



# Technical Report Preprint

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

# J903a

## Passenger Car Windshield Wiper Systems - J903a

## SAE Recommended Practice

Report of Body Engineering Committee approved August 1964 and last revised May 1966.

### 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 section 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 SAE J826, respectively; and 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.

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

(a) The driver's seat in the rearmost position. (See Fig. 1.)

(b) The 95th percentile tangential cut-off two dimensional eye range contour 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) The plan view reference line which is defined as the plan viewline outboard of the steering wheel centerline and parallel to the vehicle centerline at a distance 0.15 of the dimension from the steering wheel center to the left hand extremity of the shoulder room dimension. This dimension

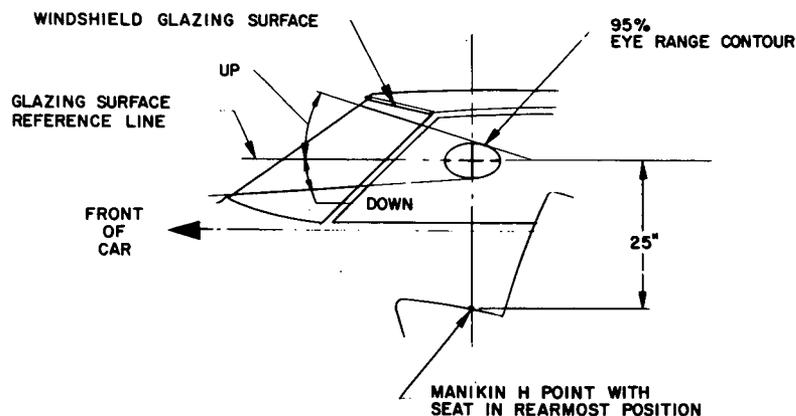


Fig. 1 - Side view of area generation

Table 1 - Areas to be Wiped

Area	Minimum Percent Wiped	Eye Range Contour, %	Angles, deg							
			Left	W*	Right	X*	Up	Y*	Down	Z*
A	80	95	18		56		10		5	
B	95	95	14		53		5		3	
C	100	95	10		15		5		1	

\*See Figs. 1 and 2.

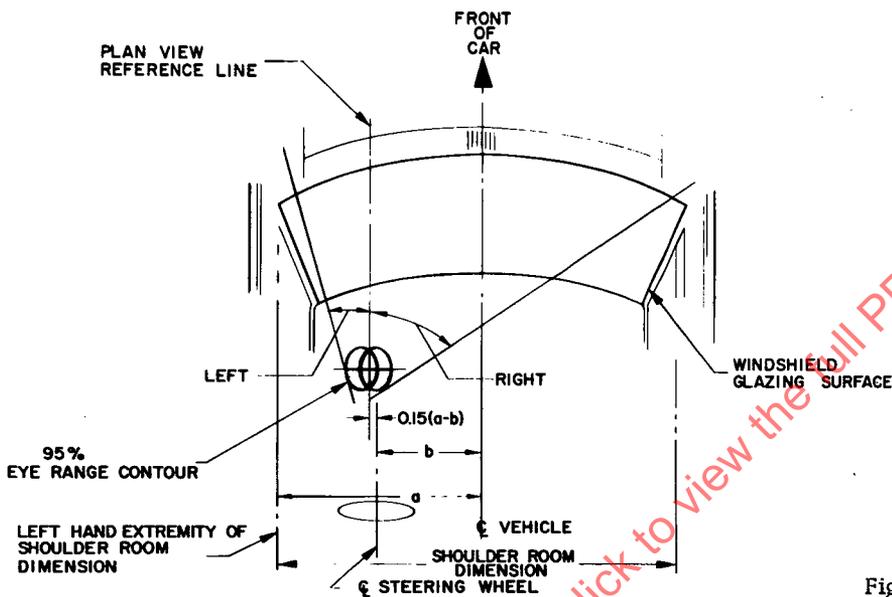


Fig. 2 - Plan view of area generation

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.

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, semiliquid, or frozen state (snow).

2.20 **RELATIVE AIR SPEED** - The vector sum of vehicle air 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 General - The windshield wiper system shall be capable of operating between temperatures of 130 F (55 C) and -20 F (-30 C).

#### 3.1.2 Description and Control of Wiped Area

3.1.2.1 Area to be Wiped - The minimum windshield area that shall be wiped is described by the use of three specific areas on the 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 sides of the eye range contour, 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 sides of the eye range contour. The planes are fixed by angles to the left and right of the plan view reference line.

Area A represents a large portion of the windshield glazing surface and serves to optimize the design wipe pattern and restrict 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.

3.1.2.2 Control of Area to be Wiped - In no instance shall the peak of unwiped area produced by either a tandem or an opposed system extend below the glazing surface reference line.

3.1.3 Frequency - All windshield wiper systems shall be capable of attaining an operating frequency of at least 45 cycles/minute, using test procedures and test conditions established in paragraph 4.1.

3.1.4 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 4.1.

3.1.5 System Strength - The system shall be capable of withstanding the loads induced by stall using test conditions and test procedures established in paragraph 4.2, with all mechanical components remaining functional.

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 4.1, the windshield wiper

blade, except for wiper blade element, must remain functional after operating 1,500,000 cycles and the wiper blade element must meet the requirements of paragraph 3.1.2 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 4.3, 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 - The wiper blade element must not be adversely affected by a 50% solution of methyl of isopropyl alcohol.

### 4. TEST METHODS

#### 4.1 WIPER SYSTEM DURABILITY TEST -

##### 4.1.1 Test Equipment -

(a) 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. Fig. 3 illustrates a typical test buck.

(b) Power Source - Must be capable of supplying power to the drive motor as specified by the vehicle manufacturer.

(c) Counters - A device for determining the number of cycles.

(d) Spray Equipment - Spray nozzles to apply water to glazing surface.

(e) Water Softener - A device, where required, to supply water meeting requirements of paragraph 4.1.2(d).

(f) Cleanser - Of a nonabrasive type.

(g) Temperature Measuring Device - Thermometer or equivalent.

##### 4.1.2 Test Conditions -

(a) Ambient temperature of 50-100 F (10-38 C).

(b) Water temperature - 100 F (38 C) max.

(c) Water Nozzles - To be located so as to provide an approximately equally distributed water flow on windshield glazing surface at rate of not less than 50 cu in./minute (820 cm<sup>2</sup>/minute) incorporating 2 nozzles.

(d) Water Hardness - Not to exceed 12 grains/gal.

4.1.3 Test Procedure - The windshield wiper system is to be operated for 1,500,000 cycles at a speed of not less than 45 cycles/minute. Water is to be applied continuously to the windshield throughout the test as indicated in paragraph 4.1.2(c).

The windshield is to be cleaned every 8 hr or whenever deposits appear on the glass. If deposits reappear within 15 minutes after cleaning, the wiper blade element must be replaced.

Any component failure, except windshield wiper blade element, during this test denotes system failure.

#### 4.2 WIPER SYSTEM STALL TEST -

##### 4.2.1 Test Equipment -

(a) Test Buck - See paragraph 4.1.1(a).

(b) Power Source - See paragraph 4.1.1(b).