

AUTOMOTIVE INDUSTRY STANDARD

Approval of
I. A Close-Coupling Device (CCD)
II. Vehicles with Regard to the fitting
of an Approved Type of CCD

PRINTED BY

THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA
P.B. NO. 832, PUNE 411 004

ON BEHALF OF

AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER

CENTRAL MOTOR VEHICLE RULES – TECHNICAL STANDING COMMITTEE

SET-UP BY

MINISTRY OF SHIPPING, ROAD TRANSPORT & HIGHWAYS
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)

GOVERNMENT OF INDIA

May 2009

Status chart of the Standard to be used by the purchaser for updating the record

Sr. No.	Corr-igenda.	Amend-ment	Revision	Date	Remark	Misc.
General remarks :						

INTRODUCTION

The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the erstwhile Ministry of Surface Transport (MOST) has constituted a permanent Automotive Industry Standard Committee (AISC) vide order No. RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India, (ARAI), Pune, being the secretariat of the AIS Committee, has published this standard. For better dissemination of this information, ARAI may publish this document on their website.

Automotive Industry is the key industry to keep the pace of economic activity in India. Road infrastructure developed in the recent years is also helping the transportation sector and hence economic activity. To cope up the pace, multi axle vehicles and vehicles with different combinations are increasing day by day due to the necessity for transportation. Vehicle speed has also increased considerably on the highways. Hence it is necessary to address the safety of the transportation modes and means.

Close Coupling Devices (CCDs) which automatically provides sufficient space between the bodies of towing vehicle and trailers if additional clearance is needed during angular movement between them. Safety of such devices and their fitment to vehicles are to be addressed to have safer and reliable road transportation.

Considering the importance of the subject of Close Coupling Devices (CCDs), it was identified in the Roadmap for Automotive Safety Regulations for formulation of AIS in line with ECE R 102. Though such devices are not mandatory in other countries, this standard will provide guidelines for CCD manufacturers, vehicle manufacturers, testing agencies and users, when such devices are used in India. Thus enhancement of safety and performance levels of the vehicles when used on the road could be achieved. Various aspects of the coupling and its requirement are addressed in the right perspective.

While preparing this standard, considerable assistance has been derived from following ECE regulation

ECE R 102 (In its original form)	Uniform Provisions Concerning the approval of: I. A Close-Coupling Device (CCD) II. Vehicles with regard to the fitting of an approved type of CCD
-------------------------------------	--

The Automotive Industry Standards Committee (AISC) responsible for preparation of this standard is given in Annex : 5

Approval of :
I. A Close-Coupling Device (CCD)
II. Vehicles with Regard to the fitting of
an Approved Type of CCD

1. SCOPE

1.1. This standard applies to vehicles of categories N2, N3, T3 and T4.

2. DEFINITIONS

2.1. For the purposes of this standard :

2.1.1. **"Close-coupling device (CCD)"** means a device which automatically provides sufficient space between the bodies of towing vehicles and trailers if additional clearance is needed during angular movement between them. Coupling devices having no adjusting effect on lengths and/or angles within the device are not covered by this standard.

2.1.2. **"Approval of a device"** means the approval of a type of close-coupling device conforming to the requirements set out in Part I below;

2.1.3. **"Approval of a vehicle"** means the approval of a vehicle with regard to the fitting of an approved close-coupling device;

2.1.4. **"Vehicle type"** means vehicles which do not differ in such essential respects as:

2.1.4.1. The make and type of the close-coupling device;

2.1.4.2. The length and width of the vehicles;

2.1.4.3. The mass of the vehicles;

2.1.4.4. The points of attachment of the close-coupling device;

2.1.4.5. The vehicle description (e.g. truck, tractor, trailer, semi-trailer, centre-axle trailer);

2.1.4.6. Steering equipment (e.g. auxiliary steering equipment, steering equipment of the trailer).

2.1.5. **"Type of close-coupling device"** means devices which do not differ in such essential respects as:

2.1.5.1. The make and type of the device;

2.1.5.2. The operating principle;

2.1.5.3. The means of attachment to vehicles;

2.1.5.4. The overall dimensions at minimum and maximum extension;

2.1.5.5. The limits of the operating angles;

2.1.5.6. The kinematic characteristics in relation to the angles of articulation;

2.1.6. **"Automatic coupling procedure"**

A coupling procedure is automatic if reversing the towing vehicle against the trailer is sufficient to engage the coupling completely and properly and to secure it automatically and to indicate proper engagement of the safety devices without any external intervention.

PART I**APPROVAL OF A CLOSE-COUPLING DEVICE (CCD)****3. TECHNICAL INFORMATION TO BE SUBMITTED BY THE MANUFACTURER FOR APPROVAL OF A CLOSE - COUPLING DEVICE**

- 3.1. The application for approval of a close-coupling device (CCD) shall be submitted by the manufacturer of the CCD or by his duly accredited representative.
- 3.2. It shall be accompanied by:
- 3.2.1. In triplicate, a detailed description and fully dimensioned scale drawings of the CCD and the method of installation. The submitted documents shall show to the satisfaction of the test agency that the CCD will function reliably and safely.
- 3.2.2. A sample of the CCD type to be approved;
- 3.2.3. A combination of vehicles representing the worst case condition, fitted with the CCD to be approved, shall be selected in conjunction with the test agency responsible for conducting the approval tests taking into account such aspects as suspension, maximum allowable mass and dimensions, wheelbase, number and position of axles and the extreme positions of the close-coupling device. More than one combination of vehicles shall be provided, if required by the test agency.
- 3.3. Test agency shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.

4. APPROVAL

- 4.1. All parts required for the installation and safe operation of a close-coupling device (e.g. parts subject to towing and/or steering forces fixed to the chassis of the towing vehicle or the trailer, and control systems) are subject to type approval.
- 4.2. If the CCD submitted for approval pursuant to this standard meets the requirements of clause 5 below, approval of that CCD type shall be granted.⁽¹⁾

5. SPECIFICATIONS**5.1. General**

- 5.1.1. The CCD shall be so designed, constructed and assembled such that a vehicle fitted with the CCD conforms to the requirements of this standard under normal conditions of road use. The coupling devices themselves shall comply with the technical requirements of AIS-091 (Part 1). Additional forces which may be caused by the assembled CCD in operation shall be taken into account.

.....
⁽¹⁾ For the purposes of approvals under Part II, the test agency may take into account tests conducted for the purposes of Part I.

- 5.1.2. The operation of the CCD shall be automatic. Even the reverse movement of the close-coupled combination shall be possible without any manual action at the CCD.
- 5.1.3⁽¹⁾ In particular, the CCD shall be so designed, constructed and assembled so as to be resistant to all stresses, corrosion and ageing to which it may be subjected (e.g. vibration, humidity, extreme temperatures).
- 5.1.4. The CCD shall enable vehicles to travel in a straight line on a level road, without any abnormal effort being applied to the steering control, either forwards or in reverse.
- 5.1.5. **System failures**
- 5.1.5.1. Any power system failure and/or control system failure of the CCD, while the vehicle is running, shall cause the coupling to extend and remain in that position. Separation of the towing vehicle and trailer shall be prevented by mechanical means under all conditions of use.
- 5.1.5.2. Any power system and/or control system failure shall be indicated to the driver by an acoustic and an optical signal.
- 5.1.6. When the vehicles are stationary no uncontrolled movement of the CCD may occur under any circumstances including long term uphill parking.
- 5.1.7. Non-automatic movement of the CCD may be possible only while the towing vehicle is stationary. An instruction to apply the parking brake of the towing vehicle shall be permanently attached to the control unit.
- 5.1.7.1. This operation shall be controlled by means of a dual control unit.
- 5.1.7.2. This control unit shall be fitted outside the driver's cabin and shall be situated in such a position that the operator is not endangered by the movement of the trailer and can see the danger area between the vehicles at a glance.
- 5.1.7.3. It shall not be possible to lock the control unit in the operating position or operate it unintentionally.
- 5.1.7.4. The movement of the trailer shall take place without jolting, at a speed of not more than 50 mm/sec.
- 5.1.7.5. Release of a control shall stop the movement immediately.
- 5.1.8. Forward movement of the towing vehicle shall not result in rearward movement of the trailer in relation to the road surface. Rearward movement of the trailer of not more than 30 mm is permitted only for switch and react purposes.
- 5.1.9. The CCD shall return to its shortest normal straight ahead operating position following relative angular movement between towing vehicle and trailer, in accordance with Annex 4.

.....
 (1)Until uniform test procedures have been agreed, the manufacturers shall provide the test agency with their test procedures and results.

- 5.1.10. Operation of the CCD shall not interfere with the dynamic stability of the combination. This requirement shall be checked during the tests described in Annex 4.
- 5.1.11. The CCD shall be designed so as to enable the vehicles to be coupled or uncoupled. All coupling operations shall be automatic, including the mechanical controls and the parts subject to towing and/or steering forces. Correct engagement of the positive locking system shall be indicated or be easily visible from the side of the vehicle alongside the coupling device. Otherwise, a remote indication shall be installed in the driver's cabin. Manual coupling of control and power supply lines is permitted provided the connections are readily accessible from a standing position and the combination can be safely driven, without these lines being connected.
- 5.1.12. The CCD when engaged shall itself provide at least the following angular movement:

	Full trailer	Centre axle trailer	Semi-trailer
horizontal	± 60°	± 90°	± 90°
vertical	± 20°	± 15°	± 12°
axial	± 15°	± 15°	--

- 5.1.13. For hydraulic or pneumatic CCD's, an optical signal shall indicate that the CCD is about to reach its maximum extension. This signal may be the same as the optical signal mentioned in clause 5.1.5.2.
- 5.1.14. The CCD shall be designed such that when coupling at an angle between the towing vehicle and trailer different from that when uncoupled, unintentional movement of the trailer or incorrect functioning of the CCD does not occur.
- 5.1.15. A plate specifying the maximum mass of the towing vehicle and the trailer, all lubrication points and the frequency of lubrication shall be affixed such that it is clearly visible even when the trailer is coupled.

5.2. Tests

The tests which the CCD shall undergo for approval are described in Annex 4 to this standard.

6. MODIFICATION OF CCD TYPE AND EXTENSION OF APPROVAL

- 6.1. Any modification of the CCD type shall be notified to the Test Agency which approved the CCD type. Test Agency may then either;
 - 6.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that the device still complies with the requirements; or
 - 6.1.2. Require a further test report.

- 6.2 In case of 6.1.2, tests for only those parameters which are affected by the modifications, shall be carried out.
- 6.3 In case of fulfillment of criteria of clause 6.1.1 or after successful, results of further verification as per clause 6.1.2, the approval of compliance shall be extended for the changes carried out.

7. CONFORMITY OF PRODUCTION

- 7.1. Every CCD approved under this standard shall be manufactured so as to conform to the type approved by meeting the requirements set out in clause 5 above.
- 7.2 Conformity of production procedures as laid down in AIS-037 shall be applicable
- 7.3 The test agency which has granted type approval may at any time verify the conformity control methods applicable to each production unit. The normal frequency of inspections authorized by the test agency shall be once every two years.

8. (Reserved)

9. (Reserved)

10. (Reserved)

PART II**APPROVAL OF VEHICLES WITH REGARD TO
THE FITTING OF AN APPROVED TYPE OF CCD****11. TECHNICAL INFORMATION TO BE SUBMITTED BY
A VEHICLE MANUFACTURER FOR APPROVAL OF
A VEHICLE FITTED WITH A CLOSE - COUPLING DEVICE**

- 11.1. The application for approval of a vehicle type with regard to the fitting of a CCD of an approved type shall be submitted by the vehicle manufacturer or by his duly accredited representative.
- 11.2. It shall be accompanied by the under mentioned documents in triplicate and the following particulars:
- 11.3. A detailed description of the vehicle type and the vehicle parts connected to the CCD, including a dimensioned drawing of the fixing points and the information and documents referred to in Annex 2.
- 11.4. At the request of the, Test Agency the approval form (i.e. the form indicated in Annex 1 to this standard) for each type of CCD shall also be supplied.
- 11.5. A vehicle, representative of the vehicle type to be approved, fitted with a CCD, shall be submitted to the Test Agency conducting the approval test.
- 11.5.1. A vehicle not having all the components appropriate to the type may be accepted provided that the applicant can show to the satisfaction of the Test Agency that the absence of the components omitted has no effect on the results of the inspections as far as the requirements of this standard are concerned.
- 11.6. The Test Agency shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.
- 11.7. Special operating instructions shall be provided for coupling operations deviating from usual ones, which shall contain in particular, instructions regarding coupling and uncoupling with different modes of operation (e.g. angled positions). Each vehicle shall be accompanied by such special operating instructions.
- 12. APPROVAL**
- 12.1. If the vehicle submitted for approval pursuant to this standard is fitted with an approved CCD and meets the requirements of clause 13 below, approval of that vehicle type shall be granted.

13. REQUIREMENTS CONCERNING THE FITTING OF AN APPROVED CCD

- 13.1. The requirements of Part I, clause 5.1., excluding clause 5.1.12. have to be fulfilled when the CCD is fitted to the vehicle, despite any influences which may be caused by the operation of the vehicle.
- 13.2. The CCD in use shall not impede the movement of the vehicles to which it is fitted. This condition shall be deemed to have been met if the test requirements described in Annex 4 are complied with.
- 13.3. Warning signal as mentioned in Part I, clauses 5.1.5.2. and 5.1.13.
- 13.3.1. The acoustic device shall be located in the driver's cabin and shall be easily audible by the driver under all circumstances, when the vehicle is in normal use.
- 13.3.2. The optical signal shall be red in colour and located on the instrument panel in the direct field of vision of the driver and shall be easily visible even in daylight.
- 13.4. Coupling and uncoupling shall be possible with coupling angles of up to 50° horizontally both to the right and left, up to 10° vertically both upward and downward with full trailers, up to 6° vertically both upward and downward with centre axle trailers and up to 7° when twisted axially in both directions, i.e., it shall be possible to couple the trailer up to the above-mentioned angular positions between towing vehicle and trailer drawbars without the necessity of intervention of additional personnel.
- During automatic coupling it is permitted for a temporary position to be arranged before final coupling is effected. The temporary position shall permit the combination to be safely manoeuvred. If the final action is operated manually the space between the vehicles shall be at least 500 mm.
- 13.5. It shall be possible from the standing position for one person to position the coupling devices prior to the coupling procedure without the use of tools. This requirement also applies to the connection and disconnection of the braking and electrical lines.
- 13.6. General requirements
- To allow automatic coupling, the drawbar eye shall be adjustable vertically to the centre height of the coupling device under all usual traffic and operational conditions.

14. MODIFICATIONS OF THE VEHICLE TYPE AND EXTENSION OF APPROVAL

- 14.1. Any modification of the vehicle type as defined in clause 2.1.4. shall be notified to the administrative department which approved the vehicle type. The department may then either:
 - 14.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the vehicle still conforms to the requirements, or
 - 14.1.2. Require a further test report.
- 14.2. In case of 14.1.2, tests for only those parameters which are affected by the modifications, shall be carried out.
- 14.3. In case of fulfillment of criteria of clause 14.1.1 or after successful, results of further verification as per clause 14.1.2, the approval of compliance shall be extended for the changes carried out.

15. CONFORMITY OF PRODUCTION PROCEDURES

- 15.1. Every vehicle approved under this standard shall be manufactured so as to conform to the type approved by meeting the requirements set out in clause 13 above.
- 15.2. Whole vehicle conformity of production procedures shall be applicable as and when laid down.
- 15.3. The test agency which has granted type approval may at any time verify the conformity control methods applicable to each production unit. The normal frequency of inspections authorized by the test agency shall be once every two years

ANNEX 1

(See 3.0)

**TECHNICAL INFORMATION TO BE SUBMITTED BY THE
MANUFACTURER FOR APPROVAL OF A CLOSE-COUPLING
DEVICE**

1. Trade name or mark of the CCD:
2. CCD type
3. Manufacturer's name and address:
4. If applicable, name and address of manufacturer's representative:
5. Brief description of the CCD:
6. Type
 - 6.1. Vehicle on which the CCD was tested:
 - 6.2. Brief description including information with regards to clause 3.2.3.
7. Minimum space between motor vehicle and towed vehicle:
8. Maximum extension of device:
9. Restrictions of use on vehicles which may be utilized (*Strike out what does not apply*).
(e.g. truck, tractor, trailer, semi-trailer, centre axle trailer).
Maximum permissible mass of the trailer:
Maximum permissible mass of the tractor:

ANNEX 2

(See 11.0)

**TECHNICAL INFORMATION TO BE SUBMITTED BY
A VEHICLE MANUFACTURER FOR APPROVAL OF
A VEHICLE FITTED WITH A CLOSE - COUPLING DEVICE**

1. Trade name or mark of vehicle:
2. Vehicle type:
3. Manufacturer's name and address:
4. If applicable, name and address of manufacturer's representative:
5. Vehicle category N2, N3, T3, T4 (*Strike out what does not apply*).
6. Brief description of the vehicle type in respect of the CCD (e.g. truck, tractor, trailer, semi-trailer, centre-axle trailer):
Maximum permissible mass of the trailer:
Maximum permissible mass of the tractor:
7. Trade name or mark of the CCD(s) and its/their approval No(s):
8. Minimum space between towing vehicle and towed vehicle:
9. Maximum length of vehicles with the CCD(s) in running position:
10. Restriction on vehicles to be coupled to the vehicle type:

ANNEX 3
(Annex reserved)

ANNEX 4

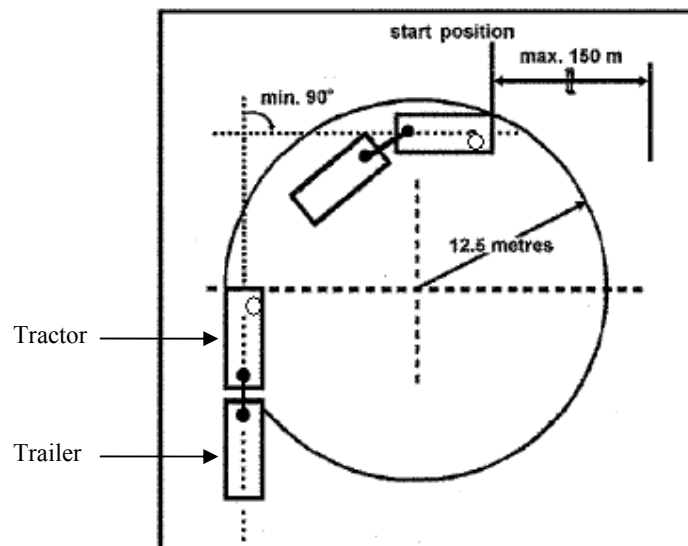
(See 5.1.10)

**REQUIREMENTS CONCERNING TESTS
AND PERFORMANCE ⁽¹⁾**

1. CCD RECOVERY DISTANCE

- 1.1. The towing vehicle/trailer combination shall be driven, from a straight ahead position, around a bend having an outside radius of 12.5 metres and stopped when the towing vehicle has turned through an angle of 90° (yaw-angle). The combination shall then be accelerated as quickly as possible up to a speed of 30 ± 2 km/h and be maintained at this speed until completion of the test. Full retraction of the CCD shall have taken place within 150 metres from the acceleration start position (see Figure 1 below).

This test shall be conducted in both left and right directions.



Note: Compliance with these requirements does not guarantee that the overall length of the vehicle combination is legal in all driving conditions.

Figure 1

- 1.2. The test agency shall verify that some retraction of the CCD takes place all the time the towing vehicle is moving forward.

(1) For the purposes of approvals under Part II, the test agency may take into account tests conducted for the purposes of Part I.

2. STABILITY OF THE COMBINATION

For the approvals under Parts I and II, the stability performance shall be measured during road tests conducted in the following conditions:

2.1. Test Conditions

2.1.1. Loading conditions

2.1.1.1. The vehicles shall be laden, the distribution of mass among the axles being that stated by the manufacturers of the vehicles; where provision is made for several arrangements of the load on the axles, the distribution of the maximum mass among the axles shall be such that the mass on each axle is proportional to the maximum permissible mass for each axle.

2.1.1.2. The height of the centre of gravity of the vehicles shall be at least 1.7 metres.

The actual loading condition shall be specified in the test report. For vehicles designed for use with a centre of gravity lower than 1.7 metres, the test may, at the discretion of the approval authority, be conducted at the lower figure.

In this case the maximum centre of gravity height shall be stated on the information plate required by clause 5.1.1.5.

2.1.2. The test shall be carried out at the speeds prescribed for each type of test.

If the maximum design speed of a vehicle is lower than the speed prescribed for a test, the test shall be performed at the vehicle's maximum speed.

2.1.3. The road shall be level and shall have a surface affording good adhesion;

2.1.4. The tests shall be performed when there is no wind liable to affect the results;

2.1.5. At the start of the tests, the tyres shall be cold and at the pressure prescribed by the manufacturer of the vehicles or tyres for the load actually borne by the wheels when the vehicles are stationary; substantially new tyres shall be used.

2.1.6. The prescribed performance shall be obtained without self amplifying reactions, without deviation of the vehicles from their course, and without unusual vibration in the steering and coupling system.

2.2. Straight Line Stability Test

2.2.1. Vehicles shall be tested at a speed of $85^{+5/-0}$ km/h and remain aligned. During the test, it shall be possible to travel along a straight section of the road without unusual steering correction by the driver.

2.2.2. ⁽¹⁾ An emergency straight line braking test from a speed of 60 km/h to rest at a mean fully developed deceleration of at least 4 m/s^2 shall not cause the combination to deviate outside a lane 3.5 metres wide.

(1) The test agency shall take account of the predominance setting of the combination

- 2.2.3. Starting from rest, a forward acceleration of at least 2 m/s^2 shall not cause any movement between the vehicles of a degree likely to cause the driver difficulty in controlling the vehicle combination. (If the acceleration prescribed for this test cannot be reached by a vehicle combination, the test shall be performed with the maximum acceleration available).
- 2.2.4. No permanent deformation shall take place during the above tests.

2.3. Change of Lane

- 2.3.1. A simulated overtaking manoeuvre, as defined in the appendix, conducted at a progressively increasing speed up to 80 km/h , shall not cause the driver any difficulty in controlling the combination.
- 2.3.2. At a speed of 20 km/h steering from one side of the track to the other alternately at least 3 times by turning the steering wheel as fast and as far as possible, no contact between the vehicles or damage to the CCD shall occur (track width is 10 metres).

3. CIRCULAR MOVEMENT

- 3.1. Starting from rest and a straight ahead position, the combination shall be driven around a curve of 25 m radius to a speed of 20 km/h at an acceleration of $2 \pm 10\% \text{ m/s}^2$. This shall not cause any movement between the vehicles of a degree likely to cause the driver difficulty in controlling the vehicle combination.
- 3.2. With the towing vehicle and trailer having adopted a steady state, turn so that the front outside edge of the towing vehicle describes a circle of radius of 25 m , at a constant speed of 5 km/h . The circle described by the rearmost outer edge of the trailer shall be measured. This manoeuvre shall be repeated under the same conditions but at a speed of $25 \text{ km/h} \pm 1 \text{ km/h}$.

During these manoeuvres, the rearmost outer edge of the trailer, travelling at a speed of $25 \text{ km/h} \pm 1 \text{ km/h}$, shall not move outside the circle described during the manoeuvre at a constant speed of 5 km/h by more than 0.70 m (see Figure 2 below).

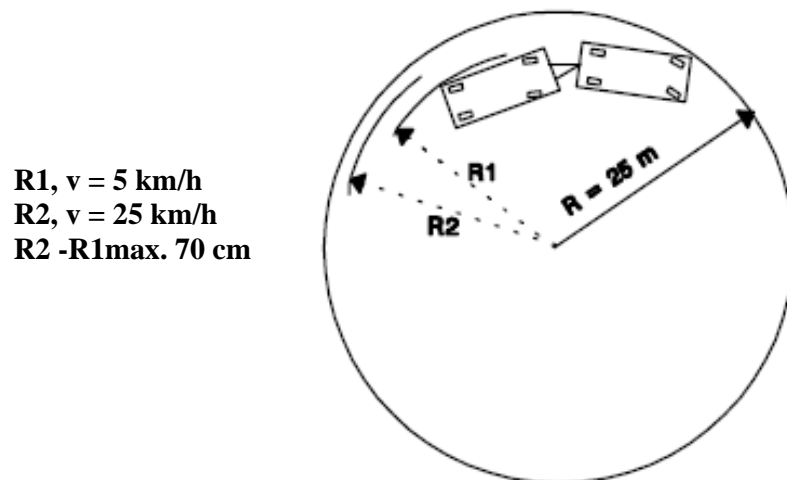


Figure 2

- 3.3. No part of the trailer shall move more than 0.5 m beyond the tangent to a circle with a radius of 25 m when towed by a vehicle leaving the circular path along the tangent while maintaining the speed of 25 km/h. This requirement shall be met from the point the tangent meets the circle to a point 40 m along the tangent. After that point the trailer shall travel without excessive deviation or unusual vibration in its steering equipment (see Figure 3 below).

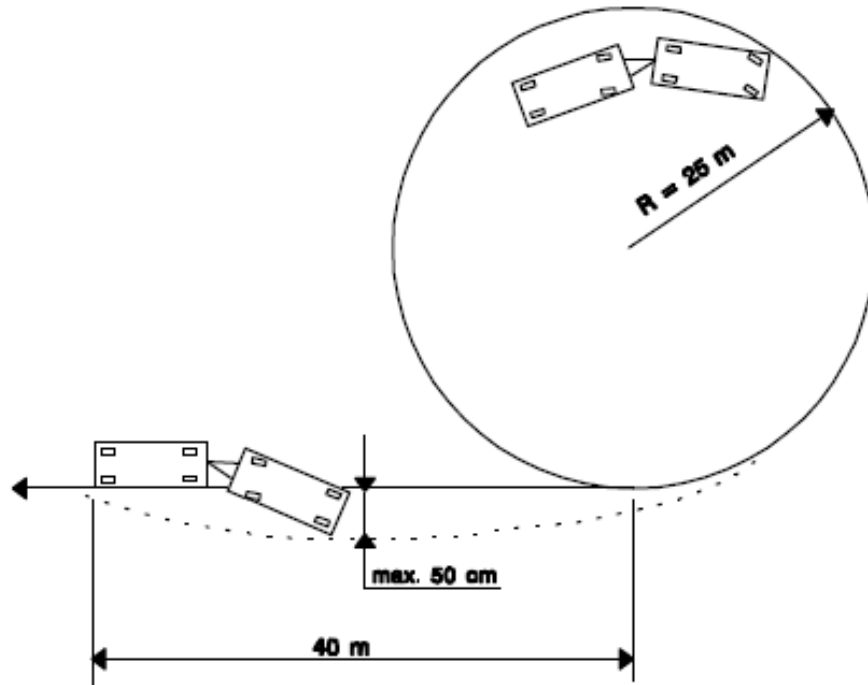


Figure 3

- 3.4. Any motor vehicle or combined vehicle which is in motion shall be able to turn within a swept circle having an outer radius of 12.50 m and an inner radius of 5.30 m. The test shall be conducted in both left and right directions. No part of the combination, where it penetrates the circle from a tangent, may overlap that tangent by more than 0.8 m beyond the point of intersection (see Figure 4 below).

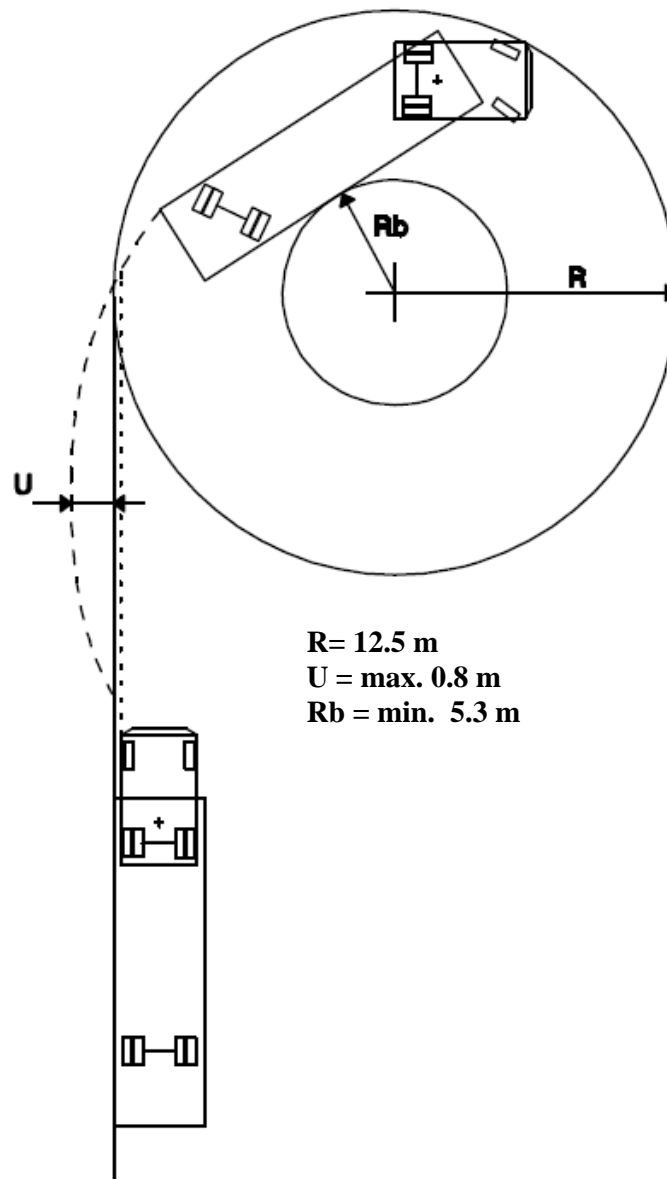
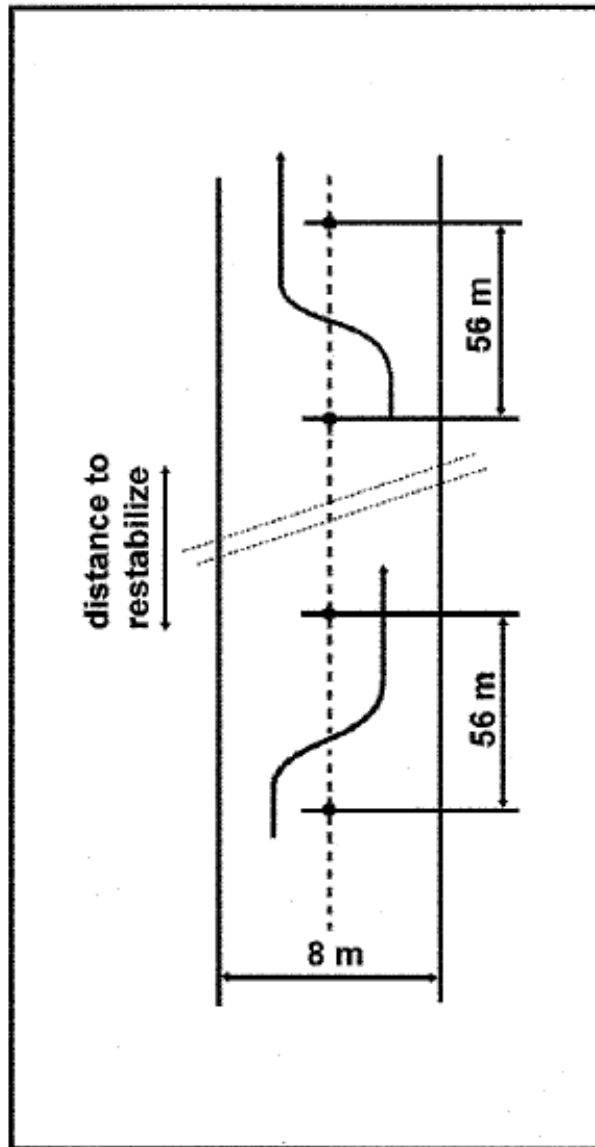


Figure 4

4. SLOPES

- 4.1. When positioned longitudinally in line and in the normal operation position:
 - 4.1.1. There shall be no unintentional contact between any part of the towing device and the towing vehicle or trailer when the vehicles are positioned at a relative vertical angle of 6° .
 - 4.1.2. No contact shall occur between the bodies of the towing vehicle and trailer at a relative vertical angle of 5° .
- 4.2. The requirements of clauses 4.1.1. and 4.1.2. may be verified by calculation at the discretion of the test agency.

**ANNEX 4 – APPENDIX I
OVERTAKING TRACK**
(See Annex 4, clause 2.3.1.)



Note: This track arrangement may be subject to revision when superseded by an ISO Standard.

ANNEX 5

(See Introduction)

COMMITTEE COMPOSITION *
Automotive Industry Standards Committee

Chairman	
Shri Shrikant R. Marathe	Director The Automotive Research Association of India, Pune
Members	Representing
Representative from	Ministry of Shipping, Road Transport & Highways (Dept. of Road Transport & Highways), New Delhi
Representative from	Ministry of Heavy Industries & Public Enterprises (Department of Heavy Industry), New Delhi
Shri Chandan Saha	Office of the Development Commissioner, Small Scale Industries, Ministry of Small Scale Industries, New Delhi
Shri Rakesh Kumar	Bureau of Indian Standards, New Delhi
Director Shri D. P. Saste (Alternate)	Central Institute of Road Transport, Pune
Dr. M. O. Garg	Indian Institute of Petroleum, Dehra Dun
Dr. C. L. Dhamejani	Vehicles Research & Development Establishment, Ahmednagar
Representatives from	Society of Indian Automobile Manufacturers
Shri T.C. Gopalan Shri Ramakant Garg (Alternate)	Tractor Manufacturers Association, New Delhi
Shri K.N.D. Nambudiripad	Automotive Components Manufacturers Association of India, New Delhi
Shri Arvind Gupta	Automotive Components Manufacturers Association of India, New Delhi

Member Secretary
Mrs. Rashmi Urdhwareshe
Deputy Director
The Automotive Research Association of India, Pune

* At the time of approval of this Automotive Industry Standard (AIS)