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Indian Standard
SPECIFICATION FOR
ELECTRICAL WIND SCREEN WIPERS

PART I WIPER SYSTEM

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BUREAU OF INDIAN STANDARDS
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Indian Standard
SPECIFICATION FOR
ELECTRICAL WIND SCREEN WIPERS
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*Shri B. S. Bhagowalia was the chairman for the meeting in which this standard was finalized.

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Indian Standard
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ELECTRICAL WIND SCREEN WIPERS
PART I WIPER SYSTEM

0. FOREWORD

0.1 This Indian Standard (Part I) was adopted by the Indian Standards Institution on 23 October 1975, after the draft finalized by the Automobile Electrical Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Since left-hand traffic has been adopted in this country, the requirements specified in this standard relate to right-hand drive only.

0.3 This standard deals with the wiper system as a whole and other standards dealing with concerned components are:

IS : 7827 (Part II)-1975 Specification for electrical wind screen wipers:
Part II Wiper motors.

IS:7827 (Part III)- Specification for electrical wind screen
wipers: Part III Wiper arms and blades (*under preparation*).

0.4 In preparing this standard assistance has been derived from SAE J903b (1973) 'Passenger car wind shield wiper system' published by the Society of Automobile Engineers, USA.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part I) deals with the test procedures and minimum performance requirements for wind screen wiping system and wiper blades with a view to:

- a) providing test procedure for testing components for a wiper system for reliability under conditions similar to vehicle installation, and

*Rules for rounding off numerical values (*revised*).

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- b) indicating the visibility requirements to be achieved after installation in the vehicle (*see* Appendix A).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Wind Screen Wiper System — An apparatus for clearing the exterior surface of wind screen glazing together with the necessary devices and controls to actuate and arrest the operations.

2.2 Wind Screen 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 wind screen glazing surface.

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

2.5 Tandem Pattern — The pattern produced by the wiper blades moving in the same direction across the wind screen glazing surface simultaneously.

2.6 Opposed Pattern — The pattern produced by the wiper blades moving in opposite directions across the wind screen glazing surface simultaneously.

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

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

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

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

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

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

2.13 Cycle — The wiper blade movement during system operation from one extreme of the wind screen wipe pattern to the other extreme and return.

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

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

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TO
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Alterations

(*Page 3, clause 0.4*) — Substitute the following for the existing clause:

"**0.4** In preparing this standard assistance has been derived from SAE J903b (1973) ' Passenger car wind shield wiper system ' and SAE J198 (1971) 'Wind shield wiper systems-trucks, buses and multipurpose vehicles' published by the Society of Automotive Engineers, USA. "

[*Page 9, clause 4.3.2(e)*] — Substitute the following for the existing matter:

'e) The input voltage level at the drive motor terminals shall be maintained at 6.75 ± 0.1 , 13.5 ± 0.1 and 27 ± 0.2 V for 6, 12 and 24 V systems respectively. '

(*Page 9, clause 4.3.3*):

a) *Line 2* — Substitute ' 800 000 cycles ' *for* ' 200 000 cycles '.

b) *Line 3* — Substitute ' 1 200 000 cycles ' *for* ' 700 000 cycles '.

(*Page 10, clause 4.6.3, line 1*) — Substitute ' rig ' *for* ' buck '.

(ETDC 14)

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

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

2.18 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.

2.19 Growth — Growth is the apparent increase in the wiped area due to the drying of water or scatter of water on the boundaries of the real wiped area due to the very high wind velocity and the resultant shift of the wiper blade on both ends of the stroke.

2.20 Unwrapped View — The actual surface area of glazing surface viewed by the driver from inside the vehicle taking into account the curvature but without any side frame, top and bottom supports, central pillars and other decorative linings.

2.21 Daylight Opening — It is the maximum unobstructed opening through any glass aperture with reveal or garnish mouldings adjoining the glazing surface installed according to a given direction or projection.

2.22 Eyellipse — A statistical representation of the driver's eye location in a motor vehicle.

3. SYSTEM REQUIREMENTS

3.1 Frequency — The wind screen wiper system shall be capable of attaining a minimum operating frequency of 30 cycles/minute when following the test procedures and test conditions described in 4.4.

3.2 Durability — Wiping system, except for element of wiping blade, shall remain functional after operating under test procedures and conditions described in 4.3.

3.3 System Strength — The system shall be capable of withstanding the loads induced by stall using test conditions and test procedures described in 4.5, with all mechanical components remaining functional.

3.4 Temperature Operational Capability — The wind screen wiper system shall be capable of operating between temperatures of 55°C and 0°C using test procedures and test conditions described in 4.6.

NOTE — Subject to agreement between purchaser and supplier the operating conditions may be agreed between temperatures of -25°C and 80°C.

4. TESTS

4.1 Classification of Tests

4.1.1 Type Tests — The following shall constitute type tests:

- a) Test for area to be wiped (*see* 4.2),
- b) Test for wiper system endurance (*see* 4.3),
- c) Test for frequency (*see* 4.4),
- d) Test for wiper system stall (*see* 4.5), and
- e) Test for wiper system temperature operation capability (*see* 4.6).

4.1.2 Acceptance Test — The test for frequency (*see* 4.4) shall be the acceptance test.

4.1.3 Routine Tests — The routine tests shall be only for the components of the system as given in the relevant parts.

4.2 Test for Area to be Wiped

4.2.1 Test Equipment — The test equipment required shall consist of the following:

- a) Drafting equipment sufficient for full size wind screen and wiper system layout.
- b) *Transparent heavy gauge plastic sheet* — prepared clear acetate or equivalent.
- c) *Test rig* — A test rig shall consist of a structure capable of rigidly maintaining, throughout the test, the proper relationship of the glazing surface and the wind screen wiping system components as established by the vehicle manufacturer.
- d) *Power source* — Shall be capable of supplying power to the drive motor as required.
- e) *Spray equipment* — Spray nozzles to apply water to glazing surface.

4.2.2 Test Procedure

4.2.2.1 Drafting

- a) Work to exterior surface of wind screen glass.
- b) The design wipe pattern will be shown plus the growth due to wet wind screen, high speed system operation, and a relative air speed of 110 km/h. This growth should be determined experimentally.

NOTE — Normally this growth is about 5° at each end of the wiped area.

- c) All calculations should be made in the unwrapped view.
- d) In vehicle position plan view and side view, lay out wind screen surface, DLO (daylight opening), eyellipse as shown in Fig. 1 & 2 and the areas *A*, *B* and *C* generated on the exterior surface of the wind screen using the angles from Table 1.
- e) Develop an unwrapped view of the wind screen surface and DLO. Design the wipe pattern, apply growth as determined experimentally, and transfer the pattern together with areas *A*, *B* and *C* into this unwrapped view.
- f) Calculate the percentages of areas *A*, *B* and *C* that are wiped with design pattern plus growth, in the unwrapped view, (see Fig. 3) and compare the values with those of Table 1.

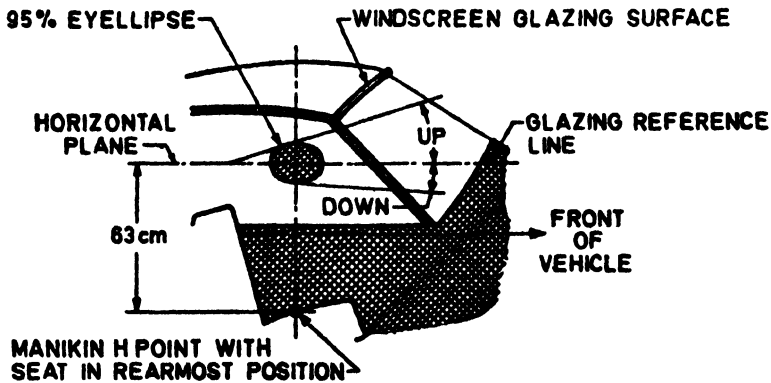


FIG. 1 SIDE VIEW OF AREA GENERATION

4.2.3 Test Rig Evaluation

- a) Operate test rig with water on and wiper system on high speed and mark outline of wipe pattern.
- b) Incorporate growth to pattern due to 110 km/h relative air speed as determined in 4.2.2.1(b).
- c) Transfer full size unwrapped view with wipe pattern and areas *A*, *B* and *C* as determined in 4.2.2.1(c) to transparent heavy gauge plastic sheet.
- d) Transfer wipe pattern from test rig to plastic sheet and recalculate the percentages of areas *A*, *B* and *C* that are wiped and compare the values with those of Table 1.

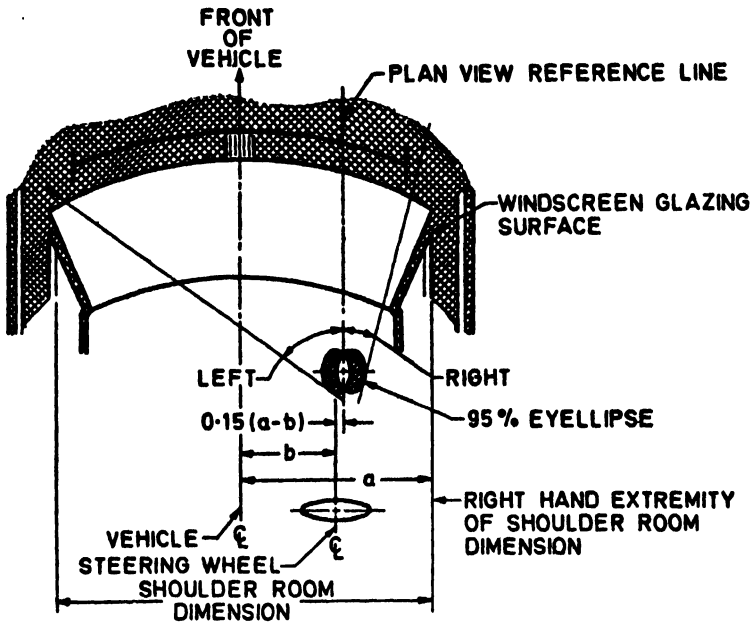


FIG. 2 PLAN VIEW OF AREA GENERATION

PATTERN GROWTH ADDED AS
EXPERIMENTALLY DETERMINED
TANDEM PATTERN SHOWN
(TYPICAL)

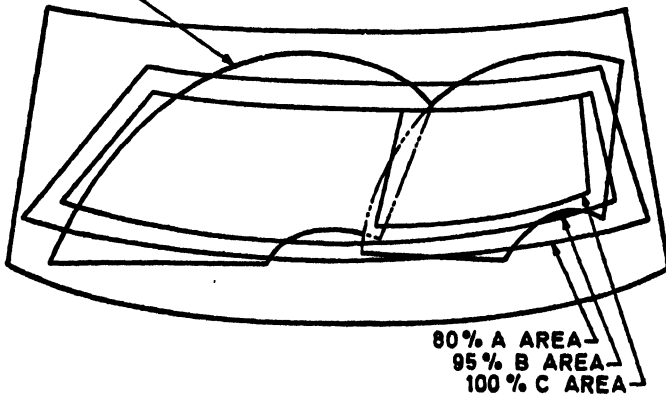


FIG. 3 WIPED AREA EVALUATION, DRAFTING, TEST PROCEDURE,
UNWRAPPED VIEW SHOWING WIPED PATTERN AND AREAS A, B AND C.

4.3 Test for Wiper System Endurance

4.3.1 Test Equipment

- a) Test rig [see 4.2.1(c)].
- b) Power source [see 4.2.1(d)].
- c) *Counters* — A device for determining the number of cycles.
- d) Spray equipment [see 4.2.1(e)].
- e) *Water softener* — A device, where required, to supply water meeting requirements of 4.3.2(d).
- f) *Cleanser* — Of a non-abrasive type.
- g) *Temperature measuring device* — Thermometer or equivalent.
- h) Voltmeter.

4.3.2 Test Conditions

- a) Ambient temperature not exceeding 40°C.
- b) Water temperature 40°C maximum.
- c) *Water nozzles* — To be located so as to provide an approximately equally distributed water flow on wind screen glazing surface at rate of not less than 820 ml/min.
- d) *Water hardness* — Not to exceed 15 ppm.
- e) Power input level at drive motor (frequency test only) at 6.75 ± 0.1 , 12.5 ± 0.1 and 27 ± 0.2 V for 6, 12 and 24 V systems respectively. The minimum power available at the drive motor, as specified by the vehicle manufacturer, under normal vehicle operating conditions.

4.3.3 Endurance Test — The wind screen wiper system shall be operated for 500 hours (approximately 200 000 cycles) for light duty and 750 hours (approximately 700 000 cycles) for heavy duty, 50 percent cycles at the high speed setting and 50 percent cycles at low speed setting. Where dictated by design a timing device may be utilized and replace the low speed cycles. In both the high speed and low speed test cycles the operational sequence shall be as follows:

Wet operation	5½ minutes
Dry operation	½ minute
Park position	1 minute, <i>Max</i>

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For the wet operation water is to be supplied to the wind screen in accordance with the provisions of 4.3.2(c). For dry operation, turn water off. The wind screen is to be cleaned as required. If rubber deposits appear within 15 minutes after cleaning, the wiper blade element shall be replaced.

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

4.4 Test for Frequency — Clean the wind screen. Water is to be applied continuously to the wind screen throughout the test, as indicated in 4.3.2(c). Apply power to the drive motor, as specified in 4.3.2(e). With a maximum control setting determine system operating frequency.

4.5 Test for Wiper System Stall

4.5.1 Test Equipment

- a) Test rig [see 4.2.1(c)].
- b) Power source [see 4.2.1(d)].

4.5.2 Test Procedure — At an ambient temperature not exceeding 40°C and with the specified power supply the wiper system shall meet the requirements specified in 3.3 when the wiper arms, in any position in the wipe cycle, are restrained from movement for 15 seconds.

4.6 Test for Wiper System Temperature Operation Capability

4.6.1 Test Equipment

- a) *General* — Test rig power source, timing device, and other pertinent equipment described in 4.3.1 shall be used in this test.
- b) *Test chamber* — A room or chamber large enough to contain the complete test rig and capable of maintaining a temperature of 55°C or 80°C in the upper range and 0°C or 25°C in the lower range.

4.6.2 Hot Test Procedure — The test rig and spray equipment are to be soaked in the test chamber at a temperature of 55±3°C for 4 hours. Alternatively at 80±3°C, if agreed between purchaser and supplier. Following this soak period and in the same temperature environment, the wiper system and spray equipment are to be turned on and operated for a period of 1/2 hour at maximum wiper speed control setting with water applied continuously as indicated in 4.3.2(c).

4.6.3 Cold Test — The test buck is to be soaked in the test chamber at temperature of 0°C or at 25±3°C for 4 hours. Following this soak period and in the same temperature environment, the wiper system is to be turned on and the wipers operated for 1/2 hour at maximum wiper system speed control setting.

APPENDIX A

(Clause 1.1)

VISIBILITY REQUIREMENTS**A-1. WIPED AREA**

A-1.1 The wiped area on the wind screen 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 (*see* Table 1).
- c) The glazing reference line which is defined as the line of intersection of the glazing surface and the horizontal plane 63 cm above the manikin *H* point (*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 centreline and parallel to the vehicle longitudinal centreline at a distance 0.15 of the dimension from the steering wheel centre to the left-hand extremity of the shoulder room dimension. The dimension may be determined by taking 0.50 of the shoulder room dimension minus the distance from steering wheel centreline of vehicle and multiplying by 0.15 (*see* Fig. 2).

TABLE 1 AREA TO BE WIPED

(Clauses 4.2.2.1 and A-1.1)

AREA	MINIMUM PER-CENT WIPED	EYELLIPSE PERCENT	ANGLES, DEG			
			Right	Left	Up	Down
(1)	(2)	(3)	(4)	(5)	(6)	(7)
A	80	95	18	56	10	5
B	95	95	14	53	5	3
C	100	95	10	15	5	1

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

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NOTE — The area to be wiped as specified here was developed after extensive study of visual requirements and reflects the minimum area that shall be wiped in order to operate a vehicle. It has been defined independent of parts of the vehicle, such as pillars, header and hood. 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 wind screen, and a relative air speed of 110 km/h.

A-2. REQUIREMENTS

A-2.1 The minimum wind screen area that shall be wiped is described by the use of three specific areas on the exterior wind screen 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 Fig. 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 wind screen 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 area used in determining the percentage of wiped area are those areas on the exterior glazing surface which are not within 25 mm 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 wind screen glazing surface and serves to optimize the design wipe pattern and minimize encroachment of pillars or headers. Using the test procedures described in 4.2, a minimum of 80 percent 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 wind screen glazing surface, permitting only minor interruption of unwiped area due to the geometry of the system. Of area *B*, 95 percent shall be cleanly wiped. Area *C* shall be 100 percent 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.

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