2,000			
H	V	75,000	20,000			
H	3L & 3R	-	10,000			
H	6L & 6R	-	3,250			
H	9L & 9R	-	1,500			
H	12L & 12R	-	750			
1.5D	V	-	5,000			
1.5D	9L & 9R	-	1,500			
2.5D	V	-	2,500			
2.5D	12L & 12R	-	750			
4D	V	5,000	-			

PHOTOMETRY TEST – HEADLAMP UPPER BEAM #4 (UB4)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		UPPER BEAM #4 (UB4)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	750			
1U	3L &3R	-	3,000			
H	V	60,000	18,000			
H	3L & 3R	-	12,000			
H	6L & 6R	-	3,000			
H	9L & 9R	-	2,000			
H	12L & 12R	-	750			
1.5D	V	-	3,000			
1.5D	9L & 9R	-	1,250			
2.5D	V	-	1,500			
2.5D	12L & 12R	-	600			
4D	V	5,000	-			

PHOTOMETRY TEST – HEADLAMP UPPER BEAM #5 (UB5)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		UPPER BEAM #5 (UB5)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	750			
1U	3L &3R	-	2,000			
H	V	15,000	7,000			
H	3L & 3R	-	3,000			
H	6L & 6R	-	2,000			
H	9L & 9R	-	1,000			
H	12L & 12R	-	750			
1.5D	V	-	2,000			
1.5D	9L & 9R	-	750			
2.5D	V	-	1,000			
2.5D	12L & 12R	-	400			
4D	V	2,500	-			

PHOTOMETRY TEST – HEADLAMP UPPER BEAM #6 (UB6)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP UPPER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		UPPER BEAM #6 (UB6)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
2U	V	-	1,500			
1U	3L &3R	-	5,000			
H	V	70,000	40,000			
H	3L & 3R	-	15,000			
H	6L & 6R	-	5,000			
H	9L & 9R	-	3,000			
H	12L & 12R	-	1,500			
1.5D	V	-	5,000			
1.5D	9L & 9R	-	1,000			
2.5D	V	-	-			
2.5D	12L & 12R	-	-			
4D	V	5,000	-			

PHOTOMETRY TEST – HEADLAMP LOWER BEAM #1M (LB1M)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		LOWER BEAM # 1M (LB1M)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
(1) 10U to 90U	(1) 90L to 90R	125	-			
4U	8L & 8R	-	64			
2U	4L	-	135			
1.5U	1R to 3R	-	200			
1.5U	1R to R	1,400	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	500			
H	V	5,000	-			
H	4L	-	135			
H	8L	-	64			
0.5D	1.5L to L	3,000	-			
0.5D	1.5R	20,000	10,000			
0.6D	1.3R	-	-			
0.86D	V	-	-			
0.86D	3.5L	-	-			
1D	6L	-	1,000			
1.5D	2R	-	15,000			
1.5D	9L & 9R	-	1,000			
2D	9L & 9R	-	-			
2D	15L & 15R	-	850			
2.5D	V	-	-			
2.5D	12L & 12R	-	-			
4D	V	7,000	-			
4D	4R	12,500	-			
4D	20L & 20R	-	-			

PHOTOMETRY TEST – HEADLAMP LOWER BEAM #1V (LB1V)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		LOWER BEAM # 1V (LB1V)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
(1) 10U to 90U	(1) 90L to 90R	125	-			
4U	8L & 8R	-	64			
2U	4L	-	135			
1.5U	1R to 3R	-	200			
1.5U	1R to R	1,400	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	500			
H	V	5,000	-			
H	4L	-	135			
H	8L	-	64			
0.5D	1.5L to L	-	-			
0.5D	1.5R	-	-			
0.6D	1.3R	-	10,000			
0.86D	V	-	4,500			
0.86D	3.5L	12,000	1,800			
1D	6L	-	-			
1.5D	2R	-	15,000			
1.5D	9L & 9R	-	-			
2D	9L & 9R	-	1,250			
2D	15L & 15R	-	1,000			
2.5D	V	-	-			
2.5D	12L & 12R	-	-			
4D	V	10,000	-			
4D	4R	12,500	-			
4D	20L & 20R	-	300			

PHOTOMETRY TEST – HEADLAMP LOWER BEAM # 2M (LB2M)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		LOWER BEAM # 2M (LB2M)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
(1) 10U to 90U	(1) 90L to 90R	125	-			
4U	8L & 8R	-	64			
2U	4L	-	135			
1.5U	1R to 3R	-	200			
1.5U	1R to R	1,400	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	500			
H	V	-	-			
H	4L	-	135			
H	8L	-	64			
0.5D	1.5L to L	3,000	-			
0.5D	1.5R	20,000	10,000			
0.6D	1.3R	-	-			
0.86D	V	-	-			
0.86D	3.5L	-	-			
1D	6L	-	1,000			
1.5D	2R	-	15,000			
1.5D	9L & 9R	-	1,000			
2D	9L & 9R	-	-			
2D	15L & 15R	-	850			
2.5D	V	-				
2.5D	12L & 12R	-	-			
4D	V	-	-			
4D	4R	12,500	-			
4D	20L & 20R	-	-			

PHOTOMETRY TEST – HEADLAMP LOWER BEAM # 2V (LB2V)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		LOWER BEAM # 2V (LB2V)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
(1) 10U to 90U	(1) 90L to 90R	125				
4U	8L & 8R	--	64			
2U	4L	-	135			
1.5U	1R to 3R	-	200			
1.5U	1R to R	1,400	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	500			
H	V	-	-			
H	4L	-	135			
H	8L	-	64			
0.5D	1.5L to L	-	-			
0.5D	1.5R	-	-			
0.6D	1.3R	-	10,000			
0.86D	V	-	4,500			
0.86D	3.5L	12,000	1,800			
1D	6L	-	-			
1.5D	2R	-	15,000			
1.5D	9L & 9R	-	-			
2D	9L & 9R	-	1,250			
2D	15L & 15R	-	1,000			
2.5D	V	-	-			
2.5D	12L & 12R	-	-			
4D	V	-	-			
4D	4R	12,500	-			
4D	20L & 20R	-	300			

PHOTOMETRY TEST – HEADLAMP LOWER BEAM # 3M (LB3M)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		LOWER BEAM # 3M (LB3M)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
(1) 10U to 90U	(1) 90L to 90R	125	-			
4U	8L & 8R	-	64			
2U	4L	-	135			
1.5U	1R to 3R	-	200			
1.5U	1R to R	1,400	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	500			
H	V	-	-			
H	4L	-	135			
H	8L	-	64			
0.5D	1.5L to L	2,500	-			
0.5D	1.5R	20,000	8,000			
0.6D	1.3R	-				
0.86D	V	-	--			
0.86D	3.5L	-	-			
1D	6L	-	750			
1.5D	2R	-	15,000			
1.5D	9L & 9R	-	750			
2D	9L & 9R	-	-			
2D	15L & 15R	-	700			
2.5D	V	-	-			
2.5D	12L & 12R	-	-			
4D	V	-	-			
4D	4R	12,500	-			
4D	20L & 20R	-	-			

PHOTOMETRY TEST – HEADLAMP LOWER BEAM # 3V (LB3V)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		LOWER BEAM # 3V (LB3V)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
(1) 10U to 90U	(1) 90L to 90R	125	-			
4U	8L & 8R	-	64			
2U	4L	-	135			
1.5U	1R to 3R	-	200			
1.5U	1R to R	1,400	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	500			
H	V	-	-			
H	4L	-	135			
H	8L	-	64			
0.5D	1.5L to L	-	-			
0.5D	1.5R	-	-			
0.6D	1.3R	-	10,000			
0.86D	V	-	4,500			
0.86D	3.5L	12,000	1,800			
1D	6L	-	-			
1.5D	2R	-	15,000			
1.5D	9L & 9R	-	-			
2D	9L & 9R	-	1,250			
2D	15L & 15R	-	1,000			
2.5D	V	-	-			
2.5D	12L & 12R	-	-			
4D	V	-	-			
4D	4R	12,500	-			
4D	20L & 20R	-	300			

PHOTOMETRY TEST – HEADLAMP LOWER BEAM # 4M (LB4M)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		LOWER BEAM # 4M (LB4M)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
(1) 10U to 90U	(1) 90L to 90R	125	-			
4U	8L & 8R	-	64			
2U	4L	-	135			
1.5U	1R to 3R	-	200			
1.5U	1R to R	1,400	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	500			
H	V	-	-			
H	4L	-	135			
H	8L	-	64			
0.5D	1.5L to L	2500	-			
0.5D	1.5R	20,000	8,000			
0.6D	1.3R	-	-			
0.86D	V	-	-			
0.86D	3.5L	-	-			
1D	6L	-	750			
1.5D	2R	-	15,000			
1.5D	9L & 9R	-	750			
2D	9L & 9R	-	-			
2D	15L & 15R	-	700			
2.5D	V	-	-			
2.5D	12L & 12R	-	-			
4D	V	-	-			
4D	4R	12,500	-			
4D	20L & 20R	-	-			

PHOTOMETRY TEST – HEADLAMP LOWER BEAM # 4V (LB4V)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		LOWER BEAM # 4V (LB4V)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
(1) 10U to 90U	(1) 90L to 90R	125	-			
4U	8L & 8R	-	64			
2U	4L	-	135			
1.5U	1R to 3R	-	200			
1.5U	1R to R	1,400	-			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	500			
H	V	5,000	-			
H	4L	-	135			
H	8L	-	64			
0.5D	1.5L to L	-	-			
0.5D	1.5R	-	-			
0.6D	1.3R	-	10,000			
0.86D	V	-	4,500			
0.86D	3.5L	12,000	1,800			
1D	6L	-	-			
1.5D	2R	-	15,000			
1.5D	9L & 9R	-	-			
2D	9L & 9R	-	1,250			
2D	15L & 15R	-	1,000			
2.5D	V	-	2,500			
2.5D	12L & 12R	-	1,000			
4D	V	10,000	-			
4D	4R	12,500	-			
4D	20L & 20R	-	300			

PHOTOMETRY TEST – HEADLAMP LOWER BEAM # 5M (LB5M)

Device manufacturer: _____
Device part number: _____ Photometric Test Distance: 100 feet
Device production number: _____ Sample Number: _____
Bulb Trade No.:_____ Test Voltage/current: _____
Aim notes: _____
Other notes: _____

HEADLAMP LOWER BEAM PHOTOMETRY REQUIREMENTS (see TABLE XVIII of FMVSS No. 108)						
TEST POINT (degrees)		LOWER BEAM # 5M (LB5M)		MEASUREMENTS		
		MAXIMUM PHOTOMETRIC INTENSITY (cd)	MINIMUM PHOTOMETRIC INTENSITY (cd)	Location	Measured	Reaim
(1) 10U to 90U	(1) 90L to 90R	125	-			
4U	8L & 8R	-	64			
2U	4L	-	135			
1.5U	1R to 3R	-	200			
1.5U	1R to R	1,400	--			
1U	1.5L to L	700	-			
0.5U	1.5L to L	1,000	-			
0.5U	1R to 3R	2,700	500			
H	V	5,000	-			
H	4L	-	135			
H	8L	-	64			
0.5D	1.5L to L	3,000	-			
0.5D	1.5R	20,000	10,000			
0.6D	1.3R	-	-			
0.86D	V	-	-			
0.86D	3.5L	-	-			
1D	6L	-	1,000			
1.5D	2R	-	15,000			
1.5D	9L & 9R	-	1,000			
2D	9L & 9R	-	-			
2D	15L & 15R	-	850			
2.5D	V	-	2,500			
2.5D	12L & 12R	-	1,000			
4D	V	7,000	-			
4D	4R	12,500	-			
4D	20L & 20R	-	-			

APPENDIX J

HEADLAMP PHYSICAL TESTS

HEADLAMP PHYSICAL TEST PROCEDURES

GENERAL TEST PROCEDURES

ABRASION TEST

ABRADING PAD

A new, unused abrading pad constructed of 0000 steel wool not less than 2.5±.1 cm. wide rubber cemented to a rigid base shaped to the same vertical contour of the lens is used for each test. The abrading pad support is equal in size to the pad and the center of the support surface is within ±2 mm. of parallel to the lens surface. The “grain” of the pad is oriented perpendicular to the direction of motion. The density of the pad is such that when the pad is resting unweighted on the lens, the base of the pad is no closer than 3.2 mm. to the lens at its closest point.

ABRADING PAD ALIGNMENT

A sample headlamp is mounted in the abrasion test fixture of Figure 5 of FMVSS No. 108 with the lens facing upward. When mounted on its support and resting on the lens of the test headlamp, the abrading pad is then weighted such that a pad pressure of 14±1 KPa. exists at the center and perpendicular to the face of the lens.

ABRASION TEST PROCEDURE

The pad is cycled back and forth (1 cycle) for 11 cycles at 4± 0.8 in. (10±2 cm.) per second over at least 80% of the lens surface, including all the area between the upper and lower aiming pads, but not including lens trim rings and edges. A pivot must be used if it is required to follow the contour of the lens.

PERFORMANCE REQUIREMENTS

After completion of the abrasion test the sample headlamp must meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼º reaim is permitted in any direction at any test point.

CHEMICAL RESISTANCE TEST

TEST FLUIDS

The five test fluids used in the chemical resistance test include;

(a) ASTM Reference Fuel C, which is composed of Isooctane 50% volume and Toluene 50% volume. Isooctane must conform to A2.7 in Annex 2 of the Motor Fuels Section of the 1985 Annual Book of ASTM Standards, Vol. 05.04, and Toluene must conform to ASTM specification D362-84, Standard Specification for Industrial Grade Toluene. ASTM Reference Fuel C must be used as specified in: Paragraph A2.3.2 and A2.3.3 of Annex 2 to Motor Fuels, Section 1in the 1985 Annual Book of ASTM Standards; and OSHA Standard 29 CFR 1910.106--Handling Storage and Use of Flammable Combustible Liquids.

(b) Tar remover (consisting by volume of 45% xylene and 55% petroleum base mineral spirits).

(c) Power steering fluid (as specified by the vehicle manufacturer for use in the motor vehicle on which the headlamp is intended to be installed).

(d) Windshield washer fluid consisting of 0.5% monoethanolamine with the remainder 50% concentration of methanol/distilled water by volume.

(e) Antifreeze (50% concentration of ethylene glycol/distilled water by volume).

FLUID APPLICATION

The entire exterior lens surface of the sample headlamp mounted in the headlamp test fixture and top surface of the lens-reflector joint is wiped once to the left and once to the right with a 6-inch square soft cotton cloth (with pressure equally applied) which has been saturated once in a container with 2 ounces of five different test fluids listed above. The lamp is wiped within 5 seconds after removal of the cloth from the test fluid. A new lamp sample may be used with each fluid.

TEST DURATION

After the headlamp sample has been wiped with the test fluid, it must be stored in its designed operating attitude for 48 hours at a temperature of 23ºC±4ºC and a relative humidity of 30% ± 10%. At the end of the 48-hour period, the headlamp is wiped clean with a soft dry cotton cloth and visually inspected.

PERFORMANCE REQUIREMENTS

After completion of the chemical resistance test, the sample headlamp must have no surface deterioration, coating delamination, fractures, deterioration of bonding or sealing materials, color bleeding, or color pickup visible without magnification and the headlamp must meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼° reaim is permitted in any direction at any test point.

CORROSION TEST

PROCEDURE

A sample headlamp, mounted on a headlamp test fixture in designed operating position and including all accessory equipment necessary to operate in its normal manner, is subjected to a salt spray (fog) test in accordance with ASTMB117-73, Method of Salt Spray (Fog) Testing, for 50 total hours, consisting of two periods of 24 hours exposure followed by a 1 hour drying period. If a portion of the device is completely protected in service, that portion is covered to prevent salt fog entry during exposure. After removal from the salt spray and the final 1 hour drying period the sample headlamp is examined for corrosion that affect any other applicable tests contained in Appendix J. If such corrosion is found, the affected test(s) must be performed on the corrosion sample and the results recorded.

PERFORMANCE REQUIREMENTS

After completion of the corrosion test, the sample headlamp must not have any observed corrosion which would result in the failure of any other applicable tests contained in Appendix J and no corrosion of the headlamp mounting and aiming mechanism that would result in the failure of the aiming adjustment tests, inward force test, or torque deflection test of Appendix J.

CORROSION-CONNECTOR TEST

PROCEDURE

A headlamp connector test must be performed on each filament circuit of the sample headlamp prior to the test in S14.6.4.1.2 of FMVSS No. 108 according to Figure 4 and S14.6.15 of FMVSS No. 108. The power source is set to provide 12. 8 volts and the resistance must be set to produce 10 amperes.

The headlamp with connector attached to the terminals, unfixtured and in its designed operating attitude with all drain holes, breathing devices or other designed openings in their normal operating positions, is subjected to a salt spray (fog) test in accordance with ASTM B117-73, Method of Salt Spray (Fog) Testing, for 240 hours, consisting of ten successive 24-hour periods.

During each period, the headlamp is mounted in the middle of the chamber and exposed for 23 hours to the salt spray. The spray is not activated during the 24th hour. The bulb is removed from the headlamp and from the test chamber during the one hour of salt spray deactivation and reinserted for the start of the next test period, at the end of the first and last three 23-hour periods of salt spray exposure, and at the end of any two of the fourth through seventh 23-hour periods of salt-spray exposure.

The test chamber is closed at all times except for a maximum of 2 minutes which is allowed for removal or replacement of a bulb during each period.

After the ten periods, the lens reflector unit without the bulb must be immersed in deionized water for 5 minutes, then secured and allowed to dry by natural convection only.

Using the voltage, resistance and pretest set up of S14.6.4.1.1 of FMVSS No. 108 the current in each filament circuit must be measured after the test conducted in S14.6.4.1.2 of FMVSS No. 108.

PERFORMANCE REQUIREMENTS

After the completion of the corrosion-connector test, the sample headlamp must show no evidence of external or internal corrosion or rust visible without magnification.

Loss of adhesion of any applied coating must not occur more than 3.2 mm from any sharp edge on the inside or out.

Corrosion may occur on terminals only if the test current produced during the test of S14.6.4.1.6 of FMVSS No. 108 is not less than 9.7 amperes.

DUST TEST

PROCEDURE

A sample headlamp, mounted on a headlamp test fixture, with all drain holes, breathing devices or other designed openings in their normal operating positions, is positioned within a cubical box, with inside measurements of 900 mm. on each side or larger if required for adequate wall clearance (i.e., a distance of at least 150 mm between the headlamp and any wall of the box).

The box contains 4.5 kg. of fine powdered cement which conforms to the ASTM C150-77 specification for Portland Cement. Every 15 minutes, the cement is agitated by compressed air or fan blower(s) by projecting blasts of air for a two-second period in a downward direction so that the cement is diffused as uniformly as possible throughout the entire box.

This test is continued for five hours after which the exterior surfaces of the headlamp are wiped clean.

PERFORMANCE REQUIREMENTS

After completion of the dust test, the sample headlamp must meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼º reaim is permitted in any direction at any test point.

TEMPERATURE CYCLE TEST AND INTERNAL HEAT TEST

SAMPLES

A sample headlamp with one or mo re replaceable light sources is tested according to the procedures of this section for a temperature cycle test and an internal heat test. The same sample headlamp is used in the temperature cycle test and then in the internal heat test.

GENERAL PROCEDURE

Tests are made with all filaments lighted at design voltage that are intended to be used simultaneously in the headlamp and which in combination draw the highest total wattage. These include but are not limited to filaments used for turn signal lamps, fog lamps, parking lamps, and headlamp lower beams lighted with upper beams when the wiring harness is so connected on the vehicle.

If a turn signal is included in the headlamp assembly, it is operated at 90 flashes a minute with a 75%±2% current ``on time."

If the lamp produces both the upper and lower beam, it is tested in both the upper beam mode and the lower beam mode under the conditions above described, except for a headlamp with a single HB1 or HB2 replaceable light source.

TEMPERATURE CYCLE TEST

PROCEDURE

A sample headlamp, mounted on a headlamp test fixture, is subjected to 10 complete consecutive cycles having the thermal cycle profile shown in Figure 6 of FMVSS No. 108.

During the hot cycle, the lamp, is energized commencing at point ``A" of Figure 6 of FMVSS No. 108 and de-energized at point ``B."

Separate or single test chambers may be used to generate the environment of Figure 6 of FMVSS No. 108.

All drain holes, breathing devices or other openings or vents of the headlamps are set in their normal operating positions.

PERFORMANCE REQUIREMENTS

After completion of the temperature cycle test, the sample headlamp must;

(a) show no evidence of delamination, fractures, entry of moisture, or deterioration of bonding material, color bleeding, warp or deformation visible without magnification

(b) show no lens warpage greater than 3 mm when measured parallel to the optical axis at the point of intersection of the axis of each light source with the exterior surface of the lens.

(c) meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼º reaim is permitted in any direction at any test point.

INTERNAL HEAT TEST

PROCEDURE

A sample headlamp lens surface that would normally be exposed to road dirt is uniformly sprayed with any appropriate mixture of dust and water or other materials to reduce the photometric output at the H-V test point of the upper beam (or the ½D-1½R test point of the lower beam as appropriate) to 25%±2% of the output originally measured in the appropriate photometric compliance test.

A headlamp with a single HB1 or HB2 replaceable light source is tested on the upper beam only.

Such reduction is determined under the same conditions as that of the original photometric measurement.

After the photometric output of the lamp has been reduced as specified above, the sample lamp and its mounting hardware must be mounted in an environmental chamber in a manner similar to that indicated in Figure 7``Dirt/Ambient Test Setup."

The headlamp is soaked for one hour at a temperature of 35º + 4° -0º C) and then the lamp is energized according to the procedure of this section for one hour in a still air condition, allowing the temperature to rise from the soak temperature.

At the end of one hour the sample lamp is returned to a room ambient temperature of 23° + 4° -0º C and a relative humidity of 30%±10% and allowed to stabilize to the room ambient temperature. The lens is then cleaned.

PERFORMANCE REQUIREMENTS

After completion of the temperature cycle test and meeting its requirements, and completion of the internal heat test, the sample headlamp must;

(a) have no lens warpage greater than 3 mm when measured parallel to the optical axis at the point of intersection of the axis of each light source with the exterior surface of the lens.

(b) meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼º reaim is permitted in any direction at any test point.

HUMIDITY TEST

PROCEDURE

The test fixture consists of a horizontal steel plate to which three threaded steel or aluminum rods of ½ inch diameter are screwed vertically behind the headlamp.

The sample headlamp assembly is clamped to the vertical rods, which are behind the headlamp. All attachments to the headlamp assembly are made behind the lens and vents or openings, and are not within 2 inches laterally of a vent inlet or outlet.

The mounted headlamp assembly is oriented in its design operating position, and is placed in a controlled environment at a temperature of 100°+7°-0º F (38º+4º-0° C) with a relative humidity of not less than 90%. All drain holes, breathing devices, and other openings are set in their normal operation positions for all phases of the humidity test.

The headlamp is subjected to 24 consecutive 3-hour test cycles. In each cycle, the headlamp is energized for 1 hour at design voltage with the highest combination of filament wattages that are intended to be used, and then de-energized for 2 hours. If the headlamp incorporates a turn signal then the turn signal flashes at 90 flashes per minute with a 75% ± 2% current “on-time.”

Within 3 minutes after the completion of the 24th cycle, the air flow test will begin. The following procedure is to occur:

The mounted assembly is removed, placed in an insulating box and covered with foam material so that there is no visible air space around the assembly;

The box is closed, taken to the air flow test chamber, and placed within it. Inside the chamber, the assembly with respect to the air flow, is oriented in its design operating position;

The assembly is positioned in the chamber so that the center of the lens is in the center of the opening of the air flow entry duct during the test;

The headlamp has at least 3 inches clearance on all sides, and at least 4 inches to the entry and exit ducts at the closest points;

If vent tubes are used which extend below the lamp body, the 3 inches are measured from the bottom of the vent tube or its protection;

The temperature of the chamber is 73°+7°-0° F (23°+4°-0° C) with a relative humidity of 30%+10%-0%;

The headlamp is not energized.

Before the test specified in paragraph S14.6.7.1.7 of FMVSS No. 108, the uniformity of the air flow in the empty test chamber at a plane 4 inches downstream of the air entry duct is measured over a 4-inch square grid. The uniformity of air flow at each grid point is ±10% of the average air flow specified in paragraph S14.6.7.1.7 of FMVSS No. 108.

The mounted assembly in the chamber is exposed, for one hour, to an average air flow of 330+0-30 ft/min. as measured with an air velocity measuring probe having an accuracy of ±3% in the 330 ft/min range. The average air flow is the average of the velocity recorded at six points around the perimeter of the lens. The six points are determined as follows: At the center of the lens, construct a horizontal plane. The first two points are located in the plane, 1 inch outward from the intersection of the plane and each edge of the lens. Then, trisect the distance between these two points and construct longitudinal vertical planes at the two intermediate locations formed by the trisection. The four remaining points are located in the vertical planes, one inch above the top edge of the lens, and one inch below the bottom edge of the lens.

After one hour, the headlamp is removed and inspected for moisture.

PERFORMANCE REQUIREMENTS

After completion of the humidity test, the sample headlamp must show no evidence of interior delamination or moisture, fogging or condensation visible without magnification.

VIBRATION TEST

SAMPLES

The mounting bracket with a sample headlamp installed must not have a resonant frequency in the 10-55 Hz. range.

PROCEDURE

The mounted sample headlamp is bolted to the anvil end of the table of the vibration test machine of Figure 21 and vibrated 750 cpm through a distance of 1/8 in. The table is spring mounted at one end and fitted with steel calks on the underside of the other end. The table is of sufficient size to completely contain the test fixture base with no overhang. The calks are to make contact with the steel anvil once during each cycle at the completion of the fall. The rack is operated under a spring tension of 60 to 70 lb. The vibration is applied in the vertical axis of the headlamp as mounted on the vehicle. Bulb filaments are not energized during the test. The test is continued for 1 hour.

PERFORMANCE REQUIREMENTS

After completion of the vibration test, there must be no evidence of loose or broken parts, other than filaments, visible without magnification.

SEALING TEST

PROCEDURE

An unfixtured sample headlamp in its design mounting position is placed in water at a temperature of 176°±5° F (60°±3° C) for one hour. The headlamp is energized in its highest wattage mode, with the test voltage at 12.8±0.1 V. during immersion.

The lamp is then de-energized and immediately submerged in its design mounting position into water at 32° +5° -0° F (0° +3° -0° C). The water is in a pressurized vessel, and the pressure is increased to 10 psi (70 kPa), upon placing the lamp in the water. The lamp must remain in the pressurized vessel for a period of thirty minutes.

This entire procedure is repeated for four cycles.

Then the lamp is inspected for any signs of water on its interior. During the high temperature portion of the cycles, the lamp is observed for signs of air escaping from its interior.

PERFORMANCE REQUIREMENTS

After completion of the sealing test, a sample headlamp confirmed to be sealed need not meet the corrosion test, dust test, or humidity test of this Section. If any water occurs on the interior or air escapes, the lamp is not a sealed lamp.

CHEMICAL RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

PROCEDURE

TEST FLUIDS

The three test fluids used in the chemical resistance test include:

(a) Tar remover (consisting by volume of 45% xylene and 55% petroleum base mineral spirits);

(b) Mineral spirits;

(c) Fluids other than water contained in the manufacturer's instructions for cleaning the reflector.

FLUID APPLICATION

With a sample headlamp in the headlamp test fixture and the lens removed, the entire surface of the reflector that receives light from a headlamp light source is wiped once to the left and once to the right with a 6-inch square soft cotton cloth (with pressure equally applied) which has been saturated once in a container with 2 ounces of one of the test fluids listed in S14.6.10.1.1 of FMVSS No. 108. The lamp is wiped within 5 seconds after removal of the cloth from the test fluid.

TEST DURATION

After the headlamp has been wiped with the test fluid, it is stored in its designed operating attitude for 48 hours at a temperature of 73° ± 7° F (23° ± 4° C) and a relative humidity of 30% ± 10%. At the end of the 48-hour period, the headlamp is wiped clean with a soft dry cotton cloth and visually inspected.

PERFORMANCE REQUIREMENTS

After completion of the chemical resistance test, the sample headlamp must have no surface deterioration, coating delamination, fractures, deterioration of bonding or sealing materials, color bleeding or color pickup visible without magnification and the headlamp must meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼º reaim is permitted in any direction at any test point.

CORROSION RESISTANCE OF REFLECTORS OF REPLACEABLE LENS HEADLAMPS TEST

PROCEDURE

A sample headlamp with the lens removed, unfixtured and in its designed operating attitude with all drain holes, breathing devices or other designed openings in their normal operating positions, must be subjected to a salt spray (fog) test in accordance with ASTM B117-73, Method of Salt Spray (Fog) Testing, for 24 hours, while mounted in the middle of the chamber.

Afterwards, the headlamp must be stored in its designed operating attitude for 48 hours at a temperature of 73° ±7°F (23 ° ±4°C) and a relative humidity of 30% ±10% and allowed to dry by natural convection only. At the end of the 48-hour period, the reflector must be cleaned according to the instructions supplied with the headlamp manufacturer's replacement lens, and inspected. The lens and seal must then be attached according to these instructions and the headlamp tested for photometric performance.

PERFORMANCE REQUIREMENTS

After the completion of the corrosion test the sample headlamp must show no evidence of corrosion or rust visible without magnification on any part of the headlamp reflector that receives light from a headlamp light source, on any metal light or heat shield assembly, or on a metal reflector of any other lamp. The sample headlamp with the replacement lens installed must meet the requirements of the appropriate photometry tests of Table XIX and Table XVIII of FMVSS No. 108. A ¼º reaim is permitted in any direction at any test point.

INWARD FORCE TEST

PROCEDURE

A sample headlamp mechanism, including the aiming adjusters, must be subjected to an inward force of 222 N directed normal to the headlamp aiming plane and symmetrically about the center of the headlamp lens face.

PERFORMANCE REQUIREMENTS

After the completion of the inward force test a sample headlamp must not permanently recede by more than 2.5 mm. The aim of the headlamp must not permanently deviate by more than 3.2 mm at a distance of 7.6 m. The aim of any headlamp that is capable of being mechanically aimed by externally applied aiming devices must not change by more than 0.30□.

TORQUE DEFLECTION TEST

PROCEDURE

The sample headlamp assembly is mounted in designed vehicle position and set at nominal aim (H=0, V=0).

A sealed beam headlamp, except Type G and Type H, is removed from its mounting and replaced by the appropriate deflectometer. (Type C and Type D – see Figure 18 of FMVSS No. 108, Type A and Type E – see Figure 16 of FMVSS No. 108, Type B - Figure 17 of FMVSS No. 108, and Type F - Figure 14 of FMVSS No. 108)

Sealed beam headlamps of Type G and Type H have the adapter of Figure 15 of FMVSS No. 108 and the deflectometer of Figure 14 of FMVSS No. 108 attached to the headlamp.

A torque of 2.25 Nm must be applied to the headlamp assembly through the deflectometer and a reading on the thumbwheel is taken. The torque must be removed and a second reading on the thumbwheel is taken.

Headlamps other than sealed beam headlamps must have the downward force used to create the torque applied parallel to the aiming reference plane, through the aiming pads, and displaced forward using a lever arm such that the force is applied on an axis that is perpendicular to the aiming reference plane and originates at the center of the aiming pad pattern (see Figure 3 of FMVSS No. 108).

For headlamps using the aiming pad locations of Group I, the distance between the point of application of force and the aiming reference plane is not less than 168.3 mm plus the distance from the aiming reference plane to the secondary plane, if used.

For headlamps using the aiming pad locations of Group II, the distance between the point of application of force and the aiming reference plane is not less than 167.9 mm plus the distance to the secondary plane, if used.

For headlamps using the nonadjustable Headlamp Aiming Device Locating Plates for the 146 mm diameter, the 176 mm diameter, and the 92x150 mm sealed beam, the distance between the point of application of force and the aiming plane is not, respectively, less than 177.4 mm, 176.2 mm, and 193.7 mm.

PERFORMANCE REQUIREMENTS

The aim of each sample headlamp must not deviate more than 0.30□ when the down the downward torque is removed.

RETAINING RING TEST

PROCEDURE

A sample headlamp with the minimum flange thickness of: Type A-31.5 mm, Type B-10.1 mm, Type C-11.8 mm, Type D-11.8 mm, Type E-31.5 mm, and Type F-8.6 mm., is secured between the appropriate mounting ring and retaining ring (mounting ring and aiming ring for Type F).

PERFORMANCE REQUIREMENTS

The sample headlamp when secured per the procedure must be held tight enough that it will not rattle.

HEADLAMP CONNECTOR TEST

PROCEDURE

A sample headlamp connected into the test circuit of Figure 4 of FMVSS No. 108 has the power supply adjusted until 10 amperes DC are flowing through the circuit. The test is repeated for each filament circuit of the headlamp.

PERFORMANCE REQUIREMENTS

The voltage drop, as measured in the test circuit of Figure 4 of FMVSS No. 108, must not exceed 40 mV DC in any applicable filament circuit of the sample headlamp.

HEADLAMP WATTAGE TEST

PROCEDURE

A sample headlamp that has been seasoned is energized so as to have 12.8 v ±20 mV DC applied across each filament circuit and the current flowing in each circuit is measured.

PERFORMANCE REQUIREMENTS

The wattage of each of each filament circuit of the sample headlamp must not exceed the appropriate value for that type of headlamp as shown in Table II-a of FMVSS No. 108.

AIMING ADJUSTMENT TEST-LABORATORY

PROCEDURE

A sample headlamp is mounted in design position at nominal (H=0, V=0) aim with an accurate measuring device such as a spot projector or other equally accurate means attached. The headlamp is adjusted to the extremes of travel in each horizontal and vertical direction.

PERFORMANCE REQUIREMENTS

Visually aimed lower beam headlamps without a VHAD are required not to have a horizontal adjustment mechanism and horizontal aim range requirements do not apply.

A sample sealed beam headlamp, other than a Type F, tested per the procedure must provide a minimum of ± 4.0º adjustment range in both the vertical and horizontal planes and if equipped with independent vertical and horizontal aiming screws, the adjustment must be such that neither the vertical nor horizontal aim must deviate more than 100 mm from horizontal or vertical planes, respectively, at a distance of 7.6 m through an angle of ± 4.0º.

A sample Type F sealed beam, integral beam, replaceable bulb, or combination headlamp tested per the procedure must provide a minimum of ± 4.0º adjustment range in the vertical plane and ± 2.5º in the horizontal plane and if equipped with independent vertical and horizontal aiming screws, the adjustment must be such that neither the vertical nor horizontal aim must deviate more than 100 mm from horizontal or vertical planes, respectively, at a distance of 7.6 m through an angle of ± 2.5º and ± 4.0º respectively.

A sample headlamp that is aimed by moving the reflector relative to the lens and headlamp housing , and vice versa must provide a minimum adjustment range in the vertical plane not less than the full range of the pitch on the vehicle on which it is installed and ±2.5º in the horizontal plane.

AIMING ADJUSTMENT TEST-ON VEHICLE

PROCEDURE

A sample headlamp is mounted on the vehicle at nominal (H=0, V=0) aim with an accurate measuring device such as a spot projector or other equally accurate means attached.

The installed range of static pitch angle is, at a minimum, determined from unloaded vehicle weight to gross vehicle weight rating, and incorporates pitch angle effects from maximum trailer or trunk loadings, the full range of tire intermix sizes and suspensions recommended and/or installed by the vehicle manufacturer, and the anticipated effects of variable passenger loading.

The headlamp is adjusted to the extremes of travel in each horizontal and vertical direction.

PERFORMANCE REQUIREMENTS

A sample headlamp tested per the procedure must provide a minimum vertical adjustment range not less than the full range of pitch of the vehicle on which it is installed.

The vertical aim mechanism must be continuously variable over the full range.

The adjustment of one aim axis through its full on-vehicle range must not cause the aim of the other axis to deviate more than ± 0.76º. If this performance is not achievable the requirements of S10.18.3.1 of FMVSS No. 108 apply, except that if the aiming mechanism is not a VHAD, the requirements specific to VHADs are not applicable, and the instruction must be specific to the aiming mechanism installed.