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IS 15802 (2008): Automotive vehicles - Windscreen wiping system for 4 wheelers other than M1 category of vehicles - Requirements [TED 11: Automotive Electrical Equipment]
Indian Standard

AUTOMOTIVE VEHICLES — WINDSCREEN WIPING
SYSTEM FOR 4 WHEELERS OTHER THAN M1
CATEGORY OF VEHICLES — REQUIREMENTS

ICS 43.040.65

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002
FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Electrical Equipments and Instruments Sectional Committee had been approved by the Transport Engineering Division Council.

This standard has been brought out in order to specify performance requirement of wiping system to ensure a clear visibility for the driver on the road during inclement weather conditions so as to make the driving safe.

In the formulation of this standard considerable assistance has been drawn from the following:

AIS-011/2001 'Automotive vehicles — Testing procedure for windscreen wiping system for 4 wheeler and other than M1 category of vehicles'

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 or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.
Indian Standard

AUTOMOTIVE VEHICLES — WINDSCREEN WIPING SYSTEM FOR 4 WHEELERS OTHER THAN M1 CATEGORY OF VEHICLES — REQUIREMENTS

1 SCOPE

This standard specifies requirements for front windscreen wiping system of all motor vehicles having minimum four wheels and having windscreen for M2, M3, N1, N2 and N3 category of vehicles.

2 REFERENCE

The following standard contains provision which through reference in this text, constitutes provision of this standard. At the time of publication, the edition indicated was valid. This standard is subject to revision and parties to agreements based on this standard is encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

<table>
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<th>IS No.</th>
<th>Title</th>
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<tr>
<td>14272</td>
<td>Automotive vehicles — Types — (Part 1) : 1995 Terminology : Part 1 Three and four wheelers</td>
</tr>
</tbody>
</table>

3 TERMINOLOGY

For the purpose of this standard definitions given in IS 14272 (Part 1) along with those given under shall apply.

3.1 Windscreen Wiping System — The wiping system consists of all apparatus for cleaning the exterior surface of windscreen glazing together with the necessary devices and controls to actuate and arrest the operations.

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

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

3.4 Effective Wipe Pattern — That portion of the wet windscreen glazing surface which is cleaned when the wiper blade travels through a cycle with system working on or above the minimum frequency.

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

3.6 Opposed Pattern — The pattern produced by the wiper blades moving in opposite directions across the windscreen glazing simultaneously.

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

3.8 Ballooning — Unwiped area within the wiped pattern, varying in size and usually round.

3.9 Streaking — Fine accurate lines of unwiped moisture within the wipe pattern.

3.10 Scallop — Uneven wipe at the outer periphery of pattern.

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

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

3.13 Wiper Cycle — Wiper cycle shall consist of wiper blade movement during system operation from one extreme of the windscreen wipe pattern to the other extreme and return.

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

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

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

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

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

3.19 Relative Air Speed — The vector difference of vehicle speed and component of the wind speed parallel to the direction of travel of the vehicle.
3.20 Growth — Growth is the apparent increase in the wiped area due to the drying of the 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 side ends of the stroke.

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

3.22 Daylight Opening (DLO) — The term ‘Daylight Opening’ (DLO) refers to the maximum unobstructed opening through any glass aperture, with reveal or garnish mouldings adjoining the glazing surface installed normal to the glass surface.

3.23 Glazing Surface Reference Line — Means the line resulting from the intersection of the glazing surface and a horizontal plane 635 mm above the seating reference point, as shown in Fig. 1.

3.24 Overall Width — Means the maximum body width measured across the body, excluding hardware and applied mouldings, but including fenders when integral with body.

3.25 Plan View Reference Line Means
a) For vehicle with bench type seats — A line parallel to the vehicle longitudinal centreline outboard of the steering wheel centreline 0.15 times the difference between one half of the shoulder room dimensions shown as ‘a’ in Fig. 2 and the distance between the steering wheel centreline to the vehicle centreline shown as ‘b’ in Fig. 2.

b) For vehicles with individual type seats — A line parallel to the vehicle longitudinal centreline located so that the geometric centre of the 95 percent eye range contour is positioned on the longitudinal centreline of the drivers designated seating position.

3.26 Shoulder Room Dimension Means — The minimum lateral dimension between the door garnish mouldings or nearest interference measured in the lateral plan through the driver’s seating reference point.

3.27 Eyellipse — The contraction of the words ‘eye’ and ‘ellipse’ used to describe a statistically derived elliptical model representing driver eye locations in road vehicles.

4 REQUIREMENTS

4.1 Each vehicle shall have a power driven windscreen wiping system that meets the requirements of 4.1.1 to 4.1.4.

4.1.1 The wiper system shall be capable of attaining the minimum operating frequency of 30 cycles/min regardless of engine load and engine speed. If the windscreen wiper is having two or more sweep frequencies then:

a) One of them shall not be less than 45 cycles/min (a cycle being the forward and return movement of the windscreen wiper).

b) One of them shall not be less than 10 and not more than 55 cycles/min.

c) The difference between the highest and the least one of the lower sweep frequencies shall be atleast 15 cycles/min.

4.1.2 Wiped Area

The minimum windscreen wiped area is described by three specific areas as percentage on defined areas on the exterior windscreen glazing surface. Three defined areas are developed with the vehicle loaded to the manufacturer’s recommended designed load and are identified in Tables 1 and 2 for all types of vehicle, as areas A, B and C. Each area will be established using the angles of Table 1 applied as shown in Fig. 1. In the side view, the upper and lower boundary of the area is established by the intersection of two planes, which are seen as lines tangent to the upper and lower edges of the eyellipse, with the windscreen glazing surface. The planes are fixed by angles above and below X-X line. In the plan view, the left and the right boundary of the area is established by the intersection of two vertical planes tangent to the left and right edges of the eyellipse with the windscreen glazing surface. The planes are fixed by angles to the left and right of the X-X line. The areas 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 rubber beading or opaque surface. The percentage is the ratio of wiped area within the defined area to the defined area, using test procedures established in 5.2.1 (see Table 1 and Table 2 for percentages to be wiped).

The wiped area is the area of the design pattern as explained above plus growth (to be measured during the test) as shown in Fig. 2. If the angles as per Table 1 meet outside the windscreen glazing surface, the areas lying on the windscreen within 25 mm from the edge of the rubber beading or opaque surface are to be considered.

4.1.3 Strength

The system shall be capable of withstanding the loads induced by stall, using test conditions and test procedures established in 5.4 with all mechanical components remaining functional.
FIG. 1 EYELLIPSE TEMPLATE LOCATION FOR RIGHT HAND DRIVE
FIG. 2 PLAN VIEW FOR BENCH SEAT

Table 1 Windscreen Wiping Area Angles
(Clauses 4.1.2)

<table>
<thead>
<tr>
<th>Classification</th>
<th>&quot;F&quot; Dimensions See Fig. 1</th>
<th>Area</th>
<th>Angle in Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Up (1)</td>
</tr>
<tr>
<td>Vehicles having GVW exceeding 7,500 kg except M3 category of vehicles with full forward control</td>
<td>0 to 1,016 mm</td>
<td>A</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1,016 to 1,270 mm</td>
<td>A</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Above 1,270 mm</td>
<td>A</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>M3 category of vehicles with full forward control and GVW exceeding 7,500 kg</td>
<td>All</td>
<td>A</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>Vehicles of category M2, M3, N1 and N2 having GVW not exceeding 7,500 kg</td>
<td>All</td>
<td>A</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 2 Minimum Windscreen Wiped Area
(Clause 4.1.2)

<table>
<thead>
<tr>
<th>Windshield Type</th>
<th>Minimum Percent Areas to be Wiped</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area A</td>
</tr>
<tr>
<td>One Piece</td>
<td>80</td>
</tr>
<tr>
<td>Multi Piece</td>
<td>65</td>
</tr>
</tbody>
</table>

4.1.4 Temperature Operational Capability

The windscreen wiper system shall be capable of operating between temperatures $55 \pm 3^\circ C$ and $0 \pm 3^\circ C$, using test procedures and test conditions established in 5.5.

4.2 Windscreen Wiper Blade

4.2.1 Ageing

The wiper blade element of the wiper blade assembly shall withstand the ozone test described in 5.6.

4.2.2 Chemical Resistance

The wiper blade element shall withstand the chemical resistance test described in 5.7.

5 TEST PROCEDURE

5.1 The test specified in 5.2 to 5.5 shall be conducted either on the complete vehicle with the wiper system installed on the vehicle or it shall be conducted with the help of the test equipment and test rig as described in Annex A.

5.2 Wiped Area Test

The procedure as given in Annex A will be followed using the test rig explained therein or on a complete vehicle.

5.3 Wiper System Frequency Test

5.3.1 Test Equipment

Apart from the test rig the additional equipments required will be counters, water softener, cleanser, temperature measuring device and voltmeter.

5.3.2 Wiper system frequency test shall be conducted under the following conditions:

- Ambient temperature not exceeding $40^\circ C$.
- Water temperature $40^\circ C$ maximum.
- Water nozzles — to be located so as to provide an approximately equally distributed water flow on windscreen glazing surface at the rate of not less than $820 \text{ cc/min}$.
- Clean, Oil — free water.
- Power input level at electrical drive motor (frequency test only) shall be maintained at $6.75 \pm 0.1$, $13.5 \pm 0.1$ and $27 \pm 0.2\text{ V}$ for $6, 12$ and $24\text{V}$ system respectively or power available at the drive motor, under normal vehicle operating conditions, as specified by vehicle manufacturer, whichever is less.
- Power input level at pneumatic drive motor (frequency test only) shall be maintained at $7 \pm 1 \text{ kg/cm}^2$ air pressure or power available at the drive motor under normal vehicle operating conditions as specified by vehicle manufacturer whichever is less.

5.3.3 System Frequency Determination

Clean the windscreen. Water is to be applied continuously to the windscreen throughout the test, as indicated in 5.3.2(c). Apply power to the drive motor as specified in 5.3.2(e) or 5.3.2(f). With appropriate control settings, determine system operating frequencies.

5.4 Test for Wiper System Stall (Strength)

5.4.1 Test Equipment

- Test rig — As described in A-1(c), and
- Power source — As described in A-1(d).

5.4.2 Test Procedure

At an ambient temperature not exceeding $40^\circ C$ and with the specified power supply, the wiper system shall meet the requirements specified in 4.1.3 when the wiper arms, in any position in the wipe circle, are restrained from movement for $15\text{ s}$.

5.5 Test for Wiper System Temperature Operation Capability

5.5.1 Test Equipment

- General — Test rig, power source, timing device, and other pertinent equipment described in 5.3.1 shall be used in this test.
- Test chamber — A room or chamber large enough to contain the complete test rig and capable of maintaining a temperature of $52^\circ C$ to $80^\circ C$ in the upper range and $0^\circ C$ to $-10^\circ C$ in the lower range.

5.5.2 Hot Test Procedure

The test rig and spray equipments are to be soaked in the test chamber at a temperature of $55 \pm 3^\circ C$ for $4\text{ h}$. Following this soak period and in the same temperature environment, the wiper system and spray equipments are to be turned on and operated for a period of half an hour at maximum wiper speed control setting with water applied continuously as indicated in 5.3.2(c).

5.5.3 Cold Test

The test rig is to be soaked in the test chamber at temperature of $0 \pm 3^\circ C$ for $4\text{ h}$. Following this soak period and in the same temperature environment, the
wiper system is to be turned ‘ON’ and the wipers operated for half an hour at maximum wiper system speed control setting.

5.6 Ozone Testing

5.6.1 Preparation of Wiper Blade Element

A 150 mm specimen of the wiper blade element assembly is to be installed in a suitable clamping fixture, in which it is to be stretched so as to cause an extension of 15 percent measured between gauge marks that are 100 mm apart.

The mounted specimens are then to be exposed for 48 h in an ozone free atmosphere.

5.6.2 Procedure

Test specimens are to be placed in the ozone test chamber for a period of 72 h. The test chamber is to be operated at a temperature of 40 ± 3°C and at a concentration of 50 pphm, by volume.

5.6.3 Specimens shall be examined for signs of cracks and shall not show cracks under ‘7X’ magnification.

5.7 Chemical Resistance Testing

A section of the wiper blade element when placed in a 50 percent solution of either methyl or isopropyl alcohol for a period of 24 h shall not change its weight by more than 2 percent.

ANNEX A

(Clauses 5.1 and 5.2)

TEST EQUIPMENTS AND TEST PROCEDURES FOR WINDSCREEN WIPER

A-1 TEST REQUIREMENT

a) Drafting equipment sufficient for full-size windshield and wiper system layout.
b) Transparent heavy gauge plastic sheet — prepared in clear acetate or equivalent.
c) Test Rig — A test rig shall consist of structure capable of 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 — The power source shall supply to the wiper motor the maximum power expected by the vehicle manufacturer under the conditions specified in any of the test procedure’s paragraphs.
e) Spray Equipment — Spray nozzles to apply water to glazing surface.

d) In vehicle position plan view and side view, layout windshield surface, DLO (Daylight opening) 95th percentile ellipse and the areas A, B and C, are generated on the exterior of the windshield, glazing surface using the angles.
e) Develop an unwrapped view of the windshield glazing surface and DLO. Design the wipe pattern, apply growth and transfer the pattern together with areas A, B and C into unwrapped view.
f) Calculate the percentages of areas A, B and C that are wiped with design pattern plus growth in the unwrapped view.

A-3 TEST RIG EVALUATION

a) Operate test rig with water ‘ON’ and wiper system on high speed, and mark outline of wipe pattern.
b) Transfer full size unwrapped view with wipe pattern and areas A, B and C to transparent heavy gauge plastic sheet.
c) Transfer wipe pattern from the test rig to the plastic sheet and recalculate the percentages of areas A, B and C that are wiped (see Fig. 3).

A-4 TEST PROCEDURE FOR ESTABLISHING MOTOR VEHICLE DRIVER’S EYE LOCATION

a) Introduction — A procedure for determining the position of driver’s eye on vehicle, as given below.
Manufacturer should specify the H-point that is, dimension H-30 and all the dimensions given in Fig. 1 and 2. However, the H-point as determined by this method and other dimensions as measured on vehicle will be used for checking the requirements of windscreen wiping. These measurements will be recorded for comparing with the values specified by the manufacturer.

b) Definitions

1) Class A vehicles — Vehicles where driver's workspace is close to N1 category of vehicles. Following limits are given as guidelines (see Fig. 1 and Fig. 2).
   Dimension H-30 equal to or less than 405 mm
   Steering wheel diameter less than 450 mm
   Torso angle L-40 range 5° to 40°

2) Class B vehicles — Vehicles where driver's workspace is close to heavy truck. Following limits are given as guidelines (see Fig. 1 and Fig. 2).
   Dimension H-30 more than 405 mm
   Steering wheel diameter more than 450 mm
   Torso angle L-40 range 1° to 18°.

c) A 3D-H-point machine is to be used.

d) The 3D-H-point machine is seated as in Fig. 1. The H-point as given by machine is used.

e) Eyellipse focus is taken at 635 mm above H-point and right eye eyellipse focus is located as shown in Fig. 1, for bench seats. For bucket seats, right and left eye will be 32.5 mm on either side of steering wheel centre line.

f) For further work any of the following methods may be used.
   1) The dimensions may be now transferred to the computer and further work may be done by simulation.
   2) Any other method to achieve the geometrical requirements.

g) Eyellipse for left and right eye are identical except that their centroids are separated horizontally by 65 mm.

h) The eyellipse for each eye is separately rotated about its centroid.
   1) For A Class vehicles — The x-axis is inward 5.4° (looking forward) in plan view and down 6.4° (looking forward) in side-view.
   2) For B Class vehicles — The x-axis is inward 5.4° (looking forward) in plan view and down 11.6° (looking forward) in side-view.

i) The angles as given in Table 1 are marked.

ii) Further work is now proceeded with as per the standard.
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Amendments Issued Since Publication

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