

**AMENDMENT NO. 3
TO
AIS-043 : 2005**

**Recommendation of Braking System and Performance Requirements
for the Combination of Agricultural Tractor and Trailer**

1.0 Page No. 6/17, clause 6.8 :

Substitute following text for existing text :

“6.8 The tests shall be carried out at the speeds prescribed for the test according to the category of the trailer. Where the combination of a trailer is so constructed that 90% of it’s maximum speed is lower than that prescribed for a test , the test shall be performed at 90% of the maximum speed of the combination as indicated in the clause 8.0 of the standard. The performance required shall be carried out both in the fully laden condition (maximum weight) and in the unladen condition of the trailer. “

2.0 Page No. 7/17, clause 6.14 :

Substitute following text for existing text :

“6.14 The parking brake test on the tractor and trailer combination shall be conducted once both on the up and down gradient, in the fully laden condition (maximum weight) of the trailer”.

3.0 Page No. 9/17, Annexure I :

Substitute following Annexure I for existing Annexure I :

Annexure I


**Technical Specifications to be submitted by the
Trailer manufacturer**

1.0	Name and address of the trailer manufacturer:	
2.0	Contact details :	
2.1	Name of the contact person and designation :	
2.2	Telephone number :	
2.3	Fax Number :	
2.4	E mail :	
3.0	Trailer Specification:	
3.1	Trailer Identification :	


3.1.1	Name / Identification of the trailer (Base Model)		
3.1.1.1	Category of the trailer as per AIS:043		
3.1.1.2	Type of trailer (Semi –Trailer / Full- Trailer)		
3.1.1.3	Number of axles		
3.1.2	Name of the Variants, if any		
3.1.2.1	Type of trailer (Semi –Trailer / Full- Trailer) :		
3.1.2.2	Category of the trailer as per AIS:043		
3.1.2.3	Number of axles (Single / Double /Other) :		
3.2	Trailer Dimensions (mm)	Base Model	Variant(s), if any
3.2.1	Overall Length		
3.2.2	Overall Width		
3.2.3	Overall Height		
3.2.4	Wheel base		
3.2.5	Wheel track		
3.2.6	Height of the trailer load platform from the ground (in case of semi-trailer this dimension may be given when coupled with the tractor)		
4.0	Description of the Service braking system:		
4.1	Make and Country of origin (If imported)		
4.2	Type (Inertia Over-run/Mechanical/Hydraulic/Pneumatic/Air assisted/vacuum assisted/Others)		
4.3	Control system & braking wheel		
4.4	Schematic layout of the trailer braking system		
5.0	Brake lining or pad :		
5.1	Nominal Dimensions, mm (Length x Width x thickness)		
5.1.1	Front wheel		
5.1.2	Rear wheel		
5.1.3	Others		
5.2	Effective area per axle, cm ²		
5.2.1	Front axle		
5.2.2	Rear axle		
5.2.3	Others		

Manufacturer :	Document No :	Test Agency :	Cert No :
Signature	Sheet No	Signature Name	Seal
Name		Designation	
Designation	Date	Date of Issue	Page No of


5.3	Make, Country of origin (If imported) and material designation	
5.3.1	Front wheel / axle	
5.3.2	Rear wheel / axle	
5.3.3	Others	
5.3.4	Whether asbestos or asbestos-free	
6.0	Brake drum or disc :	
6.1	Front axle (Disc / Drum)	
6.1.1	Effective Diameter, mm	
6.2	Rear axle (Disc / drum)	
6.2.1	Effective Diameter, mm	
6.3	Other axle , if applicable(Disc / Drum)	
6.3.1	Effective diameter, mm	
7.0	Master cylinder or brake valve (if provided):	
7.1	Make and Country of origin (If imported)	
7.2	Type	
7.3	Inner diameter of the master cylinder, mm	
7.4	Operating stroke, mm	
7.5	Type of supply tank	
8.0	Wheel cylinder / Wheel Chamber (if provided):	
8.1	Diameter, mm	
8.1.1	Front	
8.1.2	Rear	
8.1.3	Others	
8.2	Type (single acting / double acting)	
8.2.1	Front	
8.2.2	Rear	
8.2.3	Others	
9.0	Booster (if provided) :	
9.1	Make and Country of origin (If imported)	
9.2	Type	
9.3	Boost ratio	
9.4	Size of the booster, mm (diameter)	
10.0	Vacuum or Air assistance (if applicable):	
10.1	Pressure, kg/cm ²	
10.1.1	Nominal (P ₂ as per IS:11852	
10.1.2	Cut in	
10.1.3	Cut out	
10.2	Type of vacuum pump or air compressor	

Manufacturer :	Document No :	Test Agency :	Cert No :
Signature		Signature	
Name	Sheet No	Name Designation	
Designation	Date	Date of Issue	Page No of

10.3	Type of pressure regulator			
10.4	No. of tanks			
10.5	Tank Capacity, l			
		Description		Water Capacity in litres
10.5.1	Tank 1			
10.5.2	Tank 2			
10.5.3	Tank 3			
10.5.4	Tank 4			
10.6	Brake Chamber	Front	Rear	Parking
10.6.1	Make and type			
10.6.2	Size, mm			
10.6.3	Inner diameter, mm			
10.6.4	Stroke, mm			
11.0	Brake hose (if Hydraulic):			
11.1	Make, Country of origin (If imported) and Identification No.			
11.2	Free Length of hoses (mm)			
11.3	Thickness of lining (mm)			
11.4	Nominal bore dia, mm			
11.5	End fitting Type			
12.0	Failure Warning device for braking :			
12.1	Type (Visual display/ audible/others)			
12.2	Operation pressure kg/cm ² / bar / kPa			
12.3	Type of safety device			
13.0	Parking brake :			
13.1	Make and Country of origin (If imported)			
13.2	Type (mechanical/spring brake)			
13.3	Acting on Transmission/wheel			
13.4	Control System & Braking wheel			
13.5	Lining/pad			
13.5.1	Name of producer :			
13.5.2	Dimension mm			
13.5.3	Area cm ²			
13.5.4	Material			
13.6	Diameter of brake drum/disc mm			
14.0	Secondary brake (if provided) :			
14.1	Type			
14.2	Description			

Manufacturer :	Document No :	Test Agency :	Cert No :
Signature		Signature	
Name	Sheet No	Name Designation	
Designation	Date	Date of Issue	Page No of

15.0	Additional retarding devices (if fitted) :		
15.1	Type		
15.2	Description		
15.3	Deceleration at 30 km/h, m/s ²		
16.0	Brake fluid :		
16.1	Make and Country of origin (If imported)		
16.2	Trade name		
16.3	Specification/ grade as per Indian standard		
17.0	Load distribution on the trailer :		
		Laden, kg	Un laden,kg
17.1	Front axle		
17.2	Rear axle		
17.3	Other axles		
17.4	Total	GVW ----- kg	
18.0	Proportioning valve (if fitted) :		
18.1	Make and Country of origin (If imported)		
18.2	Characteristics		
18.3	Identification		
19.0	Apportioning valve (if fitted) :		
19.1	Make and Country of origin (If imported)		
19.2	Characteristics		
19.3	Identification		
20.0	Load sensing valve (if fitted) :		
20.1	Make and Country of origin (If imported)		
20.2	Characteristics		
20.3	Identification		
21.0	G valve (if fitted):		
21.1	Make and Country of origin (If imported)		
21.2	Characteristics		
21.3	Identification		
22.0	Other valves (if fitted) :		
22.1	Function		
22.2	Make and Country of origin (If imported)		
22.3	Characteristics		
22.4	Identification		
23.0	Details of the Agricultural tractor used for the test :		
23.1	Make and Model:		
23.2	Rated Engine power , kW @rpm		

Manufacturer :	Document No :	Test Agency :	Cert No :
Signature		Signature	
Name	Sheet No	Name Designation	
Designation	Date	Date of Issue	Page No of

23.3	Max speed of the tractor, km/h	
23.4	Short description of the tractor braking system :	
24.0	Tyres :	
24.1	First Axle	
24.1.1	Size and Ply rating	
24.1.2	Make	
24.1.3	Load rating / Load index	
24.1.4	Tyre pressure psi (kg/cm ²)	
24.1.5	Compliance to IS :15636-2005	
24.2	Second Axle	
24.2.1	Size and Ply rating	
24.2.2	Make	
24.2.3	Load rating / Load index	
24.2.4	Tyre pressure , psi (kg/cm ²)	
24.2.5	Compliance to IS : 15636-2005	

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ON BEHALF OF
AUTOMTIVE INDUSTRY STANDARDS COMMITTEE

UNDER
CENTRAL MOTOR VEHICLES RULES – TECHNICAL STANDING COMMITTEE

SET-UP BY
MINISTRY OF ROAD TRANSPORT & HIGHWAYS
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)
GOVERNMENT OF INDIA

May 2011

**AMENDMENT NO.2 : 2010
TO
AIS-043 : 2005**

**Recommendation of Braking System and Performance requirements for the
Combination of Agricultural Tractor and Trailer**

1.0 Page No. 4/17, clause 4.0 :

For Category R2 substitute following text for existing text :

“Category R2: Single axle trailer whose GVW exceeds 3.0 tons and does not exceed 6 tons.”

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UNDER
CENTRAL MOTOR VEHICLES RULES – TECHNICAL STANDING COMMITTEE

SET-UP BY
MINISTRY OF ROAD TRANSPORT & HIGHWAYS
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)
GOVERNMENT OF INDIA

July 2010

AMENDMENT NO.1
TO
 AIS - 043
Recommendation of Braking System and Performance requirements for the
Combination of Agricultural Tractor and Trailer

1.0 Page No. 1/17, clause 2.7 :

Substitute “ IS:11852 – 2001” for “ IS:11852 –1987 ”.

2.0 Page No. 2/17, clause 3.5, line No.5, 6 and 7 :

Substitute following text for existing text.

“ (when the forces are generated by electro-magnetic action between two parts of the tractor moving relatively to each other), ”

3.0 Page 7/17 :

After clause 6.16, the following clause be inserted.

“ 6.17 The test is to be conducted in tractor engine disconnected condition. ”

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P.BO.NO.832, PUNE 411 004

ON BEHALF OF
AUTOMTIVE INDUSTRY STANDXARDS COMMITTEE

UNDER
CENTRAL MOTOR VEHICLES RULES – TECHNICAL STANDING COMMITTEE

SET-UP BY
MINISTRY OF SHIPPING, ROAD TRANSPORT & HIGHWAYS
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)
GOVERNMENT OF INDIA

June 2007

AUTOMOTIVE INDUSTRY STANDARD

**Recommendation of Braking System
and Performance requirements for
the Combination of
Agricultural Tractor and Trailer**

PRINTED BY

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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

December 2005

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 Ministry of Surface Transport (MOST) has constituted a permanent Automotive Industry Standards 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 Web site.

Currently most of the trailers that are coupled to agricultural tractors do not employ any sort of braking system which is vital from the point of safety both for the road users and the vehicle. CMVR-TSC had therefore directed AISC to formulate a standard to adequately cover these aspects. This standard recommends the type of braking system that need to be fitted on the trailers that are attached to agricultural tractors and their performance requirements when tested in combination with the agricultural tractor.

For the purposes of testing and approval, the trailer manufacturer has to submit a prototype of the trailer fitted with a braking system, to the authorized test agencies under Rule 126 of CMVR, 1989. In case if the tractor is not available with the test agency the same shall be arranged by the concerned trailer manufacturer.

While preparing this AIS considerable assistance is derived from the following standards.

ISO/DIS 5697-1	Tractors and Machinery for Agriculture and Forestry – Braking Systems – Requirements.
IS: 12061-1994	Agricultural Tractors - Braking Performance - Method of Test.
IS: 8213-1987	Agricultural Tractor Trailer – Specification.
IS: 12239-1998	Guide for Safety and Comfort of Operator of Agricultural Tractor and Power Tillers.
IS: 12207-1987	Agricultural Tractors- Recommendations on selected Performance Characteristics
EEC Directive 76/432/EEC	Braking Devices of Wheeled Agricultural or Forestry Tractors.
IS: 11852-1987	Recommendations of Brakes and Braking System Requirements for Automotive Vehicles.

The technical specifications that are to be submitted by the trailer manufacturer are as given in Annexure I.

The list of members of panel set-up under AISC for formulation of this standard is given in Annexure II.

The Automotive Industry Standards Committee responsible for preparation of this standard is given in Annexure III.

Recommendation of Braking System and Performance Requirements for the Combination of Agricultural Tractor and Trailer.

1.0 SCOPE

This standard applies to the combination of Agricultural tractors and their trailers intended exclusively for the carriage of agricultural products and their implements.

2.0 REFERENCES

- 2.1 ISO/DIS 5697-1 Tractors and Machinery for Agriculture and Forestry – Braking Systems – Requirements.
- 2.2 IS: 12061-1994 Agricultural Tractors - Braking Performance - Method of Test.
- 2.3 IS: 8213-1987 Agricultural Tractor Trailer – Specification.
- 2.4 IS: 12239-1998 Guide for Safety and Comfort of Operator of Agricultural Tractor and Power Tillers.
- 2.5 IS: 12207-1987 Agricultural Tractors- Recommendations on selected Performance Characteristics
- 2.6 EEC Directive Braking Devices of Wheeled Agricultural or Forestry Tractors. 76/432/EEC
- 2.7 IS: 11852–1987 Recommendations of Brakes and Braking System Requirements for Automotive Vehicles.

3.0 TERMINOLOGY

- 3.1 **Braking Device** : Braking device means a combination of parts whose function is progressively to reduce the speed of a moving tractor and trailer combination or to bring it to a halt , or to keep it stationary if already halted. A device shall consist of the control, the transmission and the brakes themselves.
- 3.2 **Graduated Braking** : Graduated braking means braking during which, on either the application or release of the brakes , within the normal range of operation of the device.
 - 3.2.1 The driver can at any time increase or reduce the braking force through action on the control.
 - 3.2.2 The braking force acts in the same direction as the action on the control (monotonic function).
 - 3.2.3 It is easy to make a sufficiently fine adjustment to the braking force.

- 3.3 **Control** : Control means the part actuated directly by the driver to supply to the transmission the energy required for braking or controlling it. This energy may be the muscular energy of the driver or energy from another source controlled by the driver or a combination of these various kinds of energy.
- 3.4 **Transmission** : Transmission means the combination of components situated between the control and the brake and connecting the two operationally. The transmission may be mechanical, hydraulic, pneumatic, electrical or mixed. Where the braking power is derived from or assisted by a source of energy independent of the driver but controlled by him, the reverse of energy in the device shall likewise be regarded as part of the transmission.
- 3.5 **Brake** : Brake means the component in which the forces opposing the movement of the tractor develop. It may be a friction brake (when the forces are generated by the friction between the two parts of the tractor moving relatively to one another) , an electrical brake (when the forces are generated by electro-magnetic action between two parts of the tractor moving relatively to each other, but not in contact with one another), a fluid brake or an engine brake (when the forces are derived from a controlled increase in the braking action of the engine transmitted to the wheels). A device which mechanically locks the tractor's transmission but which cannot be used when the tractor is in motion shall be regarded as parking brake.
- 3.6 **Different types of Braking Devices** : Different types of braking devices means equipment which differs in such essential respects as :
- 3.6.1 The characteristics of one or more components, for example the material, shape or size.
- 3.6.2 The arrangement of the components, different in design.
- 3.7 **Braking System Component** : Braking system component means one of the individual parts which, when assembled, constitute the braking device.
- 3.8 **Continuous Braking** : Continuous braking means the braking of combinations of vehicles through an installation having the following characteristics :
- 3.8.1 A single control which the driver actuates progressively, by a single movement, from his driving seat.
- 3.8.2 The energy used for braking the vehicles constituting the vehicle combination is supplied from the same source (which may be the muscular energy of the driver).

- 3.8.3 The braking installation ensures simultaneous or suitably phased braking of each of the constituent vehicles of the combination, whatever their relative positions.
- 3.9 **Semi-continuous Braking** : Semi-continuous braking means the braking of combinations of vehicles through an installation having the following characteristics:
- 3.9.1 A single control which the driver can actuate progressively, by a single movement , from his driving seat.
- 3.9.2 The energy used for braking the vehicles constituting the vehicle combination is supplied from several different sources (one of which may be the muscular energy of the driver).
- 3.9.3 The braking installation ensures simultaneous or suitably phased braking of each of the constituent vehicles of the combination, whatever their relative positions.
- 3.10 **Independent Power-operated Braking or Independent Braking** : Independent power-operated braking or Independent braking means the braking of combinations of the vehicles by means of devices having the following characteristics.
- 3.10.1 A tractor brake control which is independent of the towed vehicle brake control; the latter being in all case mounted on the tractor in such a way as to be easily actuated by the driver from his driving seat.
- 3.10.2 The muscular energy of the driver is the energy used for braking the towed vehicles.
- 3.11 **Automatic Braking** : Automatic braking means braking of the towed vehicle occurring automatically in the event of separation of components of the combination of coupled vehicles, including such separation through coupling breakage, without the braking effectiveness of the remainder of the combination being substantially reduced.
- 3.12 **Weight of Ballasted tractor for Haulage** : Weight of Ballasted tractor for haulage means a tractor ballasted to the weight as recommended by the tractor manufacturer.
- 3.13 **Maximum Weight** : Maximum weight means the maximum technically permissible weight stated by the manufacturer (this weight may be higher than the ‘authorized maximum weight’).
- 3.14 **Weight of Unballasted tractor** : Weight of Unballasted tractor means tractor in running order, with full tanks and radiators, with a driver of a mass of 75 kg , but without passengers, optional accessories or load.

- 3.15 **Transport Trailer :** Any transport vehicle for agricultural or forestry use and which by design is suitable and intended by the manufacturer to be towed by a agricultural tractor.
- 3.16 **Inertia Braking System :** Inertia braking system means a braking system in which the energy necessary to produce the braking force arises from the approach of the trailer to its towing vehicle.
- 3.17 **Service Braking System :** The primary braking system used for stopping and holding the tractors and trailers during normal driving.
- 3.18 **Parking Brake System :** A system used to hold a stopped tractor and trailer in a stationary position on an incline of at least 7 degrees in the fully laden condition (GCW).

4.0 Categories of Agricultural Trailers : For the purpose of this standard Agricultural trailers can be classified into the following Categories:

- Category R1 : Single axle trailer whose GVW does not exceed 3.0 tons.
- Category R2 : Single axle trailer whose GVW exceeds 3.0 tons and does not exceed 5 tons.
- Category R3 : Any double axle trailer whose GVW does not exceed 10 tons.
- Category R4 : Any double axle or multi-axle trailer whose GVW exceeds 10 tons.

5.0 General requirements of the Braking System : The braking system shall be so designed and installed as to enable the vehicles in normal use to comply with the under mentioned requirements .

In particular , the braking system shall be so designed and installed as to resist corrosion and the effects of aging during service , which could lead to a sudden loss of braking efficiency.

The braking equipment of a vehicle shall be composed of the service braking system, the parking braking system, and when required for the power braking system. The service, parking and the automatic braking system may have common components.

Wear on the brakes shall be compensated by means of a system of manual or automatic adjustment. In addition , the controls and the parts of the transmissions and of the brakes shall possess a reserve of travel and perhaps a suitable adjustment device such that, when the brakes become heated or the brake linings have sustained a certain degree of wear, braking is ensured without an immediate adjustment being necessary.

- 5.1 **Service Braking System** : The service braking system shall make it possible to control the movement of the vehicle and to halt it safely and effectively. This shall not be applicable for the Inertia Overrun braking system.
- 5.2 **Parking Braking System** : The parking braking system shall enable the tractor and/or the tractor and trailer combination to be held in the locked position with a suitable device. The parking braking system provided on the trailer shall be so designed that it shall be operated externally from the trailer.
- 5.3 **Inertia Braking System** : The transmission of force from the coupling head to the trailer brakes shall be effected either by rod linkage or by one or more fluid circuits. Part of the transmission may, however, be formed by a sheathed cable (Bowden cable) chains or a wire rope.

All bolts at joints shall be adequately secured. In addition, these joints shall be either self-lubricating or readily accessible for lubrication.

Inertia braking systems shall be so arranged that even when the full travel is used damage by excessive forces in the transmission or the brakes is avoided. Any device (stress limiter) used to this end shall not reduce the braking force below the prescribed level. Stress limiters may either be a component of the inertia braking system or of the wheel brakes.

Inertia braking systems shall be so arranged that where maximum extended travel on the coupling head is used , no part of the transmission seizes, undergoes permanent distortion or breaks. This shall be checked by uncoupling the end of the transmission from the brake control levers.

Vertical static loads and dynamic vertical loads at the coupling head have to be taken into consideration when designing the braking system.

The inertia braking system shall permit the trailer to be reversed together with the towing vehicle. A separate reversing lock shall be provided which may be operated manually during the reversing motion.

- 5.4 **Power Braking System** : The braking system provided on category R4 type agricultural trailers and their towing tractors shall be fitted with an efficient power braking system such as pneumatic , hydraulic, air over hydraulic or any other system which meets the requirements specified in the standard.

- 6.0 General Test Conditions :** The brake performance test on the tractor trailer combination shall be done under the following conditions :
- 6.1 The brake test shall be carried out on a dry surface , with a minimum coefficient of adhesion equal to 0.8 .
 - 6.2 The longitudinal gradient of the test track shall not be more than 1 percent .
 - 6.3 The test shall be performed with the wind velocity less than 3 m/s in any direction.
 - 6.4 The inflation pressure of tyres shall be as recommended by the tractor /trailer manufacturer.
 - 6.5 The brake system and relevant pedal linkages shall be adjusted properly before the commencement of the test. The tractor/trailer manufacturer shall ensure uniform adjustment of the brakes before offering for tests if the service braking system is provided with independent left side and right side operating controls , the same shall be latched together before the commencement of the tests.
 - 6.6 The trailer shall be loaded as per the recommendation of the tractor/trailer manufacturer .The loads shall be distributed equally among the wheels of the trailer whose construction should be as per the recommendations laid down in IS : 8213
 - 6.7 The bedding-in of the liner may be done by the tractor/trailer manufacturer before it is offered for test.
 - 6.8 The tests shall be carried out at the speeds prescribed for the test according to the category of the trailer. Where the combination of a trailer is so constructed that 90% of it's maximum speed is lower than that prescribed for a test , the test shall be performed at 90% of the maximum speed of the combination as indicated in the clause 8.0 of the Standard. The performance required shall be carried out in the fully laden condition (GCW).
 - 6.9 During the test the force applied to the brake control in order to obtain the prescribed performance shall not exceed the maximum laid down for the category of the trailer.
 - 6.10 The drum or disc temperature shall be less than 100 °C before each test .
 - 6.11 The Stopping distance shall be recorded for every test using standard instruments like Correvit, etc.,

- 6.12 The prescribed performance shall be obtained without the locking of the wheels and without the combination going out of the lane with width equal to one and half times that of the trailer and without jackknifing. However, wheel locking towards the end of the stop may be permitted.
- 6.13 The service brake test on the tractor and trailer combination shall be conducted at least three times to ensure consistency within 5% of the observed results.
- 6.14 The parking brake test on the trailer and the combination of tractor and trailer shall be conducted once both on the up and down gradient.
- 6.15 The general behavior of the combination of tractor and trailer during braking shall be reported.
- 6.16 The tractor to which the trailer under test is to be hitched should be ballasted as per the recommendations of the tractor manufacturers for haulage.

7.0 Braking System Requirements on Agricultural Trailers :
 The minimum requirements of the braking system according the category of the trailer as defined in Clause No.4.0, are as indicated in the following Table :

Trailer Category	Requirements of Braking System
Category R1	<ul style="list-style-type: none"> - Service Braking System is not compulsory. - Parking Brakes are compulsory.
Category R2 and Category R3	<ul style="list-style-type: none"> - Service braking system is compulsory and shall at least be of the inertia over-run type. - Parking Brakes are compulsory.
Category R4	<ul style="list-style-type: none"> - Service brake is compulsory and shall at least be any of the pneumatic / hydraulic /coupled power brake type. - Parking brakes are compulsory.

8.0 Braking Performances requirements for Agricultural Tractor and Trailers combination :

Category of trailers	Service Brakes	Parking Brakes
R1, R2 & R3, R4	<p>Stopping distance $S \leq 0.30 V + V^2 / 63.5$ Where Test Speed $V=20\text{km/h}$.</p> <p>Control force in newtons, $F \leq 600 \text{ N}$.</p>	<p>To hold on 12 % up or down gradient.</p> <p>Control force in newtons, $F \leq 400 \text{ N}$.</p>

9.0 INTERPRETATION OF THE TEST RESULTS :

Three Service brake performance tests shall be carried out and the average performance shall be reported.

Stopping distance measured shall be corrected to the condition of specified initial speed by the following formula:

$$S_c = (S_m - 0.1 V_m) \times (V_s / V_m)^2 + 0.1 V_s$$

Where

S_c = stopping distance corrected to condition of specified speed (m),

V_s = Specified initial speed (km/h),

V_m = measured initial speed (km/h) and

S_m = measured stopping distance (m).

After correcting the stopping distance to the specified initial speed of test the results of the three tests shall be averaged and reported.

10.0 TECHNICAL SPECIFICATIONS TO BE SUBMITTED BY THE TRAILER MANUFACTURER :

The details are as given at Annexure I.

11.0 TEST REPORT:

The results of all the tests conducted shall be reported in the form of a test report.

The report shall also contain information regarding the specification and details of the tractor that was used for the test.

ANNEXURE I

(See 10.0)

**Technical Specifications to be submitted by the
Trailer Manufacturer**

- 1.0 Name and address of the trailer manufacturer :**
- 2.0 Contact details :**
- 2.1 Name of the contact person and designation :
- 2.2 Telephone number :
- 2.3 Fax Number :
- 2.4 E mail :
- 3.0 Trailer specifications :**
- 3.1 Type of trailer (semi –trailer / full- trailer) :
- 3.2 Number of axles (single / double /Other) :
- 4.0 Description of the Service braking system :**
- 4.1.1 Make and Country of origin (If imported)
- 4.1.2 Type (Inertia over-run/Mechanical/Hydraulic/Pneumatic/air assisted/vacuum assisted/others)
- 4.1.3 Control system & braking wheel
- 4.1.4 Schematic layout of the trailer braking system
- 5.0 Brake lining or pad :**
- 5.1 Nominal Dimensions, mm (Length x Width x thickness)
- 5.1.1 Front wheel
- 5.1.2 Rear wheel
- 5.1.3 Others
- 5.2 Effective area per axle, cm²
- 5.2.1 Front axle
- 5.2.2 Rear axle
- 5.2.3 Others
- 5.3 Make, Country of origin (If imported) and material designation
- 5.3.1 Front wheel / axle
- 5.3.2 Rear wheel / axle
- 5.3.3 Others
- 5.3.4 Whether asbestos or asbestos-free
- 6.0 Brake drum or disc :**
- 6.1 Front axle (Disc / Drum)
- 6.1.1 Effective Diameter, mm
- 6.2 Rear axle (Disc / drum)
- 6.2.1 Effective Diameter, mm
- 6.3 Other axle, if applicable (Disc / Drum)
- 6.3.1 Effective diameter, mm

7.0 Master cylinder or brake valve (if provided):

- 7.1 Make and Country of origin (If imported)
- 7.2 Type
- 7.3 Inner diameter of the master cylinder, mm
- 7.4 Operating stroke, mm
- 7.5 Type of supply tank

8.0 Wheel cylinder / Wheel Chamber (if provided):

- 8.1 Diameter, mm
 - 8.1.1 Front
 - 8.1.2 Rear
 - 8.1.3 Others
- 8.2 Type (single acting / double acting)
 - 8.2.1 Front
 - 8.2.2 Rear
 - 8.2.3 Others

9.0 Booster (if provided) :

- 9.1 Make and Country of origin (If imported)
- 9.2 Type
- 9.3 Boost ratio
- 9.4 Size of the booster, mm (diameter)

10.0 Vacuum or Air assistance (if provided) :

- 10.1 Pressure, kg/cm²
 - 10.1.1 Nominal
 - 10.1.2 Cut in
 - 10.1.3 Cut out
- 10.2 Type of vacuum pump or air compressor
- 10.3 Type of pressure regulator
- 10.4 No. of tanks
- 10.5 Tank Capacity l

Description Capacity

- 10.5.1 Tank 1
- 10.5.2 Tank 2
- 10.5.3 Tank 3
- 10.5.4 Tank 4

10.6	Brake Chamber	Front	Rear	Parking
10.6.1	Make and type			
10.6.2	Size mm			
10.6.3	Inner diameter mm			
10.6.4	Stroke mm			

11.0 Brake hose (if Hydraulic):

- 11.1 Make, Country of origin (If imported) and Identification No.
- 11.2 Free Length of hoses
- 11.3 Thickness of lining (mm)
- 11.4 Nominal bore dia, mm
- 11.5 End fitting Type

12.0 Failure Warning device for braking :

- 12.1 Type (Visual display/ audible/others)
- 12.2 Operation pressure kg/cm^2 / bar / kPa
- 12.3 Type of safety device

13.0 Parking brake :

- 13.1 Make and Country of origin (If imported)
- 13.2 Type (mechanical/spring brake)
- 13.3 Acting on Transmission/wheel
- 13.4 Control System & Braking wheel
- 13.5 Lining/pad
 - 13.5.1 Name of producer :
 - 13.5.2 Dimension mm
 - 13.5.3 Area cm^2
 - 13.5.4 Material
- 13.6 Diameter of brake drum/disc mm

14.0 Secondary brake (if provided) :

- 14.1 Type
- 14.2 Description

15.0 Additional retarding devices (if fitted) :

- 15.1 Type
- 15.2 Description
- 15.3 Deceleration at 30 km/h, m/s^2

16.0 Brake fluid :

- 16.1 Make and Country of origin (If imported)
- 16.2 Trade name
- 16.3 Specification/ grade as per Indian standard

17.0 Load distribution on the trailer :

	Load n, kg	Unladen,kg	Unladen F/R ratio
Front axle			
Rear axle			
Other axles			
Total			

18.0 Proportioning valve (if fitted) :

- 18.1 Make and Country of origin (If imported)
- 18.2 Characteristics
- 18.3 Identification

- 19.0 Apportioning valve (if fitted) :**
 19.1 Make and Country of origin (If imported)
 19.2 Characteristics
 19.3 Identification
- 20.0 Load sensing valve (if fitted) :**
 20.1 Make and Country of origin (If imported)
 20.2 Characteristics
 20.3 Identification
- 21.0 G valve (if fitted):**
 21.1 Make and Country of origin (If imported)
 21.2 Characteristics
 21.3 Identification
- 22.0 Other valves (if fitted) :**
 22.1 Function
 22.2 Make and Country of origin (If imported)
 22.3 Characteristics
 22.4 Identification
- 23.0 Details of the agricultural tractor used for the test :**
 23.1 Make and Model:
 23.2 Rated engine power , kW @rpm
 23.3 Max speed of the tractor, km/h
 23.4 Description of the tractor braking system :
 23.5 Axle load distribution of the tractor :

Axle	Unladen weight, kg
Front axle , normal	
Rear axle, normal	
Front axle , if ballasted	
Rear axle, if ballasted	

Annexure II
List of Members of the Panel *

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

ANNEXURE III
(See Introduction)
COMMITTEE COMPOSITION *
Automotive Industry Standards Committee

Chairman	
Shri B. Bhanot	Director The Automotive Research Association of India, Pune
Members	Representing
Shri S. K. Mishra	Ministry of Shipping, Road Transport & Highways (Dept. of, Road Transport & Highways),New Delhi
Shri Sushil Kumar	Ministry of Heavy Industries & Public Enterprises (Department of Heavy Industry), New Delhi
Shri J. K. Arya	Office of the Development Commissioner, Small Scale Industries, Ministry of Small Scale Industries, New Delhi
Shri S. K Chauduri Shri P. C. Joshi (Alternate)	Bureau of Indian Standards, New Delhi
Dr. G. K. Sharma Shri D. P. Saste (Alternate)	Central Institute of Road Transport, Pune
Director	Indian Institute of Petroleum, Dehra Dun
Dr. C. L. Dhamejani Dr. N. Karuppaiah (Alternate)	Vehicles Research & Development Establishment, Ahmednagar
Shri Dilip Chenoy	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 New Delhi
Shri G. P. Banerji	Automotive Components Manufacturers Association 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)