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Jawaharlal Nehru
“Step Out From the Old to the New”

Indian Standard

AUTOMOTIVE VEHICLES — TURNING CIRCLE AND MANEUVERABILITY REQUIREMENTS

(First Revision)

ICS 43.020
FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Braking Systems, Vehicle Testing and Performance Evaluation Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in 1987. This revision has been taken up to align the standard with ECE Regulation No. 36 ‘Uniform provisions concerning the construction of public service vehicles’ for the maneuverability requirements as updated last by Amendment 5, Revision 2 (Supplement 11 to the 03 series of amendments — Date of entry into force: 9th November 2005). The scope of the standard has been extended to L category vehicles fitted with steering wheel, M and N 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.
1 SCOPE

1.1 This standard specifies the turning circle requirements for vehicles of category L (fitted with steering wheel), M and N.

1.2 This standard also specifies maneuverability requirements for single-deck rigid or articulated vehicles designed and constructed for the carriage of persons having a capacity in excess of 22 passengers, whether seated or standing, in addition to the driver and having an overall width exceeding 2.3 m.

2 REFERENCES

The following Indian Standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<table>
<thead>
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<th>IS No.</th>
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<tr>
<td>9435 : 2004</td>
<td>Terms and definitions relating to dimensions of road vehicles other than 2 and 3 wheelers (first revision)</td>
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<td>11939 : 1996</td>
<td>Automotive vehicles — Steering control systems — Impact protection requirements and methods of measurement (first revision)</td>
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<td>12159 : 2007</td>
<td>Method of evaluation of accuracy of parameters of steering geometry of automotive vehicles (first revision)</td>
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<td>14272</td>
<td>Automotive vehicles — Types — Terminology (first revision) (under print)</td>
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3 DEFINITIONS

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

3.1 **Turning Circle Diameter (Outer)** — This shall be the diameter or turning circle defined in 5.31 of IS 9435.

3.2 **Turning Clearance Circle Diameter** — This shall be the diameter of the circle as defined in 5.32 of IS 9435.

4 PREPARATION OF THE VEHICLE

4.1 The vehicle shall be fitted with tyres, which shall have a tread depth of not less than 90 percent of the tread depth on new tyre and shall be inflated to the pressure recommended by the manufacturer. The measurement may be carried out in laden or unladen condition of the vehicle.

4.2 The steering geometry of the vehicle shall be checked and adjusted in accordance with the vehicle manufacturer’s recommendation.

4.3 The wheel lock angles of the vehicle shall be adjusted to the vehicle manufacturer’s specification.

5 MANEUVERABILITY REQUIREMENTS

5.1 The vehicle shall be able to maneuver on either lock inside a circle of 12.5 m radius without any of its outermost points projecting outside the circumference of the circle.

5.2 When the outermost points of the vehicle are moving on either wheel lock on a circle of 12.5 m radius the vehicle shall be able to move within the limits of circular track 7.2 m wide as shown in Fig. 1 or Fig. 2 as applicable.

5.3 With the vehicle stationary, a vertical plane tangential to the side of the vehicle and facing outwards from the circle shall be established by marking a line on the ground. In the case of an articulated vehicle the two rigid portions shall be aligned with the plane. When the vehicle moves from a straight line without turning the steering wheel in the opposite direction, approach into the circular area described in 5.1, no part of it shall move outside of this vertical plane by more than dimension ‘\(U\)’ given in Fig. 1 in the case of a rigid vehicle, and in Fig. 2, in the case of an articulated vehicle.

5.4 In the case of a vehicle fitted with an axle with an unloading device, these requirements shall in each case be fulfilled with the axle in the most unfavourable condition.

6 TURNING CIRCLE REQUIREMENTS

6.1 In the case of vehicles covered in 1.1, except those
FIG. 1 MANEUVERABILITY FOR RIGID VEHICLES

FIG. 2 MANEUVERABILITY FOR ARTICULATED VEHICLES
covered by 1.2, the turning circle diameter (outer) as defined in 3.1 shall not exceed 24 m.

6.2 In the case of vehicles covered in 1.2, the turning clearance circle radius as defined in 3.2 shall not exceed dimension $R$ given in Fig. 1 and Fig. 2, as applicable.

7 TECHNICAL SPECIFICATION OF VEHICLE

Technical specifications of vehicle as relevant to turning circle and maneuverability requirements shall be declared by the vehicle manufacturer and shall contain at least the details given in Annex A.

NOTE — If the specifications submitted for complete type approval of a vehicle contain the details given in Annex A, there is no necessity of submitting this information again.

8 MODIFICATIONS/CHANGES

8.1 In case test is conducted for verification of compliance to statutory requirements, the following shall be carried out.

8.1.1 Every functional modification pertaining to the information declared in accordance with 7 shall be intimated by the manufacturer to the certifying agency. The testing agency may then consider whether,

a) the model with the changed specifications still complies with the provisions; or

b) any further verification is required to establish compliance.

8.2 For considering whether any further verification is required or not, guidelines given in Annex B shall be used.

8.3 In case of 8.1.1(b), tests for only those parameters which are affected by the modifications needs to be carried out.

8.4 In case of fulfillment of criterion 8.1.1(a) or after of further verification as per 8.1.1(b) are successful, the approval of compliance shall be extended for the changes carried out.

ANNEX A

(Clauses 7)

TECHNICAL SPECIFICATION FOR VEHICLES FITTED WITH STEERING CONTROL

A-1 DETAILS OF VEHICLE MANUFACTURER

a) Name and address of the manufacturer
b) Telephone No.
c) Fax No.
d) E-mail address
e) Contact person
f) Name of model and variants (Features differentiating the model and its variants to be given in a separate table)
g) Plant/(s) of manufacture

A-2 VEHICLE TYPE

a) Type of vehicle (rigid/articulated/tractor-trailer combination/others)
b) Cab type [fully built cab (tiltable/non-tiltable)/ sleeper cab/front end structure/cowl with wind shield/cowl without wind shield]
c) Load body (fitted/not fitted)
d) Category of vehicle as per IS 14272 (Part 1)

A-3 VEHICLE DIMENSIONS

a) Length, mm
   1) Total length, mm (for articulated/combination vehicles)
b) Width, mm
c) Height (Unladen), mm
d) Wheel base, mm
   1) Axle spacing in case of multi axle vehicles
e) Wheel track, mm
   1) Front
   2) Rear
f) Body overhang, mm
   1) Front end
   2) Rear end
g) Frame overhang, mm (in case of vehicles without complete body)
   1) Front end
   2) Rear end

A-4 STEERING SYSTEM

a) Type (manual/power assisted — hydraulic/power assisted — electric/other)
b) Steering wheel
c) Maximum No. of rotation of steering wheel from lock to lock
d) Details of single/multiple combinations to be given in the form of an Annex with reference to IS 11939
e) Wheel lock angle   Inner Outer (degree)
   1) Left
   2) Right
f) Minimum turning circle diameter, mm as per 3.1
g) Minimum turning circle clearance diameter, mm as per 3.2
h) Coordinates of point defining test turning circle. (Applicable in case of vehicles without complete body which does not cover this point)

A-5 TYRE INFLATION PRESSURE (kg/cm²)

a) Front
b) Rear

ANNEX B
(Clause 8.2)
CRITERIA FOR EXTENSION OF APPROVAL

B-1 Changes where testing is considered necessary for establishing compliance to this standard with reference to a base model/base test, are as follows:

a) For turning circle diameter test:
   1) Any increase >5 percent in wheelbase,
   2) Any decrease <5 percent in wheel lock angle,
   3) Any increase >5 percent in front overhang (for turning circle clearance diameter as per 3.2 only),
   4) Any increase >5 percent in wheel track of steered axle (for turning circle diameter, mm as per 3.1 only), and
   5) Reduction in number of steered axles.

b) For maneuverability test:
   1) Any increase >5 percent in wheelbase,
   2) Any decrease <5 percent in wheel lock angle,
   3) Any increase >5 percent in front overhang,
   4) Any increase >5 percent in rear overhang,
   5) Any increase >5 percent in vehicle width, and
   6) Any increase >5 percent in wheel track.

Change other than those listed above, are considered to be having no adverse effect on above tests.

NOTE — Each of the above factors may be considered in isolation and not in combination.
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This Indian Standard has been developed from Doc No.: TED 4 (643).

Amendments Issued Since Publication

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