



PASSENGER CAR WINDSHIELD WIPER SYSTEMS — SAE J903b

SAE Recommended Practice

Report of Body Engineering Committee approved August 1964 and last revised July 1968.

1. Scope—The scope of this SAE Recommended Practice is to establish uniform test procedures and minimum performance requirements for passenger car windshield wiping systems and wiper blades. This recommended practice also provides a uniform terminology of windshield wiper system characteristics and phenomena. The test procedures are limited to those tests that can be conducted on uniform test equipment by commercially available laboratory facilities.

The test procedures and minimum performance requirements, outlined in this recommended practice, are based on currently available engineering data. It is the intent that all portions of the recommended practice will be periodically reviewed and revised as additional data regarding windshield wiping system performance are developed.

2. Definitions—

2.1 Windshield Wiper System—The wiper system consists of an apparatus for clearing the exterior surface of windshield glazing together with the necessary devices and controls to actuate and arrest the operations.

2.2 Windshield Wiper Blade—A device for cleaning the effective wipe pattern, capable of receiving pressure from an arm, comprising a suitable superstructure, supporting and controlling a wiper blade element.

2.3 Wiper Blade Element—The resilient member of the wiper blade that contacts the windshield glazing surface.

2.4 Wiped Area—The area to be wiped as defined in this paragraph was developed after extensive study of visual requirements and reflects the minimum area that must be wiped in order to operate a passenger car vehicle. This area is based on SAE J941 and J826 respectively; it has been defined independent of parts of the vehicle such as pillars, header, hood, etc. Physical parts of the vehicle are variables in their

relation to both the driver and his vision, and, therefore, are not regarded as appropriate for a baseline from which to reference the specified wiped area. The defined wiped area has been predicated on high speed wiper operation, wet windshield, and a relative air speed of 70 mph.

TABLE 1—AREA TO BE WIPED

Area	Min Per Cent Wiped	Eyellipse, %	Angles, deg			
			Left	Right	Up	Down
A	80	95	18	56	10	5
B	95	95	14	53	5	3
C	100	95	10	15	5	1

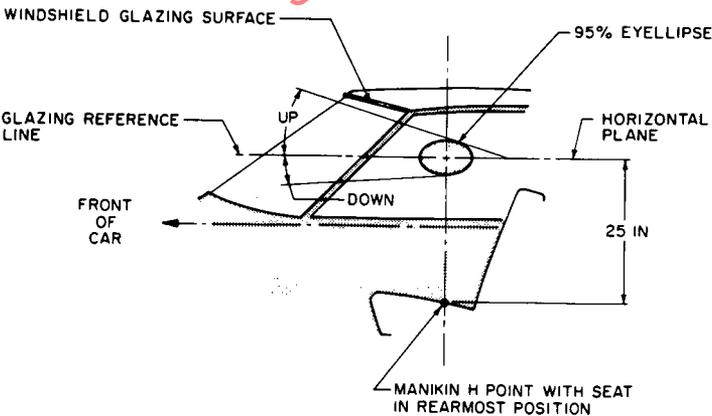


FIG. 1—SIDE VIEW OF AREA GENERATION

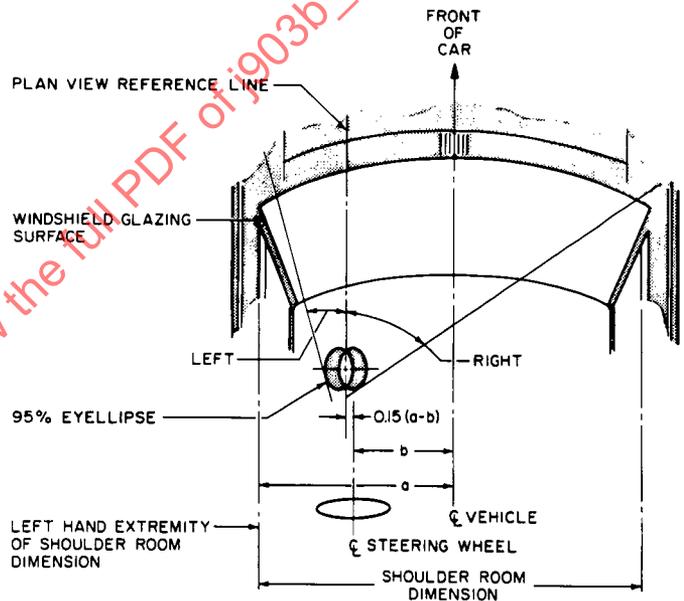


FIG. 2—PLAN VIEW OF AREA GENERATION

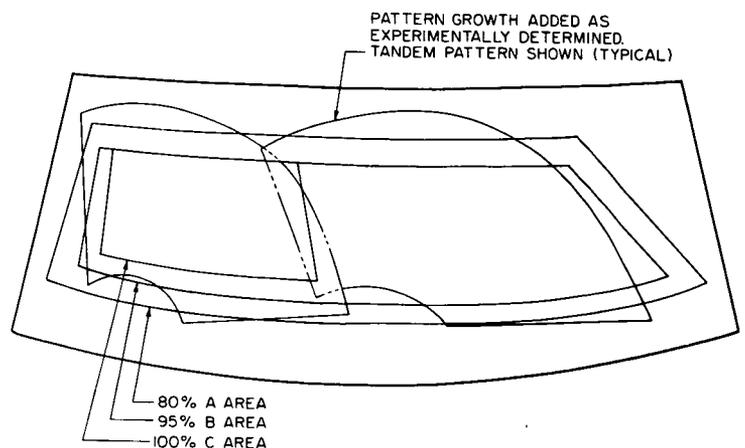


FIG. 3—WIPED AREA EVALUATION, DRAFTING TEST PROCEDURE. UNWRAPPED VIEW SHOWING WIPED PATTERN AND AREAS A, B, AND C

The wiped area on the windshield glazing surface is defined and qualified by the following:

- (a) The base design driver's seat in the rearmost position.
- (b) The 95th percentile tangential cutoff two dimensional eyellipse in accordance with SAE J941 may be used. See Table 1.
- (c) The glazing reference line which is defined as the line of intersection of the glazing surface and the horizontal plane 25 in. above the manikin H point, as defined in SAE J826. See Fig. 1.
- (d) For vehicles with bench type seats, the plan view reference line which is defined as the plan view line outboard of the steering wheel centerline and parallel to the vehicle longitudinal centerline at a distance 0.15 of the dimension from the steering wheel center to the left-hand extremity of the shoulder room dimension. The dimension can be determined by taking 0.50 of the shoulder room dimension minus the distance from steering wheel centerline to centerline of car, and multiplying by 0.15. See Fig. 2.

For individual type seats, the plan view reference line which is defined as a line parallel to the vehicle longitudinal centerline and located with the geometric center of the 95% eyellipse on the longitudinal centerline of the driver's designated seating position. The geometric center of the 95% eyellipse is defined as the midpoint of the line connecting the geometric center of each individual ellipse.

2.5 Effective Wipe Pattern—That portion of the windshield glazing surface which is cleaned when the wiper blade travels through a cycle.

2.6 Tandem Pattern—The pattern produced by the wiper blades moving in the same direction across the windshield glazing surface simultaneously.

2.7 Opposed Pattern—The pattern produced by the wiper blades moving in opposite directions across the windshield glazing surface simultaneously.

2.8 Chatter—Irregular movement of the wiper blade usually accompanied by temporary visible radial lines and/or noise.

2.9 Ballooning—Unwiped areas within the wiper pattern varying in size and usually round.

2.10 Streaking—Fine arcuate lines of unwiped moisture within the wipe pattern.

2.11 Scalloping—Uneven wipe at the outer periphery of pattern.

2.12 Lace Curtain—A maze of fine individual water droplets which are formed after the wiper blade passes over the windshield glazing surface.

2.13 Hazing—An aerated film spread by the blade and resulting in a transient trailing band on the windshield glazing surface.

2.14 Cycle—A cycle shall consist of wiper blade movement during system operation from one extreme of the windshield wipe pattern to the other extreme and return.

2.15 Snow Load—The load imposed on the wiper system by the accumulation of packed snow resulting in a limitation of blade travel.

2.16 Motor Stall Torque—The maximum torque that the motor can maintain for two cycles at specified conditions.

2.17 System Torque—Torque necessary to overcome maximum friction of the wiper blade and the driving mechanism under specified conditions.

2.18 Damp Dry—The condition of the windshield which produces the highest friction during the transition from a wet to a dry surface.

2.19 Moisture—Atmospheric water precipitation in liquid, semi-liquid, or frozen state (snow).

2.20 Relative Air Speed—The vector difference of vehicle speed and the component of the wind speed parallel to the direction of travel of the vehicle.

3. General Performance Requirements—

3.1 Windshield Wiper System Requirements—

3.1.1 DESCRIPTION OF WIPED AREA—The minimum windshield area that shall be wiped is described by the use of three specific areas on the exterior windshield glazing surface. The three areas are identified in Table 1 as areas A, B, and C. Each area has been established using the angles of Table 1 applied as shown in Figs. 1 and 2. In Fig. 1, the upper and lower boundary of the area is established by the intersection of two planes, tangent to the upper and lower edges of the eyellipse, with the windshield glazing surface. The planes are fixed by angles above and below the glazing surface reference line.

In Fig. 2, the left and right boundary of the area is established by the intersection of two planes tangent to the left and right edges of the eyellipse. The planes are fixed by angles to the left and right of the plan view reference line.

The areas used in determining the percentage of wiped area are

those areas on the exterior glazing surface which are not within 1 in. of the edge of the daylight opening (pillar, division bar, header, etc.). The percentage is the ratio of wiped area within the defined area to the defined area.

Area A represents a large portion of the windshield glazing surface and serves to optimize the design wipe pattern and minimize encroachment of pillars or headers. Using the test procedures established in paragraph 4.1, a minimum of 80% of area A shall be cleanly wiped, recognizing the geometric characteristics of both tandem and opposed systems. Area B is also a large area providing a broad horizontal band across the windshield glazing surface, permitting only minor interruption of unwiped area due to the geometry of the system. Of area B, 95% shall be cleanly wiped. Area C shall be 100% cleanly wiped, permitting no unwiped intrusion. This serves to control and restrict the location and size of peaks, moons, and the outboard angle of the left-hand blade.

3.1.2 FREQUENCY—The windshield wiper system shall be designed to provide two or more frequencies or speeds. Wiper systems which utilize a timing device to interrupt at the end of each wiping cycle or several wiping cycles are acceptable if the timing device can be varied to provide continuous operation and two or more frequencies of interrupted operation. With a maximum control setting, the windshield wiper system shall be capable of attaining a minimum operating frequency of 45 cycles/minute when following test procedures and test conditions established in paragraph 4.2.

3.1.3 DURABILITY—Wiping system, except for element of wiping blade, must remain functional after operating 1,500,000 cycles, using test procedures and test conditions established in paragraph 4.2.

3.1.4 SYSTEM STRENGTH—The system shall be capable of withstanding the loads induced by stall using test conditions and test procedures established in paragraph 4.3, with all mechanical components remaining functional.

3.1.5 TEMPERATURE OPERATIONAL CAPABILITY—The windshield wiper system shall be capable of operating between temperatures of 130 F (55 C) and -20 F (-30 C), using test procedures and test conditions established in paragraph 4.4.

3.1.6 ACCESSIBILITY—The control for the wiper system should be positioned so that it is readily accessible to the driver.

3.2 Windshield Wiper Blade Requirements—

3.2.1 DURABILITY—Using test procedures and test conditions described in paragraph 4.2, the windshield wiper blade, except for wiper blade element, must remain functional after operating 1,500,000 cycles and the wiper blade element shall wipe 75% of the effective wipe pattern after 500,000 cycles.

3.2.2 AGING—The wiper blade element of the wiper blade assembly must withstand the ozone test established in paragraph 4.5, with an ASTM rating of two or better, as defined in ASTM D 1171, Method of Test for Weather Resistance Exposure of Automotive Rubber Compounds.

3.2.3 CHEMICAL RESISTANCE—A section of the wiper blade element when placed in a 50% solution of either methyl or isopropyl alcohol for a period of 24 hr shall not exceed more than 2% weight change.

4. Test Methods

4.1 Area to be Wiped Test Procedure

4.1.1 TEST EQUIPMENT

(a) Drafting equipment sufficient for full size windshield and wiper system layout.

(b) Transparent heavy gage plastic sheet—prepared clear acetate or equivalent.

(c) Test buck—A test buck shall consist of a structure capable of rigidly maintaining, throughout the test, the proper relationship of the glazing surface and the windshield wiping system components as established by the vehicle manufacturer.

(d) Power source—Must be capable of supplying power to the drive motor as required.

(e) Spray equipment—Spray nozzles to apply water to glazing surface.

4.1.2 TEST PROCEDURE

4.1.2.1 Drafting

(a) Work to exterior surface of windshield glass.

(b) The design wipe pattern will be shown plus the growth due to wet windshield, high speed system operation, and a relative air speed of 70 mph. This growth to be determined experimentally.

(c) All calculations to be made in the unwrapped view.

(d) In car position plan view and side view, lay out windshield surface, DLO (daylight opening), eyellipse per Figs. 1 and 2, and the areas