MVD-5

State of Wisconsin \ DEPARTMENT OF TRANSPORTATION

DIVISION OF MOTOR VEHICLES
4802 SHEBOYGAN AVENUE
MADISON, WISCONSIN 53702

MARCH 15, 1968

MR. JAMES J. BURKE
REVISOR OF STATUTES
321 N.E., CAPITOL
MADISON, WISCONSIN

DEAR MR. BURKE:

WE ENCLOSE PHOTOCOPIES FROM THE 1968 EDITION OF SAE HANDBOOK, AND 1966 EDITION OF U.S. OF AMERICA STANDARDS INSTITUTE, PROPOSED TO BE ADOPTED BY REFERENCE IN OUR PROPOSED RESPECTIVE RULES RELATING TO BRAKE REQUIREMENTS UNDER 347.35 (3)(B), WIS. STATS., AND PROTECTIVE HEADGEAR AND EYE PROTECTION FOR MOTORCYCLISTS UNDER 347.485, WIS. STATS., FOR YOUR APPROVAL UNDER 227.025, WIS. STATS.

THE ABOVE REFERRED TO 1968 SAE HANDBOOK MAY BE OBTAINED FROM THE SOCIETY OF AUTOMOTIVE ENGINEERS, 485 LEXINGTON AVE., NEW YORK, N.Y.

THE 1966 EDITION OF U.S. OF AMERICA STANDARDS INSTITUTE MAY BE OBTAINED FROM THE AMERICAN STANDARDS ASSOCIATION, INC., 10 E. 40TH STREET, NEW YORK, N.Y.

PUBLIC HEARINGS ARE SCHEDULED ON BOTH RESPECTIVE RULES IN ACCORDANCE WITH CHAPTER 227, WIS. STATS., ON APRIL 15, 1968.

SINCERELY YOURS,

JAMES L. KARNS
ADMINISTRATOR

JLK:LB
ENC.

March 22, 1968

Mr. James L. Karns, Administrator
Division of Motor Vehicles
Department of Transportation
4802 Sheboygan Avenue
Madison, Wisconsin 53702

Dear Mr. Karns:

In your letter of March 15, 1968, you state that, in adopting new administrative rules, you propose to incorporate therein, by reference, certain portions of the 1968 Society of Automotive Engineers handbook and the 1966 Edition of the American Standards Institute. You ask for our consent, as provided in sec. 227.025, Wis. Stats. This statute provides that we shall so consent where the rules are of limited public interest, and where the incorporated standards are readily available in published form.

Ch 5
18

The proposed rules relate to brake systems for towed vehicles and protective headgear for motorcyclists. The incorporated standards are available from the publishers, which are the Society of Automotive Engineers and the American Standards Association. We conclude that these rules are of limited public interest and that the standards are readily available in published form.

We, therefore, give our consent to the incorporation by reference of these standards in the proposed new rules.

Very truly yours,

/s/ Bronson C. La Follette
BRONSON C. LA FOLLETTE
Attorney General

James J. Burke
JAMES J. BURKE
Revisor of Statutes

A. Starrmann

State of Wisconsin \ DEPARTMENT OF TRANSPORTATION

DIVISION OF MOTOR VEHICLES
4802 SHEBOYGAN AVENUE
MADISON, WISCONSIN 53702

March 25, 1968

Mr. James J. Burke
Advisor of Statutes
321 N. Capitol
Madison, Wisconsin

Dear Mr. Burke:

On March 19, 1968, Mr. Versnik stated in a letter to you that when we requested permission from the Attorney General to use the Society of Automotive Engineers (SAE) standards as are authoritative reference in MVD 5, a copy of the request would be forwarded to you.

This was overlooked at the time. A copy of the request is now forwarded for your information.

Sincerely,

Carl H. Zutz, Supervisor
Motor Vehicle Inspection Unit
Enforcement Bureau

CHZ:mrm
Enclosure

cc: Chief Lewis V. Versnik

State of Wisconsin \ DEPARTMENT OF TRANSPORTATION

DIVISION OF MOTOR VEHICLES
4802 SHEBOYGAN AVENUE
MADISON, WISCONSIN 53702

March 19, 1968

Mr. James J. Burke
Revisor of Statutes
321 N.E. Capitol
Madison, Wisconsin

RE: Proposed Chapter MVD 5

Dear Mr. Burke:

The attached proposed Chapter MVD 5 Motor Vehicle Inspection is submitted for your comments and corrections.

There are three separate references to standards of the Society of Automotive Engineers, 485 Lexington Avenue, New York, N.Y. 10017. A request will be submitted to the Attorney General requesting permission to use these standards in our Administrative Code. A copy of the letter plus copies of the standards will be submitted to your office at the time the request is forwarded to the Attorney General.

I would appreciate an early reply on any comments you may have regarding our proposed Chapter MVD 5 so that these can be incorporated in the presentation of Administrator Karns to the joint hearing of the Assembly and Senate Highway Committees and the public hearing scheduled for April 22, 1968.

Cordially,

Lewis V. Versnik, Chief
Enforcement Bureau and
Wisconsin State Patrol

LVV:cz:mm

March 19, 1968

The Honorable Bronson C. LaFollette
Attorney General
State Capitol
Madison, Wisconsin 53702

Dear Mr. LaFollette:

We are preparing the Vehicle Inspection Program as provided for in Chapter 257, Laws of 1967. The program is scheduled for hearing on April 22, 1968.

We are adopting certain national standards in authoritative publications therein by reference which require the approval of the Revisor of Statutes and the Attorney General's Office. We are submitting the National Standards, SAE J4c, SAE J600a and SAE J602 to you for your perusal and trust that they will meet with your approval to adopt the same by reference in the Administrative Code Chapter MVD 5, Motor Vehicle Inspection.

Very truly yours,

JAMES L. KARNS
Administrator

JLK:mm

The State of Wisconsin
Office of Attorney General
Madison

BRONSON C. LA FOLLETTE
ATTORNEY GENERAL

ARLEN C. CHRISTENSON
DEPUTY ATTORNEY GENERAL

April 8, 1968

MVD 5

Mr. James L. Karns
Administrator
Department of Transportation
Division of Motor Vehicles
4802 Sheboygan Avenue
Madison, Wisconsin 53702

Dear Mr. Karns:

You have informed us that you are proposing to adopt new administrative rules in ch. M.V.D. 5, relating to motor vehicle inspection. In so doing, you wish to incorporate by reference certain standards from the SAE handbook, and you ask our consent.

We conclude that the Society of Automotive Engineers is an organization of recognized national standing, which has promulgated standards in the SAE handbook, and this is readily available in published form. We also conclude that the proposed rules, relating to motor vehicle inspection, are of limited public interest.

We, therefore, consent to such incorporation by reference.

Very truly yours,

Bronson C. La Follette

BRONSON C. LA FOLLETTE
Attorney General

James J. Burke

JAMES J. BURKE
Revisor of Statutes

Hearing attached

STATE OF WISCONSIN)
) SS.
DEPARTMENT OF TRANSPORTATION)

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETINGS:

I, James L. Karns, Administrator of the Division of Motor Vehicles of the State of Wisconsin Department of Transportation, and legal custodian of the official records of said division, do hereby certify that the annexed, attached, created Chapter MVD 5, entitled "Motor Vehicle Inspection" of the published Wisconsin Administrative Code, marked "Exhibit A," has been duly approved and adopted by me as Administrator of said division, the 22nd day of April, 1968.

I further certify that these newly-created rules attached to my Order as "Exhibit A" which are being filed with the offices of the Revisor of Statutes and Secretary of State, respectively, have been compared by me with the original on file in this division, and that each respective copy, including "Exhibit A", is a true and correct copy of the original Order and attached "Exhibit A" on file with this division; and,

I further certify that these rules were duly approved by the joint Senate and Assembly Highway Committees also, on the 22nd day of April 1968.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the official seal of the Department of Transportation at the Hill Farms State Office Building in the city of Madison, Wisconsin, this 24th day of April, 1968.

(SEAL)

James L. Karns

Administrator
Division of Motor Vehicles
Wisconsin Department of Transportation

BEFORE THE DEPARTMENT OF TRANSPORTATION OF THE STATE OF WISCONSIN
DIVISION OF MOTOR VEHICLES

IN THE MATTER OF THE ADOPTION OF CHAPTER MVD 5 OF THE WISCONSIN ADMINISTRATIVE CODE; RULES RELATIVE TO RANDOM MOTOR VEHICLE INSPECTION UNDER 110.075, WIS. STATS.	* * * *	ORDER ADOPTING RULES

Pursuant to authority vested in the Administrator of the Division of Motor Vehicles of the Wisconsin Department of Transportation under sections 110.06, and more specifically under 110.075, Wis. Stats., created by Chapter 257 of the Laws of 1967; and, after due notice and public hearing held April 22, 1968, at 9:00 a.m., in Room 421 South, State Capitol, Madison, Wisconsin, as provided under Chapter 227 Wis. Stats.; and, jointly with the state Senate and Assembly Highway Committees for approval thereof, as required in the aforesaid subsection of the Statutes;

IT IS HEREBY ORDERED, That Chapter MVD 5 of the Wisconsin Administrative Code entitled "Motor Vehicle Inspection" relative to the programs and standards of motor vehicle inspections under 110.075, Wis. Stats., be hereby created and adopted in accordance with the aforesaid joint committees' approval, as made and provided in "Exhibit A" attached hereto and made a part hereof by reference.

This rule shall become effective July 1, 1968.

Created and adopted at Madison, Wisconsin, the 22nd day of April, 1968, and executed this 24th day of April, 1968.

(SEAL)

James Karns
Administrator
Division of Motor Vehicles
Wisconsin Department of Transportation

CERTIFICATE OF JOINT APPROVAL

We, Senator Reuben LaFave, Chairman of the Senate Highway Committee, and Assemblyman Willis J. Hutnik, Chairman of the Assembly Highway Committee, do hereby certify that at a duly-noticed joint committee meeting with the state Senate and state Assembly Highway Committees, held on April 22, 1968, at 9:00 a.m., in Room 421 South, State Capitol, Madison, Wisconsin, said committees did also jointly, with James L. Karns, Administrator of the Division of Motor Vehicles of the Department of Transportation, hold a public hearing under Chapter 227, Wis. Stats., on the Division's proposed rules relative to the programs and standards on motor vehicle inspections under 110.075, Wis. Stats., [created by Chapter 257 of the Laws of 1967] after due notice thereof published in the Administrative Register on the adoption of Chapter MVD 5 of the Wisconsin Administrative Code; and, did jointly, with Administrator James L. Karns, adopt and approve the above and foregoing referred rules marked "Exhibit A," attached to the foregoing Order and made a part thereof by reference.

Dated at Madison, Wisconsin, this 25 day of April, 1968.

Sen Reuben LaFave
Chairman, Senate Highway Committee

Willis Hutnik
Chairman, Assembly Highway Committee

CHAPTER MVD 5

MOTOR VEHICLE INSPECTION

"EXHIBIT"
"A"

CHAPTER MVD 5

MOTOR VEHICLE INSPECTION

5.01 Type of Programs
There shall be created a Random, Voluntary, Pilot and Research and Self Inspection program operated separately to serve the intent and purpose of Chapter 257, Laws of 1967.

5.02 Pilot Project Urban Area Location
The urban areas of the Pilot and Research project as set forth in Chapter 110.075 (11m) shall consist of the cities of Madison and Middleton and the villages of Monona, Shorewood Hills, and Maple Bluff.

5.03 Pilot Project Rural Area Location
The rural area of the Pilot and Research project as set forth in Chapter 110.075 (11m) shall consist of the counties of Sauk, Iowa and Richland.

STANDARDS OF INSPECTION

SUBCHAPTER I

STEERING - SUSPENSION

MVD 5.11 General requirements for steering and suspension on motor vehicles

(1) The steering should be inspected to determine that steering linkage is not worn or jammed.

(2) The steering should be inspected for lash. Lash is the condition which allows the steering wheel to be turned through some part of a revolution without any accompanying wheel movement.

(3) Visually inspect the springs, shackles, and cross stabilization linkage for broken, disconnected or noticeably loose parts.

(4) Check shock absorbers for excessive wear.

MVD 5.12 Steering and Suspension Rejections

Reject steering and suspension if:

(1) The steering is loose or is binding at any point of the turning cycle.

(2) The lash is in excess of 1/8 of one complete turn of the steering wheel.

(3) The steering linkage has broken, disconnected, or noticeably loose parts.

(4) The shock absorbing units are ineffective.

(5) The vehicle is noticeably out of alignment or is not on an even plane.

(6) The springs or shackles are broken.

(7) Any modification has been made to any part of the apring system which would cause the vehicle to ride at a higher (or lower) plane than that originally intended. Examples are cut down coil springs, lowering blocks, reversed spring shackles or heated springs.

(8) The belts assisting the power steering unit are loose or frayed.

SUBCHAPTER II

TIRES WHEELS AND RIMS

MVD 5.13 General requirements for left front tire, wheel, and rim.

(1) The left front tire, wheel and rim shall be inspected visually for wear and damage.

MVD 5.14 Left Front Tire, Wheel and Rim Rejections

Reject the left front tire, wheel or rim if:

(1) The tire has been repaired by use of a blow-out patch or boot.

(2) There are tread cuts or snags in excess of one (1) inch in any direction as measured on the tire which are deep enough to expose or damage the body cords.

(3) There is a bump, bulge, knot, sidewall separation or failure or partial failure of the tire structure.

(4) The tire is worn to the point where the tread or part of the ply or cord construction is exposed or there is less than 2/32 inch tread depth measured at two points no less than 15 inches apart in any major tread groove.

(5) The tire has been regrooved or recut and is being used on a passenger car or motor driven cycle, except tires that are specifically designed for commercial vehicles and manufactured in such a manner that regrooving or recutting is an acceptable and safe practice.

NOTE: See Section 347.45(4) Wis. Stats. regarding tire equipment.

(6) The studded tires are on the vehicle during the period when prohibited, from April 15 to October 15.

(7) The wheels or rims are damaged so that continued use may be hazardous.

(8) Loose or missing nuts, lugs, or bolts are observed.

MVD 5.15 General requirements for the right front tire, wheel and rim

(1) The right front tire, wheel and rim shall be inspected visually for wear or damage.

MVD 5.16 Right Front Tire, Wheel and Rim Rejections

Reject the right front tire, wheel or rim if:

(1) The tire has been repaired by use of a blow-out patch or boot.

(2) There are tread cuts or snags in excess of one (1) inch in any direction as measured on the tire which are deep enough to expose or damage the body cords.

(3) There is a bump, bulge, knot, sidewall separation or failure or partial failure of the tire structure.

(4) The tire is worn to the point where the tread or part of the ply or cord construction is exposed or there is less than 2/32 inch tread depth measured at two points no less than 15 inches apart in any major tread groove.

(5) The tire has been regrooved or recut and is being used on a passenger car or motor driven cycle, except tires that are specifically designed for commercial vehicle and manufactured in such a manner that regrooving or recutting is an acceptable and safe practice.

NOTE: See Section 347.45(4) Wis. Stats. regarding tire equipment.

(6) The studded tires are on the vehicle during the period when prohibited, from April 15 to October 15.

(7) The wheels or rims are damaged so that continued use may be hazardous.

(8) Loose or missing nuts, lugs, or bolts are observed.

MVD 5.17 General requirements for the left rear tire, wheel and rim

(1) The left rear tire, wheel and rim shall be inspected visually for wear or damage.

MVD 5.18 Left Rear Tire, Wheel and Rim Rejections

Reject the left rear tire, wheel or rim if:

(1) The tire has been repaired by use of a blow-out patch or boot.

(2) There are tread cuts or snags in excess of one (1) inch in any direction as measured on the tire which are deep enough to expose or damage the body cords.

(3) There is a bump, bulge, knot, sidewall separation or failure or partial failure of the tire structure.

(4) The tire is worn to the point where the tread or part of the ply or cord construction is exposed or there is less than 2/32 inch tread depth measured at two points no less than 15 inches apart in any major tread groove.

(5) The tire has been regrooved or recut and is being used on a passenger car or motor driven cycle, except tires that are specifically designed for commerical vehicles and manufactured in such a manner that regrooving or recutting is an acceptable and safe practice.

NOTE: See Section 347.45(4) Wis. Stats. regarding tire equipment.

(6) The studded tires are on the vehicle during the period when prohibited, from April 15 to October 15.

(7) The wheels or rims are damaged so that continued use may be hazardous.

(8) Loose or missing nuts, lugs, or bolts are observed.

MVD 5.19 General requirements for the right rear tire, wheel and rim

(1) The right rear tire, wheel and rim shall be inspected visually for wear or damage.

MVD 5.20 Right Rear Tire, Wheel and Rim Rejections

Reject the right rear tire, wheel or rim if:

(1) The tire has been repaired by use of a blow-out patch or boot.

(2) There are tread cuts or snags in excess of one (1) inch in any direction as measured on the tire which are deep enough to expose or damage the body cords.

(3) There is a bump, bulge, knot, sidewall separation or failure or partial failure of the tire structure.

(4) The tire is worn to the point where the tread or part of the ply or cord construction is exposed or there is less than 2/32 inch tread depth measured at two points no less than 15 inches apart in any major tread groove.

(5) The tire has been regrooved or recut and is being used on a passenger car or motor driven cycle, except tires that are specifically designed for commercial vehicles and manufactured in such a manner that regrooving or recutting is an acceptable and safe practice.

NOTE: See Section 347.45(4) Wis. Stats. regarding tire equipment.

(6) The studded tires are on the vehicle during the period when prohibited, from April 15 to October 15.

(7) The wheels or rims are damaged so that continued use may be hazardous.

(8) Loose or missing nuts, lugs, or bolts are observed.

SUBCHAPTER III

BRAKES

MVD 5.21 General requirements for brakes

(1) Wheels need not be pulled. The vehicle shall have no noticeable side pull as the service brake is applied when entering the testing area.

(2) Brake pedals, when depressed, shall have no less than 20% of total pedal travel left when fully depressed.

(3) Inspect the wheels and brake lines for any visible leak of fluid or grease for possible contamination of linings. All brake systems must be connected and in working condition.

MVD 5.22 Brake Rejections

Reject the brakes if:

(1) The vehicle stops with obvious side pull.

(2) There is insufficient pedal reserve or the pedal fades under pressure.

(3) The cables are frayed or hoses are abraded.

(4) There is excessive grease, oil, or fluid on the wheel that may have contaminated the braking surface.

(5) Any portion of the total braking mechanism is disconnected.

(6) The parking brake mechanism has no reserve, or fails to hold vehicle under load test, or the mechanism does not release under normal conditions.

SUBCHAPTER IV

EXHAUST AND FUEL SYSTEMS

MVD 5.23 General requirements for exhaust and fuel systems

(1) The exhaust system includes the manifold, muffler and all accompanying piping. The fuel system includes the fuel tank, pump, and all accompanying piping. Both are inspected visually.

MVD 5.24 Exhaust and Fuel System Rejections

Reject the exhaust or fuel system if:

(1) The muffler or any part of the exhaust system has been repaired by an inadequate patch or is not adequate for discharging fumes.

(2) The tail pipe does not extend to the outside body line of the vehicle.

(3) There is excessive noise, indicating an illegal, worn out, or modified muffler.

(4) The exhaust system is modified to pass through the passenger compartment.

(5) The fuel system inspection discloses leakage.

(6) The fuel cap is missing.

(7) The positive crankcase ventilation valve, when installed as original equipment, has been removed or disconnected.

SUBCHAPTER V

LIGHTING - ELECTRICAL

MVD 5.25 General requirements for lighting and electrical equipment

(1) All lighting equipment shall be maintained in good working order. The inspection shall include the functional operation of the following type lamps:

(a) head, (b) tail, (c) stop, (d) license, (e) parking, (f) directional, (g) beam indicator, (h) any other lamps installed as original equipment, or required additional equipment.

(2) All electrical equipment shall be maintained in good working order.

MVD 5.26 Headlamp Rejections

Reject the headlamps if:

(1) There is a failure during the functional tests.

(2) Any circuit does not light the proper filament from its respective switch position.

(3) There is a broken, or missing lamp, lens, or reflector.

(4) There is a lamp reflector not securely fastened, mounted improperly, or the headlamp mounting is loose due to fender deterioration or damage.

(5) There are inadequate or illegal lamps such as a lamp or reflector showing a beam contrary to law.

(6) The headlamp beam indicator fails to function properly.

(7) The dimmer switch fails to function properly.

(8) The connections are in poor condition or the wiring has deteriorated.

(9) The headlight aim (See MVD 5.27) is improper.

MVD 5.27 Headlight Inspection Equipment and Procedure

(1) Aim Inspection Equipment: Beams shall be inspected for aim by one of the following methods:

(a) Screen: If a screen is used, it shall be of adequate size, not less than 10 feet in width and 42 inches in height, with a matte white surface well shaded from extraneous light, and properly adjusted to the floor area on which the vehicle stands. Provision

shall be made for moving the screen so that it can be aligned parallel with the rear axle, and so that a horizontal line drawn perpendicularly from the center line of the screen will pass an equal distance midway between the two headlamps.

The screen shall be provided with a fixed vertical center line, four laterally adjustable vertical tapes, and two vertically adjustable horizontal tapes, as shown in Fig. 1. The two movable horizontal tapes shall be located on the screen at the upper and lower limits called for in the specifications with reference to the plane on which the vehicle rests, not the floor on which the screen rests. The four movable vertical tapes shall be located on the screen at the left and right limits called for in specifications with reference to center lines spaced to either side of the fixed center line of the screen by the amount the lamps are to the left and right.

(b) Headlamp Testing Machines: If a headlamp testing machine is used, it shall conform to the requirements of SAE Recommended Practice, Headlamp Testing Machines--SAE J600a (published in the 1968 SAE Handbook). It shall be in good repair and adjustment and shall be used in accordance with the manufacturer's instructions.

NOTE: This standard obtainable from Society of Automotive Engineers, 485 Lexington Ave., New York, N. Y. 10017. This standard ~~reference~~ is available in the office of the Division of Motor Vehicles and the Revisor of Statutes.

(c) Mechanical Aimers: If a mechanical aimer is used, it shall conform to the requirements of SAE Recommended Practice, Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units--SAE J602 (published in the 1968 SAE Handbook). The device shall be in good repair and adjustment and shall be used according to the manufacturer's instructions. Mechanical aimers shall be used only on mechanically aimable sealed beam units.

NOTE: This standard obtainable from Society of Automotive Engineers, 485 Lexington Ave., New York, N.Y. 10017. This ~~reference~~ standard is available in the office of the Division of Motor Vehicles and the Revisor of Statutes.

Mechanical aimers shall not be used to aim or adjust any headlamp which includes additional lenses or covers over the sealed beam unit such as are installed in Volkswagen, DKW, Porsche, Avanti, Chrysler, Imperials, Ford, and others. Official inspection stations which are equipped only with mechanical aimers may inspect only those vehicles with headlamps manufactured with aiming pads in accordance with MVD 5.82 (1)(c).

NOTE: Vehicles in use today are equipped with one of two distinct types of multiple-beam headlamp equipment: The dual headlighting system consisting of four 5-3/4 inch diameter units, or the single-headlighting system consisting of two 7-inch diameter units.

In the dual system, two lamps (identified by the number 1 on the lens) are single-filament lamps and provide the majority of the upper beam light. The other two units (identified by the number 2 on the lens) contain two filaments each. One filament operates in conjunction with the Type 1 lamp and supplements the upper beam by providing fill-in light. The other filament provides the entire lower beam light.

The 7-inch diameter Type 2 lamp (identified by the number 2 on the lens) contains two filaments. One filament produces the upper beam; the other produces the lower beam.

All Type 2 lamps, regardless of size, must be inspected and aimed on the lower beam.

The original 7-inch sealed beam lamp similarly was equipped with two filaments. These lamps can be identified by the absence of the number 2 on the lens and must be inspected and aimed on the upper beam.

NOTE: Multiple-beam lighting includes a "lower" beam for traffic or meeting conditions and an "upper" beam for open-road driving.

The inspector should see that the driver understands how to use the multiple-beam headlamps so as to obtain the best road lighting with minimum glare to other users of the highway.

(2) Preparation for Aiming: Prior to testing headlights, the vehicle shall be located in an approved space having a level floor and in proper alignment with the screen or tester. Before checking beam aim, the inspector shall:

(a) Remove ice or mud from under fenders;

(b) See that all tires are properly inflated;

(c) Rock the vehicle sideways;

(d) Check car springs for sag or broken leaves;

(e) Take into consideration faulty wheel adjustment or improper tracking of the rear axle;

(f) See that there is no unusual load in the vehicle other than the driver in the front seat;

(g) Check functioning of any "level-ride" control;

(h) Clean lenses; check for broken or cracked aiming pads; bulb burn-out and proper beam switching;

(i) See that light output is well toward the normal new lamp value.

(3) Aim Procedure

(a) Visual Method. For horizontal and vertical beam, aim sideways and up and down.

NOTE: All of the following values are based on a 25-foot test distance. Refer to Figs. 2 through 5.

1. Any upper beam of a symmetrical beam headlamp (all single- and double-beam lamps such as sealed beam 5-3/4 inch Type 1 and sealed beam 7-inch except Type 2) where the center of the high-intensity zone is:

   a. Horizontally more than 6 inches to the right or left of straight ahead.

   b. Vertically above or more than 4 inches below the lamp center level.

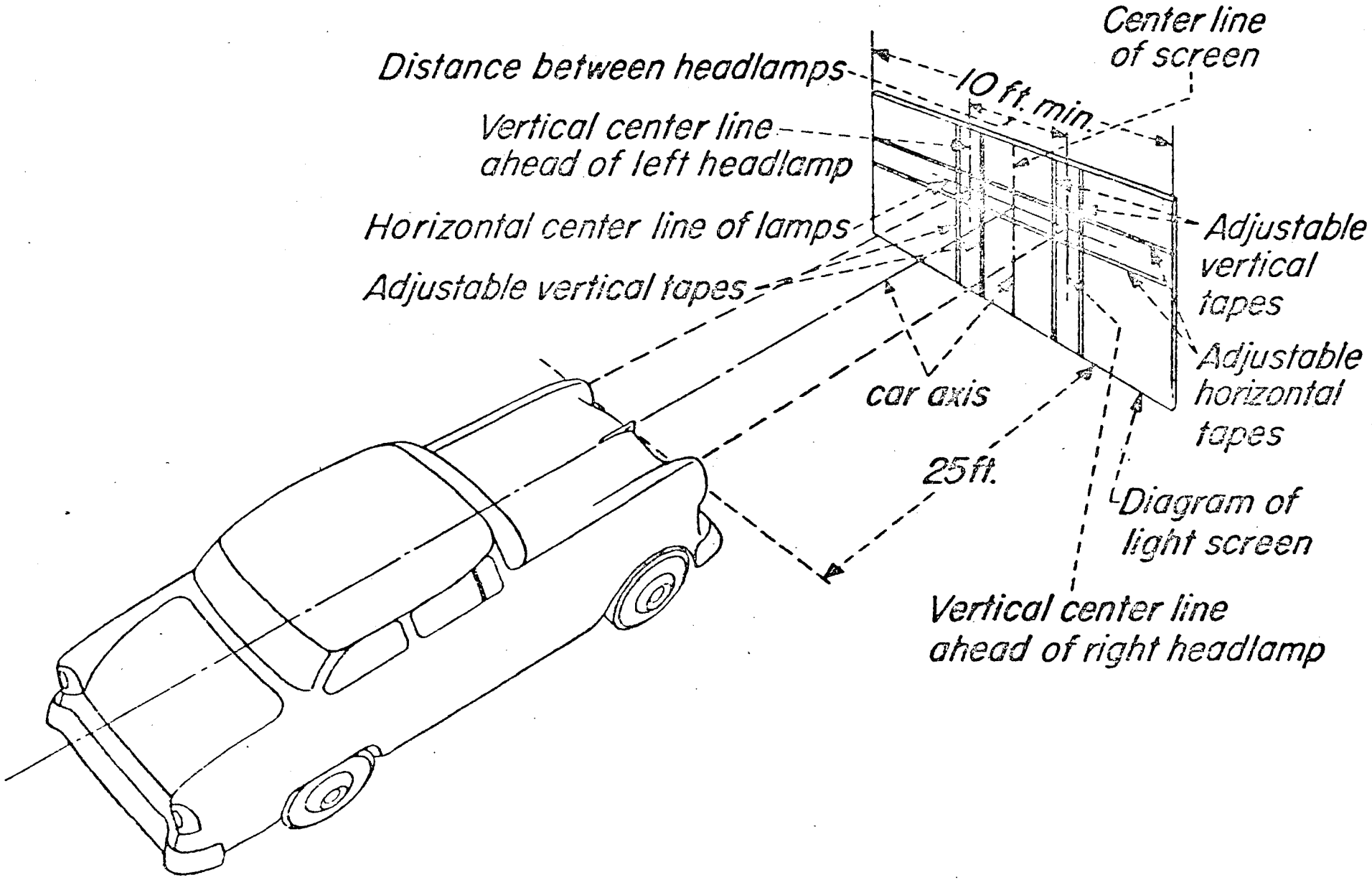
2. Any lower beam of an asymmetrical beam headlamp such as sealed beam 5-3/4 inch Type 2 and sealed beam 7-inch Type 2 lamps where:

   a. Horizontally the left edge of the high-intensity zone is to the left of straight ahead or is more than 6 inches to the right.

   b. Vertically the top edge of the high-intensity zone is more than 2 inches above or below the lamp center level.

3. Any symmetrical beam fog lamp where the center of the high-intensity zone is more than 6 inches right or left of straight ahead, or where the top edge of the high-intensity zone is higher than 2 inches below the fog lamp center level.

4. Any asymmetrical beam fog lamp where the left edge of the high-intensity zone is to the left of straight ahead or is more than 6 inches to the right, or where the top edge of the high-intensity zone is above the fog lamp center level.



HEADLIGHT SCREEN

FIGURE I

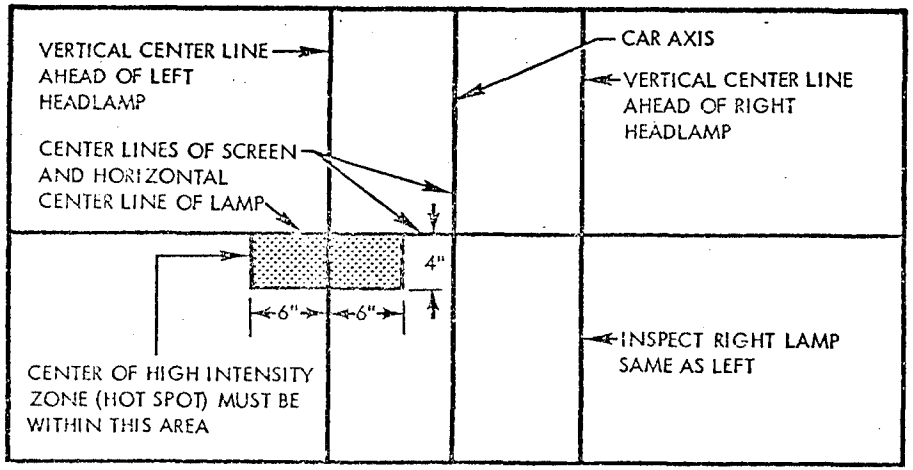


Fig. 12

Aim Inspection Limits for Upper Beam of 5¾-Inch Type 1 Sealed Beam and 7-Inch Sealed Beam, except Type 2. (All two-beam lamps not designated)

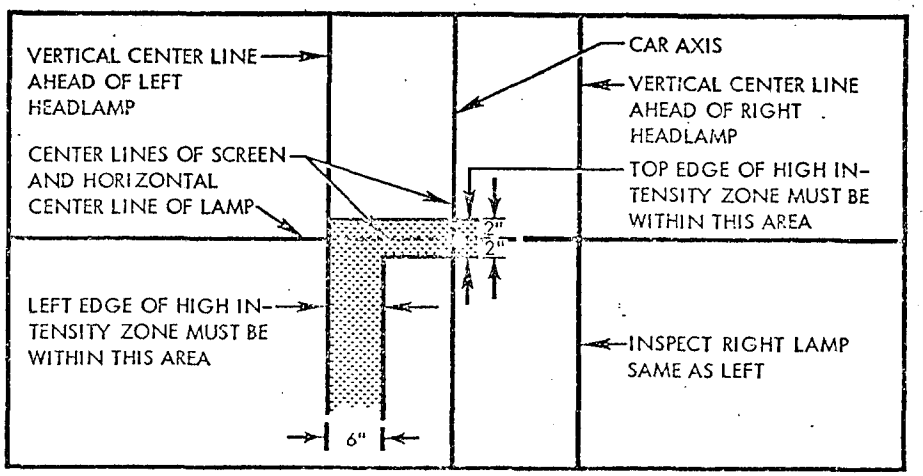


Fig. 13

Aim Inspection Limits for Lower Beam of 5¾-Inch Type 2 Sealed Beam and 7-Inch Type 2 Sealed Beam

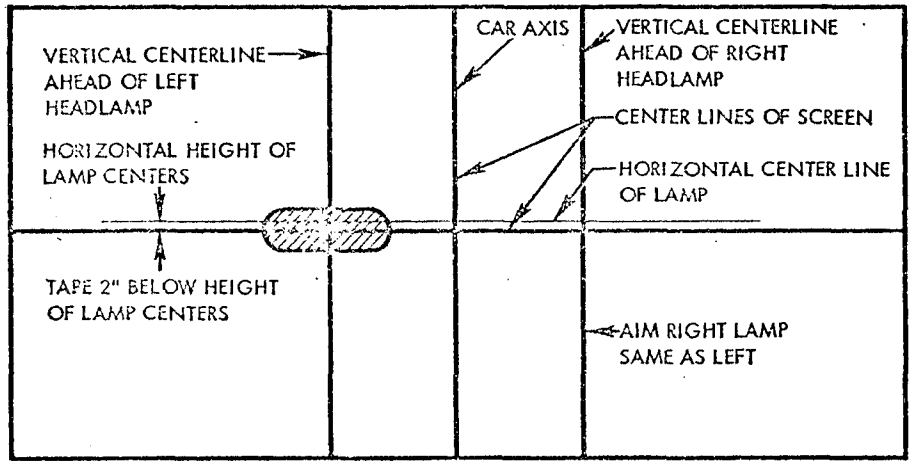


Fig. 14

How Properly Aimed Upper Beam of 5¾-Inch Type 1 and 7-Inch Sealed Beam, Except Type 2, Will Appear on the Aiming Screen 25 Feet in Front of Vehicle. (Shaded area indicates primary portion of beam)

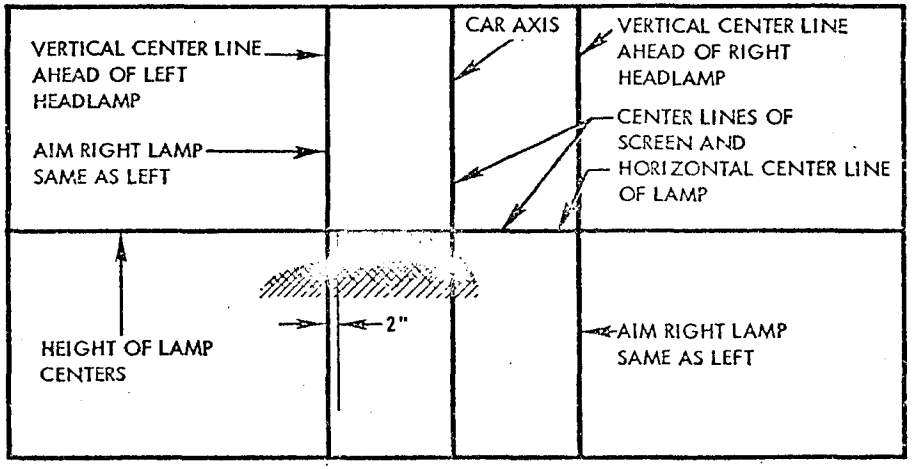


Fig. 15

How Properly Aimed Lower Beam of 5¾-Inch and 7-Inch Type 2 Sealed Beam Will Appear on the Aiming Screen 25 Feet in Front of the Vehicle. (Shaded area indicates primary portion of beam)

(b) Aim Inspection -- Mechanical Method

NOTE: See MVD 5.27(1)(c)

1. Sealed Beam 7-Inch Except Type 2 and Sealed Beam 5-3/4 Inch Type 1 Lamps

   a. Where aim is horizontal (sideways), approval shall be refused if graduation is more than 6 to the right or left of straight ahead. Mechanical aim graduation shall be set at zero straight ahead when a lamp is reaimed.

   b. When aim is vertical (up and down), approval shall be refused if graduation is higher than 0 down or lower than 4 down. Mechanical aim graduation shall be set at 2 down when one is reaiming.

2. Sealed Beam 7-Inch Type 2 and 5-3/4 Inch Type 2 Lamps

   a. When aim is horizontal (sideways), approval shall be refused if graduation is to the left of straight ahead or more than 6 to the right. Mechanical aim graduation shall be set at 1/2 to the right of straight ahead when a lamp is reaimed.

   b. When aim is vertical (up and down), approval shall be refused if graduation is higher than 0 down or lower than 4 down. Mechanical aim graduation shall be set at 2 down when one is reaiming.

MVD 5.28 Front Parking Lamp Rejections

Reject front parking lamps if:

(1) There is a failure during the functional tests.

MVD 5.29 Front Directional Signal Rejections

Reject front directional signals if:

(1) There is a failure during the functional tests.

(2) The directional signal mechanism does not function properly or does not cancel.

(3) The signal indicator lamp fails to operate.

(5) The vehicle is not equipped as required by law.

MVD 5.30 Tail Lamp Rejections

Reject the tail lamps if:

(1) There is a failure during the functional tests.

(2) Any circuit does not light the proper filament from its respective switch position.

(3) There is a broken, or missing lamp, lens, or reflector.

(4) The lamp or reflector is not securely fastened or is mounted improperly.

(5) There are inadequate or illegal lamps or reflectors.

(8) The connections are in poor condition or the wiring has deteriorated.

MVD 5.31 Brake Lamp Rejection

Reject the brake lamps if:

(1) There is a failure during the functional tests.

(5) There are inadequate or illegal lamps or reflectors.

MVD 5.32 Rear Directional Lamp Rejections

Reject the rear directional lamps if:

(1) There is a failure during the functional tests.

(5) There are inadequate or illegal lamps or reflectors.

MVD 5.33 Registration Plate Lamp Rejections

Reject the registration plate lamp if:

(1) There is a failure during the functional test or the vehicle is not equipped.

MVD 5.34 Back Up Lamp Rejections

Reject the back up lamp if:

(1) There is a failure during the functional test.

(2) It remains lighted when the vehicle is not in reverse gear.

MVD 5.35 Horn Rejections

Reject the horn if:

(1) The vehicle is not equipped with a horn.

(2) The horn is not securely fastened to the vehicle.

(3) The horn is not audible for 200 feet.

(4) The vehicle is not equipped with a button or ring for making electrical connection. (grounding of bare wire is not acceptable)

(5) The vehicle is equipped with a siren or exhaust whistle and is not an emergency vehicle.

SUBCHAPTER VI

GLAZING

MVD 5.50 General requirements for glazing.

(1) Any motor vehicle originally equipped with glazing material in the windshield, side, or rear windows, shall have all such material installed and inspected. In the case of a vehicle originally manufactured and equipped without a windshield, or other windows, this provision shall not apply. A vehicle so constructed or loaded that the view through the rear window is continually blocked need not have the window glazed. A permanent closure of some sort may cover the opening. Check operation of the window at the driver's left. Check windshield and all other windows for unauthorized material or conditions that obscure driver's view. Use glazing diagram Figure 6.

MVD 5.51 Windshield Rejections

Reject the windshield if:

(1) There is no approved safety glass.

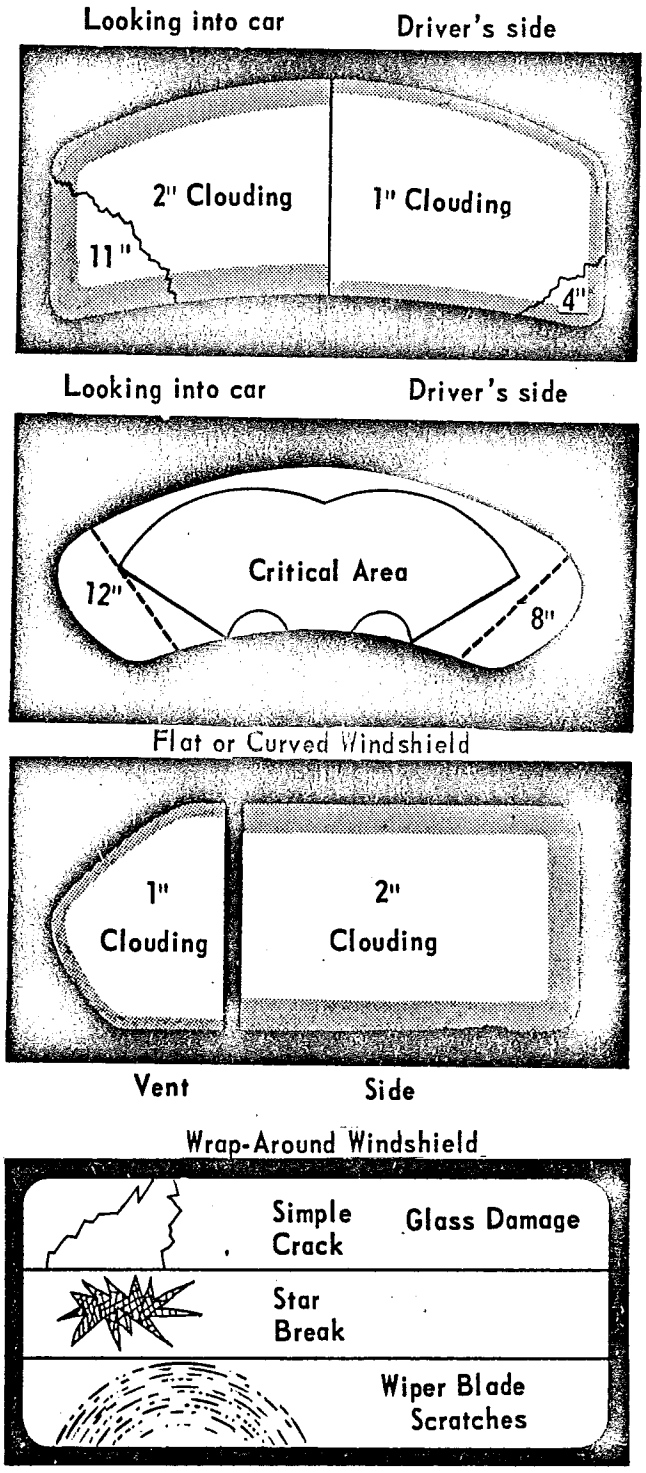
(2) There is more than 1 inch of cloudiness around the outside edge on the driver's side or 2 inches on the passenger side.

(3) There are cracks showing sharp edges or the wiper blade scratches are severe enough to distort vision.

(4) Corner cracks are over 4 inches from frame on flat and curved glass and 8 inches on wrap around glass on driver's side if extending into critical area. Passenger side shall not exceed cracks of 11 inches from outer right hand edge on flat and curved glass and 12 inches from edge on wrap around glass. Any stone or shot damage is cause for rejection if diameter is in excess of 1/2 inch in the critical wiper blade area or if diameter is in excess of 1 1/2 inches in any other portion of the windshield.

FIGURE 6

GLAZING DIAGRAM



MVD 5.52 Vent and Other Window Rejections

Reject the vents or other windows if:

(1) The window at the driver's left cannot be readily opened to permit arm signals to be made. The presence of approved turn signals does not waive this requirement.

(2) There are posters, stickers, or other non-transparent materials, except those allowed by law, located on the windshield, rear window or windows to the immediate right and left of the driver or located between the driver and the windshield or windows. Nontransparent materials are used to replace the vehicle glass or glazing materials except as provided MVD 5.50 (1).

(3) The vent has in excess of 1 inch of cloudiness around either edge or the side windows have in excess of 2 inches of cloudiness on either edge.

(4) The vehicle's rear window has more than 2 inches of cloudiness from any edge and it is not equipped with an outside rear view mirror on the drivers side. (Plastic curtains and rear windows approved for such vehicles as convertibles, jeeps, etc., must conform with restrictions as to cloudiness. If they are badly scratched, discolored, or in such condition that they distort or obstruct vision to the side or rear-THEY MUST BE REPLACED.)

SUBCHAPTER VII

WINDSHIELD WIPERS, MIRRORS, AND SPEED INDICATOR

MVD 5.53 General requirements for windshield wipers:

(1) All vehicles originally equipped with two (2) wiper arms and two (2) wiper blades (one set on driver's side and one set on passenger side) must have both in place and in good working condition. Check for satisfactory operation of windshield wipers. Check for damaged, hardened, or deteriorated blades. Check to see that blades are in firm contact with windshield.

MVD 5.54 Windshield Wiper Rejections

Reject windshield wipers if:

(1) The vehicle originally equipped with wiper arms and blades has either missing.

(2) The blade is damaged, hardened, or deteriorated.

(3) The blades are not in firm contact with windshield.

(4) The windshield wiper is incapable of cleaning the windshield adequately to allow the driver a clear view ahead.

(5) The switch is faulty.

MVD 5.55 General requirements for mirrors

(1) Inspect rearview mirrors for mounting, location, and obstruction to the rear.

MVD 5.56 Mirror Rejections

Reject mirrors if:

(1) They are missing, loosely mounted, or offer unsafe interference with the driver's view.

(2) The mirror is broken, cracked or discolored.

(3) The mirror does not provide the driver with a clear view of the highway for a distance of at least 200 feet to the rear of the vehicle. (If the vehicle is so constructed or loaded, or towing another vehicle so as to prevent the operator's view to the rear, an adequate outside mirror shall be installed.)

MVD 5.57 General requirements for speed indicator

(1) Visually inspect vehicle for statutory speed indicator requirements.

MVD 5.58 Speed Indicator Rejections

Reject speed indicator if:

(1) The vehicle is not equipped with a speed indicator.

(2) The indicator is not in operating condition.

SUBCHAPTER VIII

MISCELLANEOUS

MVD 5.60 General requirements for safety belts and seats.

(1) This category includes all belts or restraining devices, as required in Section 347.48 of Wis. Statutes, used to contain persons in the seat of a motor vehicle in the event of collision, leaving the road, or turnover. When installed, they shall be of a type that has been approved in accordance with the procedures specified in the Society of Automotive Engineers Standard for Motor Vehicle Seat Belt Assemblies (SAE-J4c)

NOTE: Seat belt specifications are available from Society of Automotive Engineers, 485 Lexington Avenue, New York, N.Y. 10017, Handbook, 1968.

This ~~reference~~ standard is available in the office of the Division of Motor Vehicles, and the Revisor of Statutes.

(2) The method of installation shall in no event reduce the efficiency of the belt assembly below the SAE requirements indicated. Any vehicle equipped with safety belts shall have all belts in good working order.

(3) Inspection Procedure: Visual inspection shall be made to determine worn or frayed webbing. Buckles shall be tried by hooking metal to metal or inserting webbing in the friction type to determine looseness. Check anchorage for looseness by pulling belt or anchorage fitting by hand. Also check for rusting of parts or floor pan to which the belts are anchored.

(4) Seat must be secured to prevent movement during operation of vehicle.

MVD 5.61 Safety Belt and Seat Rejections

Reject safety belts or seat if:

(1) Vehicle is not equipped or required belts have been removed.

(2) Equipment or installation is nonstandard.

(3) Webbing is frayed, split, or torn.

(4) Anchorage is loose.

(5) Buckles are loose or inoperative.

(6) Seat is not securely fastened.

MVD 5.62 General requirements for bumpers, fenders and projecting parts.

(1) Inspect for bumpers and fenders on those vehicles which were originally so equipped.

(2) Check for defective or dislocated parts projecting from vehicle.

MVD 5.63 Bumper, Fender and Projecting Part Rejections

Reject bumpers, fenders, or projecting parts if:

(1) The vehicle originally equipped with a bumper or fenders now lacks either or both.

(2) Any bumper or mounting bracket is broken.

(3) Any bumper is so distorted, twisted, or bent that it extends beyond the body line of the vehicle. Any defective or dislocated parts project from the vehicle.

MVD 5.64 General requirements for locks and latches.

(1) Check operation of doors, including emergency escape doors and windows, door and window latches and controls, hood latch and control.

MVD 5.65 Lock and Latch Rejections

Reject locks or latches if:

(1) The body locks, latches, or controls are damaged, worn or otherwise defective to the point where they interfere with safe operation of the vehicle or the latch does not hold fast or is wired.

SUBCHAPTER IX

REGISTRATION AND I.D. PLATES

MVD 5.66 General requirements for registration and identification plates.

(1) Check license plates, vehicle description, and registration certificate for consistency.

(2) Check license plate mounting and condition.

MVD 5.67 Registration Plate Rejections

Reject registration plates if:

(1) The plates are obscured.

(2) The plates are not firmly attached to vehicle.

(3) The numbers are not in agreement with registration card or vehicle description not in accord with registration card.

NOTE: No enforcement action will be taken by an official inspection station, but any discrepancies should be noted on the inspection report.

SUBCHAPTER X

MINIMUM REQUIREMENTS FOR MOTOR VEHICLE INSPECTION STATIONS

MVD 5.80 Space Requirements:

An area shall be available for inspection purposes as set forth below:

(1) Headlamp Testing:

(a) 12 foot width by 25 foot length when using a headlamp tester.

(b) 12 foot width by 45 foot length when using a headlamp testing screen.

(c) The floor of the building where headlamp testing is conducted must be level ($\pm 1^{o}$) constructed of concrete, provided however that compensating instruments or construction may be approved.

(2) Entire space shall be in permanent type heated building. Temporary expedients such as tents, arbors or sheds are not acceptable. Such space must be kept reasonably available during normal business hours for the purpose of inspection.

MVD 5.81 Time Requirements:

An official inspection station shall be reasonably available for conducting inspections during normal business hours of the work week. Stations shall not be licensed to operate only a few hours a day.

(1) An applicant for an official inspection station shall state on the application the hours he normally will be open to conduct vehicle inspections.

(2) An official inspection station shall have sufficient certified inspectors to perform official inspection service.

(3) There shall at all times be one certified inspector available to perform inspections.

MVD 5.82 Equipment Requirements:

(1) Any official inspection station shall have one of the following types of headlamp testing devices:

(a) A headlamp machine capable of testing all types of headlamps.

(b) A headlamp screen capable of testing all types of headlamps.

(c) A mechanical aimer capable of testing all types of headlamps manufactured with three headlamp aiming pads. Stations having only a mechanical aimer are subject to the following requirements:

1. They may only test those vehicles with headlamps manufactured with aiming pads.

2. They must advise the owner of a vehicle, which does not have headlamps with aiming pads, that they are not allowed to inspect the vehicle.

(2) Each approved testing area will be designated as follows:

(a) When a track-type headlamp tester is used, the track must be securely attached to the floor and leveled.

(b) When a caster-type headlamp tester is used, a line 4 inches wide and 8 feet long shall be painted on the floor, for operation of the headlamp machine.

(c) When a headlamp screen is used, a line 4 inches wide and 8 feet long shall be clearly painted on the floor, for positioning the headlamp screen. In addition, another line 4 inches wide and 8 feet long, shall be clearly painted on the floor, 25 feet from the screen to mark the forward point of the headlamps.

(d) When a mechanical aimer is used, a 12 feet by 25 feet area is required. A line 4 inches wide and 8 feet long must be clearly painted on the floor where the front of each vehicle will stop.

(3) A windshield scraper for removing old stickers.

(4) A measuring device to determine legality of certain mountings of lighting equipment (such as directional signals, clearance lights and reflectors).

(5) Tools and related equipment.

(a) Tire depth gauge

(b) Portable lights or trouble lamp

(c) Appropriate wrenches

(d) Appropriate screw drivers

(e) Wire brush

(f) 1/4 inch round paper punch

MVD 5.83 Additional Requirements:

(1) In close proximity to the inspection area the following items shall be posted:

(a) Official inspection station license.

(b) Certification of inspector.

(c) Charts furnished by the department stating various requirements of inspection and items to be inspected.

(2) A copy of the rules and regulations as prescribed by the Administrator shall be available at all times.

(3) Each official inspection station shall prominently display a distinctive sign designating appointment as an official inspection station.

(4) It shall be illegal for a non-inspection station to display a sign similar in design, wording, color or size which might imply that it is an official inspection station.

(5) Any official inspection station shall be deemed to be operating as an arm of the State of Wisconsin. The application to become an official inspection station requires the assurance of co-operation with the division.

(a) The official inspection station shall permit the Inspector II to reinspect any vehicle inspected by the official station during the previous two normal business days.

(b) The official inspection station shall co-operate in any reinspection by an Inspector II by furnishing the inspection space and inspection equipment for such reinspection without fee.

(6) No official inspection station license shall be transfered without Division approval.

SUBCHAPTER XI

MINIMUM REQUIREMENTS FOR CERTIFIED INSPECTORS

MVD 5.90 Certified Inspector General Requirements:

(1) Each applicant for certified inspector shall meet the age and experience requirements as follows:

(a) Applicant must be at least 18 years of age.

(b) Applicant must have a minimum of one year's experience as an automobile mechanic, or have a minimum of one year's training in auto mechanics at a vocational or trade school.

(2) The applicant shall request certification on a form prescribed for this purpose.

(3) Each applicant shall attend an 8-hour course of instruction to acquaint him with the inspection procedures and proper completion of reports.

(a) Each applicant must receive a passing grade on the written test given by the educational authority.

(b) Each certified inspector will be required to attend one refresher course prescribed by the division every year.

(4) Each applicant must demonstrate to the division his knowledge of inspection procedures by performing complete inspections on two vehicles of different manufacture to the satisfaction of the Inspector II.

(5) Each applicant must demonstrate his ability to correctly and efficiently operate the various testing devices used.

(6) Anytime a certified inspector changes his place of employment or for some other reason loses his certification he shall apply for recertification on the form prescribed by the division. Certain requirements such as the written test may be waived depending on the applicant's record. A former certified inspector may be required to demonstrate his ability to operate the testing equipment to the satisfaction of the Inspector II at his new place of employment if the equipment is different from that which he previously used.

(a) Any official inspection station shall immediately notify the division when a certified inspector leaves his employment by forwarding the employee's certification.

(b) In no case shall a former certified inspector perform any inspections at his new place of employment until he has received his recertification from the division.

SUBCHAPTER XII

INSPECTION STICKER SECURITY

MVD 5.95 General Requirements:

(1) Inspection stickers shall only be issued for those vehicles which have been properly inspected and approved.

MVD 5.96 Unlawful Acts:

(1) No official inspection station, certified inspector or any other person shall furnish, give or sell to any owner or operator of a motor vehicle or to any other person or to place in or on any vehicle an inspection sticker unless an official inspection of its mechanism and equipment shall have been made and the vehicle conforms with Wisconsin Statutes and rules of the Wisconsin Administrative Code.

(2) No designated official inspection station shall furnish, give, loan or sell inspection stickers to any other official inspection station.

(3) No person shall have in his possession any inspection sticker with the knowledge that such sticker has been illegally purchased, stolen or counterfeited.

SUBCHAPTER XIII

FEES AND REMITTANCES

MVD 5.99 General requirements

(1) A fee of three dollars ($3.00) shall be charged by the official inspection station for every inspection made, whether an approval sticker is issued or not. The fee shall be paid by the owner or his agent to the official inspection station. No portion of this fee shall be remitted to the Division of Motor Vehicles for their costs of administering the inspection program.

(2) Any vehicle returned for inspection of corrected defects within fifteen days of the original inspection shall not be charged any inspection fee.

Any vehicle returned to the original inspection station for inspection of corrected defects after a period of fifteen (15) days shall be considered as a vehicle undergoing an original inspection and the appropriate fee shall be charged.

(3) The inspection fee will include checking all inspection items required by the Division of Motor Vehicles. This is the "physical examination" of the vehicle only.

(4) The certified inspector shall always consult with the vehicle owner or his agent prior to making any repairs or adjustments determined by the inspection.

The State of Wisconsin
Office of Attorney General
Madison

BRONSON C. LA FOLLETTE
ATTORNEY GENERAL

ARLEN [illegible] CHRISTENSON
DEPUTY [illegible] ORNEY GENERAL

April 8, 1968

Mr. James L. Karns
Administrator
Department of Transportation
Division of Motor Vehicles
4802 Sheboygan Avenue
Madison, Wisconsin 53702

Dear Mr. Karns:

You have informed us that you are proposing to adopt new administrative rules in ch. M.V.D. 5, relating to motor vehicle inspection. In so doing, you wish to incorporate by reference certain standards from the SAE handbook, and you ask our consent.

We conclude that the Society of Automotive Engineers is an organization of recognized national standing, which has promulgated standards in the SAE handbook, and this is readily available in published form. We also conclude that the proposed rules, relating to motor vehicle inspection, are of limited public interest.

We, therefore, consent to such incorporation by reference.

Very truly yours,

Bronson C. La Follette

BRONSON C. LA FOLLETTE
Attorney General

James J. Burke

JAMES J. BURKE
Revisor of Statutes

APR 17 1968

Headlamp Units—SAE J602.

(a) 7 in. (except 7 in. Type 2) and 5¾ in. Type 1 sealed beam lamps.

Vertical Aim (up and down)—mechanical aim graduation should be set at 2 down.

APPROVAL SHALL BE REFUSED if graduation is higher than ½ down or lower than 3½ down.

Lateral Aim (sidewise)—mechanical aim graduation should be set at 0 (straight ahead).

APPROVAL SHALL BE REFUSED if graduation is more than 4 to the right or left of straight ahead.

(b) 7 in. Type 2 and 5¾ in. Type 2 sealed beam lamps.

Vertical Aim (up and down)—mechanical aim graduation should be set at 2 down.

APPROVAL SHALL BE REFUSED if graduation is higher than ½ down or lower than 3½ down.

Lateral Aim (sidewise)—mechanical aim graduation should be set at ½ right of straight ahead.

APPROVAL SHALL BE REFUSED if graduation is to the left of straight ahead or more than 4 right.

7. Turn Signals—Approval shall be refused for any of the following reasons:

(a) (1) Signalling unit not of an approved type, (2) not in an approved position, (3) not functioning properly, (4) not properly directed, and (5) obscured.

(b) Cancelling mechanism, if used, not functioning properly.

HEADLAMP TESTING MACHINES—SAE J600a

SAE Recommended Practice

Report of Lighting Committee approved December 1952 and last revised November 1963. Editorial change March 1965.

Scope—The purpose of this specification is to provide a laboratory test procedure for headlamp testing machines to determine their ability to aim, or to check the aim, of headlamps, fog lamps, and auxiliary driving and passing lamps, within tolerances prescribed herein. This specification does not apply to aiming devices of the kind covered by SAE Recommended Practice, Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units—SAE J602.

Samples for Test—Sample headlamp testing machines submitted for laboratory tests should be representative of the device as regularly manufactured and marketed, excepting in the case of machines using a track, an abbreviated section of track may be supplied for the test. Each sample should include all accessory equipment peculiar to the device and necessary to its service operation and calibration. Full assembly and operating instructions should be provided, including information on how to check accuracy and maintain the device in calibration.

Laboratory Facilities—The laboratory should be equipped with all facilities for accurate screen aiming and all facilities to make accurate physical and optical tests required in this specification, in accordance with established laboratory practice.

General Requirements—The headlamp testing machine should incorporate a fixed track or equivalent for positioning the aiming device in front of the headlamps.

The design of the headlamp testing machine should permit checking the aim of lamps mounted at heights from 12 to 54 in. and spaced up to 48 in. from the center of the motor vehicle.

The device and/or instructions should provide a practical means for a periodic check of its accuracy in the field.

The spirit level or other means provided for indicating vertical aim should be capable of showing at least 0.1 in. deviation with a 0.2 deg (1 in. in 25 ft) change in level.

A vertical aim scale should be provided with numerical graduations in steps, each of which represents 1 in. at 25 ft to provide for variations in aim at least from 4 in. above 0 to 10 in. below 0.

A lateral aim scale should be provided with graduations in steps of not more than 2 in. at 25 ft from straight ahead to at least 6 in. left and right.

The instructions covering use of the headlamp testing machine should include those items in the Preparation for Aiming, Section 2 (a) of SAE Recommended Practice, Lighting Inspection Code—SAE J599.

Alignment With Car—Means should be provided in the device for compensating within ±0.05 deg for reasonable variation in floor slope and clearly explained in the operating instructions.

Means should be provided in the device for accurate lateral alignment within 0.1 deg with respect to longitudinal axis of vehicle.

Visual Beam Appraisal—Machines using a photoelectric cell or cells to determine aim should also have a visual screen upon which the beam pattern is projected proportional to its appearance and aim on a screen at 25 ft. Such visual screen should be plainly visible to the operator and should have horizontal and vertical reference lines to permit visual appraisal of the aim of the lamp beam.

Test Procedure—Assuming that the headlamp testing machine complies with the general requirements, it shall be considered acceptable if it complies with additional test requirements as follows:

NOTE: The laboratory should set up the sample headlamp testing machine in accordance with the instructions furnished. At the same time and on the same axis the laboratory should set up a headlamp adjusting screen with adjustable horizontal and vertical reference lines so as to relate the aim obtained on the headlamp testing machine to that obtained with a properly aligned screen.

Aim

1. Symmetrical Beam—Upper beam [all auxiliary driving lamps, all 7 in. sealed beam units (except 7 in. Type 2 units) and all Type 1, 5¾ in. sealed beam units.]

A. The headlamp testing machine should permit determining the vertical and horizontal aim of the geometric center of the high intensity zone of the upper beam within the limits set up in these specifications.

(1) A group of sealed beam units, at least of Type 1, which meets SAE specifications but represent the maximum production variations of each lamp manufacturer, should be obtained by the testing laboratory.

Units should be selected by the laboratory which represent the extreme of production variation from the lamp manufacturer's average in their relationship of maximum intensities up, down, right, and left respectively to the geometrical center of the high intensity zone.

(a) The average vertical aim of each lamp obtained on the headlamp testing machine should not vary more than 0.2 deg (1 in. at 25 ft) from the average visual aim of each lamp obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

(b) The average horizontal aim obtained on each lamp on the headlamp testing machine should not vary left or right more than 0.4 deg (2 in. at 25 ft) from the average visual aim obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

2. Asymmetrical Beam—Auxiliary passing lamps, lower beam 5¾-in. and 7-in. Type 2 sealed beam units.

A. The headlamp testing machine should permit determining the aim of the top and left edge cutoffs of the high intensity zone of the lower beam of Type 2 lamps and of auxiliary passing lamps within the limits set up in these specifications.

(1) A group of sealed beam units, at least of Type 2, which meets SAE specifications but represent the maximum production variations of each lamp manufacturer, should be obtained by the testing laboratory.

Units should be selected by the laboratory which represent the extreme of production variation from the lamp manufacturer's average in their relationship of maximum intensities up, down, right and left to the cut off at the top and left edges.

(a) The average vertical aim of each lamp obtained on the headlamp testing machine should not vary more than 0.2 deg (1 in. at 25 ft) from the average visual aim of each lamp obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

(b) The average horizontal aim obtained on each lamp on the headlamp testing machine should not vary left or right more than 0.4 deg (2 in. at 25 ft) from the average visual aim obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

3. Symmetrical Fog Lamps

A. The headlamp testing machine should permit determining the vertical aim of the top cutoff of the high intensity zone and the hori-

zontal aim of the geometric center of the high intensity zone within the limits of these specifications.

(1) The laboratory should select at least 3 lamps from a random sampling of lamps obtained from each manufacturer, representative of those currently manufactured and meeting SAE specifications.

(a) The average vertical and horizontal aim of each lamp obtained on the headlamp testing machine should not vary more than 0.4 deg (2 in. at 25 ft) from the average visual aim obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

NOTE: Instructions furnished by the manufacturer for aiming lamps should be such that the beam patterns when viewed on the screen will fall within the limits set up in SAE Recommended Practice, Lighting Inspection Code—SAE J599.

HEADLAMP AIMING DEVICE FOR MECHANICALLY AIMABLE SEALED BEAM HEADLAMP UNITS—SAE J602

SAE Recommended Practice

Report of Lighting Committee approved October 1957 and last revised February 1959. Reaffirmed without change August 1963.

Scope—This specification applies to the requirements of a device used to aim the mechanically aimable type of sealed beam headlamp units.

The purpose of this specification is to provide a practical laboratory test procedure to determine whether the devices under test are capable of accurately positioning sealed beam headlamp units from their aiming pads and maintaining their accuracy in service within the tolerances designated in this specification.

Definition—A device used to aim mechanically aimable headlamp units consists of one or more fixtures designed to seat against the three aiming pads (aiming plane) on mechanically aimable headlamp units installed on a vehicle to facilitate accurate aiming of such units, vertically and laterally.

Samples for Test—Sample devices submitted for laboratory tests should be representative of the devices as regularly manufactured and marketed. Each sample should include all accessory equipment peculiar to the device. Full assembly and operating instructions should be provided, including information on how to check accuracy and maintain the device in calibration.

Laboratory Facilities—The laboratory should be equipped with all facilities necessary to make the tests required in this recommended practice and, shall use lamps from various manufacturers to check the attachment of the aimer.

General Requirements—The device should be of such design that the seating portion will register only on the three aiming pads on the 5¾-in. or 7-in. sealed beam units as covered by the SAE Standard, Dimensional Specifications for Sealed Beam Headlamp Unit—SAE J571.

The device should have no projections, tangs, lugs, and so forth, which will permit seating the device on any part of the headlamp, other than the three aiming pads or promote using the device on other than mechanically aimable sealed beam headlamp units.

Any device which uses an adapter to fit more than one size sealed beam unit should meet all of the requirements of this recommended practice with and without the adapter.

The seating portion (locating plane) of the aimer should meet the dimensions shown in Fig. 1, Dimensional Specifications for Headlamp Aimer Locating Plate. The locating flange on the aimer should center the device on the headlamp units or retaining rings in such a way as to insure that the seating portion will always engage the three aiming pads on the units.

When aiming headlamp units spaced 90 in. apart, the torque exerted by the aimer at the aiming plane should not exceed 36 in.-lb vertically and 12 in.-lb laterally

The means provided for securing the device to the lamp should be adequate to seat it securely against the three aiming pads on the units while in use.

If a suction cup is used to retain aimer to headlamp unit, effective diameter should not exceed 3½ in. in diameter when installed.

Means should be provided in the device for compensating within ± 0.1 deg for reasonable variations in floor slope and clearly explained in the operating instructions.

The device and/or instructions should provide a practical means for a periodic check of its accuracy in the field.

If the lateral aim is to be accomplished by reference between devices on opposite sides of the vehicle, the means provided for handling lateral adjustment (string or equivalent) should be at least 9½ in. ahead of the aiming plane.

The spirit level or other means provided for indicating vertical aim should be capable of showing at least a 0.1 in. deviation with a 0.2 deg (1 in. in 25 ft.) change in level.

A lateral aim scale should be provided with graduations in steps of not more than 2 in. at 25 ft from straight ahead to at least 6 in. left and right.

The instructions covering use of the aimer should include those items shown in the section 2(a) of Preparation for Aiming in the SAE Recommended Practice, Lighting Inspection Code—SAE J599.

The vertical aim scale should be marked —2 or 2 down with the aiming plane vertical.

The vertical aim scale should be provided with numerical graduations in steps, each of which represent 1 in. at 25 ft to provide for variations in vertical aim at least from 4 in. above 0 to 10 in. below 0.

Test Procedure—Assuming that the devices comply with the general requirements, they shall be considered acceptable if they comply with additional test requirements as follows:

NOTE 1—All tests are to be made in an ambient temperature of 75 ± 5 F unless otherwise specified.

NOTE 2—If a vertical indication means other than a spirit level is used, an equivalent accuracy should be maintained.

1. With the aiming plane vertical and with the vertical scale on the device set at —2 or 2 down, the angle through which the aiming plane must be rotated vertically to properly position the bubble in the spirit level, or equivalent, should not exceed 0.1 deg.

2. With the aiming planes in the same vertical plane and with the means provided for adjusting lateral aim in use, the angle through which the aiming plane must be rotated laterally to indicate straight ahead should not exceed ± 0.2 deg with the lamps 24 in. and 90 in. apart.

3. With the aiming planes initially in the same vertical plane and subsequently toed inward and outward 1.2 deg and with the means provided for checking lateral aim in use, the error in reading should not exceed ± 0.2 deg with the lamps 60 in. apart.

4. With the aiming plane vertical and with the vertical scale on the device set at —2 or 2 down, the level on the aimer should be adjusted prior to each of the following tests to properly position the bubble in the spirit level, or equivalent.

(a) Each step on the vertical aim scale should be checked and in no case should the variation from correct aim exceed ± 0.1 deg.

(b) A pair of aimers should be stabilized at 20 ± 5 F and then installed on a pair of unlighted units spaced 60 in. apart at the 20 F ambient temperature. After a period of 30 minutes the seating portion should continue to register against the three aiming pads and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

(c) A pair of aimers should be stabilized at 100 ± 5 F and then installed on a pair of lighted units spaced 60 in. apart at the 100 F ambient temperature. After a period of 30 minutes the seating portion should continue to register against the three aiming pads and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

(d) A pair of aimers should be exposed with the aiming plane down in a circulating air oven to 140 ± 5 F for 24 hr followed by a temperature of —40 ± 5 F for 24 hr and then permitted to return to room temperature after which they should show no visible damage. They should then be installed on a pair of unlighted units spaced 60 in. apart and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

(e) A sample aimer should be exposed to 35 ± 5 F for one hour and then immediately allowed to free fall onto a concrete floor three

zontal aim of the geometric center of the high intensity zone within the limits of these specifications.

(1) The laboratory should select at least 3 lamps from a random sampling of lamps obtained from each manufacturer, representative of those currently manufactured and meeting SAE specifications.

(a) The average vertical and horizontal aim of each lamp obtained on the headlamp testing machine should not vary more than 0.4 deg (2 in. at 25 ft) from the average visual aim obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

NOTE: Instructions furnished by the manufacturer for aiming lamps should be such that the beam patterns when viewed on the screen will fall within the limits set up in SAE Recommended Practice, Lighting Inspection Code—SAE J599.

HEADLAMP AIMING DEVICE FOR MECHANICALLY AIMABLE SEALED BEAM HEADLAMP UNITS—SAE J602

SAE Recommended Practice

Report of Lighting Committee approved October 1957 and last revised February 1959. Reaffirmed without change August 1963.

Scope—This specification applies to the requirements of a device used to aim the mechanically aimable type of sealed beam headlamp units.

The purpose of this specification is to provide a practical laboratory test procedure to determine whether the devices under test are capable of accurately positioning sealed beam headlamp units from their aiming pads and maintaining their accuracy in service within the tolerances designated in this specification.

Definition—A device used to aim mechanically aimable headlamp units consists of one or more fixtures designed to seat against the three aiming pads (aiming plane) on mechanically aimable headlamp units installed on a vehicle to facilitate accurate aiming of such units, vertically and laterally.

Samples for Test—Sample devices submitted for laboratory tests should be representative of the devices as regularly manufactured and marketed. Each sample should include all accessory equipment peculiar to the device. Full assembly and operating instructions should be provided, including information on how to check accuracy and maintain the device in calibration.

Laboratory Facilities—The laboratory should be equipped with all facilities necessary to make the tests required in this recommended practice and, shall use lamps from various manufacturers to check the attachment of the aimer.

General Requirements—The device should be of such design that the seating portion will register only on the three aiming pads on the 5¾-in. or 7-in. sealed beam units as covered by the SAE Standard, Dimensional Specifications for Sealed Beam Headlamp Unit—SAE J571.

The device should have no projections, tangs, lugs, and so forth, which will permit seating the device on any part of the headlamp, other than the three aiming pads or promote using the device on other than mechanically aimable sealed beam headlamp units.

Any device which uses an adapter to fit more than one size sealed beam unit should meet all of the requirements of this recommended practice with and without the adapter.

The seating portion (locating plane) of the aimer should meet the dimensions shown in Fig. 1, Dimensional Specifications for Headlamp Aimer Locating Plate. The locating flange on the aimer should center the device on the headlamp units or retaining rings in such a way as to insure that the seating portion will always engage the three aiming pads on the units.

When aiming headlamp units spaced 90 in. apart, the torque exerted by the aimer at the aiming plane should not exceed 36 in.-lb vertically and 12 in.-lb laterally.

The means provided for securing the device to the lamp should be adequate to seat it securely against the three aiming pads on the units while in use.

If a suction cup is used to retain aimer to headlamp unit, effective diameter should not exceed 3½ in. in diameter when installed.

Means should be provided in the device for compensating within ± 0.1 deg for reasonable variations in floor slope and clearly explained in the operating instructions.

The device and/or instructions should provide a practical means for a periodic check of its accuracy in the field.

If the lateral aim is to be accomplished by reference between devices on opposite sides of the vehicle, the means provided for handling lateral adjustment (string or equivalent) should be at least 9½ in. ahead of the aiming plane.

The spirit level or other means provided for indicating vertical aim should be capable of showing at least a 0.1 in. deviation with a 0.2 deg (1 in. in 25 ft.) change in level.

A lateral aim scale should be provided with graduations in steps of not more than 2 in. at 25 ft from straight ahead to at least 6 in. left and right.

The instructions covering use of the aimer should include those items shown in the section 2(a) of Preparation for Aiming in the SAE Recommended Practice, Lighting Inspection Code—SAE J599.

The vertical aim scale should be marked —2 or 2 down with the aiming plane vertical.

The vertical aim scale should be provided with numerical graduations in steps, each of which represent 1 in. at 25 ft to provide for variations in vertical aim at least from 4 in. above 0 to 10 in. below 0.

Test Procedure—Assuming that the devices comply with the general requirements, they shall be considered acceptable if they comply with additional test requirements as follows:

NOTE 1—All tests are to be made in an ambient temperature of 75 ± 5 F unless otherwise specified.

NOTE 2—If a vertical indication means other than a spirit level is used, an equivalent accuracy should be maintained.

1. With the aiming plane vertical and with the vertical scale on the device set at —2 or 2 down, the angle through which the aiming plane must be rotated vertically to properly position the bubble in the spirit level, or equivalent, should not exceed 0.1 deg.

2. With the aiming planes in the same vertical plane and with the means provided for adjusting lateral aim in use, the angle through which the aiming plane must be rotated laterally to indicate straight ahead should not exceed ± 0.2 deg with the lamps 24 in. and 90 in. apart.

3. With the aiming planes initially in the same vertical plane and subsequently toed inward and outward 1.2 deg and with the means provided for checking lateral aim in use, the error in reading should not exceed ± 0.2 deg with the lamps 60 in. apart.

4. With the aiming plane vertical and with the vertical scale on the device set at —2 or 2 down, the level on the aimer should be adjusted prior to each of the following tests to properly position the bubble in the spirit level, or equivalent.

(a) Each step on the vertical aim scale should be checked and in no case should the variation from correct aim exceed ± 0.1 deg.

(b) A pair of aimers should be stabilized at 20 ± 5 F and then installed on a pair of unlighted units spaced 60 in. apart at the 20 F ambient temperature. After a period of 30 minutes the seating portion should continue to register against the three aiming pads and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

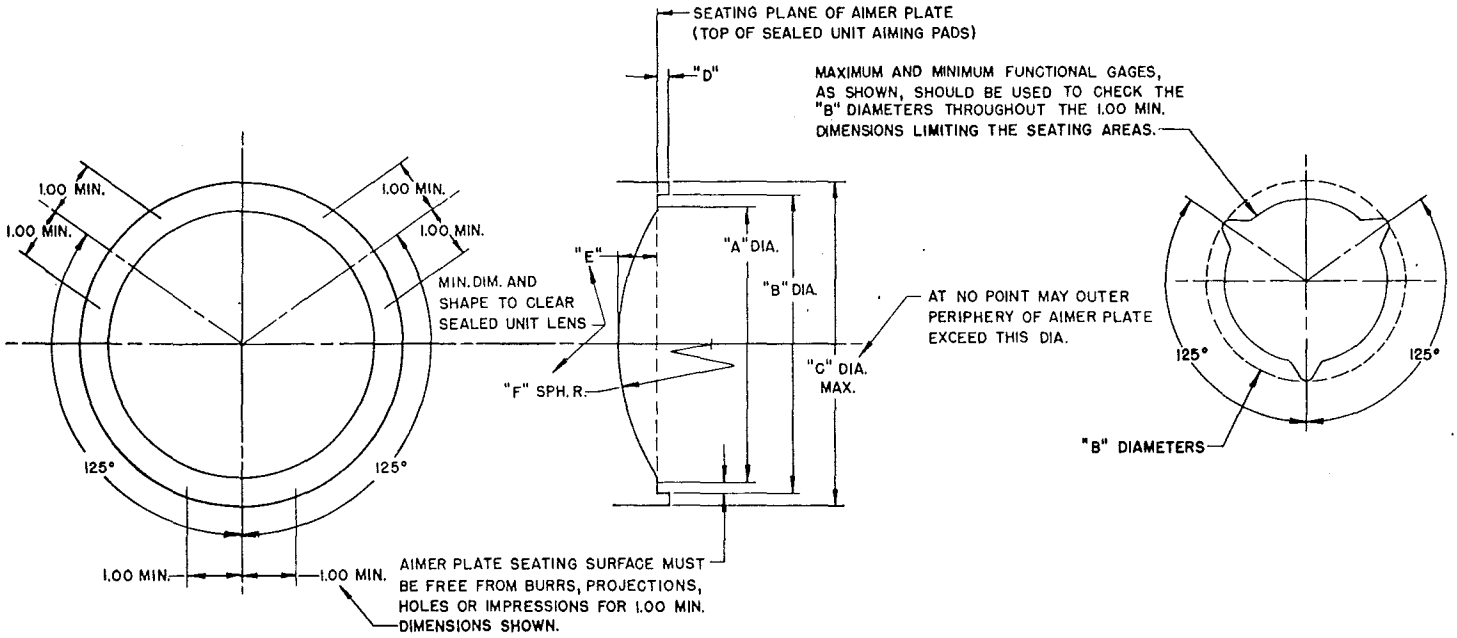
(c) A pair of aimers should be stabilized at 100 ± 5 F and then installed on a pair of lighted units spaced 60 in. apart at the 100 F ambient temperature. After a period of 30 minutes the seating portion should continue to register against the three aiming pads and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

(d) A pair of aimers should be exposed with the aiming plane down in a circulating air oven to 140 ± 5 F for 24 hr followed by a temperature of —40 ± 5 F for 24 hr and then permitted to return to room temperature after which they should show no visible damage. They should then be installed on a pair of unlighted units spaced 60 in. apart and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

(e) A sample aimer should be exposed to 35 ± 5 F for one hour and then immediately allowed to free fall onto a concrete floor three

times from its normal operating position on a headlamp at a height of 40 in. after which it should show no structural breakage. It should then be installed in combination with its companion aimer on a pair of unlighted units spaced 60 in. apart and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

NOTE: Test 4 (e) applies only to devices which are supported by the lamp.



NOTE: THERE SHALL BE NO PROJECTIONS, TANGS, LUGS, ETC., ON THIS LOCATING PLATE WHICH WILL PERMIT LOCATING THE AIMING DEVICE ON ANY PART OF THE HEADLAMP OTHER THAN THE AIMING PADS ON THE MECHANICALLY AIMABLE SEALED BEAM UNIT.

LOCATING PLATE	DIMENSIONS								
	A		B		C	D		E	F
	MAX.	MIN.	MAX.	MIN.	MAX.	MAX.	MIN.	REF.	REF.
5 3/4"	4.830	4.770	5.375	5.345	5.700	.165	.145	.70	4.40
7"	6.140	6.080	6.710	6.680	7.031	.180	.160	.96	5.60

FIG. 1—DIMENSIONAL SPECIFICATIONS FOR HEADLAMP AIMER LOCATING PLATE

INCANDESCENT LAMP IMPACT TEST—SAE J603c

SAE Recommended Practice

Report of Lighting Committee approved May 1959 and last revised June 1966.

The trend toward higher circuit voltages on military vehicles has brought with it a reduction in the service life of lamp bulbs used on tactical equipment. At the request of Army Ordnance, the Society through a subcommittee of its Lighting Committee, has been cooperating with the military on the solution of this problem as has also the University of Michigan. In this work, it early became apparent that a reliable testing machine capable of providing reproducible results in repetitive impact tests was needed adequately to measure improvements in bulb design, manufacture and quality control intended to increase service life. A test machine for this purpose has been developed by the University and tested to the extent that its use is recommended in this SAE Recommended Practice.

Experience has indicated that the service life of bulbs may be materially prolonged by mountings properly designed to cushion the unit from shock and vibration.

Scope—To provide a practical laboratory impact test for certain types of miniature incandescent lamp bulbs for use primarily in military and rough service applications and to establish minimum test requirements for such bulbs when tested in accordance with this recommended practice.

SAE lighting specifications are necessarily subject to frequent revision to keep pace with technical advances. Therefore, this inclusion of the detailed requirements of such specifications in State or Federal laws and regulations which can be changed only infrequently, is to be discouraged.

Samples for Test—Sample lamp bulbs should be representative of those regularly manufactured and marketed. Test samples should consist of lots of 20, selected in accordance with acceptable statistical procedures.

Procedure for Test—Tests should be made on the impact tester illustrated in Fig. 1.[1]

Lamp bulbs to be tested should be placed in their holders using the

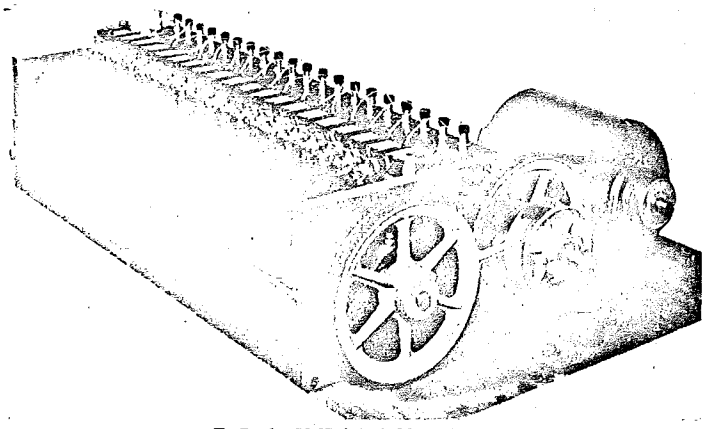


FIG. 1—IMPACT TESTER

[1] Detailed drawings and specifications for this testing machine may be obtained through the Commanding Officer, Detroit Arsenal, OTAC, Center Line, Mich. The machine has a cam with 4 uniformly spaced, adjustable offsets. The lamp bulbs under test, rest directly on this cam, and when it is rotated, the bulbs are lifted and dropped on the relatively inelastic surface of the cam. The resulting impact loads excite the lamp bulb filaments in a multinoded mode of free vibration with sufficient amplitude ultimately to cause failure.

Technical Report Preprint

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SOCIETY OF AUTOMOTIVE ENGINEERS, INC.,
485 Lexington Avenue, New York, New York 10017

J4c

MOTOR VEHICLE SEAT BELT ASSEMBLIES - SAE J4c

SAE Standard

Report of Motor Vehicle Seat Belt Committee approved November 1955 and last revised July 1965.

1. SCOPE

1.1 This SAE Standard provides for the following types of seat belt assemblies for use in motor vehicles, in order to minimize the risk of bodily harm in an accident:

Type 1 - Lap Belt for pelvic restraint.

Type 2 - Combination of pelvic and upper torso restraints.

(Type 2a - Shoulder belt - An upper torso restraint for use only in conjunction with a lap belt as a Type 2 seat belt assembly.)

Type 3 - Combination pelvic and upper torso restraint for persons weighing 50 lb (23 kg) or less and capable of sitting upright by themselves, that is children in the approximate age range of 8 months-6 years.

1.2 This standard specifies performance requirements, laboratory test procedures and minimal design requirements for seat belt assemblies when worn in the seated position.

2. DEFINITIONS

2.1 SEAT BELT ASSEMBLY - Consists of any strap, webbing, or similar device designed to secure a person in a motor vehicle with the intention of mitigating the results of a traffic accident, including all buckles or other fasteners, and all hardware designed for installing the assembly in a motor vehicle.

2.2 PELVIC RESTRAINT - A seat belt assembly or portion thereof intended to restrain movement of the pelvis.

2.3 UPPER TORSO RESTRAINT - A portion of a seat belt assembly intended to restrain movement of the chest and shoulder regions.

2.4 HARDWARE - Any metal or rigid plastic part of the seat belt assembly.

2.4.1 Buckle - A quick release connector which fastens a person in a seat belt assembly.

2.4.2 Attachment Hardware - Any or all hardware designed for securing the webbing of a seat belt assembly to a motor vehicle.

2.4.3 Adjustment Hardware - Any or all hardware designed for adjusting the size of a seat belt assembly to fit the user, including such hardware that may be integral with a buckle, attachment hardware, or retractor.

2.4.4 Retractor - A device for storing part or all of the webbing in a seat belt assembly.

2.4.4.1 Nonlocking Retractor - A retractor from which the webbing is extended to essentially its full length by a small external force, which provides no adjustment for assembly length, and which may or may not be capable of sustaining restraint forces at maximum webbing extension.

2.4.4.2 Automatic Locking Retractor - A retractor incorporating adjustment hardware by means of a positive self locking mechanism which is capable when locked of withstanding restraint forces.

2.4.4.3 Emergency Locking Retractor - A retractor incorporating adjustment hardware by means of a locking mechanism that is activated by vehicle acceleration, webbing movement relative to the vehicle, or other automatic action during an emergency and is capable when locked of withstanding restraint forces.

2.5 SEAT BACK RETAINER - The portion of some seat belt assemblies designed to restrict forward movement of a seat back.

2.6 WEBBING - A narrow fabric woven with continuous filling yarns and finished selvages.

2.7 STRAP - A narrow nonwoven material used in a seat belt assembly in place of webbing.

3. GENERAL REQUIREMENTS

3.1 SINGLE OCCUPANCY - A seat belt assembly shall be designed for use by one, and only one, person at any one time.

3.2 PELVIC RESTRAINT - A seat belt assembly shall provide pelvic restraint whether or not upper torso restraint is provided, and the pelvic restraint shall be designed to remain on the pelvis under all conditions, including collision or rollover of the motor vehicle. Pelvic restraint of a Type 2 seat belt assembly, that can be used without upper torso restraint, shall comply with requirement for Type 1 seat belt assembly in Sections 3-6 inclusive.

3.3 UPPER TORSO RESTRAINT - A Type 2 or Type 3 seat belt assembly shall provide upper torso restraint without shifting the pelvic restraint into the abdominal region. The upper torso restraint shall be designed to minimize vertical forces on the shoulders and spine. Hardware for upper torso restraint shall be so designed and located in the seat belt assembly that the possibility of injury to the occupant is minimized. A Type 2a shoulder belt shall comply with applicable requirements for a Type 2 seat belt assembly in Sections 3-6 inclusive.

3.4 HARDWARE - All hardware parts which contact, under normal usage, a person, clothing, or webbing shall be free from burrs and sharp edges.

3.5 RELEASE - A Type 1 or Type 2 seat belt assembly shall be provided with a buckle or buckles readily accessible to the occupant to permit his easy and rapid removal from the assembly. A Type 3 seat belt assembly shall be provided with a quickly recognizable and easily operated release arrangement, readily accessible to an adult. Buckle release mechanism shall be designed to minimize the possibility of accidental release.

3.6 ATTACHMENT HARDWARE - A seat belt assembly shall include all hardware necessary for installation in a motor vehicle in accordance with SAE J800a, Motor Vehicle Seat Belt Installation *, except that seat belt assemblies designed for installation in vehicles equipped with seat belt anchorages shall not require underfloor hardware. The hardware shall be designed to prevent attaching bolts and other parts becoming disengaged from the motor vehicle in services. Reinforcing plates or washers furnished for universal floor installations shall be steel, free from burrs and sharp edges on the peripheral edges adjacent to the vehicle, not less than 0.06 in. (1.5 mm) in thickness nor less than 4 sq in. (25 sq cm) in area. The distance between any edge of the plate and the edge of the bolt hole shall be at least 0.6 in. (15 mm) and any corner shall be rounded to a radius of not less than 0.25 in. (6 mm) or cut at a 45 deg angle along an hypotenuse not less than 0.25 in. (6 mm) in length.

3.7 ADJUSTMENT - A Type 1 or Type 2 seat belt assembly shall be capable of snug adjustment by the occupant by a means easily within his reach and easily operable without appreciable interference with the driving process, or shall be provided with an automatic locking or an emergency locking retractor. A Type 3 seat belt assembly shall be capable of snug adjustment to fit any child capable of sitting upright and weighing not more than 50 lb (23 kg) unless specifically labelled for use with a child in a smaller weight range.

3.8 SEAT BACK RETAINER - A Type 3 seat belt assembly designed for attachment to a seat back, or for use in a seat with a hinged back, shall include a seat back retainer unless such assembly is designed and labelled for use in specific models of motor vehicles, in which the vehicle manufacturer has provided other adequate restraint for the seat back.

3.9 WEBBING - The ends of webbing in a seat belt assembly shall be protected or treated to prevent ravelling. The end of webbing in a seat belt assembly having a metal-to-metal buckle, that is used by the occupant to adjust the size of the assembly, shall not pull out of the adjustment hardware at maximum size adjustment. Provision shall be made for essentially unimpeded movement of webbing routed between a seat back and seat cushion and attached to a retractor located behind the seat.

3.10 STRAP - A strap used in a seat belt assembly to sustain restraint forces shall comply with the requirements for webbing in Section 4, and if the strap is made from a rigid material it shall comply with applicable requirements in Sections 4-6.

3.11 MARKING - Each seat belt assembly shall be permanently and legibly marked or labelled with year of manufacture, model and name or trademark of manufacturer or distributor, or of importer if manufactured outside the United States. A model shall consist of a single combination of webbing having a specific type of fiber (nylon, polyester, or the like) weave and construction, and hardware having a specific design. Webbings of various colors may be included under the same model, but webbing of each color shall comply with the requirements for webbing in Section 4.

3.12 INSTALLATION INSTRUCTIONS - A seat belt assembly or retractor shall be accompanied by an instruction sheet providing sufficient information for installing the assembly in a motor vehicle except for a seat belt assembly or retractor installed in a motor vehicle by an automobile manufacturer. The installation instructions shall state whether the assembly is for universal installation or for installation only in specifically stated motor vehicles, and shall include at least those items in SAE J800a.

3.13 USAGE AND MAINTENANCE INSTRUCTIONS - A seat belt assembly or retractor shall be accompanied by written instructions for the proper use of the assembly, stressing particularly the importance of wearing the assembly snugly and properly located on the body, and for the maintenance of the assembly, including periodic inspection of all components. The instructions shall show the proper manner of threading webbing in the hardware of seat belt assemblies in which the webbing is not permanently fastened. Instructions for Type 2a shoulder belt shall include a warning that the shoulder belt is not to be used without a lap belt.

3.14 WORKMANSHIP - A seat belt assembly shall have good workmanship in accordance with good commercial practices.

4. REQUIREMENTS FOR WEBBING

4.1 WIDTH - The webbing in a seat belt assembly shall be not less than the following widths, when measured under conditions prescribed in paragraph 7.1:

Type 1 seat belt assembly - 1.8 in. (46 mm). or 1 3/16 (in 16ths)

Type 2 seat belt assembly - 1.8 in. (46 mm).

Type 3 seat belt assembly - 0.9 in. (23 mm) for pelvic and upper torso restraint.

4.2 BREAKING STRENGTH - The webbing in a seat belt assembly shall have not less than the following breaking strengths when tested by the procedures specified in paragraph 7.2:

Type 1 seat belt assembly - 6000 lb (2720 kg)

Type 2 seat belt assembly - 5000 lb (2270 kg) for pelvic restraint; 4000 lb (1810 kg) for upper torso restraint.

Type 3 seat belt assembly - 1500 lb (680 kg) for pelvic and upper torso restraint; 4000 lb (1810 kg) for seat back retainer and for connection for pelvic and upper torso restraint to attachment hardware when assembly has single webbing connection; 3000 lb (1360 kg) for webbing connecting pelvic and upper torso restraint to attachment hardware when as-

*Published by the Society of Automotive Engineers, 485 Lexington Avenue, New York, New York 10017.

sembly has two or more webbing connections.

4.3 ELONGATION - The webbing in a seat belt assembly shall not extend to more than the following elongations when subjected to the specified forces in accordance with the procedures specified in paragraph 7.3:

Type 1 seat belt assembly - 20% at 2500 lb (1130 kg).

Type 2 seat belt assembly - 30% at 2500 lb (1130 kg) for pelvic restraint; 40% at 2500 lb (1130 kg) for upper torso restraint.

Type 3 seat belt assembly - 20% at 700 lb (320 kg) for webbing in pelvic and upper torso restraints; 25% at 2500 lb (1130 kg) for webbing in seat back retainer and for webbing connecting pelvic and upper torso restraints to attachment hardware when assembly has single webbing connection; 25% at 1800 lb (820 kg) for webbing connecting pelvic and upper torso restraints to attachment hardware when assembly has two or more webbing connections.

4.4 RESISTANCE TO ABRASION - The webbing in a seat belt assembly after being subjected to abrasion as specified in paragraph 7.4 shall have a breaking strength not less than 75% of the strength before abrasion when measured by the procedure specified in paragraph 7.2.

4.5 RESISTANCE TO LIGHT - The webbing in a seat belt assembly, after exposure to the light of a carbon arc and after testing by the procedure specified in paragraph 7.5 shall have a breaking strength not less than 60% of the strength before exposure to the carbon arc and shall have a color retention not less than No. 2 on the Geometric Gray Scale*.

4.6 RESISTANCE TO MICRO-ORGANISMS - The webbing in a seat belt assembly after being subjected to micro-organisms and tested by the procedure specified in paragraph 7.6 shall have a breaking strength not less than 85% of the strength before subjection to micro-organisms.

4.7 COLORFASTNESS TO CROCKING - The webbing in a seat belt assembly shall not transfer color to a crock cloth either wet or dry to a greater degree than Class 3 on the AATCC Chart for Measuring Transference of Color,* when tested by the procedure specified in paragraph 7.7.

4.8 COLORFASTNESS TO STAINING - The webbing in a seat belt assembly shall not stain to a greater degree than Class 3 on the AATCC Chart for Measuring Transference of Color when tested by the procedure specified in paragraph 7.8.

5. REQUIREMENTS FOR HARDWARE

5.1 CORROSION RESISTANCE - Hardware parts of a seat belt assembly, except buckles, after being subjected to the conditions specified in paragraph 8.1, shall be free of red rust, except for permissible red rust at peripheral edges or edges of holes on underfloor reinforcing plates or washers. Buckle surfaces or other metallic parts which may come into contact with webbing, the occupant, or his clothing, when the belt is worn, shall be free of ferrous and nonferrous corrosion. Buckles and retractors shall conform to applicable requirements in paragraphs 5.7-5.11 inclusive.

5.2 TEMPERATURE RESISTANCE - Plastic, or other nonmetallic, hardware parts of a seat belt assembly, and all retractors, when subjected to the conditions specified in paragraph 8.2, shall not warp, or otherwise deteriorate, to cause the assembly to operate improperly or fail to comply with applicable requirements in Sections 5 and 6.

5.3 ATTACHMENT HARDWARE - Eye bolts, shoulder bolts, or other bolts used to secure the pelvic restraint of a seat belt assembly to a motor vehicle shall withstand a force of 5000 lb (2270 kg) when tested by the procedure specified in paragraph 8.3. A seat belt assembly, having single attachment hooks of the quick-disconnect type for connecting webbing to an eye bolt, shall be provided with a retaining latch or keeper which shall not move more than 0.08 in. (2 mm) in either the vertical or horizontal direction when tested by the procedure specified in paragraph 8.3.2.

5.4 BUCKLE RELEASE FORCE - The buckle of a Type 1 or Type 2 seat belt assembly shall release when a force of not more than 30 lb (14 kg) is applied, and the buckle of a Type 3 seat belt assembly shall release when a force of not more than 20 lb (9 kg) is applied as prescribed in paragraph 8.4.

5.5 ADJUSTMENT FORCE - The force required to decrease the size of a seat belt assembly shall not exceed 11 lb (5 kg) when measured by the procedure specified in paragraph 8.5.

5.6 TILT-LOCK ADJUSTMENT - The buckle of a seat belt assembly having tilt-lock adjustment shall lock the webbing when tested by the procedure specified in paragraph 8.6 at an angle of not less than 30 deg between the base of the buckle and the anchor webbing.

5.7 BUCKLE LATCH - The buckle latch of a seat belt assembly when tested by the procedure specified in paragraph 8.7, shall not fail, nor gall or wear to an extent that normal latching and unlatching are impaired, and a metal-to-metal buckle shall separate when in any position of partial engagement by a force of not more than 5 lb (2.3 kg).

5.8 NONLOCKING RETRACTOR - The webbing of a seat belt assembly shall extend from a nonlocking retractor within 0.25 in. (6 mm) of a maximum length when a tension of 3 lb (1.4 kg) is applied as prescribed in paragraph 8.8.

5.9 AUTOMATIC LOCKING RETRACTOR - The webbing of a seat belt assembly equipped with an automatic locking retractor shall not move more than 1 in. (2.5 cm) between locking positions of the retractor, and shall be retracted with a force of not less than 0.6 lb (0.27 kg) when measured by the procedure specified in paragraph 8.9.

5.10 EMERGENCY LOCKING RETRACTOR - An emergency locking retractor used on a Type 1 or Type 2 seat belt assembly shall lock before the webbing extends 1 in. (2.5 cm) when the retractor is subjected to an acceleration of 0.5 g (5 m/sec^2) and shall exert a retraction force of not less than 1.5 lb (0.7 kg) under zero acceleration when tested by the procedures specified in paragraph 8.10.

*Published by the American Association of Textile Chemists and Colorists, P. O. Box 886, Durham, N.C.

5.11 PERFORMANCE OF RETRACTOR - A retractor used on a seat belt assembly after subjection to the tests specified in paragraph 8.11 shall comply with applicable requirements in paragraphs 5.8-5.10 and 6.1-6.3, except that the retraction force shall be not less than 50% of its original retraction force.

6. REQUIREMENTS FOR ASSEMBLY PERFORMANCE

6.1 TYPE 1 SEAT BELT ASSEMBLY - The complete seat belt assembly, including webbing, straps, buckles, adjustment and attachment hardware, and retractors, shall comply with the following requirements when tested by the procedures specified in paragraph 9.1:

6.1.1 The assembly loop shall withstand a force of not less than 5000 lb (2270 kg); that is, each structural component of the assembly shall withstand a force of not less than 2500 lb (1130 kg).

6.1.2 The assembly loop shall extend not more than 7 in. (18 cm) when subjected to a force of 5000 lb (2270 kg); that is, the length of the assembly between anchorages shall not increase more than 14 in. (36 cm).

6.1.3 Any webbing cut by the hardware during test shall have a breaking strength at the cut of not less than 4200 lb (1910 kg).

6.2 TYPE 2 SEAT BELT ASSEMBLY - The components of a Type 2 seat belt assembly including webbing, straps, buckles, adjustment hardware, and retractors shall comply with the following requirements when tested by the procedure specified in paragraph 9.2:

6.2.1 The structural components in the pelvic restraint shall withstand a force of not less than 2500 lb (1130 kg).

6.2.2 The structural components in the upper torso restraint shall withstand a force of not less than 1500 lb (680 kg).

6.2.3 The structural components in the assembly that are common to pelvic and upper torso restraints shall withstand a force of not less than 3000 lb (1360 kg).

6.2.4 The length of the pelvic restraint between anchorages shall not increase more than 20 in. (50 cm) when subjected to a force of 2500 lb (1130 kg).

6.2.5 The length of the upper torso restraint between anchorages shall not increase more than 20 in. (50 cm) when subjected to a force of 1500 lb (680 kg).

6.2.6 Any webbing cut by the hardware during test shall have a breaking strength of not less than 3500 lb (1590 kg) at a cut in webbing of the pelvic restraint, or not less than 2800 lb (1270 kg) at a cut in webbing of the upper torso restraint.

6.3 TYPE 3 SEAT BELT ASSEMBLY - The complete seat belt assembly, including webbing, straps, buckles, adjustment and attachment hardware, and retractors, shall comply with the following requirements when tested by the procedures specified in paragraph 9.3:

6.3.1 The complete assembly shall withstand a force of 2000 lb (900 kg).

6.3.2 The complete assembly shall extend not more than 12 in. (30 cm) when subjected to a force of 2000 lb (900 kg).

6.3.3 Any webbing cut by the hardware during test shall have a breaking strength of not less than 1050 lb (480 kg) at a cut in webbing of pelvic or upper torso restraints, or not less than 2800 lb (1270 kg) at a cut in webbing of seat back retainer, or in webbing connecting pelvic and upper torso restraint at attachment hardware.

7. WEBBING TEST PROCEDURES

7.1 WIDTH - The width of webbing from three seat belt assemblies shall be measured after conditioning for at least 24 hr in an atmosphere having a relative humidity between 48-67% and a temperature of 73.4 ± 3.6 F (23 ± 2 C). The tension on the webbing during measurement of width shall be not more than 5 lb (2 kg) for Type 1 or Type 3 seat belt assemblies and 2200 ± 100 lb (1000 ± 50 kg) for Type 2 seat belt assembly. The width of webbing in Type 2 seat belt assembly may be measured during the breaking strength test described in paragraph 7.2.

7.2 BREAKING STRENGTH - Webbing from three seat belt assemblies shall be conditioned in accordance with paragraph 7.1 and tested, by ASTM E 4-64T, Methods of Verification of Testing Machines (Tentative),* for breaking strength in a testing machine of suitable capacity verified

*Published by the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.

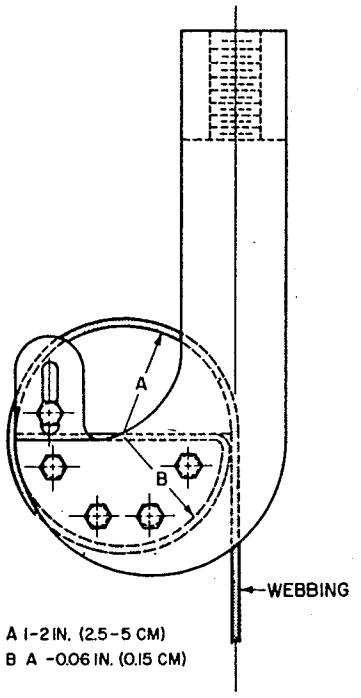

Fig. 1

to have an error of not more than 1% in the range of the breaking strength of the webbing. The machine shall be equipped with split drum grips illustrated in Fig. 1, having a diameter between 2-4 in. (5-10 cm). The rate of grip separation shall be between 2-4 in. (5-10 cm) per minute. The distance between the centers of the grips at the start of the test shall be between 4-10 in. (10-25 cm). After placing the specimen in the grips, the webbing shall be stretched continuously at a uniform rate to failure. Each value shall be not less than the applicable breaking strength requirement in paragraph 4.2, but the median value shall be used in determining the retention of breaking strength in paragraphs 4.4-4.6.

7.3 ELONGATION - Elongation shall be measured during the breaking strength test described in paragraph 7.2 by the following procedure. A preload of 50 ± 5 lb (22.5 ± 2 kg) shall be placed on the webbing mounted in the grips of the testing machine, and the needle points of an extensometer, in which the points remain parallel during test, are inserted in the center of the specimen. Initially the points shall be set at a known distance between 4-8 in. (10-20 cm) apart. When the force on the webbing reaches the value specified in paragraph 4.3, the increase in separation of the points of the extensometer shall be measured and the per cent elongation shall be calculated to the nearest 0.5%. Each value shall be not more than the appropriate elongation requirement in paragraph 4.3.

7.4 RESISTANCE TO ABRASION - The webbing from three seat belt assemblies shall be tested for resistance to abrasion by rubbing over the hexagon bar prescribed in Fig. 2 in the following manner. The webbing shall be mounted in the apparatus shown schematically in Fig. 2. One end of the webbing, A, shall be attached to a weight, B, which has a mass of 5.2 ± 0.1 lb (2.3 ± 0.05 kg) except that for Type 3 pelvic and upper torso restraint webbing a mass of 3.3 ± 0.1 lb (1.5 ± 0.05 kg) shall be used. The webbing shall be passed over two new abrading edges of the hexagon bar, C, and the other end attached to an oscillating drum, D, which has a stroke of 13 in. (33 cm). Suitable guides shall be used to prevent movement of the webbing along the axis of hexagonal bar, C. Drum D shall be oscillated for 5000 strokes (2500 cycles) at a rate of 60 ± 2 strokes (30 ± 1 cycles) per minute.

The abraded webbing shall be conditioned as prescribed in paragraph 7.1 and tested for breaking strength by the procedure described in paragraph 7.2. The median values for the breaking strengths determined on abraded and unabraded specimens shall be used to calculate the percentage of breaking strength retained.

7.5 RESISTANCE TO LIGHT - Three specimens of webbing at least 20 in. (50 cm) in length shall be suspended vertically on the inside of the specimen rack in a Type E carbon-arc light exposure apparatus described in ASTM E 42-64, Recommended Practice for Operation of Light and Water-Exposure Apparatus (Carbon-Arc Type) for Artificial Weathering Test., The apparatus shall be operated without water spray at an air temperature of 140 ± 3.6 F (60 ± 2C) measured at a point 1.0 ± 0.2 in. (2.5 ± 0.5 cm) outside the specimen rack and midway in the height. The temperature sensing element shall be shielded from radiation. The specimens shall be exposed to the light from the carbon-arc for 100 hr and then conditioned as prescribed in paragraph 7.1. The colorfastness of the exposed and conditioned specimens shall be determined on the AATCC Geometric Gray Scale. The breaking strength of the specimens shall be determined by the procedure prescribed in paragraph 7.2. The median values for the breaking strengths determined on exposed and unexposed specimens shall be used to calculate the percentage of breaking strength retained.

7.6 RESISTANCE TO MICROORGANISMS - Three specimens of webbing at least 20 in. (50 cm) in length shall be subjected successively to the procedures prescribed in Section 1C1 - Water Leaching, Section 1C2 - Volatilization, and Section 1B3 - Soil Burial Test of AATCC Tentative Test Method 30-1957T, Fungicides, Evaluation of Textiles; Mildew and Rot Resistance of Textiles. * After soil burial for a period of 2 weeks, the specimens shall be washed with water, dried and conditioned as prescribed in paragraph 7.1. The breaking strengths of the specimens shall be determined by the procedure prescribed in paragraph 7.2. The median values for the breaking strengths determined on exposed and unexposed specimens shall be used to calculate the percentage of breaking strength retained. NOTE: This test shall not be required on webbing made from material which is inherently resistant to microorganisms.

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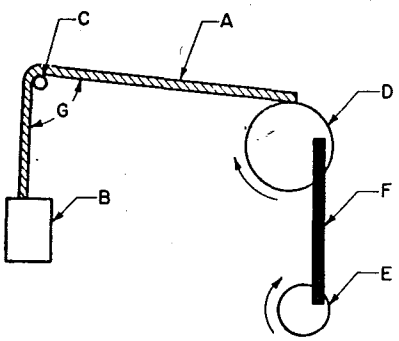


A - Webbing
B - Weight
C - Hexagonal rod
Steel, SAE 51416
Hardness, RB 97 - RB 101
Surface, cold drawn finish
Size, 0.250 ± 0.001 in. (6.35 ± 0.03 mm)
Radius on edges, 0.020 ± 0.004 in. (0.5 ± 0.1 mm)
D - Drum dia, 16 in. (40 cm)
E - Crank
F - Crank arm
G - Angle between webbing, 85 ± 2 deg

Fig. 2

7.7 COLORFASTNESS TO CROCKING - Webbing from three seat belt assemblies shall be tested by the procedure specified in AATCC Standard Test Method 8-1961, Colorfastness to Crocking (Rubbing).

7.8 COLORFASTNESS TO STAINING - Webbing from three seat belt assemblies shall be tested by the procedure specified in AATCC Standard Test Method 107-1962, Colorfastness to Water, with the following modifications: distilled water shall be used, perspiration tester shall be used, the drying time in paragraph 4 of the AATCC procedure shall be 4 hr, and the section entitled, "Evaluation Method for Staining (3)" shall be used to determine colorfastness on the AATCC Chart for Measuring Transference of Colors.

8. TEST PROCEDURES FOR HARDWARE

8.1 CORROSION RESISTANCE - All hardware from three seat belt assemblies shall be tested by ASTM B 117-64, Standard Method of Salt Spray (Fog) Testing. The period of test shall be 50 hr for all attachment hardware at or near the floor, consisting of two periods of 24 hr exposure to salt spray followed by 1 hr drying and 25 hr for all other hardware, consisting of one period of 24 hr exposure to salt spray followed by 1 hr drying. In the salt spray test chamber, the part from the three assemblies shall be oriented differently, selecting those orientations most likely to develop corrosion on the larger areas. At the end of the test, the hardware shall be washed with water to remove the salt. After drying, the hardware shall be examined for corrosion. Retractors shall be tested for corrosion resistance after 5000 cycles of operation as prescribed in paragraph 8.11.

8.2 TEMPERATURE RESISTANCE - Three seat belt assemblies having plastic or nonmetallic hardware or having retractors shall be subjected to the conditions prescribed in Procedure IV of ASTM D 756-56, Standard Methods of Test for Resistance of Plastics to Accelerated Service Conditions. The dimension and weight measurements shall be omitted. Buckles shall be unlatched and retractors shall be fully retracted during conditioning. The hardware parts after conditioning shall be used for all applicable tests in Sections 5 and 6.

8.3 ATTACHMENT HARDWARE -

8.3.1 Attachment Bolts - Attachment bolts used to secure the pelvic restraint of a seat belt assembly to a motor vehicle shall be tested in the following manner: to one head of a testing machine described in paragraph 7.2, two belt sections shall be attached. At the free end of each belt section, attachment hardware from the seat belt assembly (that is, sister hooks, and so on) shall be attached. The attachment hardware shall be fastened by the bolt in a fixture on the other head of the testing machine as shown in Fig. 3, which has a standard 7/16 -20 - UNF - 2B threaded hole in a hardened steel plate at least 0.4 in. (1 cm) in thickness; the axis of this threaded hole forms a 45 deg angle with the line of pull of the belt sections. The bolt shall be 0.2 in. (5 mm) from its fully seated position with the attachment hardware from the two belt sections attached. A force of 5000 lb (2270 kg) shall be applied. A bolt from each of three seat belt assemblies shall be tested.

8.3.2 Single Attachment Hooks - Single attachment hooks for connecting webbing to an eye bolt shall be tested in the following manner: the hook shall be held rigidly so that the retainer latch or keeper, with cotter pin or other locking device in place, is in a horizontal position as shown in Fig. 4. A force of 150 ± 2 lb (68 ± 1 kg) shall be applied vertically as near as possible to the free end of the retainer latch, and the movement of the latch by this force at the point of

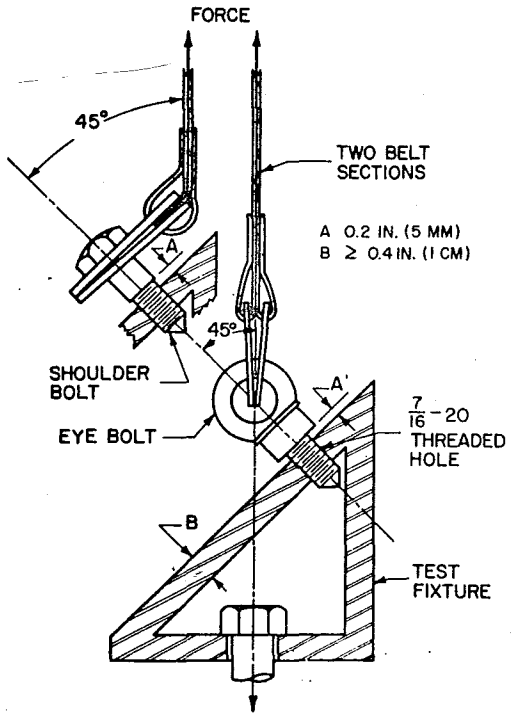


Fig. 3

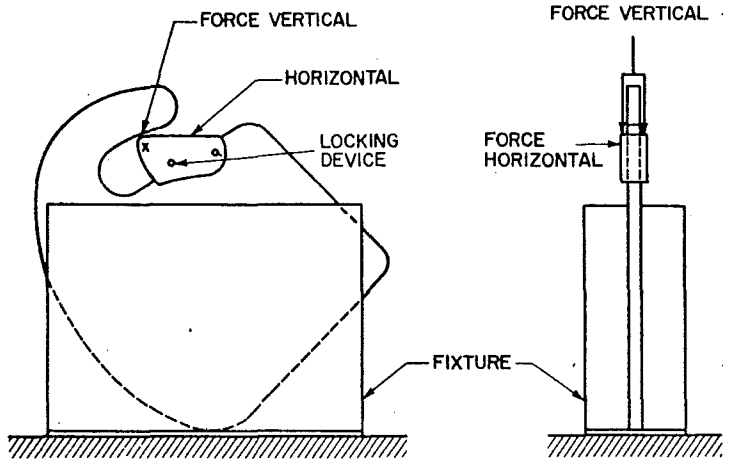


Fig. 4 - Single attachment hook

application shall be measured. The vertical force shall be released, and a force of 150 ± 2 lb (68 ± 1 kg) shall be applied horizontally as near as possible to the free end of the retainer latch. The movement of the latch by this force at the point of load application shall be measured. Alternatively, the hook may be held in other positions, provided the forces and the movements of the latch are measured at the points indicated in Fig. 4.

8.4 BUCKLE RELEASE FORCE - Three seat belt assemblies shall be tested to determine compliance with the maximum buckle release force requirements, following the assembly test in Section 9. After subjection to the force applicable for the assembly being tested, the force shall be reduced and maintained at 150 ± 10 lb (68 ± 4 kg) on the assembly loop of a Type 1 seat belt assembly, 75 ± 5 lb (34 ± 2 kg) on the components of a Type 2 seat belt assembly, or 45 ± 5 lb (20 ± 2 kg) on a Type 3 seat belt assembly. The buckle release force shall be measured by applying a force on the buckle in the manner and direction typical of that which would be employed by a seat belt occupant. For lever release buckles, the force shall be applied on the centerline of the buckle lever or finger tab in such direction as to produce maximum releasing effect. A hole 0.1 in. (2.5 mm) in diameter may be drilled through the buckle tab or lever on the centerline between 0.12-0.13 in. (3.0-3.3 mm) from its edge, and a small loop of soft wire may be used as the connecting link between the buckle tab or lever and the force measuring device.

8.5 ADJUSTMENT FORCE - Three seat belt assemblies shall be tested for adjustment force on the webbing at the buckle or other manual adjusting device, normally used to adjust the size of the assembly. With no load on the anchor end, the webbing shall be drawn through the adjusting device at a rate of 20 ± 2 in. (50 ± 5 cm) per minute and the maximum force shall be measured to the nearest 0.25 lb (0.1 kg) after the first 1 in. (25 mm) of webbing movement. The webbing shall be precycled 10 times prior to measurement.

8.6 TILT-LOCK ADJUSTMENT - This test shall be made on buckles or other manual adjusting devices having tilt-lock adjustment, normally used to adjust the size of the assembly. Three buckles or devices shall be tested. The base of the adjustment mechanism and the anchor end of the webbing shall be oriented in planes normal to each other. The webbing shall be drawn through the adjustment mechanism in a direction to increase belt length at a rate of 20 ± 2 in. (50 ± 5 cm) per minute, while the plane of the base is slowly rotated in a direction to lock the webbing. Rotation shall be stopped when the webbing locks, but the pull on the webbing shall be continued until there is a resistance of at least 20 lb (9 kg). The locking angle between the anchor end of the webbing and the base of the adjustment mechanism shall then be measured to the nearest degree. The webbing shall be precycled 10 times prior to measurement.

8.7 BUCKLE LATCH - The buckles from three seat belt assemblies shall be fully opened and closed at least 10 times. Then the buckle shall be clamped or firmly held against a flat surface so as to permit normal movement of buckle parts, but with the metal mating plate (metal-to-metal buckles) or webbing end (metal-to-webbing buckles) withdrawn from the buckle. The release mechanism shall be moved 200 times through the maximum possible travel against its stop with a force of 30 ± 3 lb (14 ± 1 kg) at a rate not to exceed 30 cpm. The buckle shall be examined to determine compliance with the performance requirements of paragraph 5.7. A metal-to-metal buckle shall be examined to determine whether partial engagement is possible by means of any technique representative of actual use. If partial engagement is possible, the maximum force of separation when in such partial engagement shall be determined.

8.8 NONLOCKING RETRACTOR - After the retractor is cycled 10 times by full extension and retraction of the webbing, the retractor and webbing shall be suspended vertically and a force of 4 lb (1.8 kg) shall be applied to extend the webbing from the retractor. The force shall be reduced to 3 lb (1.4 kg). The residual extension of the webbing shall be measured by manual rotation of the retractor drum or by disengaging the retraction mechanism. Measurements shall be made on three retractors.

8.9 AUTOMATIC LOCKING RETRACTOR - Three retractors shall be tested in a manner to permit the retraction forces to be determined exclusive of the gravitational forces on hardware or webbing being retracted. The webbing shall be fully extended from the retractor. While the webbing is being retracted the average force of retraction within ±2 in. (5 cm) of 75% extension (25% retraction) shall be determined and the webbing movement between adjacent locking segments shall be measured in the same region of extension.

8.10 EMERGENCY LOCKING RETRACTORS - Three retractors shall be tested in a manner to permit the retraction forces to be determined exclusive of the gravitational forces on the hardware or webbing being retracted. The webbing shall be fully extended from the retractor. While the webbing is being retracted the average force of retraction within ±2 in. (5 cm) of 75% extension (25% retraction) shall be determined. The retractor shall be subjected to an acceleration of 0.5 g (5 m/sec^2) within a period of 50 msec while the webbing is at 75% extension and the webbing movement before locking shall be measured under each of the following conditions: for a retractor sensitive to the rate of webbing withdrawal, the retractor shall be accelerated in the direction of webbing withdrawal while oriented horizontally and at angles of 45, 90, 135, and 180 deg to the horizontal plane; for a retractor sensitive to vehicle acceleration, the retractor shall be accelerated in three directions normal to each other while oriented horizontally and at angles of 45, 90, 135, and 180 deg to the horizontal plane, unless the retractor locks by gravitational force when tilted in any direction to an angle of 45 deg or more.

8.11 PERFORMANCE OF RETRACTORS - After completion of the temperature resistance test described in paragraph 8.2, the retractor shall be mounted in an apparatus capable of extending the webbing fully, applying a force of 20 lb (9 kg) at full extension, and allowing the webbing to retract freely and completely. The webbing shall be withdrawn from the retractor and allowed to retract repeatedly in this

apparatus until 5000 cycles are completed. The retractor and webbing shall then be subjected to the corrosion test prescribed in paragraph 8.1. After the corrosion test, the webbing shall be extended fully and allowed to dry at least 16 hr under standard laboratory conditions specified in paragraph 7.1. The performance of the retractor after the corrosion test shall be determined by withdrawing the webbing manually and allowing the webbing to retract for 25 cycles.

The retractor and webbing shall then be subjected to dust in a chamber similar to one illustrated in Fig. 5 containing about 2 lb (0.9 kg) of coarse grade dust conforming to the specification given in SAE J726a. The dust shall be agitated every 20 minutes for 5 sec by compressed air, free of oil and moisture, at a gage pressure of 80 ± 8 lb/in.^{2} (5.6 ± 0.6 kg/cm^2) entering through an orifice 0.060 ± 0.004 in. (1.5 ± 0.1 mm) in diameter.

The webbing shall be extended to the top of the chamber and kept extended at all times, except that the webbing shall be subjected to 10 cycles of complete retraction and extension within one to two minutes after each agitation of the dust. At the end of 5 hr, the assembly shall be removed from the chamber and the retractor functional performance shall be determined by withdrawing the full length of webbing manually and allowing the webbing to retract for 25 cycles.

Nonlocking and automatic locking retractors shall be subjected to 5000 additional cycles of webbing withdrawal and retraction, and emergency locking retractors shall be subjected to 45,000 additional cycles of webbing withdrawal and retraction as previously described. The locking mechanism of an emergency locking retractor shall be actuated about 10,000 times during the 50,000 cycles. At the end of test, compliance of the retractors with applicable requirements in paragraphs 5.8-5.10 shall be determined. Three retractors shall be tested for performance.

9. TEST PROCEDURES FOR ASSEMBLY PERFORMANCE

9.1 TYPE 1 SEAT BELT ASSEMBLY - Three complete seat belt assemblies including webbing, straps, buckles, adjustment and attachment hardware, and retractors, arranged in the form of a loop as shown in Fig. 6, shall be tested in the following manner:

9.1.1 The testing machine shall conform to the requirements specified in paragraph 7.2. A double-roller block shall be attached to one head of the testing machine. This block shall consist of 2 rollers 4 in. (10 cm) in diameter and sufficiently long so that no part of the seat belt assembly touches parts of the block other than the rollers during test. The rollers shall be mounted on antifriction bearings and spaced 12 in. (30 cm) between centers, and shall have sufficient capacity so that there is no brinelling, bending, or other distortion of parts which may affect the results. An anchorage bar shall be fastened to the other head of the testing machine.

9.1.2 The attachment hardware furnished with the seat belt assembly shall be attached to the anchorage bar. The anchor points shall be spaced so that the webbing is parallel in the two sides of the loop. The attaching bolt shall be parallel, or at an angle of 45 or 90 deg, to the webbing, whichever results in the greatest angle between webbing and attachment hardware, except that eye bolts shall be vertical, and attaching bolts of a seat belt assembly designed for use in specific models of motor vehicles shall

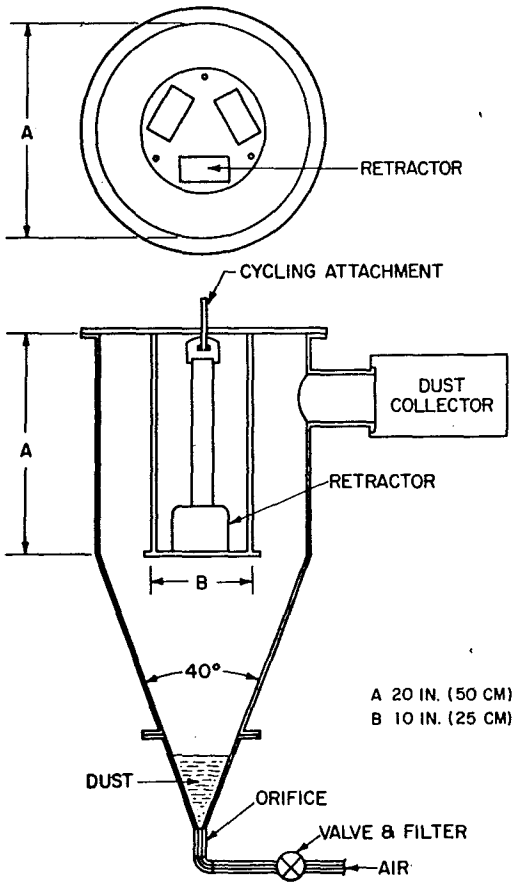


Fig. 5

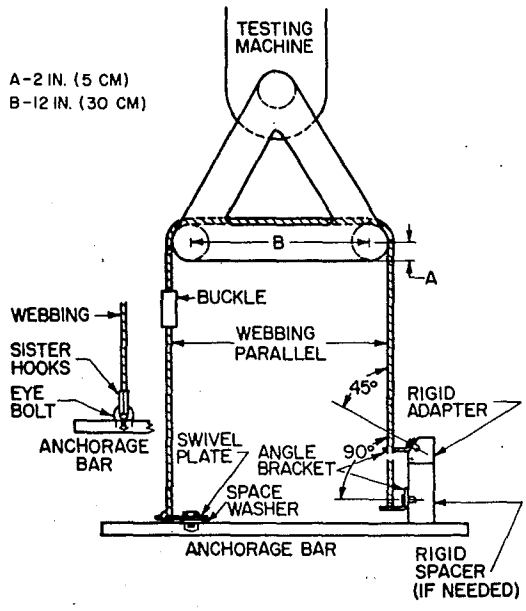


Fig. 6

be installed to produce the maximum angle in use indicated by the installation instructions.

Rigid adapters between anchorage bar and attachment hardware shall be used if necessary, to locate and orient the adjustment hardware. The adapter shall have a flat support face perpendicular to the threaded hole for the attaching bolt and adequate in area to provide full support for the base of the attachment hardware connected to the webbing. If necessary, a washer shall be used under a swivel plate or other attachment hardware that would crush or damage the webbing as the attaching bolt is tightened.

9.1.3 The length of the assembly loop from attaching bolt to attaching bolt shall be adjusted to about 51 in. (130 cm), or as near thereto as possible. A force of 55 lb (25 kg) shall be applied to the loop to remove any slack in webbing at hardware. The force shall be removed and the heads of the testing machine shall be adjusted for an assembly loop between 48-50 in. (122-127 cm) in length. The length of the assembly loop shall then be adjusted by applying a force between 20-22 lb (9-10 kg) to the free end of the webbing at the buckle, or by the retraction force of an automatic locking or emergency locking retractor. A seat belt assembly that can not be adjusted to this length shall be adjusted as closely as possible. An automatic locking retractor or an emergency locking retractor, when included in a seat belt assembly, shall be locked at the start of the test, with a tension on the webbing slightly in excess of the retractive force in order to keep the retractor locked.

The buckle shall be in location so that it does not touch the rollers during test, but, to facilitate making the buckle release test in paragraph 8.4, the buckle should be between the rollers or near a roller in one leg.

9.1.4 The heads of the testing machine shall be separated at a rate of 2-4 in. (5-10 cm) per minute until a force of 5000 ± 5 lb (2270 ± 20 kg) is applied to the assembly loop. The extension of the loop shall be determined from measurements of head separation before and after the force is applied. The force shall be decreased to 150 ± 10 lb (68 ± 4 kg) and the buckle release force measured as prescribed in paragraph 8.4.

9.1.5 After the buckle is released, the webbing shall be examined for cutting by the hardware. If the yarns are partially, or completely, severed in a line for a distance of 10% or more of the webbing width, the cut webbing shall be tested for breaking strength as specified in paragraph 7.2, locating the cut in the free length between grips. If there is insufficient webbing on either side of the cut to make such a test for breaking strength, the webbing shall be repositioned in the hardware using another seat belt assembly. A tensile force of 2500 ± 25 lb (1135 ± 10 kg) shall be applied to the components or a force of 5000 ± 50 lb (2270 ± 20 kg) shall be applied to an assembly loop. After the force is removed, the breaking strength of the cut webbing shall be determined as previously prescribed.

9.1.6 A seat belt assembly containing an emergency locking retractor or automatic locking retractor shall also be tested with the webbing fully extended. If a Type 1 seat belt assembly includes an automatic locking retractor or an emergency locking retractor the webbing and retractor shall be subjected to a tensile force of 2500 ± 25 lb (1135 ± 10 kg) with the webbing fully extended from the retractor.

9.2 TYPE 2 SEAT BELT ASSEMBLY - All components of the three seat belt assemblies shall be tested in the following manner:

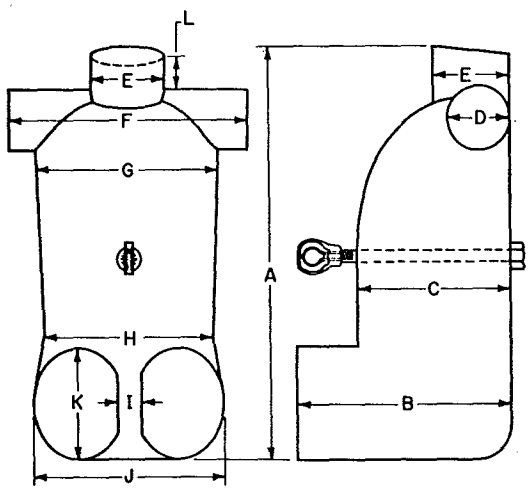
9.2.1 The pelvic restraint between anchorages shall be adjusted to a length between 48-50 in. (122-127 cm) or as near this length as possible if the design of the pelvic restraint does not permit its adjustment to this length. An automatic locking or emergency locking retractor, when included in a seat belt assembly, shall be locked at the start of the test with a tension on the webbing slightly in excess of the retracted force in order to keep the retractor locked. The attachment hardware shall be oriented to the webbing as specified in paragraph 9.1.2 and illustrated in Fig. 6. A tensile force of 2500 ± 25 lb (1135 ± 10 kg) shall be applied on the components in any convenient manner and the extension between anchorages under this force shall be measured. The force shall be reduced to 75 ± 5 lb (34 ± 2 kg) and the buckle release force measured as prescribed in paragraph 8.4.

9.2.2 The components of the upper torso restraint shall be subjected to a tensile force of 1500 ± 15 lb (680 ± 5 kg) following the procedure previously prescribed for testing pelvic restraint, and the extension between anchorages under this force shall be measured. If the testing apparatus permits, the pelvic and upper torso restraints may be tested simultaneously. The force shall be reduced to 75 ± 5 lb (34 ± 2 kg) and the buckle release force measured as prescribed in paragraph 8.4.

9.2.3 Any component of the seat belt assembly common to both pelvic and upper torso restraint shall be subjected to a tensile force of 3000 ± 30 lb (1360 ± 15 kg).

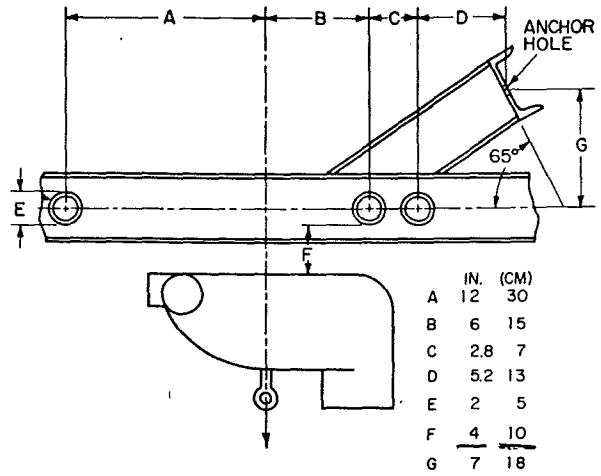
9.2.4 After the buckle is released in tests of pelvic and upper torso restraints, the webbing shall be examined for cutting by the hardware. If the yarns are partially or completely, severed in a line for a distance of 10% or more of the webbing width, the cut webbing shall be tested for breaking strength as specified in paragraph 7.2, locating the cut in the free length between grips. If there is insufficient webbing on either side of the cut to make such a test for breaking strength, the webbing shall be repositioned in the hardware using another seat belt assembly. The force applied shall be 2500 ± 25 lb (1135 ± 10 kg) for components of pelvic restraint, and 1500 ± 15 lb (680 ± 5 kg) for components of upper torso restraint. After the force is removed, the breaking strength of the cut webbing shall be determined as prescribed above.

9.2.5 A seat belt assembly containing an emergency locking retractor or automatic locking retractor shall also be tested with the webbing fully extended. If a Type 2 seat belt assembly includes an automatic locking retractor, or an emergency locking retractor, the webbing and retractor shall be subject to a tensile force of 2500 ± 25 lb (1135 ±



	IN.	CM
A	15	38
B	8	20
C	5.8	14.5
D	2.3	5.8
E	2.9	7.3
F	9	23
G	6.8	17
H	6.4	16
I	0.6	1.5
J	7.3	18.5
K	4.2	10.7
L	1.3	3.3

Fig. 7



	IN.	(CM)
A	12	30
B	6	15
C	2.8	7
D	5.2	13
E	2	5
F	4	10
G	7	18

Fig. 8

10 kg) with the webbing fully extended from the retractor or to a tensile force of 1500 ± 15 lb (680 ± 5 kg) with the webbing fully extended from the retractor if the design of the assembly permits only upper torso restraint forces on the retractor.

9.3 TYPE 3 SEAT BELT ASSEMBLY - Three seat belt assemblies including webbing, straps, buckles, adjustment and attachment hardware and retractors shall be tested in the following manner:

9.3.1 The testing machine shall conform to the requirements specified in paragraph 7.2. A torso having the dimensions shown in Fig. 7 shall be attached to one head of the testing machine through a universal joint which is guided in essentially a frictionless manner to minimize lateral forces on the testing machine. An anchorage and simulated seat back shall be attached to the other head as shown in Fig. 8.

9.3.2 Attachment hardware for an assembly having single webbing connection shall be fastened at the anchor hole shown in Fig. 8 which is centered along the length of the anchorage bar. Attachment hardware for an assembly having two webbing connectors shall be fastened at anchor holes 16 in. (40 cm) apart on the anchorage bar, equidistant from the center.

Attachment hardware for an assembly whose design precludes such attachment shall be fastened in accordance with the installation instructions. The back of the torso shall be positioned in a plane parallel to, and at a distance of 4 in. (10 cm) from the plane of the simulated seat back. The seat belt assembly shall be installed on the torso in accordance with installation instructions and the webbing to the attachment hardware shall be adjusted with effectively no slack. The heads of the testing machine shall be separated at a rate of 2-4 in. (5-10 cm) per minute until a force of 2000 lb (900 kg) is applied. The extension of the seat belt assembly shall be determined from measurement of head separation in the testing machine before and after the force is applied. The force shall be reduced to 45 ± 5 lb (20 ± 2 kg) and the release force of the buckle(s) measured as prescribed in paragraph 8.4. A seat back retainer not connected to pelvic or upper torso restraint, shall be subjected separately to a force of 2000 lb (900 kg).

9.3.3 After the buckle is released, the webbing shall be examined for cutting by the hardware. If the yarns are partially or completely severed in a line for a distance of 10% or more of the webbing width, the cut webbing shall be tested for breaking strength as specified in paragraph 7.2, locating the cut in the free length between grips. If there is insufficient webbing on either side of the cut to make such a test for breaking strength, the webbing shall be repositioned in the hardware using another seat belt assembly. A tensile force shall be applied to the components as follows: webbing in pelvic or upper torso restraints - 700 lb (320 kg); webbing in seat back retainer or webbing connecting pelvic and upper torso restraint to attachment hardware - 1500 lb (680 kg). After the force is removed, the breaking strength of the cut webbing shall be determined as previously prescribed.

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NUMERICAL INDEX

Each surface vehicle report carries a "J" number designation. Successive revisions are noted with an "a", "b", "c", etc. This index covers only those lighting reports appearing in the 1967 SAE Handbook.

LIGHTING IDENTIFICATION CODE—SAE J759 SAE Recommended Practice

Report of Lighting Committee approved November 1960 and last revised March 1961. Editorial change August 1967.

Definition—A lighting identification code is a series of standardized markings for lighting devices which a manufacturer or a supplier may use to mark his product to indicate the SAE Lighting Standard or Standards to which the device is designed to conform. The code is not intended to limit the manufacturer or supplier in applying other markings to the devices.

THE SOCIETY OF AUTOMOTIVE ENGINEERS DOES NOT APPROVE PRODUCTS; HENCE, THE USE OF MARKINGS IN ACCORDANCE WITH THIS CODE SHOULD NOT BE INTERPRETED TO MEAN THAT A DEVICE SO MARKED HAS SAE APPROVAL.

Requirements—The identification code in letters and numbers at least 1/8 in. high should be permanently marked on the lens or body where it can be observed with the device mounted in its normal position on the vehicle, except that the headlamp marking may be located where it can be observed by removing an ornamental bezel.

The identification code should consist of a series of letters and numbers in the following sequence:

1. SAE

2. One or more letters identifying the SAE Standard or Standards to which the device is designed to conform. Multipurpose devices may be marked to cover each function for which the device was originally designed and manufactured to perform, and may be used to carry out one or more of these functions.

[1] In multipurpose devices which include both reflex reflectors and turn signals, the code letters indicating reflex reflectors should always follow the turn signal designations (I or D); for example, IA or DA.

The following letters indicate applicable SAE Standard:

A—[1]Reflex reflectors—Class A	**PC**—Combination clearance and side marker lamps
D—[1]Turn signal lamps—Class B	**Q**—Turn signal operating units—Class A
E—Side turn signal lamps	**QB**—Turn signal operating units—Class B
F—Fog lamps	**QC**—Vehicular hazard warning signal operating unit
H—Sealed beam headlamps (marking applies to housing)	**R**—Back-up lamps
I—[1]Turn signal lamps—Class A	**S**—Stop lamps
K—Cornering lamps	**T**—Tail lamps
L—License plate lamps	**V**—Liquid burning emergency flares
M—Motorcycle and motor driven cycle headlamps—motorcycle type	**W1**—Warning lamps for emergency, maintenance and service vehicles
N—Motorcycle and motor driven cycle headlamps—motor driven cycle type	**W2**—Warning lamps for school buses
O—Spot lamps	**W3**—360 deg emergency warning lamps
P—Identification or parking lamps	**X**—Electric emergency lanterns
P1—Clearance or side marker lamps	**Y**—Driving lamps
	Z—Passing lamps

3. The last two numbers of a year, which mean that the code letters refer to the SAE Standards or Recommended Practices current in the year indicated.

4. Example of a code marking: SAE STDB 59.

Translated, this means SAE Standard current in 1959 for stop lamps, tail lamps, Class B turn signals, and Class B reflex reflectors.

Subsequently, if the SAE Standards referenced in the example have not been revised, and hence are still current in 1961, for instance, the manufacturer could change the year marking on this device to "61" if he so desired. The coding might thus become: SAE STDB 61. This coding change might also be made if the standards have been revised in the interim and the device meets the new requirements.

HEADLAMP BEAM SWITCHING—SAE J564a SAE Recommended Practice

Report of Lighting Division approved January 1934 and last revised by Lighting Committee April 1964.

The switching of automobile headlamps between the upper and the lower beams should be by means of a switch 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 means should be provided for indicating to the driver that the upper beam is on. The upper beam indicator should consist of a red light, with a minimum area equivalent to that of a 3/16 in. diameter circle, plainly visible to drivers of all heights under normal driving conditions when headlights are required.

SEMIAUTOMATIC HEADLAMP BEAM SWITCHING DEVICES — SAE J565a

SAE Recommended Practice

Report of Lighting Committee approved August 1954 and last revised April 1965.

1. On the approach of another legally lighted vehicle the device shall switch the lamps to the lower beam at a distance not less than that required by law, and hold the lamps on lower beam as long as there are any such vehicles approaching within this distance.
2. After passing the approaching vehicle or vehicles, if the device provides automatic return to the upper beam, the switch shall be made promptly when there is insufficient light to hold the device on lower beam.
3. Means shall be provided to enable the driver to select either the upper or lower beam under all normal conditions.
4. The device, whether operative or not, shall not interfere with the normal functioning of the beam indicator.
5. Means shall be provided to enable the driver readily and quickly to determine whether or not beam selection is being controlled automatically.
6. The device shall function throughout the range of voltage variation normally experienced on motor vehicles.
7. Provisions shall be made for adjustments of aim and sensitivity. The sensitivity adjustment may be available to the driver at the option of the manufacturer.
8. The device shall have sufficient sensitivity throughout a total lateral angle to cause a switch to lower beam when vehicles are approaching on moderate curves. On the other hand, the device shall not be excessively sensitive to road side lights.
9. The device should have sufficient sensitivity throughout a range of vertical angle to take care of variations in loading and operation on moderate variations in road grade. It should maintain the headlamp on lower beam continuously when driving on adequately lighted streets.
10. The complete device shall be mechanically sound and the electrical circuit shall be stable and dependable under all normal operating conditions and shall be so constructed that any failure of the semiautomatic device shall not result in loss of use of the lower beam.
11. The light sensitive portion of the device should be mounted at least 24 in. above the road surface. The lens or cover ahead of the light sensitive element should be accessible for cleaning.
12. If the warm-up time of the device exceeds 10 sec, it should maintain the lamp on lower beam during warm-up.

HEADLAMP MOUNTINGS—SAE J566

SAE Recommended Practice

Report of Lighting Division approved June 1936. Reaffirmed without change by Lighting Committee January 1960.

[In order to facilitate setting and maintaining the proper adjustment of headlight beams on motor vehicles in use, the following requirements for headlamp design and mounting have been adopted in the belief that they will be followed in general practice and be equally applicable to new designs of headlamps and headlamp mountings.]

Headlamps and headlamp mountings shall be so designed and constructed that:

1. The axis of the light beams may be adjusted to the left, right, up, or down from the designed setting, the amount of adjustability to be determined by practical operating conditions and the type of equipment.
2. The adjustments may be conveniently made by one man with the tools ordinarily available.
3. When the headlamps are secured, the aim will not be disturbed under ordinary conditions of service.

BULB SOCKETS—SAE J567b

SAE Standard

Report of Electric Equipment Division approved August 1915 and last revised by Lighting Committee April 1964. Editorial change August 1965.

Scope—This SAE Standard covers dimensional and performance requirements for bulb sockets intended for use in motor vehicles.

Definition

Bulb Socket is a means of properly receiving, retaining, and positioning a bulb in its intended application and for making electrical contact.

Tension Type Socket is one in which an auxiliary means is employed to augment the retention and positioning of the bulb.

Requirements—The dimensional requirements indicated in Figs. 1, 2, 3, and 4 are intended to insure functional compatibility between bulb sockets and bulbs. The pictorial part of these figures is not intended to restrict design or define mounting means. Its sole purpose is

TABLE 1—PLUG GAGES FOR SOCKETS

Socket Type	Go Gage (Dia)	No-Go Gage (Dia)
B-1, B-2, C-2	0.6035	0.6095
A-1	0.3665	0.3735

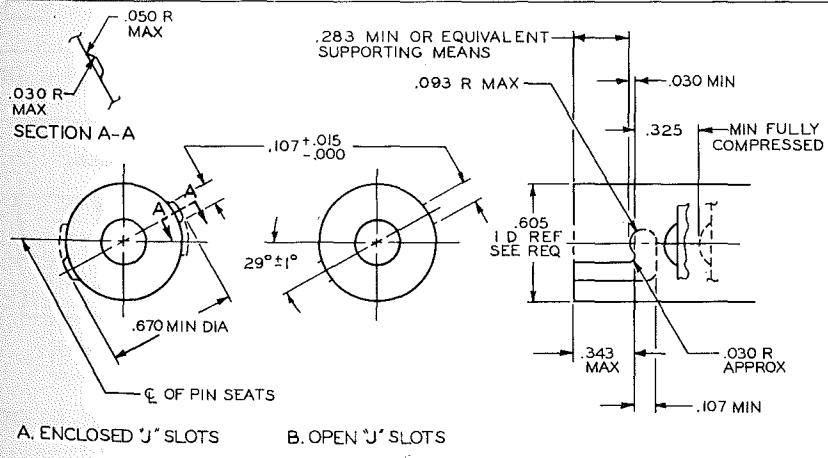


FIG. 1—SOCKET FOR BULB BASE B-1

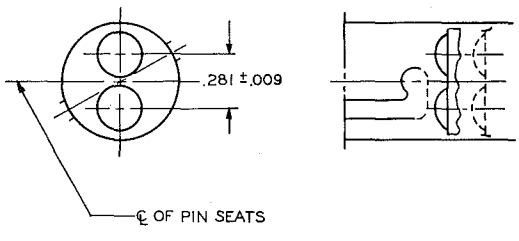


FIG. 2—SOCKET FOR BULB BASE B-2

to provide a means for defining basic dimensions. While the figures show the commonly used J-slot method of positioning the bulb, other methods may be used provided the bulb, in final position, seats in the socket in accordance with the dimensions shown.

Contacts shall be designed and spaced so that they will not short to each other or to ground.

Inside diameters of sockets are to be checked with the sockets mounted in the lamps in which they are used, employing the plug gages indicated in Table 1. In checking tension type sockets, a reasonable amount of force may be used for inserting the go gage.

The socket must retain the applicable minimum bulb gage (Fig. 5) to assure retention of the smallest allowable bulb base.

Once installed in a lamp or device, the bulb socket shall provide satisfactory electrical connections to the bulb and shall meet mechanical and electrical requirements of the lamp or device as specified in the applicable SAE Standard.

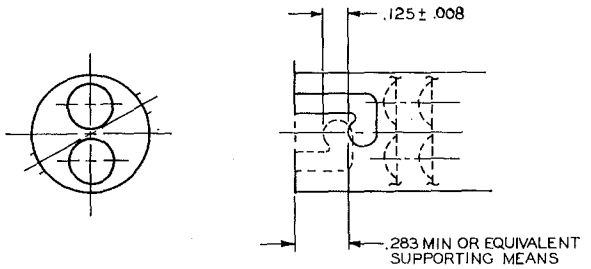


FIG. 3—SOCKET FOR BULB BASE C-2[1]

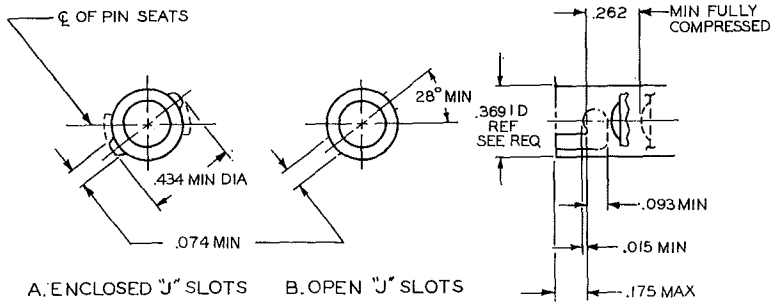


FIG. 4—SOCKET FOR BULB BASE A-1

[1]Dimensions for Figs. 2 and 3 are the same as those shown for Fig. 1 except where otherwise indicated.

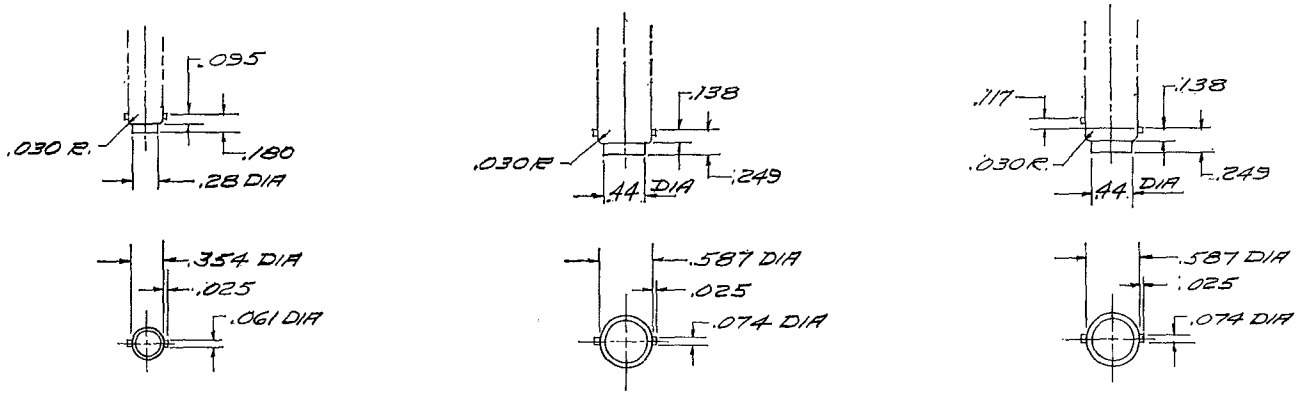
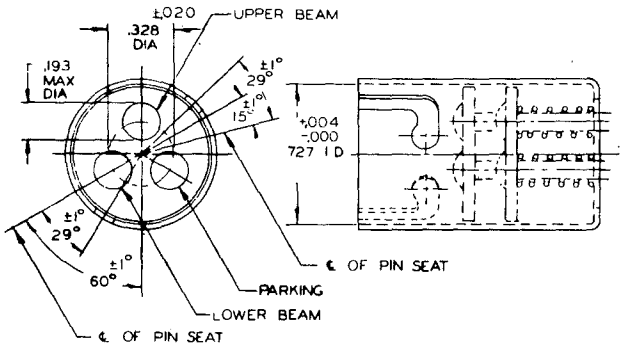


FIG. 5—MINIMUM BULB GAGES

CONNECTORS AND PLUGS—SAE J856

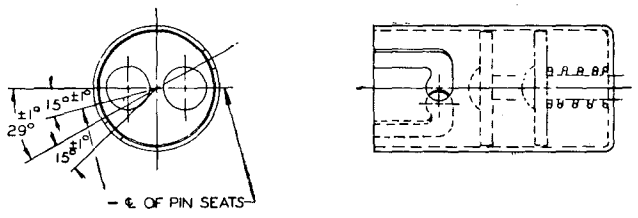
SAE Standard

Report of Electric Equipment Division approved June 1936 and last revised by Lighting Committee April 1963.



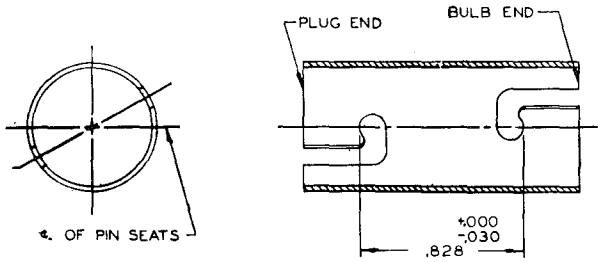
THREE WAY OFFSET PIN, LARGE FOR PLUG BASE TYPE SEE FIG. 11

FIG. 1—SOCKET, PLUG, THREE WAY OFFSET PIN, LARGE



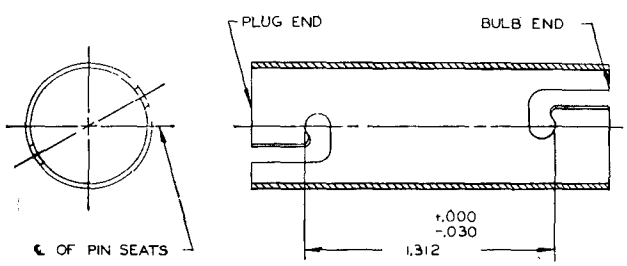
DOUBLE CONTACT OFFSET PIN FOR PLUG BASE TYPE SEE FIG. 8

FIG. 2—SOCKET, PLUG, DOUBLE CONTACT OFFSET PIN



FOR PLUG BASE TYPE SEE FIG. 9, FOR BULB BASE TYPES B-1 AND B-2

FIG. 3—SOCKET, PLUG-BULB, DOUBLE END, SHORT[1]



FOR PLUG BASE TYPE SEE FIG. 10, FOR BULB BASE TYPES B-1 AND B-2

FIG. 4—SOCKET, PLUG-BULB, DOUBLE END, LONG[1]

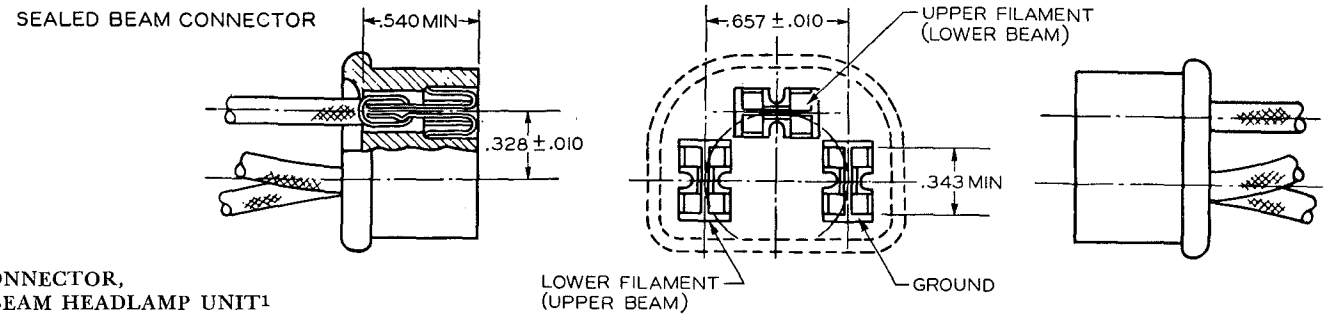


FIG. 5—CONNECTOR, SEALED BEAM HEADLAMP UNIT[1]

[1] All dimensions for the following are the same as those given for Figs. 1 and 2, except where otherwise indicated.

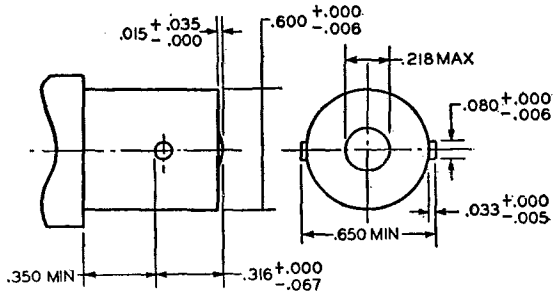


FIG. 6—PLUG, SINGLE CONTACT

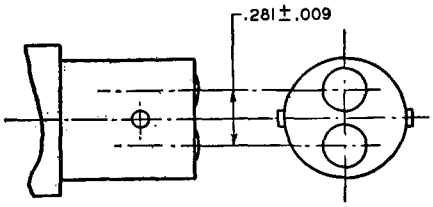


FIG. 7—PLUG, DOUBLE CONTACT

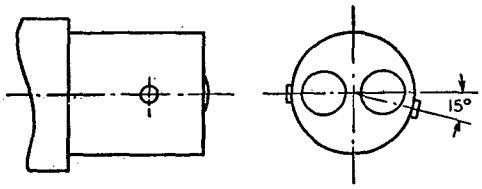


FIG. 8—PLUG, DOUBLE CONTACT OFFSET PIN[2]

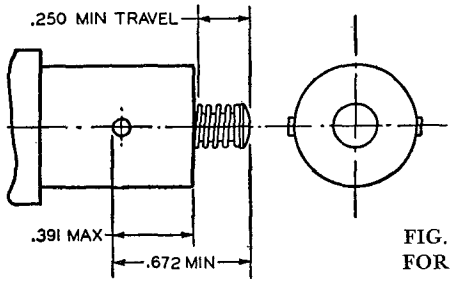


FIG. 9—PLUG, SINGLE CONTACT FOR SHORT DOUBLE END SOCKET[2]

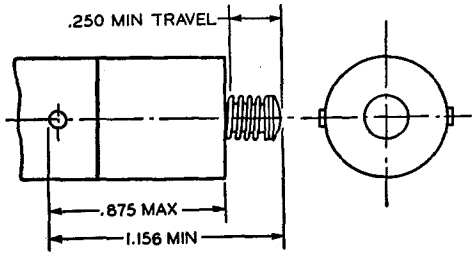


FIG. 10—PLUG, SINGLE CONTACT FOR LONG DOUBLE END SOCKET[2]

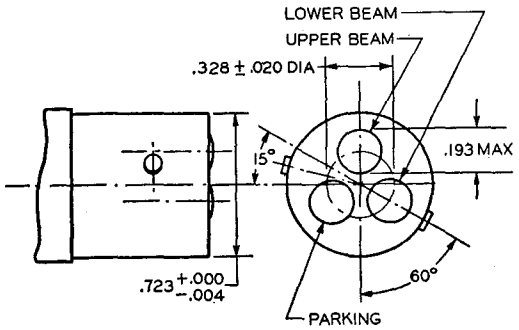


FIG. 11—PLUG, THREE WAY OFFSET PIN, LARGE[2]

[2] All dimensions for the following are the same as those given for Figs. 6 and 7, except where otherwise indicated.

SOCKETS RECEIVING PREFOCUS BASE LAMPS—SAE J568 SAE Standard

Report of Lighting Committee approved January 1951. Reaffirmed without change February 1959.

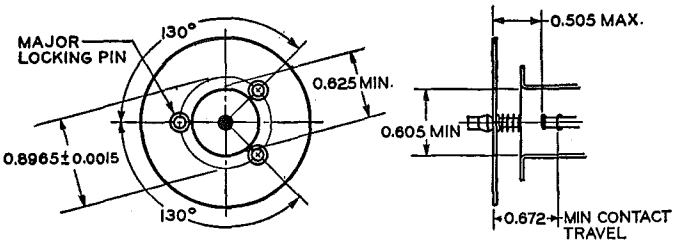


FIG. 1—PREFOCUS SOCKET FOR TYPE E-1 BASE

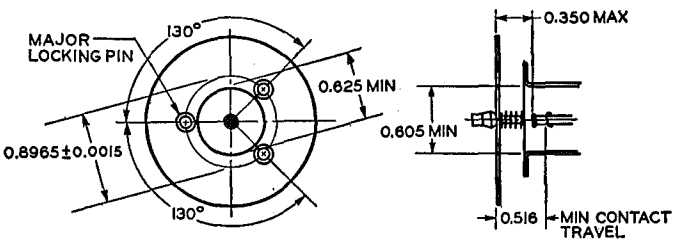


FIG. 2—PREFOCUS SOCKET FOR TYPE F-1 BASE

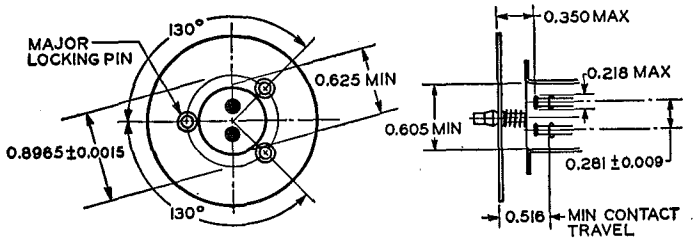


FIG. 3—PREFOCUS SOCKET FOR TYPE F-2 BASE

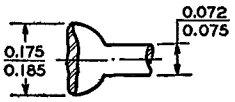


FIG. 4—DETAIL OF LOCKING PIN

LAMP BULBS AND BASES — SAE J569c SAE Standard

Report of Lighting Division approved March 1918 and last revised by Lighting Committee May 1967.

BULB, BASE, AND FILAMENT TYPES

Bulb, Base, and Filament Types—Shown in Figs. 1, 2, and 3, respectively. The filament center length is measured from the center of the filament.

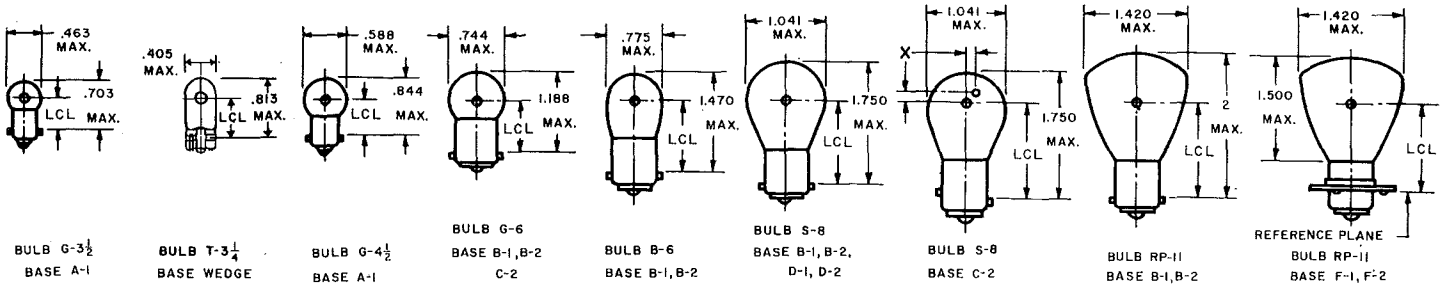


FIG. 1—BULB TYPES

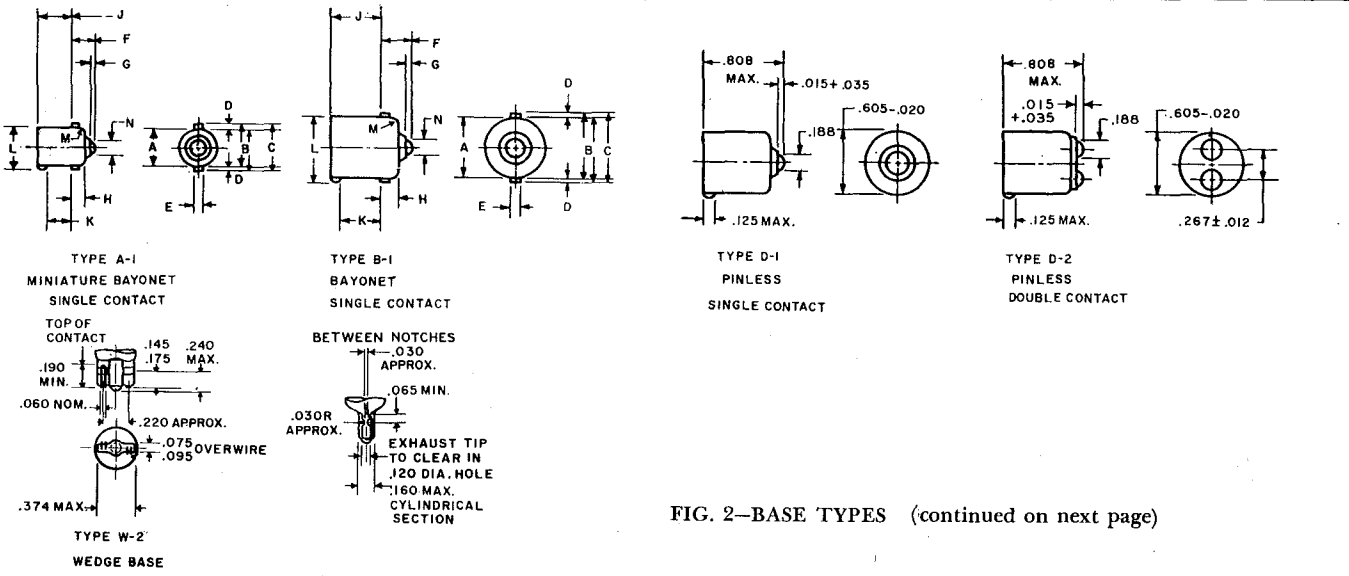


FIG. 2—BASE TYPES (continued on next page)

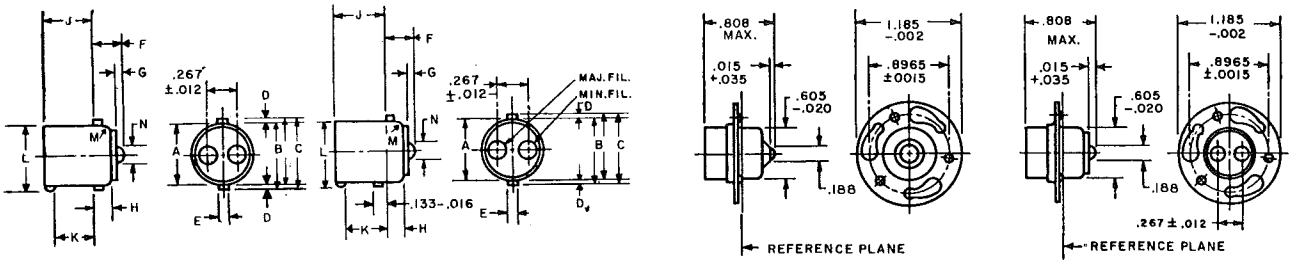


FIG. 2—BASE TYPES

TABLE I—BASE DIMENSIONS[a]

Dimension	Bayonet (B-1, B-2, C-2)	Miniature (A-1)	Dimension	Bayonet (B-1, B-2, C-2)	Miniature (A-1)	Dimension	Bayonet (B-1, B-2, C-2)	Miniature (A-1)
A[c]	0.5925–0.6025	0.354–0.366	E	0.074–0.080	0.061–0.067	K	0.350 min	0.180 min
B	0.616–0.636	0.384–0.400	F	0.249–0.316[b]	0.180–0.255	L	0.645 max	0.410 max
C	0.668 max	0.432 max	H	0.138–0.170	0.095–0.131	M	0.032 nom	0.032 nom
D	0.025 min	0.025 min	J	0.492–0.508	0.300–0.324	N	0.188 nom	0.156 nom

[a] Apply to bases on complete lamp bulbs.
[b] On bases B-2, C-2, D-2, and F-2 heights of solder contacts are to be within 0.020 in. of each other.
[c] Both minimum and maximum to be measured with ring gage. Applies to all parts of base except within 1/8 in. from bulb end.

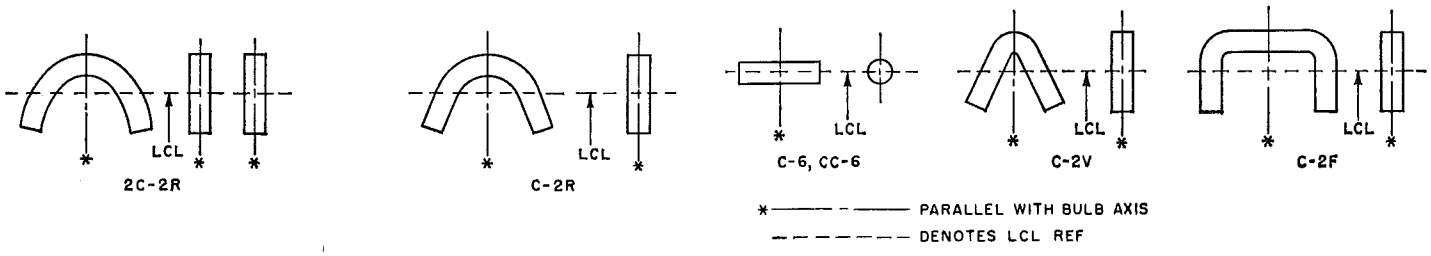


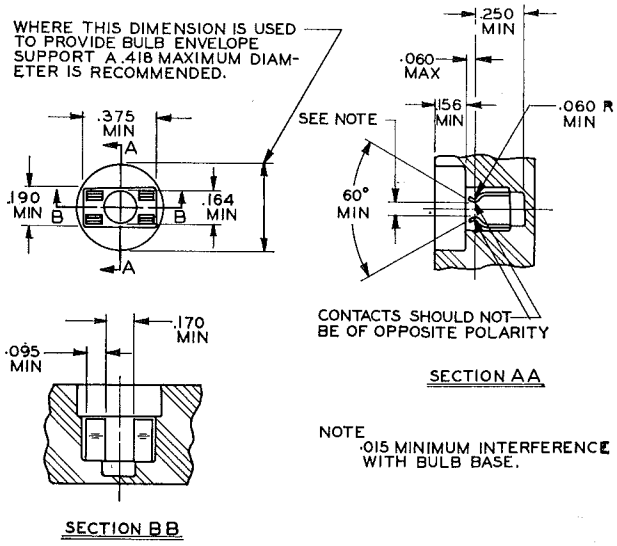
FIG. 3—FILAMENT TYPES

WEDGE BASE TYPE SOCKET—SAE J822

SAE Recommended Practice

Report of Lighting Committee approved April 1962.

Scope—This SAE Recommended Practice is intended to provide uniform dimensions for sockets for wedge base type bulbs employed in automotive practice. The dimensions indicated in the figure correspond to dimensions for wedge base type bulbs indicated in SAE J569.



DIMENSIONAL SPECIFICATIONS FOR SEALED BEAM HEADLAMP UNITS — SAE J571b

SAE Standard

Report of Lighting Division approved February 1940 and last revised by Lighting Committee April 1965.

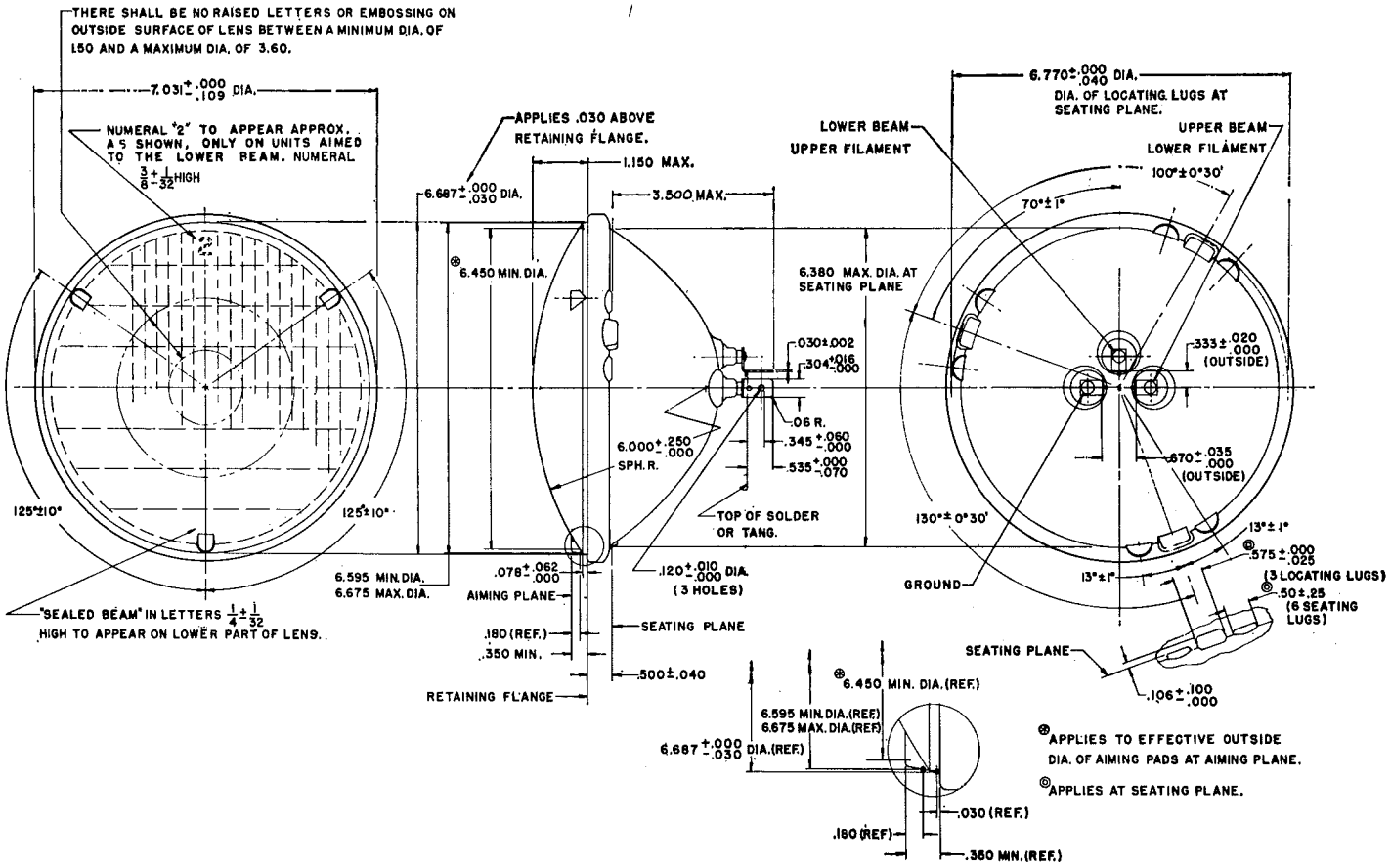


FIG. 1—SEALED BEAM HEADLAMP UNIT, 7 IN. DIAMETER

General Requirements for Sealed Beam Headlamp Units (Figs. 1, 3, and 4)—Manufacturer's name and/or trade mark to appear on lens.

The face of letters, numbers or other symbols molded on the surface of the lens, shall not be raised more than 0.020.

Mark trade number and voltage on unit.

The unit shall be designed so that with the aiming plane normal to the photometer axis, the beam shall meet the SAE photometric specifications. See SAE Recommended Practice, Lighting Inspection Code—SAE J599, for visual aiming instructions.

Aiming pad designs may vary but must meet limiting dimensions shown.

Intersection of vertical and horizontal centerline through contacts must fall within 0.25 of axis of unit.

General Requirements for Sealed Beam Headlamp Mounting Rings (Figs. 2 and 5)—Mounting rings have three locating notches, one of which is narrower than the others. The narrow notch is shown in the preferred location at a 7 o'clock orientation. However, the narrow notch may be located at 2 o'clock.

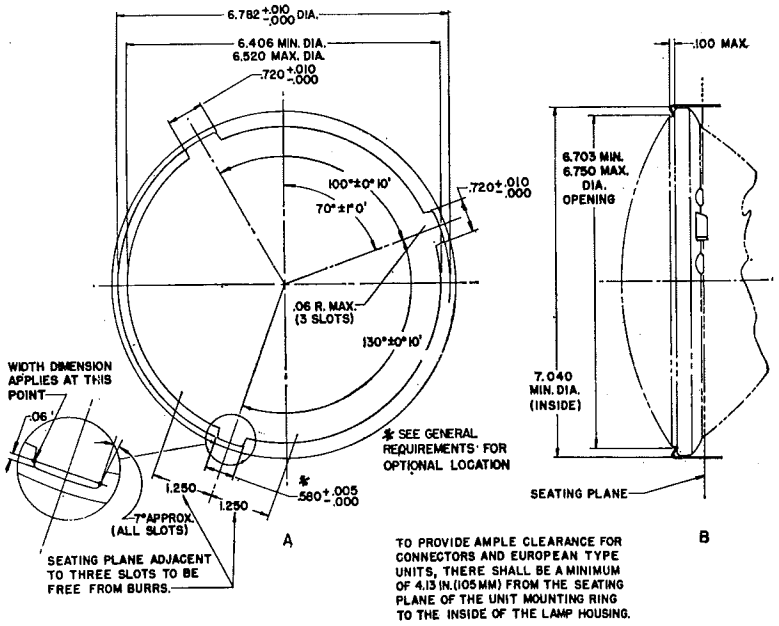


FIG. 2—(A) FRONT VIEW OF SLOTS OR NOTCHES FOR 7 IN. DIAMETER SEALED BEAM HEADLAMP MOUNTING RING OR LAMP BODY, AND (B) SEALED BEAM HEADLAMP UNIT RETAINING RING

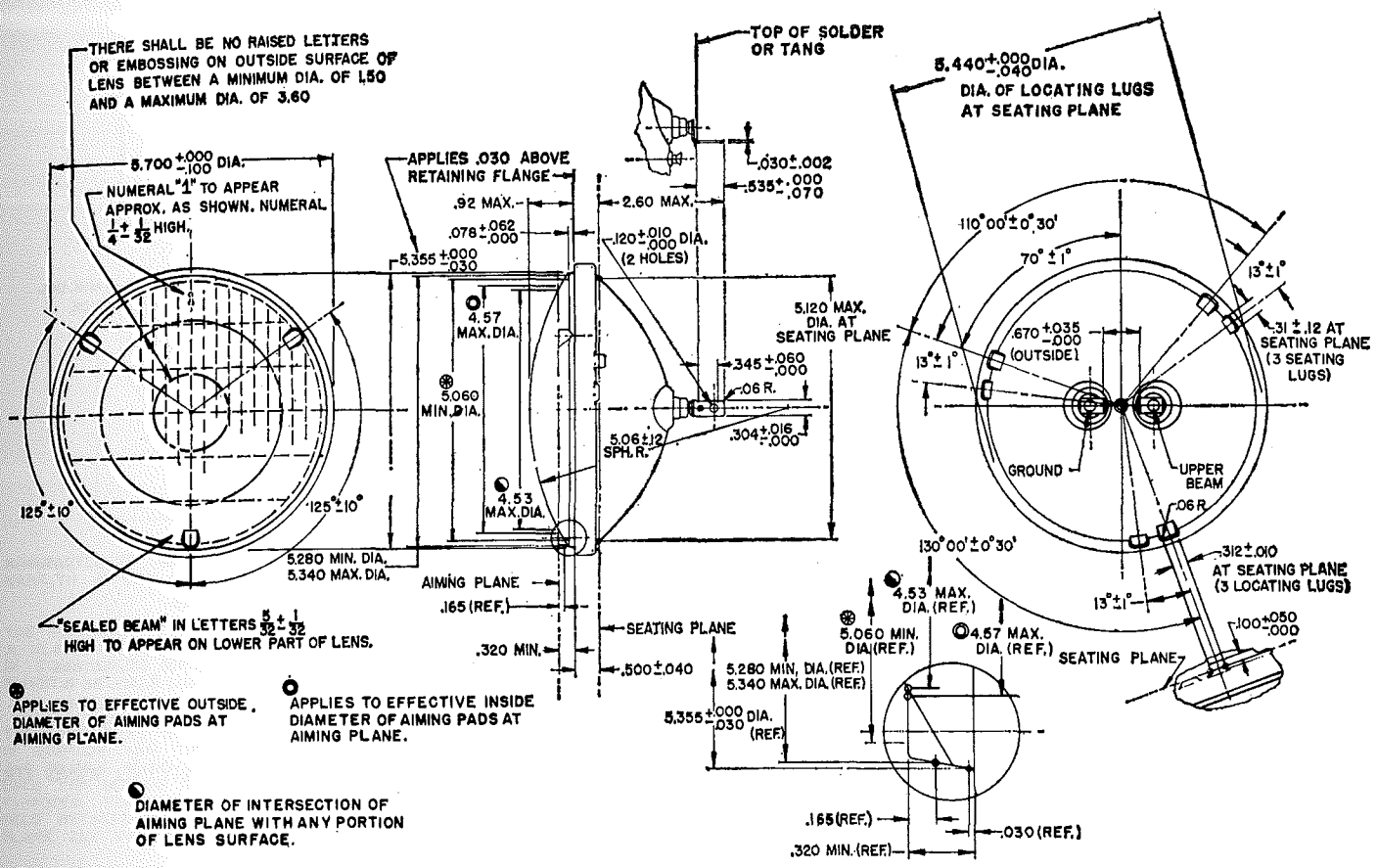
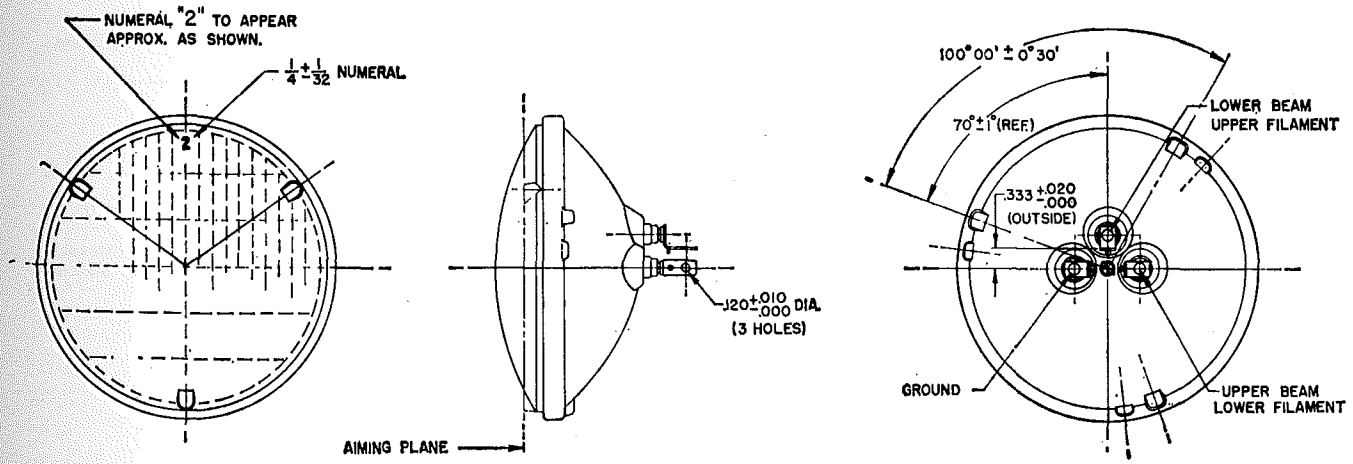


FIG. 3—TYPE 1 SEALED BEAM HEADLAMP UNIT, 5¾ IN. DIAMETER



NOTE: SAME AS TYPE 1 SEALED-BEAM HEADLAMP UNIT, 5¾ IN. DIAMETER, EXCEPT AS SHOWN.

FIG. 4—TYPE 2 SEALED BEAM HEADLAMP UNIT, 5¾ IN. DIAMETER

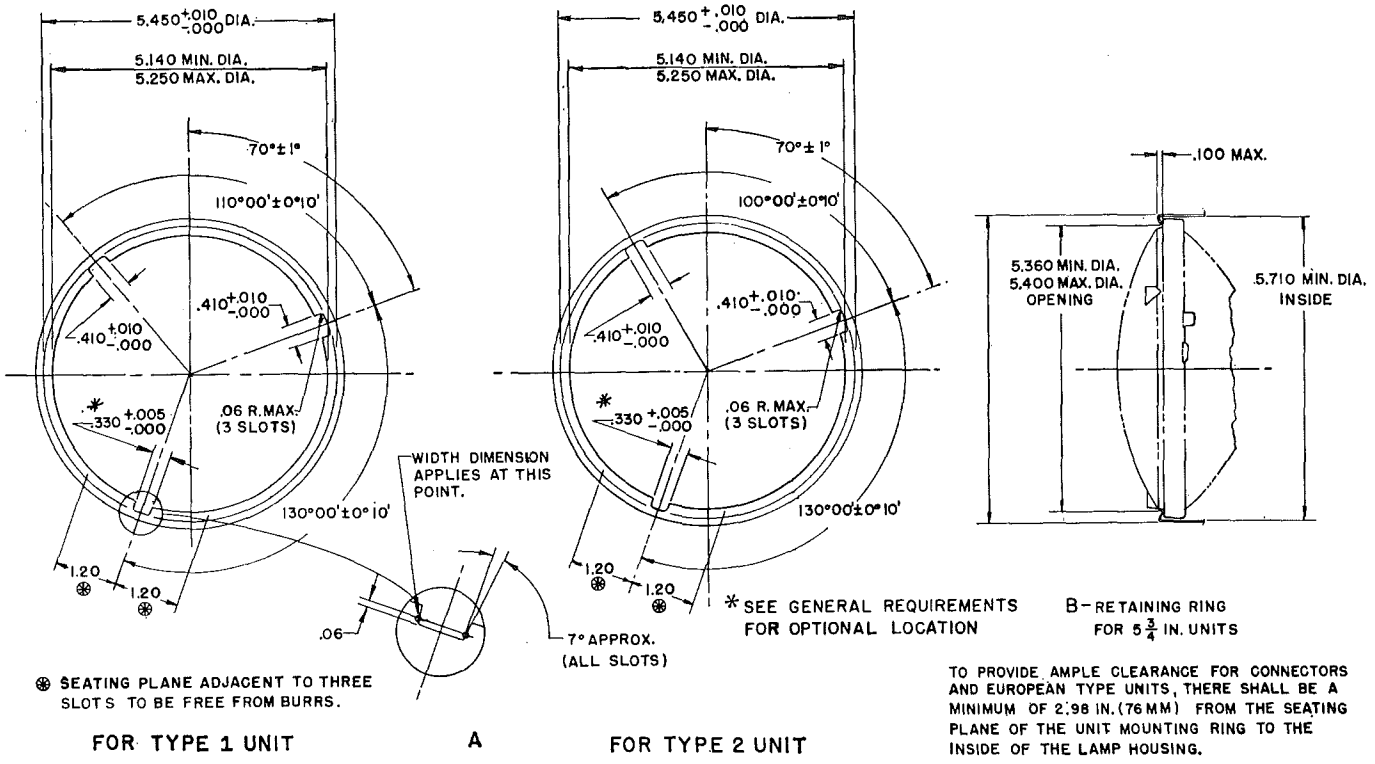


FIG. 5—(A) FRONT VIEW OF SLOTS OR NOTCHES FOR 5¾ IN. DIAMETER SEALED BEAM HEADLAMP MOUNTING RING OR LAMP BODY, AND (B) SEALED BEAM HEADLAMP UNIT RETAINING RING

DIMENSIONAL SPECIFICATIONS FOR GENERAL SERVICE SEALED LIGHTING UNITS—SAE J760

SAE Recommended Practice

Report of Lighting Committee approved March 1961.

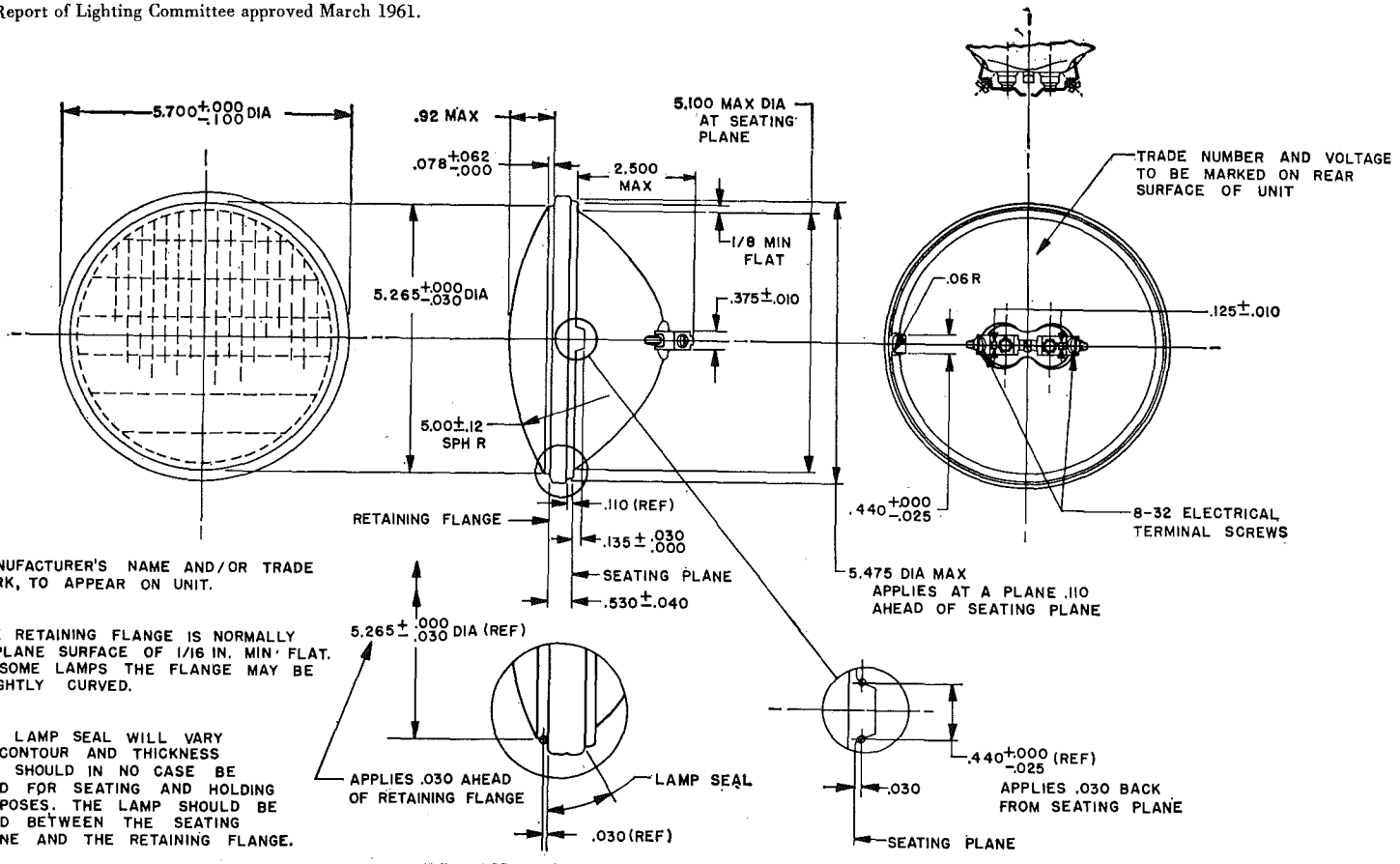


FIG. 1—DIMENSIONS OF 5¾ IN. DIA SEALED LIGHTING UNIT

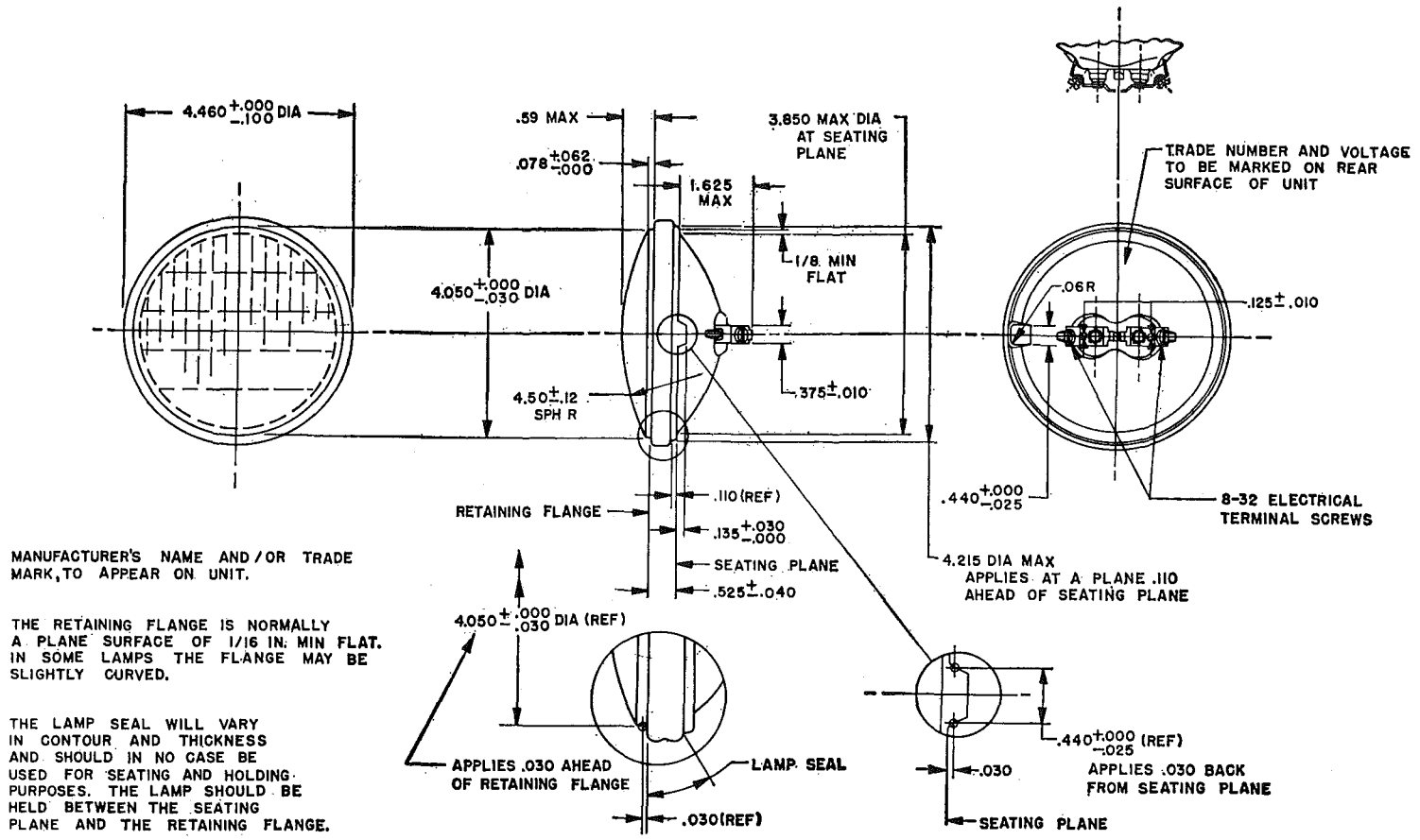
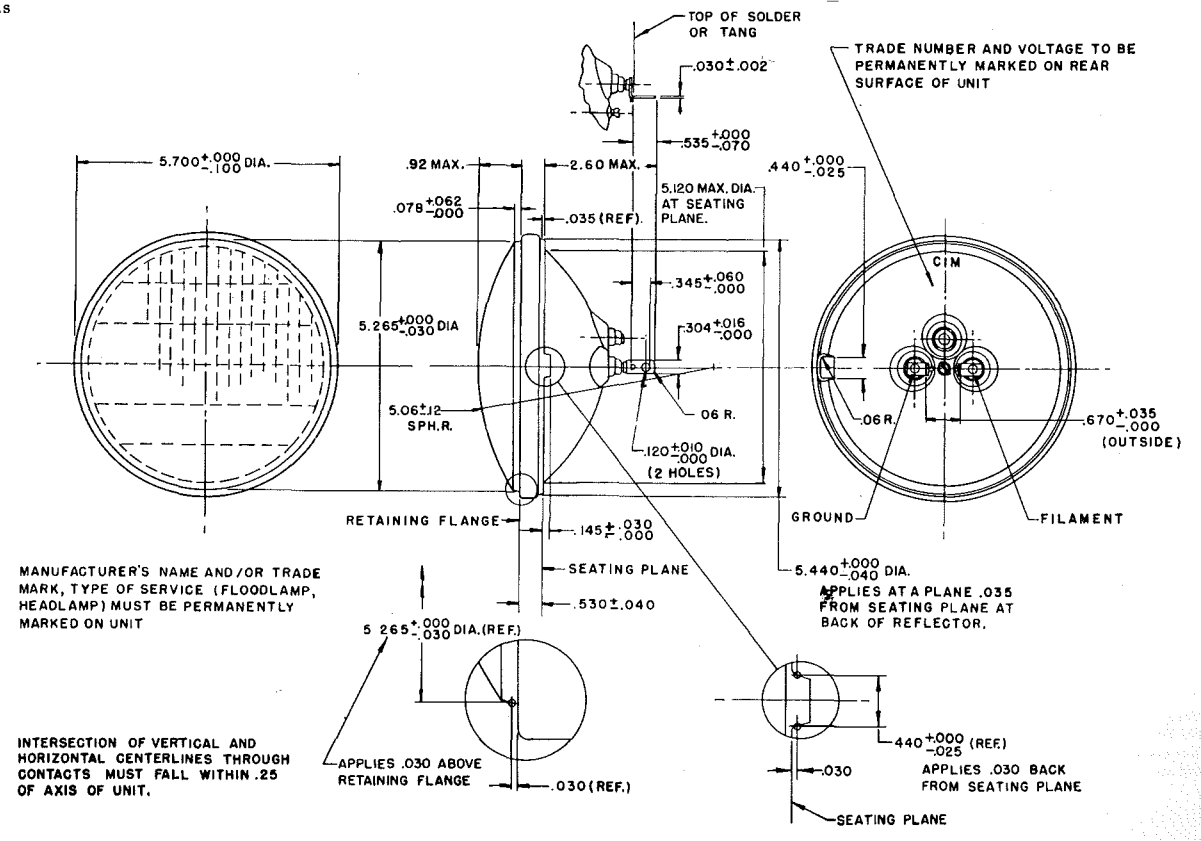


FIG. 2—DIMENSIONS OF 4½ IN. DIA SEALED LIGHTING UNIT

DIMENSIONAL SPECIFICATIONS FOR SEALED LIGHTING UNIT FOR CONSTRUCTION AND INDUSTRIAL MACHINERY—SAE J572 SAE Standard

Report of Contruction and Industrial Machinery Technical Committee and Lighting Committee approved May 1951 and last revised February 1959.s



LAMP BULBS AND SEALED UNITS—SAE J573b

SAE Standard

Report of Lighting Division approved March 1918 and last revised by Lighting Committee August 1966.

TABLE 1—MOTOR-VEHICLE ELECTRIC LAMP BULBS (FOR NEW DESIGNS OR ORIGINAL EQUIPMENT)

Typical Services[a]	Trade No.	Design					Rated Average Lab Life Design v, hr	Filament				Bulb Type[b]	Base	
		Mean Spherical, cp	CP Tolerance ±, %	Volts	Amps	Amp Tolerance ±, %		Type	Light Center Length (LCL), in.	LCL Tolerance, ±	Axial Alignment Tolerance, ±		Type[b]	Description
6-v Circuits														
A, C	51	1	20	7.5	0.22	10	1000	C-2R	0.500	0.093	0.093	G-3-1/2	A-1	Min Bay.
A	55	2	12	7.0	0.41	7	500	C-2R	0.562	0.093	0.093	G-4-1/2	A-1	Min Bay.
L, M, P, T	63	3	8	7.0	0.63	5	1000	C-2R	0.750	0.093	0.093	G-6	B-1	SC Bay.
E	81[c]	6	9	6.5	1.02	5	500	C-2R	0.750	0.093	0.093	G-6	B-1	SC Bay.
E	209	15	9	6.5	1.78	5	100	C-6	1.062	0.062	0.062	B-6	B-1	SC Bay.[f]
E	210	15	9	6.5	1.78	5	100	C-6	1.062	0.062	0.062	B-6	B-2	DC Bay.[f]
E, D, S	1129	21	7	6.4	2.63	4	200	C-6	1.250	0.040	0.040	S-8	B-1	SC Bay.[f]
B	1133	32	7	6.2	3.91	4	200	C-2R	1.250	0.040	0.040	RP-11	B-1	SC Bay.[f]
D, L, S, T, P	1154	21	8	6.4	2.63	5	200	C-6	1.250	0.040	0.040	S-8	C-2	DC Bay.[f]
		3	12	7.0	0.75	8	1000	C-6	[e]	[e]	[e]	—	—	Indexing
12-v Circuits														
A, C	53	1	20	14.4	0.12	10	1000	C-2V	0.500	0.093	0.093	G-3-1/2	A-1	Min Bay.
A, C, H	53X	1	20	14.4	0.12	10	1000	C-2F	0.500	0.093	0.093	G-3-1/2	A-1	Min Bay.
A, C	57	2	20	14.0	0.24	10	500	C-2V	0.562	0.093	0.093	G-4-1/2	A-1	Min Bay.
A, C, H	57X	2	20	14.0	0.24	10	500	C-2F	0.562	0.093	0.093	G-4-1/2	A-1	Min Bay.
A, L, M, T	67	4	15	13.5	0.59	8	[d]	C-2R	0.812	0.093	0.093	G-6	B-1	SC Bay.
E, M	89	6	15	13.0	0.58	8	750	C-2R	0.750	0.093	0.093	G-6	B-1	SC Bay.
E, M	90	6	15	13.0	0.58	8	750	C-2R	0.750	0.093	0.093	G-6	B-2	DC Bay.
A, C	158	2	20	14.0	0.24	10	500	C-2V	0.562	0.093	0.093	T-3-1/4	W-2	Wedge
A, C	161	1	20	14.0	0.19	10	1500	C-2F	0.562	0.093	0.093	T-3-1/4	W-2	Wedge
A, C	194	2	20	14.0	0.27	10	1500	C-2F	0.562	0.093	0.093	T-3-1/4	W-2	Wedge
A, E, H, M, T	631	6	20	14.0	0.63	10	1000	2C-2R	0.750	—	—	G-6	B-1	SC Bay.
E	1003	15	9	12.8	0.94	5	100	C-6	1.062	0.062	0.062	B-6	B-1	SC Bay.[f]
E	1004	15	9	12.8	0.94	5	100	C-6	1.062	0.062	0.062	B-6	B-2	DC Bay.[f]
D, L, P, S, T	1034	32	10	12.8	1.80	5	200	C-6	1.250	0.040	0.040	S-8	C-2	DC Bay.[f]
		4	12	14.0	0.51	8	[d]	C-6	[e]	[e]	[e]	—	—	Indexing
B, D, S	1073	32	10	12.8	1.80	5	200	C-6	1.250	0.040	0.040	S-8	B-1	SC Bay.[f]
B, D, S	1141	21	10	12.8	1.44	6	500	C-6	1.250	0.040	0.040	S-8	B-1	SC Bay.[f]
B, D, S	1142	21	10	12.8	1.44	6	500	C-6	1.250	0.040	0.040	S-8	B-2	DC Bay.[f]
A, H, M, T, L	1155	4	12	13.5	0.59	8	[d]	2C-2R	0.812	—	—	G-6	B-1	SC Bay.[f]
B, D, H, S	1156	32	10	12.8	2.10	5	600	C-6	1.250	0.040	0.040	S-8	B-1	SC Bay.[f]
D, H, L, P, S, T	1157	32	10	12.8	2.10	5	600	C-6	1.250	0.040	0.040	S-8	C-2	DC Bay.[f]
		4	12	14.0	0.59	8	[d]	C-6	[e]	[e]	[e]	—	—	Indexing
G	1195	50	12	12.5	3.00	7	300	C-2V	1.250	0.030	0.030	RP-11	B-1	SC Bay.[f]
G	1507	50	12	12.5	3.00	7	300	C-2V	0.875	0.010	0.010	RP-11	F-1	SC Prefocus
A, C, H	1895	2	20	14.0	0.27	10	1500	C-2F	0.562	0.093	0.093	G-4-1/2	A-1	Min Bay.

[a] Letter designations are defined as follows: A-Instrument; B-Back-up; C-Indicator; D-Turn signal; E-Interior; G-Auxiliary service; H-Heavy duty service; L-License; M-marker, clearance, and identification; P-Parking; S-Stop; T-Tail.

[b] See SAE J569.

[c] When bulb No. 81 is operated at 5.5 v, it supplies approximately 3 cp. Therefore, it may be used instead of the 3 cp No. 63 in commercial vehicle applications wherein relatively high voltage drop is experienced at the end of long lines.

[d] Over 2000 hr at 14 v.

[e] Filament spacing is denoted by dimension S(110±0.020 in.) in SAE J569, Fig. 1.

[f] Plane of pins with respect to filament is 90±15 deg. On remaining types filament orientation is random.

TABLE 2—SEALED UNITS (FOR NEW DESIGNS OR ORIGINAL EQUIPMENT)

Type of Service[a]	Trade No.	Design		Rated Average Lab. Life, hr	Max Amps at Design Volts	Filament Type	Bulb Type	Dimensional Specification	Terminals	
		Watts	Volts						No.	Type
6-Volt Circuits at 7.0v[b]										
H	6006	50–40	6.1–6.2	75–150	8.60–6.80	C-6—C-6	PAR 56	Fig. 1[c]	3	Lugs
F	4012	35	6.2	80	5.93	C-6	PAR 46	Fig. 1[d]	2	Screws
F	4015	35	6.2	80	5.93	C-6	PAR 36	Fig. 2[d]	2	Screws
S	4515	30	6.4	35	4.95	C-6	PAR 36	Fig. 2[d]	2	Screws
S	4535	30	6.4	35	4.95	C-6	PAR 46	Fig. 1[d]	2	Screws
12-Volt Circuits at 14.0v[b]										
H	4001	37.5	12.8	200	3.14	C-6	PAR 46	Fig. 3[c]	2	Lugs
H	4002	37.5–50	12.8–12.8	200–320	3.14–4.20	C-6—C-6	PAR 46	Fig. 4[c]	3	Lugs
H, X	4005	37.5–50	12.8–12.8	240–400	3.14–4.20	C-6—C-6	PAR 46	Fig. 4[c]	3	Lugs
H, X	4006	37.5	12.8	240	3.14	C-6	PAR 46	Fig. 3[c]	2	Lugs
S	4404	30	12.8	35	2.58	C-6	PAR 36	Fig. 2[d]	2	Screws
S	4405	30	12.8	35	2.58	CC-6	PAR 36	Fig. 2[d]	2	Screws
F	4412	35	12.8	100	2.93	C-6	PAR 46	Fig. 1[d]	2	Screws
F	4415	35	12.8	100	2.93	C-6	PAR 36	Fig. 2[d]	2	Screws
H	6012	50–40	12.8–12.8	200–320	4.20–3.36	C-6—C-6	PAR 56	Fig. 1[c]	3	Lugs
H, X	6013	50–40	12.8–12.8	240–400	4.20–3.36	C-6—C-6	PAR 56	Fig. 1[c]	3	Lugs

[a] Letter designations are defined as follows: F-Fog; H-Sealed Beam Headlamp; S-Spot; X-Heavy Duty Service.

[b] For convenience and simplification of life testing, all lamps designed for use on 6v circuits are life tested at 7v, and all lamps designed for use on 12v circuits are life tested at 14v. In general the life at average service voltages is longer.

[c] See SAE J571, Dimensional Specifications for Sealed Beam Headlamp Units.

[d] See SAE J760, Dimensional Specifications for General Service Sealed Lighting Units.

TEST FOR MOTOR VEHICLE LIGHTING DEVICES AND COMPONENTS — SAE J575d

SAE Standard

Report of Lighting Division approved May 1942 and last revised by Lighting Committee November 1966. Editorial change August 1967.

A. Scope—This standard covers standardized basic tests, test methods. and requirements applicable to many of the lighting devices and components covered by SAE Standards, Recommended Practices and Information Reports. Table 1 provides a convenient reference indicating which of these tests and requirements in this standard apply to each device or component.

B. Samples for Tests—Samples submitted for laboratory test shall be representative of the devices as regularly manufactured and marketed. Each sample shall include not only the device but also accessory equipment necessary to operate it in normal 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.

C. Bulbs—Unless otherwise specified, bulbs used in the tests should be supplied by the laboratory and should be representative of standard bulbs in regular production. They should be selected for accuracy in accordance with specifications listed in Table 1 of SAE Standard, Lamp Bulbs and Sealed Units—SAE J573, and should be operated at their rated mean spherical candlepower, except as otherwise specified. Where special bulbs are specified, they should be submitted with the devices and the same or similar bulbs used in the tests and operated at their rated mean spherical candlepower.

D. Laboratory Facilities—The laboratory shall be equipped to test the sample in accordance with the requirements of the SAE Standard or Recommended Practice for the specific device.

E. Vibration Test—A sample unit, as mounted on the support supplied, shall be bolted to the anvil end of the table of the vibration test machine and vibrated approximately 750 cpm through a distance of 1/8 in. The table shall be spring mounted at one end and fitted with steel calks on the under side of the other end. These calks are to make contact with the steel anvil once during each cycle at the completion of the fall. The rack shall be operated under a spring tension of 60 to 70 lb. This test shall be continued for 1 hr.

The unit shall then be examined. Any unit showing evidence of material physical weakness, lens or reflector rotation, displacement or rupture of parts except bulb failures, shall be considered to have failed, provided that rotation of lens or reflector shall not be considered as a

TABLE 1—APPLICABLE TEST PROCEDURES

Device	SECTION												
	SAE Report No.	SAE Identification Code Letters	B Samples	C Bulbs	D Lab Facilities	E Vibration	F Moisture	G Dust	H Corrosion	I Color	J Photometry	K Out-of-Focus	L Warpage
Sealed Beam Headlamp Units	J579		x		x					x	x		
Sealed Beam Headlamps	J580	H	x		x	x			x				
Driving Lamps	J581	Y	x	x	x	x	x	x	x	x	x	x	x
Passing Lamps	J582	Z	x	x	x	x	x	x	x	x	x	x	x
Fog Lamps	J583	F	x	x	x	x	x	x	x	x	x	x	x
Motorcycle and Motor Driven Cycle Headlamps	J584	M	x	x	x	x	x	x	x	x	x	x	
Tail Lamps	J585	T	x	x	x	x	x	x	x	x	x		x
Stop Lamps	J586	S	x	x	x	x	x	x	x	x	x		
License Plate Lamps	J587	L	x	x	x	x	x	x	x	x			x
Turn Signal Lamps	J588	I D	x	x	x	x	x	x	x	x	x		x
Turn Signal Operating Units	J589	Q QB	x	x	x								
Spot Lamps	J591	O	x	x	x	x	x	x	x	x			
Identification or Parking Lamps Clearance or Side Marker Lamps Combination Clearance and Side Marker Lamps	J592	P P1 PC	x x x	x x x	x x x	x x x	x x x	x x x	x x x	x x x	x x x		x x x
Back Up Lamps	J593	R	x	x	x	x	x	x	x	x	x		
Reflex Reflectors	J594	A B	x		x	x	x		x	x			
Warning Lamps—Emergency, Maintenance and Service Vehicles	J595	W1	x	x	x	x	x	x	x	x	x		x
Electric Emergency Lanterns	J596	X	x		x	x	x	x	x	x			x
Liquid Burning Emergency Flares	J597	V	x		x	x			x				
Sealed Units for Construction and Industrial Machinery	J598				x						x		
Emergency Reflex Reflectors	J774		x			x	x		x	x			
360 Deg Emergency Warning Lamps	J845	W2	x	x	x	x	x	x	x				x
Cornering Lamps	J852	K	x		x	x	x	x	x	x			x
Warning Lamps—School Buses	J887	W3	x	x	x	x	x	x	x				x
Vehicular Hazard Warning Signal Operating Unit	J910	QC	x	x	x								
Side Turn Signal Lamps	J914	E	x	x	x	x	x	x	x	x	x		x

[a] This table lists only those test procedures and requirements which are stated in this standard. Reports listed in second column should be checked for possible additional requirements for each device.

TABLE 2[a]—PHOTOMETRIC MINIMUM CANDLEPOWER REQUIREMENTS

Test Points, deg		Tail Lamps[b]			Stop Lamps and Class B Turn Signals[b, d]				Class A Turn Signals[b, d]	
		Red Lighted Compartments[c]			Red Lighted Compartments[b]			Amber	Red	Amber
		1	2	3	1	2	3			
10U and 10D	10L	0.3	0.5	0.7	5	10	15	15	10	25
	V	0.5	1.0	1.5	10	20	30	30	25	60
	10R	0.3	0.5	0.7	5	10	15	15	10	25
5U and 5D	20L	0.3	0.5	0.7	5	10	15	15	10	25
	10L	0.8	1.3	2.0	15	25	40	40	30	75
	5L	1.3	2.0	3.0	25	40	60	60	50	125
	V	1.8	3.0	4.5	35	60	90	90	70	175
	5R	1.3	2.0	3.0	25	40	60	60	50	125
	10R	0.8	1.3	2.0	15	25	40	40	30	75
	20R	0.3	0.5	0.7	5	10	15	15	10	25
H	20L	0.4	0.7	1.0	7	15	20	20	15	35
	10L	0.8	1.3	2.0	15	25	40	45	40	100
	5L	2.0	3.5	5.0	40	70	100	120	80	200
	V	2.0	3.5	5.0	40	70	100	120	80	200
	5R	2.0	3.5	5.0	40	70	100	120	80	200
	10R	0.8	1.3	2.0	15	25	40	45	40	100
	20R	0.4	0.7	1.0	7	15	20	20	15	35
Maximum-Rear Lamps Only		15[e]	20[e]	25[e]	180[f]	240[f]	300[f]	900[f]	300[f]	900[f]

[a] Specifications are based on laboratories using accurate, rated bulbs during testing.

[b] Lamps designed for use in both 6v and 12v systems shall be tested with 12v bulbs.

[c] A multiple compartment lamp 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.

[d] When the stop signal is optically combined with the turn signal, the circuit shall be such that the stop signal cannot be turned on in the turn signal which is flashing.

[e] A tail lamp shall not exceed the listed maximum candlepower at night over any area larger than that generated by a 1/4 deg radius, within a solid cone angle from 20L to 20R and from H to 10U. When the tail lamp is combined with the turn and/or stop signal lamp, the signal lamp shall not be less than three times the candlepower of the tail lamp at any test point on or above horizontal, except that at H-V, H-5L, H-5R, and 5U-V, the signal lamp shall not be less than five times the candlepower of the tail lamp.

[f] Lamps intended for the rear of a vehicle shall not exceed the listed candlepower at night over any area larger than that generated by a 1/4 deg radius.

failure when tests show compliance with specifications despite such rotation. See SAE Information Report, Vibration Test Machine—SAE J577.

F. Moisture Test—A sample unit shall 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 45 deg from a nozzle with a solid cone spray. During the Moisture Test the lamp shall revolve about its vertical axis at a rate of 4 rpm. This test shall be continued for 12 hr. The water shall then be turned off and the unit permitted to drain for 1 hr.

The unit shall then be examined. Moisture accumulation in excess of 2 cc shall constitute a failure.

G. Dust Test—A sample unit with any drain hole closed shall be mounted in its normal operating position, at least 6 in. from the wall in a cubical box with inside measurements of 3 ft on each side containing 10 lb of fine powdered cement in accordance with ASTM C 150-56, Specification for Portland Cement. At intervals of 15 minutes, this dust shall 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. The dust is then allowed to settle. This test shall be continued for 5 hr.

After the dust test the exterior surface shall be cleaned. If the maximum candlepower is within 10% of the maximum as compared with the condition after the unit is cleaned inside and out, the unit shall be considered to have met the requirements of this test. Where sealed units are used, the dust test shall not be required.

H. Corrosion Test—A sample unit shall be subjected to a salt spray (fog) test in accordance with the latest ASTM B 117, Method of Salt Spray (Fog) Testing, for a period of 50 hr, consisting of two periods of 24-hr exposure and 1-hr drying time each.

There shall be no evidence of excessive corrosion immediately after the preceding test has been completed, which would affect the proper functioning of the device.

I. Color Test—Refer to SAE Standard, Color Specification for Electric Lamps—SAE J578.

J. Photometry—The photometric measurement shall be made at a distance between the light source and the point of measurement specified for the lighting device. The device shall be mounted in its normal operating position.

When making photometric measurements at specific test points, the candlepower values between test points shall not be less than the lower specified value of the two closest adjacent test points (on a horizontal or vertical line) for minimum values.

In locating the test points, as designated in the respective candlepower requirements (Table 2) the following nomenclature shall apply:

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

The other points on the test screen are measured in terms of degrees from these two lines. Degrees to the right (R) and to the left (L) are regarded as being to the right and left of the vertical line when the observer stands behind the lighting device and looks in the direction of the emanating light beam when the device is properly aimed for photometry with respect to the H-V point.

Similarly, the upward angles designated as U and the downward angles designated D, refer to light emanating at angles above and below the horizontal line, respectively.

EXAMPLE: 4D-3L is a point 4 deg below H and 3 deg to the left of V. 1U-V is a point 1 deg above H and on the line V.

K. Out-of-Focus Tests on Unsealed Units—Tests shall be made for each of four out-of-focus filament positions, except that the complete distribution may be omitted. Where conventional bulbs with two pin bayonet bases are used, candlepower tests shall be made with the light source 0.060 in. above, below, ahead, and behind the designed position. If prefocused bulbs are used, the limiting positions at which tests are made shall be 0.020 in. above, below, ahead, and behind the designed position. The minimum values for out-of-design position shall be 80% of the in-design position. The lamp may be reaimed for each of the out-of-focus positions of the light source.

L. Warpage Test Devices with Plastic Lenses—A sample unit shall be mounted in its normal position and operated at rated voltage in an oven for 1 hr at 120 F ambient temperature. The device should be operating in the test in the same manner as it will be operated in service. The lens color shall be identical to that intended for use in the device.

After this warpage test has been completed, there shall be no evidence of warpage of lenses which would affect the proper functioning of the device.

PLASTIC MATERIALS FOR USE IN OPTICAL PARTS, SUCH AS LENSES AND REFLECTORS, OF MOTOR VEHICLE LIGHTING DEVICES — SAE J576b SAE Recommended Practice

Report of Lighting and Nonmetallic Materials Committees approved January 1955 and last revised July 1965. Editorial change August 1966.

[SAE lighting standards and recommended practices are subject to frequent change to keep pace with technical advances. Hence, their requirements should not be incorporated in laws where flexibility of revision is lacking.]

1. Scope—This SAE Recommended Practice provides test methods and requirements to evaluate the suitability of plastic materials intended for optical applications in motor vehicles. The tests of this practice are intended to determine physical and optical characteristics of the material only, and are not intended to cover the performance of plastics when molded and installed in a finished assembly. Performance expectations of such a finished assembly, including its plastic components, are to be based on tests of lamps, and so forth, as specified in SAE Standards and Recommended Practices for motor vehicle lighting lamps and reflectors.

2. Definitions

2.1 Material—For the purpose of this recommended practice, the term "material" broadly includes type and grade of plastics, composition, or manufacturer's designation (number) and color.

3. Test Procedures

3.1 Materials To Be Tested—These tests shall be made of each material to be offered for use in optical parts employed in motor vehicle lighting equipment, using colors defined in SAE J578. A test of one color and formulation shall cover variations in dye concentration, but shall not cover changes in dye materials or changes in polymers.

3.2 Types of Tests—Two basic types of tests are employed: an Outdoor Exposure Test and a Heat Test.

3.3 Samples Required—

3.3.1 GENERAL—Samples of plastic shall be injection molded into polished molds to produce 3 in. diameter discs with two faces flat and parallel. In both tests each exposed surface of the samples should contain a minimum uninterrupted area of 5 sq. in.

3.3.2 THICKNESS—Samples shall be furnished in the following thicknesses:

THICKNESS, IN.	TOLERANCE, IN.
0.062	±0.005
0.125	±0.005
0.250	±0.005

3.3.3 NUMBER OF SAMPLES REQUIRED—

Outdoor Exposure Test: 1 sample/each thickness/each site × 2 sites for each material = 2 samples/each thickness for each material

Heat Test: 2 samples/each thickness for each material = 2 samples/each thickness for each material

Control: 1 sample/each thickness for each material = 1 sample each

NOTE: This specimen must be kept properly protected from influences which may change its appearance and properties.

Total: = 5 samples/each thickness for each material

3.4 Outdoor Exposure Test—

3.4.1 EXPOSURE SITES—Florida (warm, moist climate) and Arizona (warm climate).

3.4.2 SAMPLE MOUNTING—One sample of each thickness of each material at each test station shall be mounted at a 45 deg angle to the vertical, facing south. The exposed surface of the samples shall contain a minimum uninterrupted area of 5 sq in., and they shall be mounted in the open no closer than 12 in. to their background.

3.4.3 EXPOSURE TIME AND CONDITIONS—The time of exposure shall be two years. During this time samples shall be cleaned at least once every three months by washing with mild soap and water, and then rinsing. Rubbing shall be avoided.

3.5 Heat Test—

3.5.1 SAMPLE MOUNTING—Two samples of each thickness of each material shall be supported in the vertical position with not more than 1 in. segments at the bottoms retained in the fixtures, thereby leaving the upper 5 sq in. of surface area on each side of each sample uncovered and unsupported.

3.5.2 TEST TIME AND TEMPERATURE—The samples shall be placed for two hours in a circulating air oven at 175 ± 5 F.

3.6 Luminous Transmittance and Color Measurements—Measurements shall be made in accordance with ASTM D 791, Method of Test for Luminous Reflectance, Transmittance and Color of Materials.

4. Material Performance Requirements—A material will be said to conform to this Recommended Practice in a range of thicknesses stated by the materials manufacturer if the following conditions are met.

4.1 Before Exposure to any Tests—The trichromatic coefficients for that stated range of thicknesses conforms to the requirements of SAE J578.

4.2 After Outdoor Exposure—

4.2.1 LUMINOUS TRANSMITTANCE—The luminous transmittance of the exposed samples using CIE Illuminant A (2854 K) shall not have changed by more than 25% of the luminous transmittance of the unexposed control sample when tested in accordance with ASTM D 791.

4.2.2 APPEARANCE—The exposed samples, when compared with the unexposed control samples, shall not show surface deterioration, crazing, haze, dimensional changes, color bleeding, delamination, or loss of surface luster.

4.2.3 TRICHROMATIC COEFFICIENTS—In the stated range of thicknesses, the trichromatic coefficients for that range of thicknesses shall conform to the requirements of SAE J578.

4.3 After Heat Test—

4.3.1 APPEARANCE—After exposure to the heat test and cooling to room temperature, the samples shall show no significant change in shape and general appearance when compared with corresponding unexposed control samples.

4.3.2 TRICHROMATIC COEFFICIENTS—After exposure to the heat test and cooling to room temperature, the trichromatic coefficients of the samples in the stated range of thickness shall conform to the requirements of SAE J578.

VIBRATION TEST MACHINE—SAE J577 SAE Information Report

Report of Lighting Division approved January 1940 and last revised by Lighting Committee May 1958. Editorial change April 1964.

[This SAE Information Report contains an illustration giving the essential arrangement and dimensions for a test machine which is satisfactory for the vibration test required by the SAE laboratory test specifications for motor-vehicle electric lamps and is published as a guide for building these machines. Detailed drawings for the vibration test machine shown in Fig. 1 can be obtained from the Society of Automotive Engineers, 485 Lexington Avenue, New York, New York, 10017.]

TABLE 1—CAM PROFILE RADII[a]

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

[a] The cam width is to be between 1/2 and 1 in.

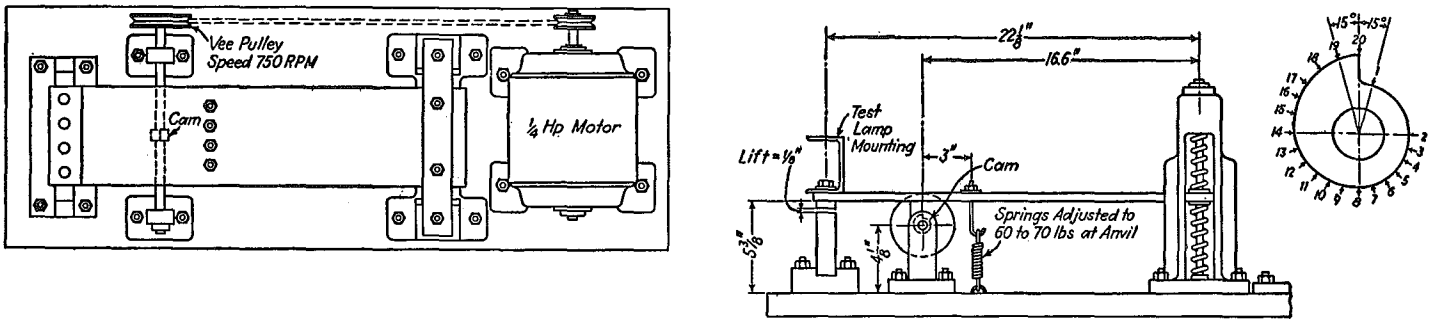


FIG. 1—VIBRATION TEST MACHINE

COLOR SPECIFICATION FOR ELECTRIC SIGNAL LIGHTING DEVICES — SAE J578a

SAE Standard

Report of Lighting Committee approved January 1942 and last revised April 1965. Editorial change October 1966.

[SAE lighting specifications are subject to frequent change to keep pace with technical advances. This SAE Standard is intended for use by State or Federal authorities having regulatory powers over motor vehicles, but its inclusion in State or Federal laws where flexibility of revision is lacking is discouraged.]

Scope—The purpose of this specification is to define and provide for the control of colors employed in motor vehicle lighting equipment. The specification applies to the overall effective color of light emitted by the device and not to the color of light from a small area of the cover lens.

Definitions—Fundamental definitions of color are expressed by Chromaticity Coordinates according to the CIE (1931) standard colorimetric system.[1] A tungsten lamp at 2854 K color temperature, is used as Standard Source A.

Red—The color of light emitted from the device shall have the y—coordinate not greater than 0.33, and the z—coordinate not greater than 0.008.

Yellow (Amber)—The color of light emitted from the device shall have the y—coordinate not less than 0.39 nor greater than 0.44, and the z—coordinate not greater than 0.010.

White (Achromatic)—The color of light emitted from the device shall meet the following coordinates:

y shall be no greater than 0.31 plus 0.25 x.
y shall be no less than 0.28 plus 0.25 x.
x shall be no greater than 0.50.
x shall be no less than 0.41.

Method of Color Measurement—One of the methods listed in the following paragraphs shall be used to check the color of the light from the device for compliance with the color specifications. The device shall be operated at design voltage. Components (bulbs, caps, lenses, and the like) shall be tested in a fixture or manner simulating the intended application.

[1]Illuminating Engineering Society Lighting Handbook and the Science of Color by the Optical Society of America.

1. Visual Method—In this method the color of the light from the device undergoing the inspection is compared visually with the color of the light from a standard. The standard may consist of CIE Source A and a filter or limit glass. A tungsten lamp at 2854 K color temperature is used as CIE Source A. The chromaticity coordinates of the color standards shall be as close as possible to the limits listed in the definitions. The color of the standard filters is determined spectrophotometrically.

RED—Red shall not be acceptable if it is less saturated (paler) yellower or bluer than the limit standard.

YELLOW (AMBER)—Yellow shall not be acceptable if it is less saturated (paler) or greener than the green limit standard or redder than the red limit standard.

WHITE—White shall not be acceptable if it differs materially in color from the color of light emitted by the filament of the lamp used in the equipment, at designed voltage.

In making visual appraisals, the light from the device illuminates a portion of the comparator field. The standard illuminates an immediately adjacent field portion of approximately equal area. It is preferable that the standard field should surround the comparator field, or vice versa. The locations of the standard and test sample shall be adjusted so the comparison fields have equal and uniform luminance (brightness). The test equipment shall be so arranged that light is brought into the comparator field from the full aperture of the device or component.

2. Tristimulus Method—This method is based on photoelectric receivers with response curves matching the CIE standard tristimulus curves. The measurement may be performed by integrating the light from the colored source in a sphere. A color shift due to the selectivity of the sphere paint shall be corrected by the use of a correction filter or a correction factor, or shall be compensated by an appropriate calibration method

3. Spectroradiometric or Spectrophotometric Method—In the CIE standard colorimetric system, the chromaticity coordinates are computed from the spectral energy distribution curve.

SEALED BEAM HEADLAMP UNITS FOR MOTOR VEHICLES — SAE J579a

SAE Standard

Report of Lighting Division approved January 1940 and last revised by Lighting Committee August 1965.

Scope—These specifications apply to sealed beam units (hermetically sealed). Headlamps are covered by separate SAE Standards.

Definitions

Sealed Beam Unit—An integral and indivisible optical assembly with the name "Sealed Beam" molded in the lens.

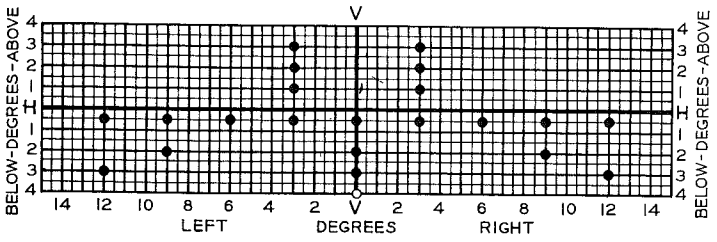
Upper Beam—A clear road beam intended primarily for distant illumination and for use on the open highway when not meeting other vehicles.

Lower Beam—A beam low enough on the left to avoid glare in the eyes of oncoming drivers and intended for use in congested areas and on highways when meeting other vehicles within a distance of 500 ft.

7-In. Type 2 Sealed Beam Unit—A sealed unit 7-in. in diameter providing an upper and a lower beam. Two similar units are used on a vehicle.

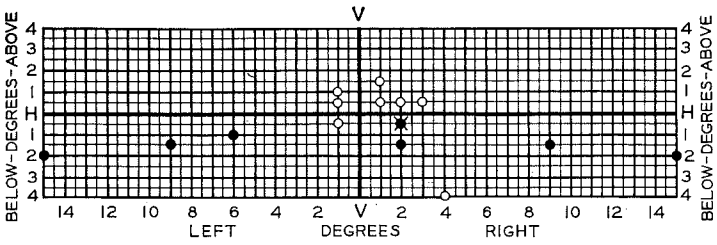
UPPER BEAM

7 IN. TYPE 2 SEALED BEAM AND DUAL 5¾ IN. SEALED BEAM



LOWER BEAM

7 IN. TYPE 2 SEALED BEAM AND DUAL 5¾ IN. SEALED BEAM



POINTS MARKED "o" DESIGNATE MAXIMUM CANDLEPOWER
POINTS MARKED "•" DESIGNATE MINIMUM CANDLEPOWER
POINTS MARKED "⧓" DESIGNATE MAX AND MIN CANDLEPOWER

FIG. 1—PHOTOMETRIC TEST POINTS

5¾-In. Type 1 Four-Lamp Dual Sealed Beam Unit—A sealed unit 5¾ in. in diameter having a single filament.

5¾-In. Type 2 Four-Lamp Dual Sealed Beam Unit—A sealed unit 5¾ in. in diameter having two filaments.

5¾-In. Dual Sealed Beam Roadlighting—Four units are used on a vehicle. The upper beam is provided by the Type 1 units and the lower filament in the Type 2 units. The lower beam is provided by the upper filament in the Type 2 units.

Mechanically Aimable Sealed Beam Unit—A sealed unit having 3 pads on the face of the lens preaimed during manufacture to form an aiming plane.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test

Section D—Laboratory Facilities

Section J—Photometric Test Points. The angular relation between significant test points for the upper and lower beams is as shown in Fig. 1.

Color Test—The color of the light from a sealed beam unit should be white.

Dimensional Specifications—See SAE J571.

Electrical and Life Specifications—See Table 2, SAE J573.

Clarity of Hot Spot Definition—The geometric center of the high intensity zone of the upper beam of the 5¾-in. Type 1 sealed beam unit, and the top and left edge of the high intensity zone of the lower beam of the 7-in. Type 2 and 5¾-in. Type 2 sealed beam units shall be deemed sufficiently defined for the purpose of service aiming, if they can be set by 3 experienced observers on a vertical screen at 25 ft within a maximum vertical deviation of ±0.2 deg and within a maximum horizontal deviation of ±0.4 deg. The aim for each observer shall be taken as the average of at least 3 observations.

TABLE 1—TEST POINT VALUES FOR 7-IN. TYPE 2 SEALED BEAM UNITS

Upper Beam (One 7-in. Unit)			Lower Beam (One 7-in. Unit)		
Position, deg	Max cp	Min cp	Position, deg	Max cp	Min cp
3U-3R and 3L	—	500	1U-1L to left	500	—
2U-3R and 3L	—	1,000	1/2U-1L to left	800	—
1U-3R and 3L	—	2,000	1/2D-1L to left	2,000	—
1/2D-V	—	20,000	1-1/2U-1R to right	1,000	—
1/2D-3R and 3L	—	10,000	1/2U-1R to 3R	2,000	—
1/2D-6R and 6L	—	3,250	1/2D-2R	15,000	6,000
1/2D-9R and 9L	—	1,500	1D-6L	—	1,000
1/2D-12R and 12L	—	750	1-1/2D-2R	—	15,000
2D-V	—	5,000	1-1/2D-9L and 9R	—	1,000
2D-9R and 9L	—	1,500	2D-15L and 15R	—	700
3D-V	—	2,500	4D-4R	12,500	—
3D-12R and 12L	—	750	10U to 90U[a]	125	—
4D-V	5,000	—			
Maximum	37,500	—			

[a] From the normally exposed surface of the lens.

TABLE 2—TEST POINT VALUES FOR 5-3/4-IN. FOUR LAMP DUAL SEALED BEAM UNITS

Upper Beam (One Type 1, No. 4001 and One Type 2, No. 4002 Unit)					Lower Beam (One Type 2 Unit)		
Position, deg	Type 1, No. 4001		Type 2, No. 4002		Position, deg	Max cp	Min cp
	Max cp	Min cp	Max cp	Min cp			
3U-3R and 3L	—	450	—	300	1U-1L to left	500	—
2U-3R and 3L	—	750	—	750	1/2U-1L to left	800	—
1U-3R and 3L	—	3,000	—	2,000	1/2D-1L to left	2,000	—
1/2D-V	—[a]	18,000	—[a]	7,000	1-1/2U-1R to right	1,000	—
1/2D-3R and 3L	—	12,000	—	3,000	1/2U-1R to 3R	2,000	—
1/2D-6R and 6L	—	3,000	—	2,000	1/2D-2R	15,000	6,000
1/2D-9R and 9L	—	2,000	—	1,000	1D-6L	—	1,000
1/2D-12R and 12L	—	750	—	750	1-1/2D-2R	—	15,000
2D-V	—	3,000	—	2,000	1-1/2D-9L and 9R	—	1,000
2D-9R and 9L	—	1,250	—	750	2D-15L and 15R	—	700
3D-V	—	1,500	—	1,000	4D-4R	12,500	—
3D-12R and 12L	—	600	—	400	10U to 90U[b]	125	—
4D-V	2,500	—	2,500	—			

[a] Combined maximum candlepower at 1/2D-V shall not exceed 37,500.

[b] From the normally exposed surface of the lens

Visual Appraisal of Aim—The aiming plane of the sealed beam unit shall be located parallel to a vertical screen at 25 ft with the centerline normal to the plane intersecting the H-V point on the screen. The visual appraisal of mechanically aimable units shall be deemed sufficiently accurate if the average aim of 3 experienced observers with a minimum of 3 observations each is within the following allowable tolerances:

5¾-in. Type 1 Sealed Beam Unit—The geometric center of the high intensity area of the beam shall be 2 in. below horizontal ±1½ in. and straight ahead on vertical within ±4 in. left and right.

5¾-in. Type 2 and 7-in. Type 2 Sealed Beam Units—The top of the high intensity area of the lower beam shall be at horizontal ±1½ in. and the left edge straight ahead at vertical to 4 in. right.

Beam Aim During Photometric Test—7-in. Type 2 and 5¾-in. units shall be aimed mechanically by centering the unit on the photometer axis and with the aiming plane through the faces of the pads on the lens normal to the photometer axis.

Photometric Test—Photometric tests shall be made with the photometer at a distance of 60 ft from the lamp. The unit shall be operated at its rated voltage during the tests.

The beam or beams from the unit shall meet the candlepower specifications listed in Tables 1 and 2 except that a tolerance of ±¼ deg in location may be allowed for any test point to allow for variations in readings between laboratories.

SEALED BEAM HEADLAMP—SAE J580a

SAE Standard

Report of Lighting Committee approved March 1960 and last revised June 1966.

Definitions

Sealed Beam Headlamp—A sealed beam headlamp including one or more sealed beam units is a major lighting device used to provide general illumination ahead of the vehicle.

Mounting Ring—The adjustable ring upon which the sealed beam unit is mounted in the headlamp.

Retaining Ring—The clamping ring that holds the sealed beam unit against the mounting ring.

Scope—This specification applies to the functional parts of the headlamp and does not include decorative doors or bezels which are not required for retaining the sealed beam unit.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section D—Laboratory Facilities
Section E—Vibration Test
Section H—Corrosion Test

Sealed Beam Unit Tests—Sealed beam headlamp units are tested separately in accordance with SAE J579.

Dimensional Checks—The mounting ring and the retaining ring shall comply with SAE Standard, Dimensional Specifications for Sealed Beam Headlamp Units—SAE J571, Figs. 2 and 5.

General Requirements—Headlamps shall be designed so that they may be checked by mechanical aimers without the removal of any ornamental trim rings or other parts. Aiming adjustments shall be accessible when trim rings are removed.

A headlamp, when in use, shall not have any styling or other feature, such as a glass cover or grille in front of the lens.

Aiming Adjustment Tests

1. A minimum aiming adjustment of ±4 deg must be provided in both the vertical and horizontal planes.

2. The mechanism, including the aiming adjustment, must be so designed as to prevent the unit from receding into the lamp body or housing when an inward pressure of 50 lb is exerted on the outer surface of the lens.

3. Headlamps with independent vertical and horizontal aiming adjusting screws.

(a) The headlamp unit mounting must be provided with independent vertical and horizontal aiming adjustments. The adjustment screws must be so positioned that neither the vertical nor horizontal aim will deviate more than 4.00 in. from the horizontal or vertical planes respectively, at a distance of 25 ft, through an angle of plus to minus 4 deg.

(b) The self-locking devices used to hold aiming screws in position must continue to operate satisfactorily up to 10 adjustments on each screw, over a length of screw thread of ±⅛ in.

NOTE: 3 (a) and 3 (b) not applicable to lamps with ball and socket or equivalent adjusting means.

Gasket Requirements—Gaskets used to seal between movable parts must be so designed or attached that they will not hinder or interfere with the ease of reassembly in service when replacing a burned out unit.

Retaining Ring Requirements

1. Positive means must be provided for holding the sealed beam unit to the mounting ring. The fastening means shall be deemed adequate if it will withstand and hold the sealed beam unit securely in its proper position at the end of 25 replacements.

2. When a unit having a flange thickness of 0.465 in. is secured between the retaining and the mounting ring, it shall be held tight enough to that it will not rattle.

Proper Seating of Sealed Beam Unit—The sealed beam unit seating areas on the headlamp mounting ring or equivalent must be kept free from sharp burrs and other protuberances that might cause unit breakage or improper seating. This area will include a distance of 1¼ in. each side of the center of the locating lug notch.

Connector Requirements—The voltage drop between any sealed beam contact and the connector at the end of a 3-in. wire lead from the socket shall not exceed 40 millivolts with a 10 amp load.

ELECTRIC SUPPLEMENTARY DRIVING LAMPS—SAE J581

SAE Standard

Report of Lighting Division approved January 1941 and last revised by Lighting Committee March 1960. Editorial change April 1964. Reaffirmed without change September 1966.

[Electric supplementary driving lamps are for use with headlamps other than sealed beam headlamps. The supplementary lamp should be turned off when approaching or closely following other cars. Switching should be arranged so that when the supplementary driving lamp switch is closed, the lamp will light only when the upper beam from the regular headlamps is in use.

SAE lighting specifications are subject to frequent change to keep pace with technical advances. This SAE Standard is intended for use by State or Federal authorities having regulatory powers over motor vehicles, but its inclusion in State or Federal laws where flexibility of revision is lacking is discouraged.]

Definition—A supplementary driving lamp is a unit used to supplement the upper beam from headlamps other than sealed beam. It is not intended for use alone or with the traffic or lower beam.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test
Section J—Photometric Test Points
Section K—Out-of-Focus Tests on Unsealed Units
Section L—Warpage Test on Devices with Plastic Lenses

Color Test—The color of the light from a supplementary driving lamp should be white.

Photometric Tests—Shall be made with the photometer at a distance of at least 60 ft from the lamp.

At-Focus Tests—The light source shall be located in the designed position as specified by the manufacturer.

The beam from the lamp shall be aimed vertically with reference to the horizontal line through the photometer axis as specified by the manufacturer.

The beam from the lamp shall be aimed laterally with reference to the vertical centerline through the photometer axis in the same manner as the manufacturer specifies that it be aimed on the car with respect to the vertical centerline ahead of the lamp.

Candlepower values shall be recorded at 1 deg intervals for all points within the angles bounded by 3U, 4D, 12L, and 12R, except that in the cases of beams which are symmetrical laterally, the complete distribution may be recorded for the left half only.

The beam from the lamp should meet the photometric specifications listed in the table when it is aimed to center the maximum intensity on the photometer axis, except that when the maximum exceeds 25,000 cp, the 25,000 cp point directly above the maximum intensity should be aimed at the photometer axis.

The maximum anywhere not lower than 1 D should be 50,000 cp.

An aiming tolerance of ± ¼ deg should be allowed for manufacturing variations. An additional tolerance of ±20% shall be allowed for 12-v filaments.

Out-of-Focus Tests on Unsealed Units—Similar tests shall be made for each of four out-of-focus filament positions, except that the complete distribution may be omitted. Where conventional bulbs with two-pin bayonet bases are used, candlepower tests shall be made with the light source 0.060 in. above, below, ahead, and behind the designed position. If prefocused bulbs are used, the limiting positions at which tests are made shall be 0.020 in. above, below, ahead, and behind the designed position.

The beam from each lamp may be reaimed in accordance with above instructions for each of the out-of-focus positions of light source.

Position, deg	Max cp	Position, deg	Min cp
3U—3L to 3R	3,000	H—3L to 3R	7,500
2U—3L to 3R	5,000	1D—6L to 6R	2,500
1U—3L to 3R	8,000	2D—6L to 6R	1,500
H—V	25,000	H—V	15,000

ELECTRIC SUPPLEMENTARY PASSING LAMPS—SAE J582 SAE Standard

Report of Lighting Division approved January 1941 and last revised by Lighting Committee March 1960. Editorial change April 1964. Reaffirmed without change September 1966.

Aiming and Usage—For greatest visibility, with reasonable limitation of glare to approaching drivers, the left edge of the stray light immediately to the left of the high intensity zone should be aimed at the vertical line through the lamp center, at 25 ft. The top of the high intensity zone should be aimed at the level of the passing lamp center at 25 ft, car unloaded. The unit should be turned off when traveling winding roads and in congested areas in cities. It should be wired so that it can be turned on or off only with the lower beam of the regular headlamps. In event means are provided to permit turning the passing lamp on or off conveniently—when the lower beam is on—without removing the hands from the steering wheel, an aim 3 in. higher than that recommended above is desirable.

Definition—A passing lamp is a unit intended to supplement the lower beam from headlamps, including sealed beam.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test
Section J—Photometric Test Points
Section K—Out-of-Focus Tests on Unsealed Units
Section L—Warpage Test on Devices with Plastic Lenses

Color Test—The color of the light from a supplementary passing lamp should be white.

Photometric Tests—Shall be made with the photometer at a distance of at least 60 ft from the lamp.

At-Focus Tests—The light source shall be located in the designed position as specified by the manufacturer.

The beam from the lamp shall be aimed vertically with reference to the horizontal line through the photometer axis as specified by the manufacturer.

The beam from the lamp shall be aimed laterally with reference to the vertical centerline through the photometer axis in the same manner as the manufacturer specifies that it be aimed on the car with respect to the vertical center line ahead of the lamp.

Candlepower values shall be recorded at 1 deg intervals for all points within the angles bounded by 2U, 1½D, 12L, and 12R, except that in the cases of beams which are symmetrical laterally, the complete distribution may be recorded for the left half only.

The beam from the lamp should meet the photometric specifications listed in the table when it is aimed in accordance with the manufacturer's service instructions.

An aiming tolerance of ±¼ deg should be allowed on individual points. An additional tolerance of ± 20% shall be allowed for 12-v filaments.

Position, deg	Max cp
1U—1L to left and above	400
1/2U—1L to left	500
1/2D—1L to left	1,000
1-1/2D—1L to left	3,000
2U—1R to right and above	1,000
1U—1R to right	3,000
H—1R to right	7,000
1-1/2D—2R to 4R	10,000 min

Out-of-Focus Tests on Unsealed Units—Similar tests shall be made for each of four out-of-focus filament positions, except that the complete distribution may be omitted. Where conventional bulbs with two pin bayonet bases are used, candlepower tests shall be made with the light source 0.060 in. above, below, ahead, and behind the designed position. If prefocused bulbs are used, the limiting positions at which tests are made shall be 0.020 in. above, below, ahead, and behind the designed position.

The beam from the lamp may be reaimed in accordance with the instructions above for each of the out-of-focus positions of light source.

FOG LAMPS—SAE J583b SAE Standard

Report of Lighting Division approved May 1937 and last revised by Lighting Committee April 1963. Editorial change April 1964.

Definition—Fog lamps are lamps which may be used with, or in lieu of, the lower beam headlamps to provide road illumination under conditions of rain, snow, dust, or fog.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test
Section I—Color Test. The light from a fog lamp should be white to amber.
Section J—Photometry

Section L—Warpage Test on Devices with Plastic Lenses.

Photometric Tests—Shall be made with the photometer at a distance of at least 60 ft from the lamps.

At-Focus Tests—The light source shall be located in the design position as specified by the manufacturer.

Symmetrical beams shall be aimed straight ahead with the top of the beam 4 in. below the lamp center level at 25 ft. Asymmetrical beams shall be aimed with the left edge of the high intensity zone straight ahead and the top of the beam 2 in. below the level of the lamp center at 25 ft.

When aimed as described, the beam from a SINGLE fog lamp shall meet the candlepower requirements in Table 1.

A tolerance of ± ¼ deg shall be allowed for any test point. An additional tolerance of ± 20% shall be allowed for out-of-focus tests.

Out-of-Focus Tests—Similar tests shall be made for each of four out-of-focus filament positions. Where conventional bulbs with two pin bayonet bases are used, candle power tests shall be made with the light source 0.060 in. above, below, ahead, and behind the designed position. If prefocused bulbs are used, the limiting positions at which tests are made shall be 0.020 in. above, below, ahead, and behind the designed position.

The beam from the lamp may be reaimed in accordance with the instructions above for each of the out-of-focus positions of the light source.

TABLE 1—CANDLEPOWER REQUIREMENTS

Position, deg	Candlepower	Position, deg	Candlepower
Lines—8U to 90U	75 max	H—1R to Right	1000 max
Line—4U	125 max	1-1/2D—1L to 3L	8000 max
Line—2U	200 max	1-1/2D—1R to 3R	2000 min
Line—1U	300 max	1-1/2D—3R to 9R	1000 min
H—1L to Left	500 max	3D—15L to 15R	1000 min

MOTORCYCLE AND MOTOR DRIVEN CYCLE HEADLAMPS—SAE J584

SAE Standard

Report of Lighting Committee approved January 1949 and last revised March 1960. Editorial change April 1964.

Definition—A motorcycle or motor driven cycle headlamp is a major lighting device used to provide general illumination ahead of the vehicle. A motor driven cycle is defined in Section 1—132 of the Uniform Code as every motorcycle, including every motor scooter, with a motor which produces not to exceed 5 hp, and every bicycle with motor attached.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test—Where sealed units are used, the dust test shall not be required.
Section H—Corrosion Test
Section J—Photometric Test Points—The angular relation between significant test points for the various upper and lower beams is as shown on the following charts.
Section K—Out-of-Focus Tests on Unsealed Units

Color Test—The light from the lamps should be white.

Out-of-Focus Tests on Unsealed Units—See Section K of SAE J575.

Beam Aim During Photometric Test—The upper beam of a multiple beam headlamp shall be aimed visually so that the geometric center of the zone of highest intensity falls 0.4 deg vertically below the lamp axis. The beam from a single beam headlamp shall be aimed straight ahead with the top of the beam aimed vertically to obtain 2000 cp at H-V.

Photometric Tests—Shall be made with the photometer at a distance of 60 ft from the lamp. The bulb or unit shall be operated at its rated voltage during the test.

At-Focus Tests—The light source or sources shall be located in the designed position as specified by the manufacturer.

The beams or beam from a single lamp shall meet the candle power specifications listed in the following tables except that a tolerance of ± ¼ deg in location may be allowed for any test point to allow for variations in readings between laboratories.

General Requirement — Optional with this specification, one 7-in. sealed beam unit or one 5¾-in. Type 1 and one 5¾-in. Type 2 sealed beam units meeting the requirements of SAE J579 may be used on a motorcycle or a motor driven cycle.

TABLE 1—UPPER BEAM

Position, deg	Motorcycle	Motor Driven Cycle	
	Multiple Beam, cp	Multiple Beam, cp	Single Beam, cp
1U—4L	—	—	400 max
1U—V	—	—	200–1,000
H—V	10,000 min	2,000 min	2,000
1/2D—V	20,000 min	5,000 min	5,000 min
1/2D—3L and 3R	4,000 min	3,000 min	3,000 min
1/2D—6L and 6R	1,000 min	750 min	750 min
1D—V	15,000 min	5,000 min	5,000 min
2D—V	5,000 min	3,000 min	3,000 min
3D—V	2,500 min	1,000 min	1,000 min
3D—6L and 6R	750 min	500 min	500 min
4D—V	5,000 max	5,000 max	5,000 max
Maximum anywhere	75,000	—	—

TABLE 2—LOWER BEAM

Position, deg	Motorcycle Multiple Beam, cp	Motor Driven Cycle Multiple Beam, cp
1-1/2U—1R to right	1,000 max	1,000 max
1U—1L to left	500 max	500 max
1/2U—1R to 3R	2,000 max	2,000 max
1/2U—1L to left	800 max	800 max
1/2D—1R to right	10,000 max	10,000 max
1/2D—1L to left	2,000 max	2,000 max
2D—3R	3,000 min	2,000 min
2D—3L	2,000 min	1,500 min
2D—6L and 6R	750 min	500 min
4D—4R	12,500 max	12,500 max

TAIL LAMPS—SAE J585c

SAE Standard

Report of Lighting Division approved March 1918 and last revised by Lighting Committee June 1966.

Definition—Tail lamps are lamps used to designate the rear of a vehicle by a warning light.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test

Section J—Photometric Test—All beam candlepower measurements shall be made with a bar photometer, or equivalent, with the center of light at a distance of at least 4, and preferably 10, ft from the photometer screen. In measuring distances and angles, the incandescent filament shall be taken as the center of light. The lamp axis shall be taken as the horizontal line through the light source and parallel to what would be the longitudinal axis of the vehicle if the lamp were mounted in its normal position on the vehicle.

Tail lamps designed to be operated on a vehicle through a resistance or equivalent, shall be photometered with the listed design voltage of

the design source applied, across the combination of resistance and filament.

Section L—Warpage Test on Devices with Plastic Lenses

Bulb Sockets—See SAE J567.

Color Test—The tail lamp indication shall be red. See SAE J578.

Tail Lamp in Combination—When tail lamp is optically combined with another lamp such as a stop lamp or a turn signal and a two filament bulb is used, the bulb should have an indexing base and the socket should be designed so that bulbs with nonindexing bases cannot be used.

Installation Requirements—(These requirements are not a part of the test specifications.)

Signals from lamps on both sides of the vehicle shall be visible through a horizontal angle from 45 deg to the left to 45 deg to the right. Where more than one lamp or optical area is lighted on each side of the car, only one such area on each side need comply. To be considered visible, the lamp must provide an unobstructed projected illuminated area of outer lens surface, excluding reflex, at least 2 sq in. in extent, measured at 45 deg to the longitudinal axis of the vehicle.

STOP LAMPS—SAE J586b

SAE Standard

Report of Lighting Division approved February 1927 and last revised by Lighting Committee June 1966.

Definition—Stop lamps are lamps giving a steady warning light to the rear of a vehicle, or train of vehicles, to indicate the intention of the operator of a vehicle to diminish speed or stop.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test

Section J—Photometric Test—All beam candlepower measurements shall be made with a bar photometer, or equivalent, with the center of light at a distance of at least 10 ft from the photometer screen. In measuring distance and angles, the incandescent filament shall be taken as the center of light. The lamp axis shall be taken as the horizontal line through the light source and parallel to what would be the longitudinal axis of the vehicle if the lamp were mounted in its normal position on the vehicle.

Bulb Sockets—See SAE J567.

Color Test—The stop signal indication should be red or amber, preferably red. See SAE J578.

Signals from lamps on both sides of the vehicle shall be visible through a horizontal angle from 45 deg to the left to 45 deg to the right. Where more than one lamp or optical area is lighted on each side of the car, only one such area on each side need comply. To be considered visible, the lamp must provide an unobstructed projected illuminated area of outer lens surface, excluding reflex, at least 2 sq. in. in extent, measured at 45 deg to the longitudinal axis of the vehicle.

LICENSE PLATE LAMPS—SAE J587b

SAE Standard

Report of Lighting Division approved March 1918 and last revised by Lighting Committee April 1964.

Definition—A license plate[1] lamp is a lamp used to illuminate the license plate on the rear of a vehicle. If a tail or a stop lamp is combined with a license plate lamp, the combination should also meet the requirements in the specifications relating to these other devices.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test
Section L—Warpage Test on Devices with Plastic Lenses

Bulb Sockets—See SAE J567.

Color—The light from the license plate lamp should be white.

General Requirements—The lamp design should be such that, when mounted on a vehicle as intended, the angle between the plane of the license plate and the plane on which the vehicle stands will not exceed 90 ± 15 deg.

The license plate holder shall be designed and constructed so as to provide a substantially plane surface on which to mount the plate.

The license lamp or lamps shall be of such size and design as to provide illumination on all parts of the 6 x 12 in. test plate. The light rays shall reach all portions of an imaginary plate of the same size at least 1 in. ahead of the actual test plate measured perpendicular to the plane of the plate.

When a single lamp is used to illuminate the plate, mounted above or below it, the lamp and license plate holder shall bear such relation to each other that at no point on the plate will the incident light make an angle of less than 8 deg to the plane of the plate.

When two or more lamps are used to illuminate the plate, the minimum 8 deg incident light angle shall apply only to that portion of the plate which the particular lamp is designed to illuminate.

All foot-candle (ft-c) measurements shall be made on a rectangular test plate of clean, white blotting paper mounted on the license plate holder in the position ordinarily taken by the license plate. The face of the test plate shall be 1/16 in. from the face of the license plate holder.

For lamps used on all vehicles, the test stations shall be located on the face of the test plate as in Fig. 1.

Photometric Test—The illumination at each of the eight stations on the test plate shall be at least 1.0 ft-c. The ratio of maximum to minimum illumination shall not exceed 20 to 1. The average of the two highest and the two lowest illumination values recorded at the eight test stations shall be taken as maximum and minimum values respectively.

Installation Recommendation (This recommendation is not a part of the test specification)—The license plate lamp or lamps should be mounted so as to illuminate the plate from the top or sides. This recommendation does not apply to motorcycles or motor driven cycles.

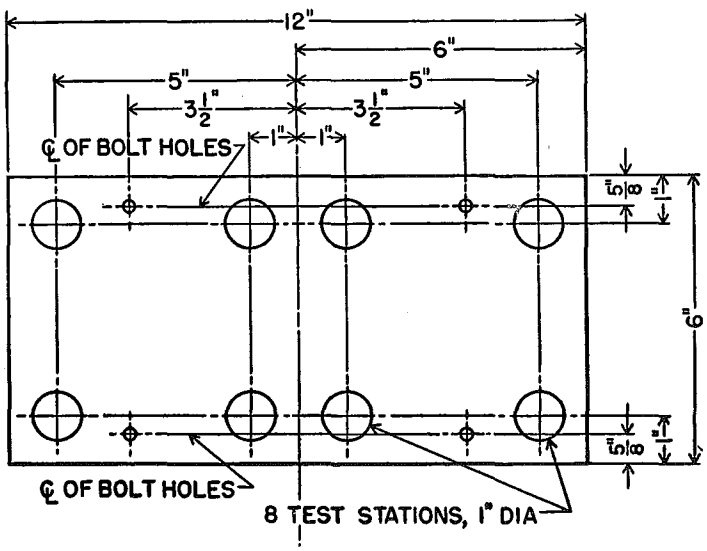


FIG. 1—STANDARD TEST PLATE

[1] For maximum legibility, it is recommended that the license plate have a dark colored background and light colored symbols with maximum contrast in reflectivity. No part of the license plate should be specular. A black background with white symbols is preferred.

TURN SIGNAL LAMPS—SAE J588d

SAE Standard

Report of the Lighting Division approved February 1927 and last revised by Lighting Committee June 1966.

Definition—Turn signal lamps are the signalling elements of a turn signal system which indicate a change in direction by giving flashing warning lights on the side toward which the turn will be made. (For flashing rate and "on" period see SAE J590).

Classification—Turn signal lamps are classified as either Class A or Class B.

Class A lamps may be used on any vehicle but are primarily for use on Trucks, Truck Tractors, Trailers, and Buses which are 80 or more in. wide.

Class B lamps are primarily for use on Vehicles and Trailers which are less than 80 in. wide.

General Requirements—The effective projected illuminated area measured on a plane at right angles to the axis of a lamp must not be less than 12 sq in. for Class A and 3½ sq in. for Class B.

The illuminated area of a Class A or Class B signal lamp need have no arrow, word, letter or other device intended to identify the signal.

The flashing signal from a double-faced signal lamp shall not be obliterated when subjected to external light rays from either in front or behind, at any and all angles.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test
Section J—Photometric Test—For Class A and Class B turn signal lamps, see Section J and Table 2 of SAE J575.

Rear signals from double faced Class A turn signal lamps shall meet the candlepower requirements in Table 2 from directly to the rear to the left for a left lamp and from directly to the rear to the right for a right lamp, except that at H-V, the candlepower shall be not less than 60 for red lights and not less than 180 for amber. (The intent of the foregoing sentence is to permit the manufacturer to provide glare protection for the driver.)

All beam candlepower measurements shall be made with the incandescent filament of the signal lamp at least 10 ft from the photometer screen. The lamp axis is the horizontal line through the filament parallel to what would be the longitudinal axis of the vehicle if the lamp were mounted in its normal position on the vehicle.

Section L—Warpage Test on Devices with Plastic Lenses.

Bulb Sockets—See SAE J567.

Color Test—The color of the light from turn signal lamps shall be red or amber to the rear and amber to the front of the vehicle. See SAE J578.

Installation Requirements—(These requirements are not a part of the test specifications.)

Signal lamps on the front and on the rear shall be spaced as far apart laterally as practical, so that the direction of turn will be clearly understood.

The optical axis (filament center) of the front turn signal lamp shall be at least 4 in. from the inside diameter of the retaining ring of the headlamp unit providing the lower beam, so that the signal can be clearly distinguished when the headlamps are lighted on the lower beam.

When one turn signal is used on each side of the front and rear, visibility of the front signal to the front and the rear signal to the rear shall not be obstructed by any part of the vehicle throughout the photometric test angles for the lamps. In addition, signals from lamps mounted on the left side of the vehicle shall be visible through a horizontal angle of 45 deg to the left, and signals from lamps mounted on the right side of the vehicle shall be visible through a horizontal angle of 45 deg to the right. To be considered visible, the lamp must provide an unobstructed projected illuminated area of outer lens surface, excluding reflex, at least 2 sq in. in extent, measured at 45 deg to the longitudinal axis of the vehicle;

1. EXCEPT when there is more than one signal lamp on each side at the front or rear, only one lamp on each side, both front or rear, need comply with the 45 deg requirement, and
2. EXCEPT that on combinations of vehicles, signal lamps showing to the rear on other than the rearmost vehicle shall be visible from not less than 10 deg to the left to 45 deg to the left for the left signal and from not less than 10 deg to the right to 45 deg to the right for the right signal.

Turn Signal Pilot Indicator—(Not a part of the test specifications.) If any signal lamp is not readily visible to the driver, there shall be an illuminated indicator to give him a clear and unmistakable indication that the turn signal system is turned "on." Except on truck tractor-trailer combinations using variable load flashers, failure of one or more turn signal lamps to operate should be indicated by a "steady on," "steady off" or by a significant change in the flashing rate of the illuminated indicator. The illuminated indicator shall consist of one or more bright lights flashing at the same frequency as the signal lamps, and shall be plainly visible to drivers of all heights when seated in normal position in the driver's seat, while driving in bright sunlight. The illuminated indicator may be supplemented by an audible signal.

IF THE ILLUMINATED INDICATOR IS LOCATED INSIDE THE VEHICLE, FOR EXAMPLE IN THE INSTRUMENT CLUSTER, IT SHOULD EMIT A GREEN COLOR AND HAVE A MINIMUM AREA EQUIVALENT TO A 3/16 IN. DIA CIRCLE.

IF THE ILLUMINATED INDICATORS ARE LOCATED ON THE OUTSIDE OF THE VEHICLE, FOR EXAMPLE ON THE FRONT FENDERS, THEY SHOULD EMIT AN AMBER COLOR AND HAVE A MINIMUM AREA OF 0.1 SQ IN.

TURN SIGNAL OPERATING UNITS—SAE J589

SAE Standard

Report of Lighting Committee approved September 1950 and last revised March 1960. Editorial change April 1964.

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

Operating units are divided into two groups, Class A and Class B. Class A turn signal operating units may be used on any vehicle.

Class B turn signal operating units may be used on any passenger car; and on any other vehicles where the distance from the center of the steering wheel to the extreme left side of the vehicle is less than 24 in. and where distance from center of steering wheel to extreme rear end of vehicle or combination of vehicles is less than 14 ft, except that Class B operating units should not be used on truck tractors.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities

Durability Test—The unit should be operated with the maximum bulb load to be used on the vehicle. The voltage drop from the input terminal of the switch to each lamp terminal (including 3 in. of No. 16 or 18 gage wire on each side of the switch) should be measured at the beginning and at intervals of not more than 25,000 cycles during, and upon completion of the cycle test. (NOTE: Flasher not to be included in circuit during test.) When the unit is provided with a self-cancelling mechanism, the test equipment should be arranged so that the unit will be turned "off" in its normal operating manner. The test should be made at a rate not to exceed 15 complete cpm. One complete cycle should consist of the following sequence: off, left turn, off, right turn, and back to off. During the test, the unit should be operated at 6.4 v for 6-v systems or 12.8 v for 12-v systems, from a power supply meeting the following requirements:

1. Output current—approximately ten times load current.
2. Regulation—less than 5% voltage change.
3. Ripple voltage—not more than 5%.
4. Response time—not more than 25 millisec rise time from 0 to

rated current at rated voltage in a pure resistance circuit.

5. Output impedance—not more than 0.005 ohms (dc).

Test requirements are as follows:

Class A Operating Units ..... 175,000 complete cycles
Class B Operating Units ..... 50,000 complete cycles

If the voltage drop does not exceed 0.25 for either 6.4 or 12.8 line voltage, and if the unit is still operative after completion of the test (except that bulbs may be replaced during the period of the test), it should be considered satisfactory.

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

SIDE TURN SIGNAL LAMPS — SAE J914

SAE Recommended Practice

Report of Lighting Committee approved February 1965.

Definition—A side turn signal lamp is a lamp mounted on the side of a vehicle which flashes in unison with the front and rear turn signal lamps to indicate the intention of the vehicle to change direction toward the side on which the signal lamp is flashing.

Identification Code Designation—The identification code designation is E.

General Test Provisions—The following sections from SAE J575 are a part of this recommended practice:

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test
Section L—Warpage Test on Devices with Plastic Lenses

Bulb Sockets—See SAE J567.

Color Test—The color of the light from a side turn signal shall be amber. See SAE J578.

Photometry Tests—(See also Section J of SAE J575.) Photometric tests shall be made with the photometer at a distance of at least 10 ft from the lamp. The H-V axis shall be taken as parallel to the longitudinal axis of the vehicle.

Candlepower requirements for a lamp mounted on the left side of the vehicle are shown in Table 1. Left-hand angles shall be substituted for right-hand angles for a lamp mounted on the right side of the vehicle.

TABLE 1—CANDLEPOWER REQUIREMENTS[a]

Position, deg	Candlepower, minimum	Position, deg	Candlepower, minimum
15U–90R	20	H–60R	30
10U–60R	20	–90R	30
5U–5R	40	5D–5R	40
–20R	30	–20R	30
H–5R	50	10D–60R	20
–20R	30	15D–90R	20

[a] 300 candlepower maximum at all points.

Installation Requirements—(These requirements are not a part of the test specifications.)

Pilot Indicator—There shall be an illuminated indicator, which may be the same indicator used for the front and rear turn signals (see SAE J588), to give the driver a clear and unmistakable indication that the side turn signal lamp is turned "on" and functioning normally. Except on towed vehicle combinations using variable load flashers, a failure of the side turn signal lamp to operate should be indicated by a "steady on" or "steady off" of the illuminated indicator.

Mounting Height—Side turn signal lamps shall be mounted on the vehicle at a height of not more than 72 in. nor less than 36 in.

CORNERING LAMPS — SAE J852b

SAE Recommended Practice

Report of Lighting Committee approved April 1963 and last revised February 1965.

Definition—Cornering lamps are steady burning lamps used in conjunction with the turn signal system to supplement the headlamps by providing additional illumination in the direction of turn.

Identification Code Designation—K.

General Test Provisions—The following sections from SAE J575 are a part of this recommended practice:

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section H—Corrosion Test
Section L—Warpage Test: Except that the device shall be cycled 3 minutes on and 12 minutes off until the operating time totals 1 hr.

Dust Tests—Where sealed units are used, the dust test shall not be required. For other type lamps, see Section G of SAE J575.

Color Test—The color of the light from a cornering lamp shall be white or amber (see SAE J578).

Photometric Test—Photometric tests should be made with the photometer at a distance of at least 10 ft from the lamp.

The line on the test screen formed by the intersection of a horizontal plane through the light source of the lamp should be designated as H. The line formed on the test screen by the intersection of a vertical plane through the light source and parallel to vehicles longitudinal axis should be designated as V. The intersection of these two lines should be designated as H-V.

A single lamp mounted on a test stand to simulate mounting on the vehicle should meet the following photometric specifications (test points shown are for a lamp mounted on the left side of the vehicle—right hand angle should be substituted for left angle for a lamp mounted on the right side of the vehicle).

Position, deg	Candlepower	Position, deg	Candlepower
8U-90U—V-L	125 max	H—V to L	500 max
4U—V-L	200 max	2-1/2 D—30 L	300 min
2U—V-L	300 max	2-1/2 D—45 L	500 min
1U—V-L	400 max	2-1/2 D—60 L	300 min

Installation Requirements (These requirements are not a part of the test specifications.)

Cornering lamps are primarily intended to be used during the times that headlamps are required.

Means should be provided to turn on the cornering lamps with the turn signal lamps or by another suitable means and they should turn off when the turn signal lamps are turned off. If the cornering lamps are not turned off automatically, a visible or audible means shall be provided to indicate to the driver when the lamps are on.

AUTOMOTIVE TURN SIGNAL FLASHERS—SAE J590b

SAE Standard

Report of Lighting Committee approved March 1960 and last revised July 1965. Editorial change October 1965.

Definition—An automotive turn signal flasher is a device which causes a turn signal lamp to be operated intermittently (flash) as long as it is turned on.

Scope—Flashers referred to in this SAE Standard are for nominal 12 or 6 v d-c circuits and are intended to operate at the design load for the turn signal system as stated by the manufacturer. EXAMPLE: two No. 1034 bulbs plus one No. 57 pilot bulb or three No. 1073 bulbs plus one No. 57 pilot bulb.

Samples Required and Selection for Tests—Fifty flashers, which shall be representative of those regularly manufactured and marketed, shall be submitted for test. Samples shall include means of connection into the lighting circuit if other than the standard sealed beam type plug-in connector is used. The design load for the turn signal system and the mounting position (if necessary) shall be specified by the manufacturer. All flashers for test shall be initially selected at random from the sample lot.

Test Circuitry and Equipment Requirements—See SAE J823. The standard test circuit is shown therein.

Pilot Indication—The means of producing the visible pilot indication required in the turn signal system may be incorporated in the flasher. A means of producing an audible signal may be incorporated in the flasher. The "means" shall function satisfactorily under all the test conditions that are applied to the flasher.

Performance Requirements—The performance requirements shall be based upon a test of 20 samples chosen at random from the initial 50. At least 17 of the 20 samples shall meet the requirements specified in the following paragraphs 1, 2, and 3.

1. Starting Time—A flasher having normally closed contacts shall open (turn off) within 1.0 sec for a unit designed to operate two signal lamps, or within 1.25 sec for a unit designed to operate more than two signal lamps. A flasher having normally open contacts shall complete the first cycle (close the contacts and then open the contacts) within 1.5 sec. The time measurement will start when the voltage is initially applied. The test shall be made in an ambient temperature of 75 ± 10 F with the design load connected, and the power source for the test circuit adjusted to apply design voltage at the bulbs. Compliance shall be based on an average of three starts, which shall be separated by a cooling interval of 5 minutes.

2. Voltage Drop—The test shall be made in an ambient temperature of 75 ± 10 F with the design load connected in the standard test circuit, and the power source for the test circuit adjusted to apply 12.8 v or 6.4 v at the bulbs according to the flasher rating. The lowest voltage drop across the flasher shall not exceed 0.40 v for a unit designed to operate two signal lamps or 0.45 for a unit designed to operate more than two signal lamps. The voltage drop shall be measured between the input and the load terminals at the flasher and during the "on" period after the flashers have completed a minimum of five consecutive cycles.

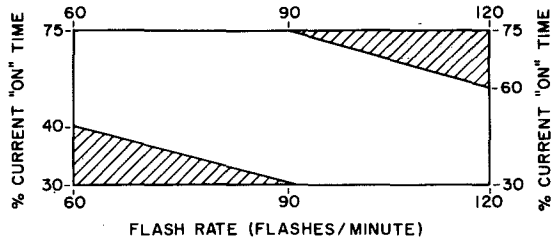


FIG. 1—FLASH RATE (FLASHES PER MINUTE)

3. Flash Rate and Percent Current "On" Time—The flash rate and the percent current "on" time of normally closed type flashers shall be within the unshaded portion of the polygon shown in Fig. 1. The flash rate and percent current "on" time of normally open type flashers shall be within the entire rectangle shown below including the shaded areas.

Flash rate and percent current "on" time shall be measured after the flashers have been operating for five consecutive cycles and shall be an average of at least three consecutive cycles. The above operating tolerances shall apply over combinations of bulb voltages and ambient temperatures tabulated:

(a) 12.8 v (or 6.4 v) and 75 ± 10 F
(b) 12.0 v (or 6.0 v) and 0 ± 5 F
(c) 15.0 v (or 7.5 v) and 0 ± 5 F
(d) 11.0 v (or 5.5 v) and 125 ± 5 F
(e) 14.0 v (or 7.0 v) and 125 ± 5 F

Durability Test Requirements—Twenty flashers conforming to paragraphs 1, 2, and 3 (a) shall be selected from the remaining 30 and shall be subjected to the durability test. The test shall run on each flasher with the design load for the turn signal system connected in a standard test circuit, and with the power source for the durability test adjusted to apply 14 v or 7.0 v according to the flasher rating to the input terminals of the standard test circuit.

Total Time: 200 hr.
Cycle of Operation: 15 sec "on", 15 sec "off"
Ambient Temperature During Test: 75 ± 10 F

At the conclusion of the durability test, each flasher shall be tested in the standard test circuit with design load for the turn signal system. The power source for the test circuit shall be adjusted to apply 12.8 v (or 6.4 v) at the bulbs as stated in the paragraph on Performance Requirements.

At least 17 out of the 20 samples tested shall then comply with the provisions of paragraphs 1, 2, and 3 (a) under Performance Requirements.

VEHICULAR HAZARD WARNING SIGNAL FLASHER — SAE J945

SAE Recommended Practice

Report of Lighting Committee approved February 1966.

Definition—A vehicular hazard warning flasher is a device which, as long as it is turned on, causes all the required signal lamps listed in SAE J910 to flash.

Scope—Flashers referred to in this SAE Recommended Practice are for nominal 6 v d-c or 12 v d-c circuits as specified by the manufacturer, and are required to operate from two signal lamps to the maximum design load, including pilot lamps, as stated by the manufacturer.

Samples Required and Selection for Tests—Fifty flashers, which shall be representative of those regularly manufactured and marketed, shall be submitted for test. Samples shall include means of connection into the lighting circuit if other than the standard sealed beam type plug-in connector is used. The maximum design load for the hazard warning signal flasher and the mounting position (if necessary) shall be specified by the manufacturer. All flashers for test shall be selected initially at random from the sample lot.

Test Circuitry and Equipment Requirements—See SAE J823. The standard test circuit is shown therein.

Pilot Indication—The means of producing the visible pilot indication required in the hazard warning signal system may be incorporated in the flasher. A means of producing an audible signal also may be incorporated in the flasher. The "means" shall function satisfactorily under all the test conditions that are applied to the flasher.

Performance Requirements—The performance requirements shall be based upon a test of 20 samples chosen at random from the initial lot of 50. At least 17 of the 20 samples shall meet the following requirements:

1. Starting Time—A flasher having normally closed contact shall open (turn off) within 1.5 sec after voltage is applied. A flasher having normally open contacts shall complete the first cycle (close the contacts and then open the contacts) within 1.5 sec after voltage is applied. The

test shall be made in an ambient temperature of 75 ± 10 F with the minimum and maximum load connected, and the power source for test circuit adjusted to apply design voltage at the bulbs.

2. Voltage Drop—The test shall be made 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 lowest voltage drop during the "on" period, measured between the input and the load terminals after the flashers have completed a minimum of five consecutive cycles, shall not exceed 0.45 v.

3. Flash Rate and Percent Current "On" Time—The flash rate and the percent current "on" time of normally closed type flashers shall be within the unshaded portion of the polygon shown in Fig. 1. The flash rate and percent current "on" time of normally open type flashers shall be within the entire rectangle shown, including the shaded areas.

Flashing rate and percent current "on" time shall be measured after the flashers have been operating for a minimum of five consecutive cycles and shall be an average of at least three consecutive cycles. The previous operating tolerances shall apply for loads of two signal lamps and the maximum design load, including pilot lamps, as specified by the manufacturer, over combinations of bulb voltages and ambient temperatures tabulated:

(a) 12.8v (or 6.4v) and 75 ± 10F.
(b) 11.0v (or 5.5v) and 0 ± 5F.
(c) 13.0v (or 6.5v) and 0 ± 5F.
(d) 11.0v (or 5.5v) and 125 ± 5F.
(e) 13.0v (or 6.5v) and 125 ± 5F.

7. Durability Test Requirements—A random selection of 20 flashers from the remaining 30 samples conforming to paragraphs 1, 2, and 3 (a) under Performance Requirements shall be subject to a durability test. The test shall be run with the maximum design load connected into the standard test circuit specified in SAE J823 and the power source for the test circuit adjusted to apply and maintain 13.0 v (or 6.5 v) according to the flasher rating to the input terminals of the test circuit throughout the test.

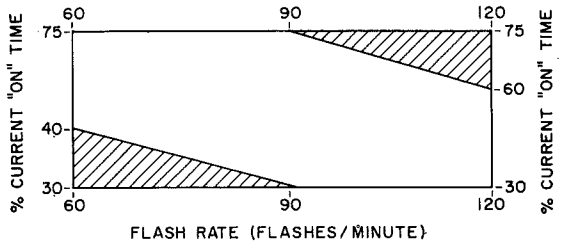


FIG. 1—FLASH RATE (FLASHES PER MINUTE)

Flashers shall flash continuously for a total time of 36 hr in an ambient temperature of 75 ± 10 F.

At the conclusion of the durability test, each flasher shall be tested in the standard test circuit with the minimum of two signal lamp bulbs and maximum design load, including pilot lamps, as specified by the manufacturer. The power source for the test circuit shall be adjusted to apply design voltage at the bulbs. The ambient temperature shall be 75 ± 10 F.

At least 17 of the samples tested shall comply with the provisions of paragraphs 1, 2 and 3 (a) under Performance Requirements.

SPOT LAMPS—SAE J591a

SAE Standard

Report of Lighting Committee approved October 1951 and last revised January 1957. Editorial change April 1964.

Definition—Spot lamps are lamps which provide a substantially parallel beam of light and which can be aimed at will.

General Requirements—The spot lamp beam pattern should be well defined and substantially round or oval in shape.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test—Where sealed units are used, the dust test shall not be required.
Section H—Corrosion Test

Bulb Sockets—See SAE J567.

Color Test—The color of light from spot lamps should be white.

CLEARANCE, SIDE MARKER, IDENTIFICATION, AND PARKING LAMPS—SAE J592b

SAE Standard

Report of Lighting Division approved January 1937 and last revised by Lighting Committee April 1964.

Definitions

Clearance Lamps—Lamps which show to the front or rear of a 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.

Side Marker Lamps—Lamps which show to the side of a vehicle, mounted on the permanent structure of the vehicle as near as practicable to the upper front and rear extreme edges to indicate the overall length of the vehicle. They may also be mounted at intermediate locations on the sides of the vehicle.

Combination Clearance and Side Marker Lamps—Single lamps which simultaneously fulfill the requirements of clearance and side marker lamps.

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, nor more than 12, in. 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.

Parking Lamps—Whether separate or in combination with other lamps, parking lamps are lamps on the left only, or on both the left and right of the vehicle, which show to the front and are intended to mark the vehicle when parked.

Identification Code Designation

P—Identification or parking lamps.
P1—Clearance or side marker lamps.
PC—Combination clearance and side marker lamps.

General Requirements—The following sections from SAE J575 are a part of this standard:

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test
Section I—Color Test—The color of light from front clearance lamps,

TABLE 1—PHOTOMETRIC MINIMUM CANDLEPOWER REQUIREMENTS CLEARANCE AND SIDE MARKER LAMPS

	Test Points, deg	Clearance and Side Marker Lamps			Test Points, deg	Clearance and Side Marker Lamps	
		Red	Amber			Red	Amber
10U	45L	0.25	0.62	H	10R	0.25	0.62
	V	0.25	0.62		20R	0.25	0.62
	45R	0.25	0.62		30R	0.25	0.62
					45R	0.25	0.62
H	45L	0.25	0.62				
	30L	0.25	0.62	10D	45L	0.25	0.62
	20L	0.25	0.62		V	0.25	0.62
	10L	0.25	0.62		45R	0.25	0.62
	V	0.25	0.62				

front and intermediate side marker lamps, and front identification lamps shall be amber. The color of light from rear clearance lamps, rear side marker lamps and rear identification lamps shall be red. The color of light from parking lamps shall be white or amber.

Section J—Photometric Test—Photometric tests shall be made at a distance of at least 4 ft. The H-V axis of a parking, clearance, or identification lamp shall be taken as parallel with the longitudinal axis of the vehicle. The H-V axis of a side marker lamp shall be taken as normal to the longitudinal axis of the vehicle. The H-V axis of a combination clearance and side marker lamp shall be taken as parallel with the longitudinal axis of the vehicle when checking clearance lamp test points, and normal to this vehicle axis when checking side marker test points.

Minimum candlepower requirements for clearance and side marker lamps are shown in Table 1. Minimum candlepower requirements for identification and parking lamps are shown in Table 2. Combination clearance and side marker lamps shall comply with both clearance and side marker minimum candlepower requirements.

Section L—Warpage test on devices with plastic lenses.

Bulb Sockets—See SAE J567.

Parking Lamp in Combination—When a parking lamp is optically combined with a turn signal, and the parking lamp is connected to be operated with the headlamps, the turn signal shall not be less than three times the candlepower of the parking lamp at any test point on or above horizontal, except that at H-V, H-5L, H-5R, and 5U-V the turn signal shall not be less than five times the candlepower of the parking lamp. When a two filament bulb is used, the bulb shall have an indexing base and the socket shall be designed so that bulbs with non-indexing bases cannot be used.

TABLE 2—PHOTOMETRIC MINIMUM CANDLEPOWER REQUIREMENTS IDENTIFICATION AND PARKING LAMPS

	Test Points, deg	Identification Lamps		Parking Lamps	
		Red	Amber	Amber	White
10U	5L	0.25	0.62	0.62	1.00
	V	0.25	0.62	0.62	1.00
	5R	0.25	0.62	0.62	1.00
5U	10L	0.25	0.62	0.62	1.00
	5L	0.25	0.62	0.62	1.00
	V	0.25	0.62	0.62	1.00
	5R	0.25	0.62	0.62	1.00
	10R	0.25	0.62	0.62	1.00
H	20L	0.25	0.62	0.62	1.00
	10L	0.25	0.62	0.62	1.00
	5L	0.25	0.62	0.62	1.00
	V	0.25	0.62	0.62	1.00
	5R	0.25	0.62	0.62	1.00
	10R	0.25	0.62	0.62	1.00
	20R	0.25	0.62	0.62	1.00
5D	10L	0.25	0.62	0.62	1.00
	5L	0.25	0.62	0.62	1.00
	V	0.25	0.62	0.62	1 00
	5R	0.25	0.62	0.62	1.00
	10R	0.25	0.62	0.62	1.00
10D	5L	0.25	0.62	0.62	1.00
	V	0.25	0.62	0.62	1.00
	5R	0.25	0.62	0.62	1.00

BACK UP LAMPS — SAE J593b

SAE Standard

Report of Lighting Committee approved August 1947, and last revised May 1966.

Definition—Back up lamps may be used to provide illumination behind the vehicle when the vehicle is in reverse motion.

Means should be provided either to turn the back up lamps off automatically when the vehicle is in forward motion, or to indicate to the driver by visible or audible means that back up lamps are on.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test
Section J—Photometric Test Points

Bulb Sockets—See SAE J567.

Color Test—The color of the light from a back up lamp should be white. See SAE J578.

Photometric Test—Photometric tests shall be made with the photometer at a distance of at least 10 ft. from the lamp.

The light source shall be located at the designed position as specified by the manufacturer.

The light from a single lamp should meet the following photometric specification when aimed in accordance with the manufacturer's service instructions:

H and above .....300 max cp
1½ D and above .....800 max cp

The line on the test screen formed by the intersection of the horizontal plane through the light source is designated as H.

REFLEX REFLECTORS — SAE J594d

SAE Standard

Report of Lighting Division approved January 1931 and last revised by Lighting Committee March 1967.

Definition—Reflex reflectors, for the purpose of this specification, include only devices which are used on vehicles to give an indication to an approaching driver by reflected light from the lamps on the approaching vehicle. Reflex reflectors should be visible at night from all distances between 100 and 600 ft when illuminated by the lower beam.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section D—Laboratory Facilities
Section E—Vibration Test

Section F—Moisture Test—Except that in the case of sealed units there shall be no visible moisture within the unit.

Section G—Dust Test
Section H—Corrosion Test

Section I—Color Test—The test sample 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 should be twice the thickness of the reflector as measured from the face of the lens to the apexes of the reflecting elements.

Section J—Photometry—The reflex reflector shall be set up for testing as shown in Fig. 1. The test distance shall be 100 ft. The source of illumination shall be a lamp with a 2 in. effective diameter and with a filament operating at 2854K color temperature. The observation point shall be located directly above the source of illumination. The reflex reflector shall be mounted on a goniometer with the center of the reflex area at the center of rotation and at the same horizontal level as the source of illumination. The axis of the reflex reflector shall be taken as parallel to the longitudinal axis of the vehicle.

Photometric measurements of reflex reflectors shall be made at various observation angles and entrance angles as shown in Table 1. 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 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 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 as viewed from behind the reflector.

Photometric measurements may be made visually or photoelectrically. With either method, the candlepower which the reflex reflector is projecting toward the observation point shall be determined. Also, the

TABLE 1—MINIMUM CANDLEPOWER PER INCIDENT FOOT-CANDLE FOR CLASS A RED REFLEX REFLECTOR[a]

Observation Angle, deg	Entrance Angles, deg				
	0	10 Up	10 Down	20 Left	20 Right
0.2	4.5	3.0	3.0	1.5	1.5
1.5	0.07	0.05	0.05	0.03	0.03

[a] Amber values shall be 2.5 times indicated red values and white values shall be 4 times indicated red values.

illumination on the reflex reflector from the source of illumination shall be measured in footcandles. The recorded measurement of each test point is the quotient of the projected candlepower divided by the footcandle illumination. Reflex reflectors may have any linear or area dimensions; but, for the photometric test a maximum area of 12 sq in. contained within a 7 in. diameter circle shall be exposed.

In making visual measurements, a comparison lamp, emitting red light similar in spectral quality to the reflex reflector, shall be located adjacent to the reflector (at an angle not to exceed ½ deg) and arranged so that the observer can readily vary the candlepower from 0.01 to 0.25 to make the intensity duplicate that of the reflex reflector under test. To bring the candlepower of the reflex reflector into the range of the calibrated standard, means shall be provided to change the intensity of the source of illumination without changing the filament color temperature. The comparison lamp shall be designed to avoid reflection from the source of illumination back in the direction of the observer. Also, it shall be of such size, and so diffused, that when viewed by the observer (if necessary through a 2½ × reducing monocular), the candlepower can be readily compared and adjusted to that of the reflex reflector. The observer shall have at least 10 minutes of dark adaptation before making observations.

In making photoelectric measurements, the opening to the photocell shall not be more than ½ in. vertical by 1 in. horizontal, with the observation point above the source of illumination.

Reflex reflectors, which do not have a fixed rotational position on the vehicle, shall be rotated about their axes through 360 deg to find the minimum candlepower per footcandle which shall be reported for each test point. If the output falls below the minimum requirement at any test point, the reflector shall be rotated ± 5 deg about its axis from the angle where the minimum output occurred; and the maximum candlepower per footcandle within this angle shall be reported as a tolerance value.

Reflex reflectors, which, by their design or construction, permit mounting on the vehicle in fixed rotational position, shall be tested in this position. A visual locator, such as the word "TOP" shall not be considered adequate to establish a fixed rotational position on the vehicle.

The uncolored reflection from the front surface shall be such that, at any of the test stations, the color of the signal shall not be obliterated.

Plastic Material Test—See SAE J576.

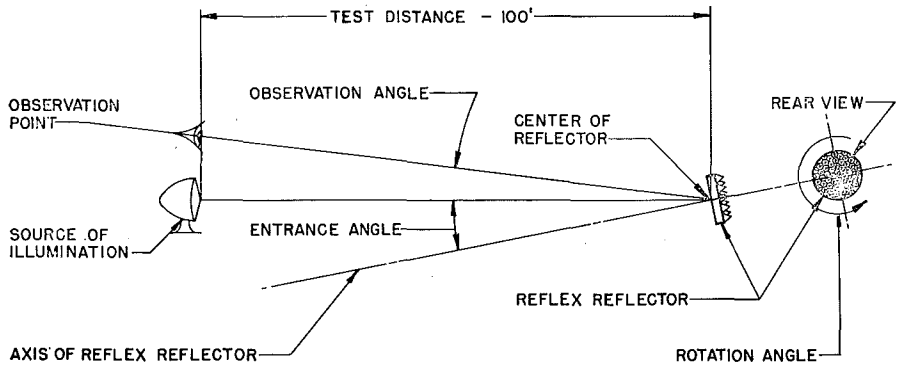


FIG. 1—SETUP FOR TESTING

EMERGENCY REFLEX REFLECTORS — SAE J774a SAE Recommended Practice

Report of Lighting Committee approved June 1961 and last revised April 1965.

Definition—An emergency reflex reflector is a device to be placed on the roadway to warn the driver of an approaching vehicle of a stationary hazard by reflection of the light from the lamps of the approaching vehicle.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test

Section E—Vibration Test—The complete device should be tested in stored position. The reflex reflectors should show no evidence of surface abrasion at the conclusion of the test.

Section F—Moisture Test—A reflex reflector unit should be tested in functional position. There should be no visible moisture within the individual reflex reflectors.

Section H—Corrosion Test—A reflex reflector unit should be tested in functional position.

Color Test—The emergency reflex reflector indication should be red. See SAE J578. The test sample 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 should be twice the thickness of the reflector as measured from the face of the lens to the apexes of the reflecting elements.

Plastic Material Test—See SAE J576.

Setup for Photometric Testing—SAE J594.

General Requirements

1. The Complete Device—A complete warning device may consist of one to three emergency reflex reflector units and a container or rack for storage. During storage the faces of the individual reflex reflectors should be protected from dirt and damage. The reflex reflector units should be readily extractable from the storage container or rack and should be readily set up in functional position without the use of tools.

2. Reflex Reflector Unit—Each emergency reflex reflector unit should consist of a holder with two reflex reflectors on each side, one above the other (two bidirectional reflectors may be used). The effective area of individual reflex reflectors should be at least 6 sq in. The holder should provide positive means for maintaining the reflector faces perpendicular to the surface on which the reflex reflector unit rests.

3. With the reflex reflector in functional position, the top of the effective luminous area should be at least 7 in. above the surface upon which the device rests.

Test Requirements

1. Photometric Test—One reflex reflector unit should be tested in accordance with SAE J594, except total values for each side should be as specified in Table 1.

TABLE 1—MINIMUM CANDLEPOWER PER INCIDENT FOOT CANDLE[a]

Observation Angle, Deg	Entrance Angle, deg				
	0	10 Up	10 Down	20 Left	20 Right
0.2	18.0	12.0	12.0	5.0	5.0
1.5	0.14	0.10	0.10	0.06	0.06

[a]Reflectors which are rotated 360 deg orientation angle need not be tested at the "down" or "right" entrance angles.

2. **Wind Test**—Reflex reflector units should be tested for their ability to withstand wind pressure. If flags or flag mounting means are provided, flags shall be included in the Wind Test. One unit in functional position should be set upon a horizontal brushed concrete surface and subjected to a wind of 40 mph velocity blowing in a horizontal direction. The unit should be tested with the wind direction perpendicular to the reflector faces, first on one side, second the other side, and then at three intermediate positions. Tipping, turning, or sliding on the supporting surface should be cause for rejection.

FLASHING WARNING LAMPS FOR AUTHORIZED EMERGENCY, MAINTENANCE AND SERVICE VEHICLES—SAE J595b

SAE Standard

Report of Lighting Committee approved December 1948 and last revised July 1964.

Definition—Flashing warning lamps covered in this standard are for use on authorized emergency, maintenance and service vehicles.

Identification Code Designation—The identification code designation is W1.

General Requirements—Warning lamps should have at least 12 sq in. of effective illuminated area. The exposed illuminated area of the lamp need have no word, letter, nor other device intended to identify the signal.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test

Section J—Photometric Test—All beam candlepower measurements shall be made with a bar photometer or equivalent, with the filament of the lamp at a distance of at least 10 ft from the photometer screen. The lamp axis shall be taken as the light source parallel to the longitudinal axis of the vehicle. (For minimum candlepower requirements see Table 1.)

Section L—Warpage Test on Devices with Plastic Lenses

Bulb Sockets—See SAE J567.

Color Test—The warning lamp indication shall be red or amber. See SAE J578.

General Warning Signal System Recommendations—(These general recommendations are not a part of the test specifications.)

Each vehicle should be equipped with two flashing lamps on the rear and two flashing lamps on the front.

Front and rear warning lamps should be mounted as high and as far apart as practicable, but in no case should the lateral spacing be less than 3 ft. The location of front warning lamps should be such that they can be clearly distinguished when the headlamps are lighted on the lower beam.

Visibility of front warning lamps to the front and of rear warning lamps to the rear should be unobstructed by any part of the vehicle 10 deg above to 10 deg below the horizontal and from 45 deg to the right to 45 deg to the left of the centerline of the vehicle.

Warning lamps should flash no slower than 60, nor faster than 120, times per minute under normal operating conditions. The "on" period of the flasher should be between 30 to 75%.

There should be a visible or audible means of giving a clear and unmistakable indication to the driver when the warning lamps are turned "on" and functioning normally.

To improve the effectiveness of the signal, it is recommended that, where practical, the area of the vehicle immediately surrounding the signal be painted black.

TABLE 1—MINIMUM CANDLEPOWER REQUIREMENTS

Test Points, deg		Candlepower, Min		Test Points, deg		Candlepower, Min	
		Red	Amber			Red	Amber
10U	5L	20	60	H	V	300	900
	V	50	150		5R	200	600
	5R	20	60		10R	75	225
					20R	30	90
5U	20L	20	60				
	10L	50	150	5D	20L	20	60
	5L	100	300		10L	50	150
	V	150	450		V	150	450
	5R	100	300		10R	50	150
	10R	50	150		20R	20	60
	20R	20	60				
				10D	5L	20	60
H	20L	30	90		V	50	150
	10L	75	225		5R	20	60
	5L	200	600				

VEHICULAR HAZARD WARNING SIGNAL OPERATING UNIT—SAE J910

SAE Recommended Practice

Report of Lighting Committee approved January 1965. Editorial change January 1966.

1. Definition—A vehicular hazard warning signal operating unit is a driver controlled device which causes all turn signal lamps to flash simultaneously to indicate to the approaching drivers the presence of a vehicular hazard.

2. Identification Code Designation—The identification code designation will be QC.

3. General Requirements—

(a) The following sections from SAE J575 are a part of this recommended practice.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities

(b) The unit may be an independent switch or it may be in combination with the turn signal operating unit.

(c) The vehicular hazard signal function shall operate independently of the ignition switch.

(d) If the vehicular hazard operating unit is combined with the turn signal operating unit, the operating motion of the hazard function shall differ from the actuating motion of the turn switch function.

(e) If the vehicular hazard unit requires the operation of more than one switch, a means shall be provided for actuating all switches simultaneously by a single driver action.

4. Durability Test—The vehicular hazard operating unit shall be durability tested at rated voltage with the maximum bulb load to be used on the vehicle. (NOTE: Flasher not to be included in the circuit during test.) The unit should be turned "on" and "off" in the normal manner, at a rate of not more than 15 cpm. One cycle shall consist of "off" to "on" and return to "off." The test sequence shall consist of: 10,000 cycles at a temperature of 75 ± 10 F; 1 hr "on" at a temperature of 75 ± 10 F.

The unit shall be operative at the completion of the test (except bulbs may be replaced during the period of test) and the voltage drop from the input terminal to each output terminal (including 3 in. of No. 16 or No. 18 gage wire on each side of the switch) shall not exceed 0.3 v with rated lamp load for either 6.4 or 12.8 line voltage before and after test. A combination switch shall meet all other applicable requirements for its function, in addition to the above durability test.

5. Pilot Indicator Lamps—In vehicles equipped with right- and left-hand turn signal pilot indicators, both pilots and/or a separate pilot shall flash simultaneously while the vehicle hazard operating unit is turned "on." In vehicles equipped with a single turn signal pilot indicator, a separate vehicular hazard pilot indicator shall flash and the turn signal pilot may flash while the vehicular hazard operating unit is turned "on." If a separate vehicular hazard pilot indicator is used, it shall emit a red color and have a minimum area equivalent to a 0.5 in. diameter circle.

6. Flashers—Flashers used with hazard warning signal switches shall comply with SAE J945.

SCHOOL BUS RED SIGNAL LAMPS—SAE J887

SAE Standard

Report of Lighting Committee approved July 1964.

Definition—School bus red signal lamps are alternately flashing lamps mounted horizontally both front and rear, intended to identify a vehicle as school bus and to inform other users of highway that such vehicle is stopped on highway to take on or discharge school children.

Identification Code Designation—The identification code designation will be W2.

General Requirements—The effective projected illuminated area measured on a plane at right angles to the axis of the lamp must not be less than 19 sq in.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test
Section L—Warpage Test on Devices with Plastic Lenses

Bulb Sockets—See SAE J567.
Color Test—See SAE J578.
Photometric Test—See Section J of SAE J575.

All beam candlepower measurements shall be made with a bar photometer, or equivalent, with the filament of the lamp at a distance of at least 10 ft from the photometer screen. The lamp axis shall be taken as the horizontal line through the light source parallel to what would be the longitudinal axis of the vehicle, if the lamp were mounted in its normal position on the vehicle.

An aiming tolerance of ±½ deg vertical and ±1 deg horizontal should be allowed for manufacturing and laboratory variations.

Aiming Provisions—The lamps should be equipped with aiming pads on the lens face suitable for use with mechanical headlamp aimer. See SAE J571 (Figs. 1 and 3) for aiming pad dimensions and locations. The lamp should be designed so that with the aiming plane normal to the photometer axis, the beam shall meet the photometric specifications indicated in Table 1.

General Signal System Recommendations—(These general recommendations are not a part of the test specifications.)

Each vehicle should be equipped with two alternately flashing red lamps on the rear and two alternately flashing red lamps on the front. They should be controlled by a manually actuated switch and shall flash alternately at a rate of 60-120 cycles per minute. The "on" period of the flasher should be long enough to permit the bulb filament to come up to full brightness. There should be a visible or an audible means of giving a clear and unmistakable indication to the driver when the signal lamps are turned on. Front and rear signal lamps should be spaced as far apart laterally as practical but in no case shall the spacing between the lamps be less than 40 in.

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

The visibility of the front signal lamps to the front and of the rear signal lamps to the rear should be unobstructed by any part of the vehicle from 5 deg above to 10 deg below horizontal and from 30 deg to the right to 30 deg to the left of center line of the lamps.

To improve the effectiveness of the signal, it is recommended that the area of the vehicle immediately surrounding the signal lamp be painted black.

Lamps should be mounted on the school bus with their aiming plane vertical and normal to the vehicle axis. A suggested tolerance for this aim is 5 in. at 25 ft in vertical aim and 10 in. at 25 ft in horizontal aim. If lamps are aimed or inspected with a mechanical headlamp aimer (see SAE J602) the graduation settings for aim should be 2 down and 0 sideways. The limits for inspection should be from 3 up to 7 down and from 10 right to 10 left.

TABLE 1 — MINIMUM PHOTOMETRIC CANDLEPOWER FOR RED SCHOOL BUS WARNING LAMPS

Test Point		Candlepower	Test Point		Candlepower
5U	20L	150	H	20R	180
	10L	300		30R	30
	5L	300			
	V	300	5D	30L	30
	5R	300		20L	200
	10R	300		10L	300
	20R	150		5L	450
				V	450
H	30L	30		5R	450
	20L	180		10R	300
	10L	400		20R	200
	5L	500		30R	30
	V	600			
	5R	500	10D	5L	40
	10R	400		V	40
				5R	40

ELECTRIC EMERGENCY LANTERNS—SAE J596

SAE Standard

Report of Lighting Division approved January 1937 and last revised by Lighting Committee March 1960. Editorial change April 1964.

Definition—An emergency electric lantern is a self-powered device capable of providing and displaying a warning light, either flashed[1] or steady burning, for use as provided in the Safety Regulations of the Interstate Commerce Commission and in the Uniform Vehicle Code to indicate to the driver of an approaching vehicle that a stationary vehicular hazard is present and that he should proceed with caution.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test

The above tests shall be made before the reliability and photometric or visibility test.[2]

Section L—Warpage Test on Devices with Plastic Lenses

Color Test—The indication of lanterns using incandescent bulbs shall be red. See SAE J578.

Reliability Test—In the case of lanterns which can be turned on or off at will, a sample unit shall be set up in complete form and operated for 1000 cycles, using the operating unit or switch submitted with the device as a part thereof. This test shall be made at a rate not to exceed 50 times per minute. In the case of flashing units the rate shall be slow enough to permit the unit to flash at least twice for each operation of the switch.

When this test is completed, the operating unit shall not show any evidence of material physical weakness, excessive wear, or high resistance.

The lantern shall be turned on for a period of 12 hr. During this test, the "on" period for the flasher, if one is provided, shall be long enough at all times to permit the source to come up to required visibility or full brightness. The rate of flashing during the test shall not be less than 60 or more than 150 cpm, except for gaseous discharge lamps in which the rate of flashing shall not be more than 200 cpm.

If during these tests the flasher (if one is provided) continues to function as specified, and if after these tests the lantern with the battery used in the tests meets all optical requirements, the lantern shall be considered satisfactory from the reliability standpoint.

Photometric Test—This test is for emergency lanterns with a continuous beam or long "on"-period flash.

All beam candlepower measurements shall be made with the center of light at a distance of at least 4 ft from the photometer screen. In measuring distances and angles, the source shall be taken as the center of light. The lamp axis shall be taken as the horizontal line through the light source parallel to the mounting surface as indicated by the manufacturer.

Directly to the front and rear of the lanterns on the axis, the light shall have an intensity of at least 0.50 cp.

To the front and rear of the lantern, from 2½ deg up to 2½ deg down and from 20 deg left to 20 deg right, there shall be at least 0.30 cp.

To the front and rear of the lantern, from 5 deg up to 5 deg down and from 30 deg left to 30 deg right, there shall be at least 0.10 cp.

Visibility Test—This test is for emergency lanterns with a short "on"-period flash.[3]

In measuring distances and angles, the source shall be taken as the center of light.

To the front and rear of the lantern, from 2½ deg up to 2½ deg down and from 20 deg left to 20 deg right, the signal shall be visible from a distance of at least 1000 ft after dark.

To the front and rear of the lantern, from 5 deg up to 5 deg down and from 30 deg left to 30 deg right, the signal shall be visible from a distance of at least 750 ft.

[1] Flashing greatly increases the attracting power of an emergency electric lantern and should be encouraged as a means for identifying the presence of a hazard.

[2] The optical specifications are based upon the assumption that suitable regulations covering the removal or recharging of the electrical supply will be made and enforced by the proper authorities.

[3] When the "on" period of a flasher is extremely short as in the case of the gaseous discharge lamp operated through a condenser discharge, the candlepower alone without the duration time of discharge is meaningless; therefore, a Visibility Test is preferable.

360 DEG EMERGENCY WARNING LAMP—SAE J845

SAE Recommended Practice

Report of Lighting Committee approved January 1963. Editorial change April 1964.

Purpose—The purpose of this SAE Recommended Practice is to provide minimum performance requirements and test procedures for 360 deg emergency warning signal lamps.

Definition—360 deg emergency warning signal lamps are devices for use on authorized emergency vehicles.

General Requirements—This standard specifically pertains to that type of signal device that will project a flashing beam signal throughout 360 deg on the horizontal plane passing through the center of the light source. The device shall project a beam of light on a vertical plane rotating around the horizontal axis of the lamp and shall have a total light spread of at least 10 deg extending a minimum of 5 deg above and below the horizontal axis of the light source.

The flash rate when observed from a fixed position shall be between 60 and 120 flashes per minute. When the flash rate is produced by current interruption, the on period shall be long enough to permit the bulb to come up to full brightness.

The color of the lens when used on vehicles on highway emergency service missions shall be red or amber.

The lamp dome or cover lens shall project a minimum area of 16 sq in. as measured on a vertical plane passing through the center of the lamp.

General Test Provisions—The following sections from SAE J575 are a part of this recommended practice:

Section B—Samples for Test
Section C—Lamp Bulbs
Section D—Laboratory Facilities
Section E—Vibration Test
Section F—Moisture Test
Section G—Dust Test
Section H—Corrosion Test
Section L—Warpage Test

Color Test—See SAE J578.

Extreme Temperature Tests

Heat—The device shall be subjected to an ambient temperature of 120 F continuously for 6 hr. From the beginning of the sixth hour to the end of the test, the device shall be lighted and operated at its normal rated voltage. At the end of the sixth hour, the device shall continue to function normally except that for the purpose of this test the flash rate shall not be greater than 130 flashes per minute.

Cold—The device shall be subjected to an ambient temperature of −25 F for 6 hr. At the end of the sixth hour, the device shall be lighted and operated at its normal rated voltage.

After the unit has been allowed to operate for 3 minutes, the device shall function normally except that for the purpose of this test the flash rate shall not be less than 50 flashes per minute.

Photometric Test

Lamps Flashed by Current Interruption—All candlepower measurements shall be made with the incandescent filament of the signal lamp at least 15 ft or more from the photometer screen.

In photometric tests of lamps which are flashed by current interruption, the lamp shall be mounted so that the horizontal plane through the photometer axis passes through the center of the light source. The vertical axis through the center of the light source shall be perpendicular to this horizontal plane.

The lamp shall be turned about its vertical axis until the photometer indicates minimum candlepower. This shall be the H-V point. With the lamp in this position, the candlepower measured within the angular limits shall not be less than the values specified in the table of minimum photometric values.

Lamps Flashed by Rotation or Oscillation—All candlepower measurements shall be made with the incandescent filament of the signal lamp at least 60 ft or more from the photometer screen.

In photometric tests of lamps which are flashed by rotation, the lamps shall be mounted so that the horizontal plane through the photometer axis passes through the center of the light source of the rotating element. The vertical axis through the center of the light source shall be perpendicular to this horizontal plane.

The rotating element shall be turned on its vertical axis until the photometer indicates maximum candlepower. This shall be the H-V point. The candlepower measured within the angular limits shall not be less than the values specified in Table 1.

Installation Recommendations—(These recommendations are not part of the test specification.)

1. In view of the wide variety of uses for 360 deg warning lamps, care must be taken to select a lamp with performance characteristics commensurate with the function and speed of the vehicle upon which it will be used.

TABLE 1—PHOTOMETRIC MINIMUM CANDLEPOWER REQUIREMENTS

Test Angles, deg	Candlepower, Min	
	Red	Amber
5 U to 5 D	50	125
2½ U to 2½ D	200	500

2. It is desirable that all emergency warning lamps described by this specification be provided with an illuminated switch or pilot indicator to give the driver a clear and unmistakable indication that the emergency warning lamp system is turned on.

3. Emergency warning lamps should be mounted to provide 360 deg visibility at all times.

LIQUID BURNING EMERGENCY FLARES—SAE J597 SAE Standard

Report of Lighting Committee approved January 1949 and last revised January 1957. Editorial change April 1964.

Definition—A liquid burning emergency flare is a device capable of providing and displaying a warning light, indicating to the driver of an approaching motor vehicle that a hazard is present and that he should proceed with caution.

The following sections from SAE J575 are a part of this standard.

Section B—Samples for Test

Section D—Laboratory Facilities

Section E—Vibration Test—(Flares shall be provided in sets of three contained in a metal rack or metal box which can be securely mounted on the vibration machine.)

Section H—Corrosion Test

Instructions—The manufacturer shall furnish with each set of flares submitted for laboratory test printed instructions as to wick adjustment, maximum filling level, the method of installation, and such other details as the manufacturer may deem necessary in order that the user of these flares may be able to operate them at their maximum efficiency.

Weatherproof Test—The flares used for these tests shall be filled with kerosene to the level recommended in the manufacturer's instructions and shall have the wicks adjusted as recommended by the manufacturer.

After a preheating period of 5 minutes in still air, a sample flare, lighted and mounted in its normal operating position on a table rotating at 4 rpm and in a wind approximately 2 mph, shall be subjected to a water spray from an adjustable solid cone nozzle (such as the ordinary garden hose spray nozzle) set so that the nozzle outlet is 8 to 12 ft horizontally from the sample and 1 to 3 ft vertically above the sample, with the nozzle axis pointing upward at an angle of approximately 45 deg with the horizontal, and with the water striking the sample at an angle of approximately 45 deg with the horizontal in a downward direction.

Under the conditions specified above and with a water pressure of 5 to 7½ psi at the nozzle, the rate of precipitation at the location of the sample shall be adjusted to 0.10 in. per min. The sample shall be introduced gradually into the spray and after being placed in the test location shall continue to operate under these conditions for 15 min. This test shall be made on each of the three flares constituting a set, and two out of three shall pass the test.

With the rate of rotation and the wind condition the same as described above, the water pressure shall be further increased to a value of 18 to 20 psi and the sample moved farther from the nozzle, if necessary, to a location giving a precipitation of 0.01 in. per min striking the sample at approximately 45 deg with the horizontal. Under these conditions, the sample shall continue to operate for 1 hr and 30 min. This test shall be made on each of the three flares constituting a set, and two out of the three shall pass the test.

NOTE: Solid cone spray nozzles, operating at 5 to 7½ psi, give a spray consisting of relatively large drops when set so that the center of the stream at the flare shows 0.10 in. per min precipitation. At higher pressures, the drops are smaller. These conditions are comparable to actual rain.

Reliability, Standard, and Life Tests—The flares used for these tests shall be filled with kerosene to the level recommended by the manufacturer and shall have the wicks adjusted in accordance with the manufacturer's instructions.

A flare that is nearly empty of fuel shall be lighted, placed on a horizontal concrete surface similar to a pavement, and allowed to burn in still air for a preheating period of 5 min. It shall then be placed suddenly in an air stream of 40 mph and withdrawn. After rotating through approximately 45 deg, it shall again be placed in the air stream and withdrawn. It shall be rotated again through an additional 45 deg approximately and placed in the air stream and withdrawn a third time. If the flame is extinguished or if the flare slides or is overturned by the wind on any one of these three operations, the sample shall have failed to pass the test. The test shall then be repeated on each of the other two samples constituting a set, and two out of the three shall pass the test.

A flare, lighted and mounted in its normal operating position, rotating about its vertical axis at 4 rpm, shall be subjected to a horizontal current of air having a velocity the equivalent of wind at 40 mph. This test shall continue for 15 min and the flare shall remain lighted throughout the entire 15-min period.

Upon completion of these tests, the flare shall, while lighted and rotated as specified above, be subjected to a horizontal current of air having a velocity of 5 mph. The total uninterrupted burning time, including the first 15 min at 40 mph, shall be at least 12 hr. The flare shall not be refilled during test; there shall be no adjustment of wick.

The flare shall operate satisfactorily for a period of at least 2 hr in still air.

Photometric Test—A sample flare, when subjected to a wind velocity of 5 mph and 40 mph, respectively, shall produce a minimum of 0.10 cp in a horizontal direction.

SEALED LIGHTING UNITS FOR CONSTRUCTION AND INDUSTRIAL MACHINERY—SAE J598a SAE Recommended Practice

Report of Construction and Industrial Machinery Technical Committee and Lighting Committee approved February 1959 and last revised June 1964.

[Construction and Industrial Machinery is normally operated off highways, therefore this SAE Recommended Practice is not intended to be used as a basis for regulations by those having authority over motor vehicles used on public highways.]

Scope—This recommended practice applies to floodlamp and headlamp units intended for use on off-highway vehicles and machines generally known as earthmoving equipment. Other performance and dimensional information is contained in SAE J572 and SAE J760.

Definitions

Floodlamp (Trade No. 4078, 4478, 4578 - 5¾ in. dia; 4406, 4593 - 4½ in. dia)—Recommended for general illumination of area close to the machine.

Typical usage—Track type vehicle front and rear lamps
Wheel tractor scraper front lamp
Scraper bowl illumination
Motor grader blade illumination

Tractor shovel bucket illumination
Off-Highway truck back-up light

General Service Lamp (Trapezoidal Flood), (Trade No. 4411, 4589 - 4½ in. dia)—Recommended for general illumination of areas up to 75 ft from the machine.

Typical usage—Wheel type tractor shovel front lamp
Motor grader front lamp

Headlamp (Trade No. 4080, 4480, 4880 - 5¾ in. dia)—The headlamp has a single beam with a sharp cutoff at the top to reduce glare to other vehicles and to minimize reflection from dust.

Typical usage—Wheel tractor scraper headlamp
Off-Highway truck headlamp

Laboratory Facilities—See Section D of SAE J575.

Photometric Test Points—See Section J of SAE J575.

Photometric Test—Photometric tests shall be made with the photometer or light sensitive device at a distance of 60 ft from the lamp. The unit shall be operated at its design voltage during the tests. For test values see Tables 1, 2, 3, and 4. A tolerance of ± ¼ deg shall be allowed for any test point.

Beam Aim During Photometric Test

1. Floodlamp and General Service Lamp Units—Visually center the beam vertically and horizontally on the photometer axis.

2. Headlamp Unit—Visually center the beam laterally on the photometer axis with the top cutoff of the beam 1 deg below photometer axis.

Additional Data—Additional data for each of these lamps are provided in Table 5.

The units whose characteristics are shown in Tables 3 and 4 are also widely used for purposes other than Construction and Industrial Machinery Lighting. The tables are presented to facilitate lamp application and machine design.

Installation Recommendations—(These recommendations are not a part of the test specification.)

The units recommended have been evaluated for lighting performance with satisfactory results in average job situations when used as suggested under Definitions.

Dimensional interchangeability among types and voltages makes it possible for the equipment designer or operator to choose units to suit the wide variety of job conditions met in service.

Floodlamp units are not recommended as the sole source of forward illumination for vehicles capable of speeds in excess of 10 mph. Similarly General Service Lamps are not recommended as the sole source of forward illumination for vehicles capable of speeds in excess of 25 mph.

These units have been selected with special emphasis on light for working conditions and lamp durability, which are best provided by units producing only a single beam. Because machines that travel on construction haul roads often encounter traffic similar to highway conditions, CAREFUL AIMING of the lighting units is required. Headlamp systems composed of these types have been made that restrict glare to acceptable limits, while maintaining adequate illumination for the work areas. This approach avoids the necessity of using dimming switches. Systems employing four or more units, combining headlamps and floodlamps, with or without dimming switches, have been devised which provide a marked improvement in operating efficiency.

Good results from a CIM lighting system require ample provision for individual adjustment of the lamp unit aim. Some applications have used to advantage vertical aims from 30 deg above to 15 deg below the horizontal and lateral aims from 15 deg left to 15 deg right.

Service life of units may be materially prolonged by mountings properly designed to cushion the unit from shock and vibration inherent in construction machinery. Where space permits, it is recommended that the 5¾ in. units be specified to obtain maximum illumination and lamp life.

TABLE 1—TEST POINT VALUES FOR FLOODLAMP[a], 5-3/4 IN. DIAMETER (Trade No. 4078, 4478, 4578)

Position, deg	Min cp	Position, deg	Min cp
10U—V	750	H—20R and 20L	500
10U—10R and 10L	500	5D—V	1,000
10U—20R and 20L	250	5D—10R and 10L	750
5U—V	1,000	5D—20R and 20L	500
5U—10R and 10L	750	10D—V	750
5U—20R and 20L	500	10D—10R and 10L	500
H—V	1,000	10D—20R and 20L	250
H—10R and 10L	750		

[a] The extremities of the beam should be diffused.

TABLE 2—TEST POINT VALUES FOR HEADLAMP, 5-3/4 IN. DIAMETER (Trade No. 4080, 4480, 4880)

Position, deg	Max cp	Min cp	Position, deg	Max cp	Min cp
1U—10R and 10L	500	—	3D—10R and 10L	—	3,000
H—10R and 10L	1,000	—	3D—15R and 15L	—	1,500
1-1/2D—V	—	3,000	5D—V	—	3,000
1-1/2D—10R and 10L	—	1,500	5D—15R and 15L	—	750
1-1/2D—15R and 15L	—	1,000	8D—V	—	1,000
3D—V	—	6,000	8D—10R and 10L	—	600

TABLE 3—TEST POINT VALUES FOR GENERAL SERVICE LAMP, 4-1/2 IN. DIAMETER (Trade No. 4411, 4589)

Position, deg	Min cp	Position, deg	Min cp
10U—V	1,500	H—8R and 8L	650
10U—5R and 5L	1,200	10D—V	500
H—V	1,000	10D—12R and 12L	300

TABLE 4—TEST POINT VALUES FOR GENERAL SERVICE FLOODLAMP, 4-1/2 IN. DIAMETER (Trade No. 4406, 4593)

Position, deg	Min cp	Position, deg	Min cp
15U—V	250	H—40R and 40L	175
15U—40R and 40L	125	15D—V	250
H—V	400	15D—40R and 40L	125

TABLE 5—SEALED UNITS FOR CONSTRUCTION AND INDUSTRIAL MACHINERY

Type of Service[a]	Trade No.	Design		Rated Average Lab Life, hr at v	Max Amp at Design Volts	Filament Type	Type and Size	Max Dia, in.	Max Overall Length	Dimensional Specification	Terminal	No. of Contacts
		Watts	Volts									
6-Volt Circuits												
1	4078	50	6.4	500 at 7	8.2	C-6	PAR 46	5.70	4	Fig. 1[b]	Lug	2
2	4080	50	6.4	500 at 7	8.2	C-6	PAR 46	5.70	4	Fig. 1[b]	Lug	2
12-Volt Circuits												
3	4411	35	12.8	300 at 14	2.93	C-6	PAR 36	4.46	2-3/4	Fig. 2[c]	Screw	2
1	4406	35	12.8	300 at 14	2.93	C-6	PAR 36	4.46	2-3/4	Fig. 2[c]	Screw	2
1	4478	60	13	800 at 14	4.9	2-C6 in series	PAR 46	5.70	4	Fig. 1[b]	Lug	2
2	4480	60	13	800 at 14	4.9	2-C6 in series	PAR 46	5.70	4	Fig. 1[b]	Lug	2
24-Volt Circuits												
3	4589	50	28	400 at 28	1.95	CC-6	PAR 36	4.46	2-3/4	Fig. 2[c]	Screw	2
1	4593	50	28	400 at 28	1.95	CC-6	PAR 36	4.46	2-3/4	Fig. 2[c]	Screw	2
1	4578	60	28	800 at 28	2.3	2-C6 in series	PAR 46	5.70	4	Fig. 1[b]	Lug	2
2	4880	60	28	800 at 28	2.3	2-C6 in series	PAR 46	5.70	4	Fig. 1[b]	Lug	2

NOTE: Service life of construction units might not equal laboratory life because of vibration, shock, and variations in vehicle voltage.

[a] Number designations are defined as follows: 1—Floodlamp, 2—Headlamp, 3—General Service Lamp.

[b] See SAE J572.

[c] See SAE J760.

LIGHTING INSPECTION CODE—SAE J599a SAE Recommended Practice

Report of Lighting Division approved January 1937 and last revised by Lighting Committee March 1962.

[This code is intended only for the inspection and maintenance of lighting equipment on motor vehicles that are in operation.

The original SAE code, adopted in 1937, was drafted for use in preparing Interstate Commerce Commission regulations for trucks and buses in interstate operation under the 1935 Motor-Carrier Act. Subsequently the SAE code served as a basis for Section 2, Lighting Systems, of the American Standard Code for Inspection Requirements for Motor Vehicles, ASA D7-1939. The ASA inspection requirements for lighting systems were adopted by the Society as the SAE Recommended Practice in January 1940. This SAE Recommended Practice conforms, in general, to the latest revision of ASA-D7.

SAE lighting specifications are subject to frequent change to keep pace with technical advances. This SAE Recommended Practice is intended for use by State or Federal authorities having regulatory powers over motor vehicles, but its inclusion in State or Federal laws where flexibility of revision is lacking is discouraged.]

1. Definitions of Beams

(a) **Single Beam**—A single beam headlamp provides only one fixed beam that is not adjustable from the driver's seat.

(b) Multiple Beam—A multiple beam headlamp provides two or more beams which may be selected as required.

(c) Symmetrical Beam—A symmetrical beam has both sides symmetrical with respect to the median vertical plane.

(d) Asymmetrical Beam—An asymmetrical beam is one in which both sides are not symmetrical with respect to the median vertical plane.

2. General Headlamp-Testing Requirements

(a) Preparation for Aiming—Before checking beam aim, the inspector shall:

(1) Remove ice or mud from under fenders.

(2) See that no tire is noticeably deflated.

(3) Check car springs for sag or broken leaves.

(4) Take into consideration faulty wheel alignment or improper tracking of the rear axle.

(5) See that there is no load in the vehicle other than the driver in the front seat.

(6) Check functioning of any "level-ride" control.

(7) Clean lenses and aiming pads.

(8) Check for bulb burn-out and proper beam switching.

(9) See that light output is well towards normal new lamp value.

(10) Rock the vehicle sideways.

The reference to higher standards mentioned in the notes in Section 4 should be drawn to the attention of the car owner.

(b) Equipment—Beams should be inspected for aim either (1) on a screen at a distance of 25 ft ahead of the headlamps, or (2) with inspection equipment which gives essentially equivalent results, or (3) with a mechanical headlamp aimer which can be used with mechanically aimable headlamps.

(1) If a screen is used, it should be of adequate size with a matte-white surface well shaded from extraneous light and properly adjusted to the floor area on which the vehicle stands. Provision should be made for moving the screen so that it can be aligned parallel with the rear axle, and so that a horizontal line drawn perpendicular from the centerline of the screen will pass an equal distance between the two headlamps. The screen should be provided with a fixed vertical centerline, four laterally adjustable vertical tapes, and two vertically horizontal tapes should be located on the screen at the upper and lower limits called for in the specifications with reference to the plane on which the vehicle rests, not the floor on which the screen rests. The four movable vertical tapes should be located on the screen at the left and right limits called for in the specification with reference to centerlines spaced to either side of the fixed centerline on the screen by the amount the lamps are to the left and right.

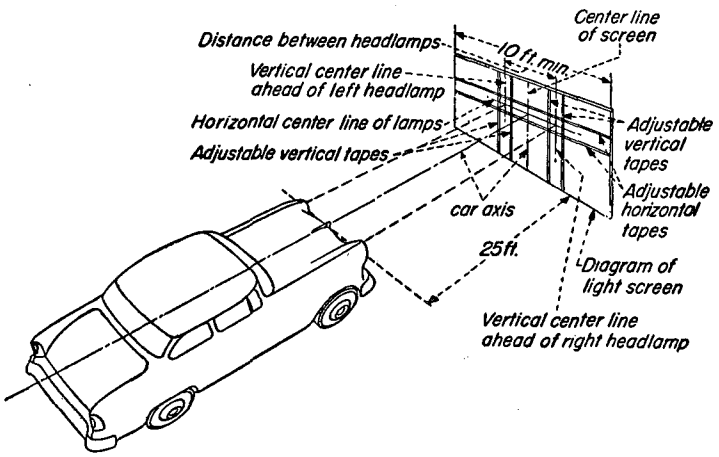


FIG. 1—CAR POSITION WITH RESPECT TO SCREEN

(2) If a headlamp testing machine is used it should conform to the requirements of SAE Recommended Practice, Headlamp Testing Machines—SAE J600. It should be in good repair and adjustment and used in accordance with the manufacturer's instructions.

(3) If a mechanical aimer is used it should conform to the requirements of SAE Recommended Practice, Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units—SAE J602. The device should be in good repair and adjustment and should be used according to the manufacturer's instructions. Mechanical aimers should be used only on mechanically aimable sealed beam units.

NOTE 1: Vehicles in use today generally are equipped with one of two types of headlighting: the dual headlighting system consisting of 5¾ in. dia sealed beam units or the single headlighting system consisting of two 7 in. dia sealed beam units.

In the dual system, two lamps (identified by "1" on the lens are single filament lamps and provide the majority of the upper beam light. The other two units (identified by "2" on the lens) contain two filaments each. One filament operates in conjunction with the type "1" lamp and supplements the upper beam by providing fill-in light. The other filament provides the entire lower beam light.

The 7 in. dia type "2" lamp (identified by "2" on the lens) contains two filaments. One filament produces the upper beam and the other produces the lower. All type "2" lamps, regardless of size, must be aimed and inspected for aim on the lower beam.

The original 7 in. sealed beam can be identified by the absence of "2" on the lens. These lamps must be aimed and inspected for aim on the upper beam.

NOTE 2: The inspector should see that the driver understands how to use the multiple beam headlamps so as to obtain the best road lighting with minimum glare to other users of the highway.

3. General Lamp-Inspection Limits—General lamp inspection includes the following types of lamps: head, tail, stop, license, clearance, signal, marker, and fog.

Any of the following defects shall be cause for rejection:

(a) Any bulb in any lamp required by law or regulation or in any fog lamp which fails to function properly.

(b) An improperly connected circuit which does not light the proper filaments for the different switch positions.

(c) A cracked, broken, or missing lens.

(d) A lens that is rotated, upside down, wrongside out, or is otherwise incorrectly installed.

(e) A lens marked "left" or "right," not appropriately installed.

(f) A separable type lens, the name of which does not correspond with the name stamped on the lamp body, unless it is specifically approved for use with that lamp body.

(g) A headlamp or fog lamp with dirt or moisture inside, any obvious discoloration, contamination, or reflector deterioration.

(h) A lamp which is not securely fastened to the vehicle.

(i) A lamp showing a beam of color contrary to law or regulation.

(j) Any defects in wiring or lighting equipment that would be likely to influence adversely the effectiveness of the lighting performance.

(k) Any auxiliary equipment placed on, in, or in front of the headlamp which is not a part of the original approved equipment.

(l) Beam indicator lamps which do not indicate the proper beam to the driver and which do not function properly.

(m) Any lamp or lens which is turned or inclined so that its light is not properly directed.

4. Lamp Output Inspection—Approval shall be refused when the light produced by any headlamp or auxiliary lamp designed for use in place of a headlamp (whether measured in terms of maximum beam candlepower, average beam candlepower, lamp output, or other term) is less than 50% of the normal new lamp value.

NOTE: A light output of 70% or more of new lamp value, while not required in this code, is desirable. See Section 2 (a) for use.

5. Lamp Aiming and Inspection—Visual Method—All of the following values are based upon a 25 ft test distance. See Figs. 2, 3, 4, and 5.

(a) The headlamps listed below are to be aimed on the upper beam. See Fig. 2.

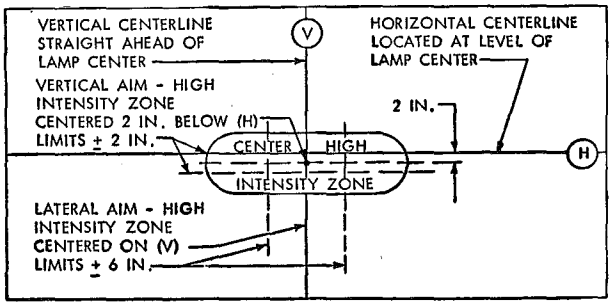


FIG. 2—AIM INSPECTION LIMITS FOR UPPER BEAM OF:
5¾ in. Type 1 Sealed Beam
7 in. Sealed Beam, except Type 2

Vertical Aim (up and down)—center of high intensity zone 2 in. below the horizontal line which represents the level of the lamp center.

APPROVAL SHALL BE REFUSED if the center of the high intensity zone is above the horizontal line or more than 4 in. below.

Lateral Aim (sidewise)—center of high intensity zone on the vertical line straight ahead of lamp center.

APPROVAL SHALL BE REFUSED if the center of the high intensity zone is more than 6 in. right or left of the vertical centerline.

(b) The headlamps listed below are to be aimed on the lower beam. See Fig. 3.

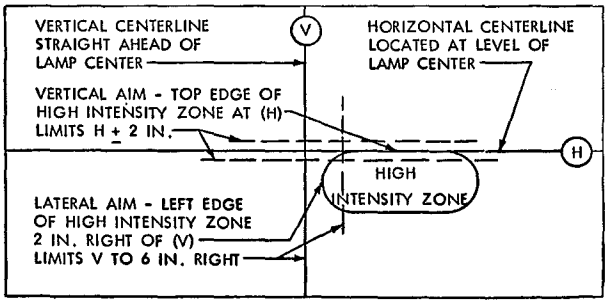


FIG. 3—AIM INSPECTION LIMITS FOR LOWER BEAM OF:
5¾ in. Type 2 Sealed Beam
7 in. Type 2 Sealed Beam
Caution—Do not aim or inspect these lamps on the upper beam
Auxiliary passing lamp (single beam)

Vertical Aim (up and down)—top edge of high intensity zone on the horizontal line which represents the level of the lamp center.

APPROVAL SHALL BE REFUSED if the top edge of the high intensity zone is more than 2 in. above or below the horizontal line.

Lateral Aim (sidewise)—left edge of the high intensity zone 2 in. right of the vertical centerline straight ahead of the lamp center.

APPROVAL SHALL BE REFUSED if the left edge of the high intensity zone is to the left of the vertical centerline or more than 6 in. to the right.

(c) Fog lamps with symmetrical beams. See Fig. 4.

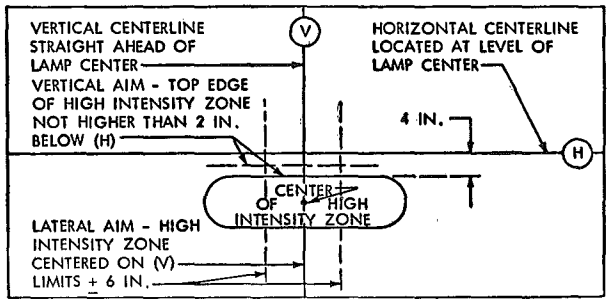


FIG. 4—AIM INSPECTION LIMITS FOR SYMMETRICAL BEAM FOG LAMPS

Vertical Aim (up and down)—top edge of high intensity zone 4 in. below the horizontal line which represents the level of the lamp center.

APPROVAL SHALL BE REFUSED if the top edge of the high intensity zone is higher than 2 in. below the horizontal line.

Lateral Aim (sidewise)—center of high intensity zone on vertical line straight ahead of lamp center.

APPROVAL SHALL BE REFUSED if the center of the high intensity zone is more than 6 in. right or left of the vertical centerline.

(d) Fog lamps with asymmetrical beams. See Fig. 5.

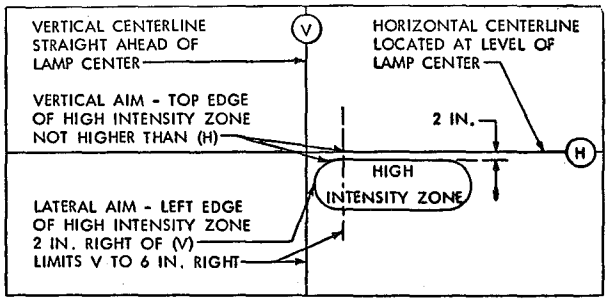


FIG. 5—AIM INSPECTION LIMITS FOR ASYMMETRICAL BEAM FOG LAMPS

Vertical Aim (up and down)—top edge of high intensity zone 2 in. below the horizontal line which represents the level of the lamp center.

APPROVAL SHALL BE REFUSED if the top edge of the high intensity zone is above the horizontal line.

Lateral Aim (sidewise)—left edge of high intensity zone 2 in. right of the vertical centerline straight ahead of lamp center.

APPROVAL SHALL BE REFUSED if the left edge of the high intensity zone is to the left of the vertical centerline or more than 6 in. to the right.

(e) Table 1 summarizes the beam aim and inspection tolerances for head, fog, driving, and passing lamps.

6. Lamp Aiming and Inspection—Mechanical Method—It is recommended that mechanically aimable lamps be aimed and inspected using a mechanical aimer which conforms to SAE Recommended Practice, Headlamp Aiming Device for Mechanically Aimable Sealed Beam

TABLE 1—BEAM AIM AND INSPECTION TOLERANCES FOR HEADLAMPS, FOG, AND PASSING LAMPS

HEADLAMP IDENTIFICATION	AREA OF HIGH INTENSITY ZONE TO BE USED FOR AIMING & INSPECTION	INSPECTION LIMITS AND BEAM TO BE INSPECTED FOR AIM				AIMING CHART FIG. NO.	RECOMMENDED NOMINAL AIMING FOR ADJUSTING STATIONS			
		LATERAL AIMING		VERTICAL AIMING			LATERAL AIMING OF BEAM		VERTICAL AIMING OF BEAM	
		UPPER	LOWER	UPPER	LOWER		UPPER	LOWER	UPPER	LOWER
5-3/4" TYPE 1 - S.B.	VERTICAL & HORIZONTAL CENTER	HOR. CENTER V± 6"		VERTICAL CENTER H TO 4" BELOW H		2	HORIZONTAL CENTER ON V		VERTICAL CENTER 2" BELOW H	
5-3/4" TYPE 2 - S.B	TOP & LEFT EDGES		LEFT EDGE V TO 6" RIGHT		TOP EDGE H± 2"	3		LEFT EDGE 2" R OF V		TOP EDGE AT H
7" TYPE 2 - S.B.	"		"		"	3		"		"
7" REGULAR - S.B.	VERTICAL & HORIZONTAL CENTER	HOR. CENTER V± 6"		VERTICAL CENTER H TO 4" BELOW H		2	HORIZONTAL CENTER ON V		VERTICAL CENTER 2" BELOW H	
FOG LAMPS SYMMETRICAL BEAM	"	"		TOP EDGE 2" BELOW H		5	"		TOP EDGE 4" BELOW H	
FOG LAMPS ASYMMETRICAL BEAM	TOP & LEFT EDGES	LEFT EDGE V TO 6" RIGHT		TOP EDGE NOT ABOVE H		6	LEFT EDGE 2" RIGHT OF V		TOP EDGE 2" BELOW H	
AUXILIARY PASSING LAMP	TOP & LEFT EDGES		LEFT EDGE V TO 6" RIGHT		TOP EDGE H± 2"	3		LEFT EDGE 2" R OF V		TOP EDGE AT H

Abbreviations used above—S.B.—sealed beam; H—horizontal centerline at level of lamp center; V—vertical centerline straight ahead of lamp center; Hor.—referring to horizontal center of high intensity zone.

Headlamp Units—SAE J602.

(a) 7 in.-(except 7 in. Type 2) and 5¾ in.-Type 1 sealed beam lamps.

Vertical Aim (up and down)—mechanical aim graduation should be set at 2 down.

APPROVAL SHALL BE REFUSED if graduation is higher than ½ down or lower than 3½ down.

Lateral Aim (sidewise)—mechanical aim graduation should be set at 0 (straight ahead).

APPROVAL SHALL BE REFUSED if graduation is more than 4 to the right or left of straight ahead.

(b) 7 in. Type 2 and 5¾ in. Type 2 sealed beam lamps.

Vertical Aim (up and down)—mechanical aim graduation should be set at 2 down.

APPROVAL SHALL BE REFUSED if graduation is higher than ½ down or lower than 3½ down.

Lateral Aim (sidewise)—mechanical aim graduation should be set at ½ right of straight ahead.

APPROVAL SHALL BE REFUSED if graduation is to the left of straight ahead or more than 4 right.

7. Turn Signals—Approval shall be refused for any of the following reasons:

(a) (1) Signalling unit not of an approved type, (2) not in an approved position, (3) not functioning properly, (4) not properly directed, and (5) obscured.

(b) Cancelling mechanism, if used, not functioning properly.

HEADLAMP TESTING MACHINES—SAE J600a

SAE Recommended Practice

Report of Lighting Committee approved December 1952 and last revised November 1963. Editorial change March 1965.

Scope—The purpose of this specification is to provide a laboratory test procedure for headlamp testing machines to determine their ability to aim, or to check the aim, of headlamps, fog lamps, and auxiliary driving and passing lamps, within tolerances prescribed herein. This specification does not apply to aiming devices of the kind covered by SAE Recommended Practice, Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units—SAE J602.

Samples for Test—Sample headlamp testing machines submitted for laboratory tests should be representative of the device as regularly manufactured and marketed, excepting in the case of machines using a track, an abbreviated section of track may be supplied for the test. Each sample should include all accessory equipment peculiar to the device and necessary to its service operation and calibration. Full assembly and operating instructions should be provided, including information on how to check accuracy and maintain the device in calibration.

Laboratory Facilities—The laboratory should be equipped with all facilities for accurate screen aiming and all facilities to make accurate physical and optical tests required in this specification, in accordance with established laboratory practice.

General Requirements—The headlamp testing machine should incorporate a fixed track or equivalent for positioning the aiming device in front of the headlamps.

The design of the headlamp testing machine should permit checking the aim of lamps mounted at heights from 12 to 54 in. and spaced up to 48 in. from the center of the motor vehicle.

The device and/or instructions should provide a practical means for a periodic check of its accuracy in the field.

The spirit level or other means provided for indicating vertical aim should be capable of showing at least 0.1 in. deviation with a 0.2 deg (1 in. in 25 ft) change in level.

A vertical aim scale should be provided with numerical graduations in steps, each of which represents 1 in. at 25 ft to provide for variations in aim at least from 4 in. above 0 to 10 in. below 0.

A lateral aim scale should be provided with graduations in steps of not more than 2 in. at 25 ft from straight ahead to at least 6 in. left and right.

The instructions covering use of the headlamp testing machine should include those items in the Preparation for Aiming, Section 2 (a) of SAE Recommended Practice, Lighting Inspection Code—SAE J599.

Alignment With Car—Means should be provided in the device for compensating within ±0.05 deg for reasonable variation in floor slope and clearly explained in the operating instructions.

Means should be provided in the device for accurate lateral alignment within 0.1 deg with respect to longitudinal axis of vehicle.

Visual Beam Appraisal—Machines using a photoelectric cell or cells to determine aim should also have a visual screen upon which the beam pattern is projected proportional to its appearance and aim on a screen at 25 ft. Such visual screen should be plainly visible to the operator and should have horizontal and vertical reference lines to permit visual appraisal of the aim of the lamp beam.

Test Procedure—Assuming that the headlamp testing machine complies with the general requirements, it shall be considered acceptable if it complies with additional test requirements as follows:

NOTE: The laboratory should set up the sample headlamp testing machine in accordance with the instructions furnished. At the same time and on the same axis the laboratory should set up a headlamp adjusting screen with adjustable horizontal and vertical reference lines so as to relate the aim obtained on the headlamp testing machine to that obtained with a properly aligned screen.

Aim

1. Symmetrical Beam—Upper beam [all auxiliary driving lamps, all 7 in. sealed beam units (except 7 in. Type 2 units) and all Type 1, 5¾ in. sealed beam units.]

A. The headlamp testing machine should permit determining the vertical and horizontal aim of the geometric center of the high intensity zone of the upper beam within the limits set up in these specifications.

(1) A group of sealed beam units, at least of Type 1, which meets SAE specifications but represent the maximum production variations of each lamp manufacturer, should be obtained by the testing laboratory.

Units should be selected by the laboratory which represent the extreme of production variation from the lamp manufacturer's average in their relationship of maximum intensities up, down, right, and left respectively to the geometrical center of the high intensity zone.

(a) The average vertical aim of each lamp obtained on the headlamp testing machine should not vary more than 0.2 deg (1 in. at 25 ft) from the average visual aim of each lamp obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

(b) The average horizontal aim obtained on each lamp on the headlamp testing machine should not vary left or right more than 0.4 deg (2 in. at 25 ft) from the average visual aim obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

2. Asymmetrical Beam—Auxiliary passing lamps, lower beam 5¾-in. and 7-in. Type 2 sealed beam units.

A. The headlamp testing machine should permit determining the aim of the top and left edge cutoffs of the high intensity zone of the lower beam of Type 2 lamps and of auxiliary passing lamps within the limits set up in these specifications.

(1) A group of sealed beam units, at least of Type 2, which meets SAE specifications but represent the maximum production variations of each lamp manufacturer, should be obtained by the testing laboratory.

Units should be selected by the laboratory which represent the extreme of production variation from the lamp manufacturer's average in their relationship of maximum intensities up, down, right and left to the cut off at the top and left edges.

(a) The average vertical aim of each lamp obtained on the headlamp testing machine should not vary more than 0.2 deg (1 in. at 25 ft) from the average visual aim of each lamp obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

(b) The average horizontal aim obtained on each lamp on the headlamp testing machine should not vary left or right more than 0.4 deg (2 in. at 25 ft) from the average visual aim obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

3. Symmetrical Fog Lamps

A. The headlamp testing machine should permit determining the vertical aim of the top cutoff of the high intensity zone and the hori-

zontal aim of the geometric center of the high intensity zone within the limits of these specifications.

(1) The laboratory should select at least 3 lamps from a random sampling of lamps obtained from each manufacturer, representative of those currently manufactured and meeting SAE specifications.

(a) The average vertical and horizontal aim of each lamp obtained on the headlamp testing machine should not vary more than 0.4 deg (2 in. at 25 ft) from the average visual aim obtained on the screen by three experienced observers. A minimum of 3 observations should be made by each observer on both the headlamp testing machine and the screen.

NOTE: Instructions furnished by the manufacturer for aiming lamps should be such that the beam patterns when viewed on the screen will fall within the limits set up in SAE Recommended Practice, Lighting Inspection Code—SAE J599.

HEADLAMP AIMING DEVICE FOR MECHANICALLY AIMABLE SEALED BEAM HEADLAMP UNITS—SAE J602

SAE Recommended Practice

Report of Lighting Committee approved October 1957 and last revised February 1959. Reaffirmed without change August 1963.

Scope—This specification applies to the requirements of a device used to aim the mechanically aimable type of sealed beam headlamp units.

The purpose of this specification is to provide a practical laboratory test procedure to determine whether the devices under test are capable of accurately positioning sealed beam headlamp units from their aiming pads and maintaining their accuracy in service within the tolerances designated in this specification.

Definition—A device used to aim mechanically aimable headlamp units consists of one or more fixtures designed to seat against the three aiming pads (aiming plane) on mechanically aimable headlamp units installed on a vehitle to facilitate accurate aiming of such units, vertically and laterally.

Samples for Test—Sample devices submitted for laboratory tests should be representative of the devices as regularly manufactured and marketed. Each sample should include all accessory equipment peculiar to the device. Full assembly and operating instructions should be provided, including information on how to check accuracy and maintain the device in calibration.

Laboratory Facilities—The laboratory should be equipped with all facilities necessary to make the tests required in this recommended practice and, shall use lamps from various manufacturers to check the attachment of the aimer.

General Requirements—The device should be of such design that the seating portion will register only on the three aiming pads on the 5¾-in. or 7-in. sealed beam units as covered by the SAE Standard, Dimensional Specifications for Sealed Beam Headlamp Unit—SAE J571.

The device should have no projections, tangs, lugs, and so forth, which will permit seating the device on any part of the headlamp, other than the three aiming pads or promote using the device on other than mechanically aimable sealed beam headlamp units.

Any device which uses an adapter to fit more than one size sealed beam unit should meet all of the requirements of this recommended practice with and without the adapter.

The seating portion (locating plane) of the aimer should meet the dimensions shown in Fig. 1, Dimensional Specifications for Headlamp Aimer Locating Plate. The locating flange on the aimer should center the device on the headlamp units or retaining rings in such a way as to insure that the seating portion will always engage the three aiming pads on the units.

When aiming headlamp units spaced 90 in. apart, the torque exerted by the aimer at the aiming plane should not exceed 36 in.-lb vertically and 12 in.-lb laterally.

The means provided for securing the device to the lamp should be adequate to seat it securely against the three aiming pads on the units while in use.

If a suction cup is used to retain aimer to headlamp unit, effective diameter should not exceed 3½ in. in diameter when installed.

Means should be provided in the device for compensating within ± 0.1 deg for reasonable variations in floor slope and clearly explained in the operating instructions.

The device and/or instructions should provide a practical means for a periodic check of its accuracy in the field.

If the lateral aim is to be accomplished by reference between devices on opposite sides of the vehicle, the means provided for handling lateral adjustment (string or equivalent) should be at least 9½ in. ahead of the aiming plane.

The spirit level or other means provided for indicating vertical aim should be capable of showing at least a 0.1 in. deviation with a 0.2 deg (1 in. in 25 ft.) change in level.

A lateral aim scale should be provided with graduations in steps of not more than 2 in. at 25 ft from straight ahead to at least 6 in. left and right.

The instructions covering use of the aimer should include those items shown in the section 2(a) of Preparation for Aiming in the SAE Recommended Practice, Lighting Inspection Code—SAE J599.

The vertical aim scale should be marked —2 or 2 down with the aiming plane vertical.

The vertical aim scale should be provided with numerical graduations in steps, each of which represent 1 in. at 25 ft to provide for variations in vertical aim at least from 4 in. above 0 to 10 in. below 0.

Test Procedure—Assuming that the devices comply with the general requirements, they shall be considered acceptable if they comply with additional test requirements as follows:

NOTE 1—All tests are to be made in an ambient temperature of 75 ± 5 F unless otherwise specified.

NOTE 2—If a vertical indication means other than a spirit level is used, an equivalent accuracy should be maintained.

1. With the aiming plane vertical and with the vertical scale on the device set at —2 or 2 down, the angle through which the aiming plane must be rotated vertically to properly position the bubble in the spirit level, or equivalent, should not exceed 0.1 deg.

2. With the aiming planes in the same vertical plane and with the means provided for adjusting lateral aim in use, the angle through which the aiming plane must be rotated laterally to indicate straight ahead should not exceed ± 0.2 deg with the lamps 24 in. and 90 in. apart.

3. With the aiming planes initially in the same vertical plane and subsequently toed inward and outward 1.2 deg and with the means provided for checking lateral aim in use, the error in reading should not exceed ± 0.2 deg with the lamps 60 in. apart.

4. With the aiming plane vertical and with the vertical scale on the device set at —2 or 2 down, the level on the aimer should be adjusted prior to each of the following tests to properly position the bubble in the spirit level, or equivalent.

(a) Each step on the vertical aim scale should be checked and in no case should the variation from correct aim exceed ± 0.1 deg.

(b) A pair of aimers should be stabilized at 20 ± 5 F and then installed on a pair of unlighted units spaced 60 in. apart at the 20 F ambient temperature. After a period of 30 minutes the seating portion should continue to register against the three aiming pads and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

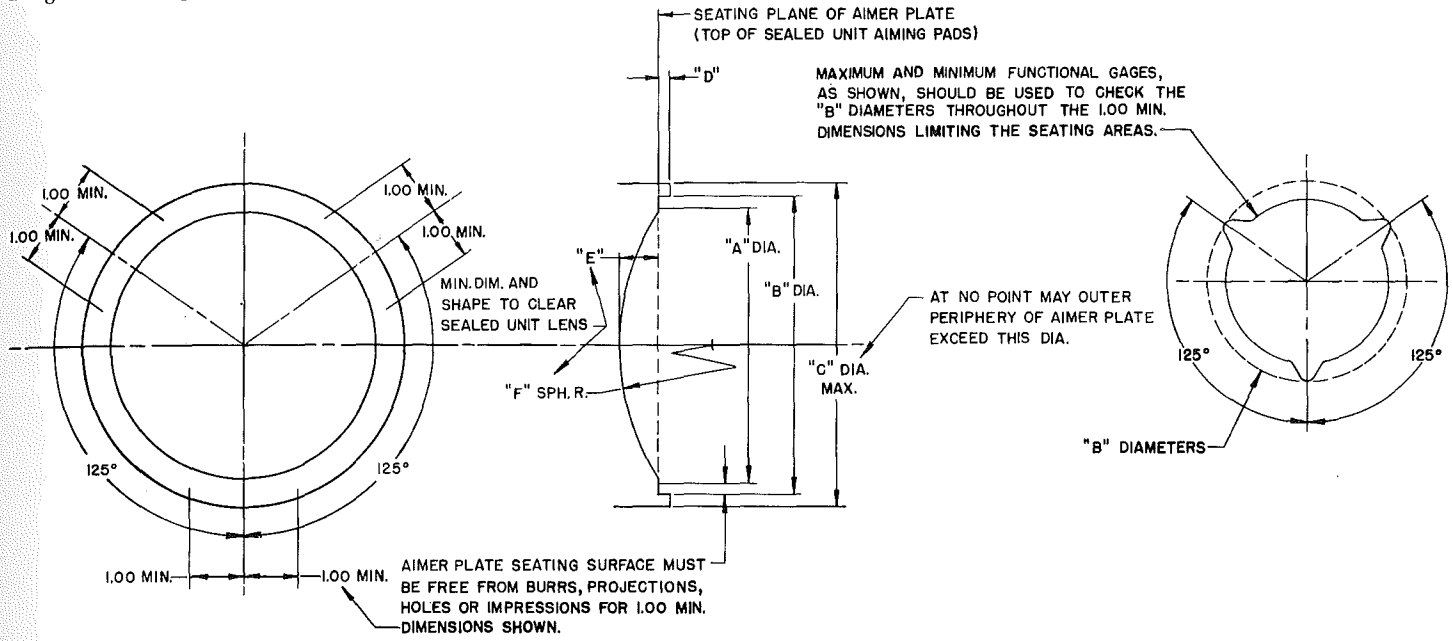
(c) A pair of aimers should be stabilized at 100 ± 5 F and then installed on a pair of lighted units spaced 60 in. apart at the 100 F ambient temperature. After a period of 30 minutes the seating portion should continue to register against the three aiming pads and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

(d) A pair of aimers should be exposed with the aiming plane down in a circulating air oven to 140 ± 5 F for 24 hr followed by a temperature of —40 ± 5 F for 24 hr and then permitted to return to room temperature after which they should show no visible damage. They should then be installed on a pair of unlighted units spaced 60 in. apart and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

(e) A sample aimer should be exposed to 35 ± 5 F for one hour and then immediately allowed to free fall onto a concrete floor three

times from its normal operating position on a headlamp at a height of 40 in. after which it should show no structural breakage. It should then be installed in combination with its companion aimer on a pair of unlighted units spaced 60 in. apart and the variation from correct vertical aim should not exceed ± 0.1 deg and the variation from correct lateral aim should not exceed ± 0.2 deg.

NOTE: Test 4 (e) applies only to devices which are supported by the lamp.



NOTE: THERE SHALL BE NO PROJECTIONS, TANGS, LUGS, ETC., ON THIS LOCATING PLATE WHICH WILL PERMIT LOCATING THE AIMING DEVICE ON ANY PART OF THE HEADLAMP OTHER THAN THE AIMING PADS ON THE MECHANICALLY AIMABLE SEALED BEAM UNIT.

LOCATING PLATE	DIMENSIONS								
	A		B		C	D		E	F
	MAX.	MIN.	MAX.	MIN.	MAX.	MAX.	MIN.	REF.	REF.
5 3/4"	4.830	4.770	5.375	5.345	5.700	.165	.145	.70	4.40
7"	6.140	6.080	6.710	6.680	7.031	.180	.160	.96	5.60

FIG. 1—DIMENSIONAL SPECIFICATIONS FOR HEADLAMP AIMER LOCATING PLATE

INCANDESCENT LAMP IMPACT TEST—SAE J603c

SAE Recommended Practice

Report of Lighting Committee approved May 1959 and last revised June 1966.

The trend toward higher circuit voltages on military vehicles has brought with it a reduction in the service life of lamp bulbs used on tactical equipment. At the request of Army Ordnance, the Society through a subcommittee of its Lighting Committee, has been cooperating with the military on the solution of this problem as has also the University of Michigan. In this work, it early became apparent that a reliable testing machine capable of providing reproducible results in repetitive impact tests was needed adequately to measure improvements in bulb design, manufacture and quality control intended to increase service life. A test machine for this purpose has been developed by the University and tested to the extent that its use is recommended in this SAE Recommended Practice.

Experience has indicated that the service life of bulbs may be materially prolonged by mountings properly designed to cushion the unit from shock and vibration.

Scope—To provide a practical laboratory impact test for certain types of miniature incandescent lamp bulbs for use primarily in military and rough service applications and to establish minimum test requirements for such bulbs when tested in accordance with this recommended practice.

SAE lighting specifications are necessarily subject to frequent revision to keep pace with technical advances. Therefore, this inclusion of the detailed requirements of such specifications in State or Federal laws and regulations which can be changed only infrequently, is to be discouraged.

Samples for Test—Sample lamp bulbs should be representative of those regularly manufactured and marketed. Test samples should consist of lots of 20, selected in accordance with acceptable statistical procedures.

Procedure for Test—Tests should be made on the impact tester illustrated in Fig. 1.[1]

Lamp bulbs to be tested should be placed in their holders using the

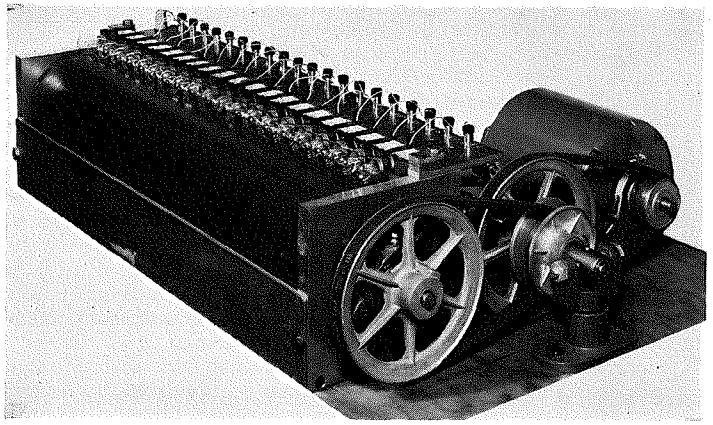


FIG. 1—IMPACT TESTER

[1] Detailed drawings and specifications for this testing machine may be obtained through the Commanding Officer, Detroit Arsenal, OTAC, Center Line, Mich. The machine has a cam with 4 uniformly spaced, adjustable offsets. The lamp bulbs under test, rest directly on this cam, and when it is rotated, the bulbs are lifted and dropped on the relatively inelastic surface of the cam. The resulting impact loads excite the lamp bulb filaments in a multinoded mode of free vibration with sufficient amplitude ultimately to cause failure.

proper inserting tool and loading fixture with filaments in the correct operating position.[2]

With the holders and lamps mounted on the machine and with the lamps raised from contact with the cam before starting the test sequence, the filaments in the lamps to be tested should be lighted for 10 minutes at test voltage. The test voltage, as measured at the binding posts should be 14.0 v for 12-v types and 28.0 v for 24-v types. Any lamp which fails during the 10 minute burning period should be replaced.

With the lamp bulbs resting on the cam, the tester should be operated without interruption for 360 minutes or until 75% of the lamps have failed, whichever occurs first.

During the test the lamps should be cycled 25 minutes "on" and 5 minutes "off," starting with the "on" cycle. The offsets of the cam should be set at 0.070 + 0.010 —0 in. and the rotational speed should be 200±2 rpm.

Minimum Performance Requirements —On completion of the test, the percentage of lamp bulbs surviving should be not less than the minimum average values specified in Table 1. Should the first lot fail, additional lots should be tested and the average percent surviving of the total number of lamp bulbs tested should be not less than the minimum average values specified in Table 1.

[2] Plane of filament horizontal.

TABLE 1—MINIMUM AVERAGE PERCENT OPERATIVE

Trade No.	At 30 Minutes	At 360 Minutes
12-Volt Lamps		
57	95	70
67	95	90
89	95	90
194	95	90
631	95	90
1003	90	40
1034 Major	95	80
Minor	95	80
1073	95	80
1141	90	75
1155	95	95
1156	95	90
1157 Major	95	90
Minor	95	95
1247	95	90
1445	90	85
1893	95	95
1895	95	90
24-Volt Lamps		
313	70	—
623	95	90
1251	95	90
1683	90	50
1691	—[a]	—[a]

[a] To be determined.

AUTOMOTIVE FLASHER TEST EQUIPMENT — SAE J823a

SAE Standard

Report of Lighting Committee approved April 1962 and last revised July 1965.

Scope—The purpose of this SAE Standard is to specify the test circuitry and instruments required for determining the performance of automotive flashers.

Laboratory Facilities—The laboratory shall be equipped with all facilities to make the tests required in the specification, in accordance with established laboratory practice, including the following:

1. The flashers shall be connected in a standard test circuit shown in Fig. 1 using the design load for the turn signal system within 0.5% as specified by the flasher manufacturer. The effective series resistance between the power supply and the bulb sockets (excluding the flasher and bulb load using shorting bars) shall be 0.10 ± 0.01 ohms.

Measure circuit resistance at A-B with flasher and bulb load each shorted out with an effective shunt resistance not to exceed 0.005 ohms.

Adjust the voltage at the bulbs as required for performance testing at C-D with the flasher shorted out by an effective shunt resistance not to exceed 0.005 ohms. The load current shall be held to the rated value for the total bulb load within 0.5% by simultaneously adjusting trimming resistance, R. The flashers shall be mounted as specified by the manufacturer if special precautions are required.

2. Means shall be provided to maintain ambient temperatures of 0 ± 5 F, 75 ± 10 F, and 125 ± 5 F.

3. A suitable high impedance recording voltage measuring device connected to points X-Y shall be used for measuring flash rate, percent current "on" time, starting time, and voltage drop across the flasher. The measurement of these quantities shall not disturb the circuit.

4. The power supply for tests to requirements for Flash Rate and Percent "On" Time, Starting Time, Voltage Drop, and Pilot Indication in SAE J590, shall comply with the following specifications:

(a) Output Voltage: Capable of supplying to the input terminals of the Standard Circuit 11 to 16 v d-c for 12 v flashers or 5 to 9 v d-c for 6 v flashers.

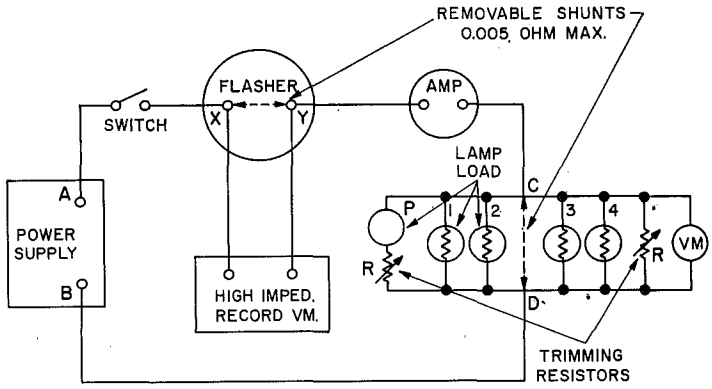
(b) Output Current: Capable of supplying rated flasher current continuously and approximately 10 times rated flasher current for 50 millisec duration.

(c) Regulation:

Dynamic: The output voltage shall not deviate more than 1.0 v from 0 to maximum load (including inrush current) and shall recover 63% of its maximum excursion within 100 microsec.

Static: The output voltage shall not deviate more than 2% with changes in static load from 0 to maximum (not including inrush current).

(d) Ripple Voltage: Maximum 75 mv, peak to peak.



NOTE: RESISTANCE LOOKING INTO TERMINALS A-B WITH REMOVABLE SHUNTS IN PLACE SHALL BE 0.10±0.01 OHMS.

FIG. 1—STANDARD TEST CIRCUIT AUTOMOTIVE FLASHER

5. The power supply for the Durability Test in SAE J590 shall comply with the following specifications:

(a) Output Voltage: Capable of supplying 14 v d-c or 7 v d-c according to the flasher rating to the input terminals of the standard test circuit.

(b) 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 one flasher times the number of flashers started on their flashing cycle at the same instant.

(c) Regulation:

Dynamic: The output voltage shall not deviate more than 1.0 v from 0 to maximum load (including inrush current) and should recover 63% of its maximum excursion within 5 millisec.

Static: The output voltage shall not deviate more than 2% with changes in static load from 0 to maximum (not including inrush current).

(d) Ripple Voltage: Maximum 300 mv, peak to peak.