

**IS 9253 : 2013**

**(Reaffirmed 2019)**

*भारतीय मानक*

कृषि कार्य हेतु पहिये वाला ट्रैक्टर — खेत में कार्य संपादन और  
कर्षण (हुलाई) परीक्षण — मार्गदर्शिका  
(तीसरा पुनरीक्षण)

*Indian Standard*

**AGRICULTURAL WHEELED TRACTORS — FIELD  
PERFORMANCE AND HAULAGE TESTS —  
GUIDELINES**

*( Third Revision )*

ICS 65.060.10

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Agricultural Tractors and Power Tillers Sectional Committee, FAD 11

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Agricultural Tractors and Power Tillers Sectional Committee had been approved by the Food and Agriculture Division Council.

Agricultural tractors are basically meant for field operations like ploughing, cultivation, harrowing, etc and haulage of agricultural produce and their residues. Therefore, it is very important that tractors perform well in the field operations and haulage and it necessitated the formulation of guidelines for field performance and haulage tests of agricultural tractors.

This standard was first published in 1979 and subsequently revised in 1987 and 2001. Based on the experience gained in the use of this standard by the Central Farm Machinery Training and Testing Institute, Budni, a need was felt to revise it again. This revision includes the following major changes/additions:

- a) Duration of field performance test has been reduced from 50 h to 35 h; and
- b) Requirements for test track for haulage test have been specified.

Field performance of the tractors vary with the field conditions. It is, therefore, recommended that the test results obtained under different conditions shall not taken into consideration for evaluating the comparative field performance of tractors.

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*

# AGRICULTURAL WHEELED TRACTORS — FIELD PERFORMANCE AND HAULAGE TESTS — GUIDELINES ( *Third Revision* )

## 1 SCOPE

This standard covers the guidelines for conducting the field performance and haulage tests of agricultural wheeled tractors.

## 2 REFERENCES

The following 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.

<i>IS No.</i>	<i>Title</i>
2720 (Part 2) : 1973	Method of test for soil: Part 2 Determination of water content ( <i>second revision</i> )
11082 : 1984	Technical requirements of agricultural tractor for wet land cultivation

## 3 FIELD PERFORMANCE TESTS

### 3.1 General

**3.1.1** A range of implements, matched to the tractor, required for operations given in **3.1.2** should be supplied by the applicant. The tests shall be conducted with these implements. If the matching implements have not been supplied by the applicant, the tests shall be performed with those implements which are available at the testing station and as mutually agreed upon by the applicant and the testing station.

**3.1.2** The field performance of the tractor shall be evaluated with the following two groups of the implements:

- Primary tillage implements* — Mould board/disc plough and rotary tiller (rotavator); and
- Wet land cultivation such as with half cage wheel or full cage wheel with or without implements.

### 3.2 Selection of Land

The land selected for test shall preferably be agricultural land on which a crop was harvested within last one year. The field operation should be made, as far as possible, in test fields where furrow length of minimum 50 m, excluding the head land, wherever applicable, would be available. In case of puddling test, the furrow length may be a minimum 25 m. The field selected for ploughing/rotavation, should not have undergone any previous tillage operations after the harvest of the last crop. The surface should be reasonably level and the slope should not exceed 3 percent in any direction. The condition of field shall be checked and reported in the proforma given in Annex A.

### 3.3 Preparation of Tractor for Test

**3.3.1** The tractor should be fitted with the accessories in accordance with the manufacturer's/applicant's recommendations. The servicing and maintenance shall be carried out as per the schedule prescribed by the manufacturer/applicant in the printed literature.

**3.3.2** The tractor shall be fitted with ballast as recommended by the manufacturer/applicant in his sale/instructions manual and tyres shall be inflated according to the recommendations of the manufacturer for field work.

**3.3.3** At the beginning of the test, the skid depth of tyre tread bars measured at the central line of the tyres shall be at least 65 percent of their height, when new. Test shall be conducted with tread bars worn up to 50 percent of skid depth when new.

### 3.4 Field Operations

**3.4.1** Field operations with plough and rotavator shall be carried out for duration of 20 h under upland condition with minimum 10 h of operation with each implement mentioned under **3.1.2**. The test under wet land condition shall be conducted for 10 h in actual field condition and 5 h for waterproof test in the laboratory condition. In case the tractor is not recommended for wet land operation, the total duration

## IS 9253 : 2013

of test shall be completed with above implements. The total duration of field testing with plough and rotavator in such cases shall be 35 h.

**3.4.2** The operations except puddling shall be carried out in fields having soil moisture generally required for the type of operation. The soil moisture range for tillage operation for different soils is given in Table 1 for guidance.

**Table 1 Recommended Soil Moisture Range for Tillage Operation for Different Soils**

Sl No. (1)	Soil Type (2)	Moisture (Wet Basis) Percent (3)
i)	Light	2-8
ii)	Medium	5-12
iii)	Heavy	6-18

**3.4.2.1** The moisture content shall be determined in accordance with IS 2720 (Part 2).

**3.4.3** The gear selected shall be one in which satisfactory and safe operation is attained. The gear selected for the operations shall be maintained during the test except at head land. The limiting factor for the speed should be such that the wheel slip shall be within 20 percent. The throttle setting for all field operations shall be conducted at full throttle setting. The suggested range of speeds for different operations are given in Table 2 for guidance.

**Table 2 Recommended Speed Ranges for Various Field Operations for Field Tests**

Sl No. (1)	Field Operation (2)	Range of Speed km/h (3)
i)	Ploughing (with mould board and disc plough)	2.0-5.0
ii)	Rotavation	2.0-4.0
iii)	Harrowing and cultivation	3.0-7.0
iv)	Puddling	2.0-4.5

**3.4.4** The throttle setting for field testing shall be conducted at full throttle setting. The initial throttle setting shall not be disturbed during the operation with

particular implement. However, the throttle may be reduced at head land.

**3.4.5** For puddling operation, as far as possible, the land should have minimum 100 mm of standing water prior to test. The speed selected for operations shall be in accordance with the manufacturer's recommendations.

**3.4.6** During and after the operation, the data/ observations shall be recorded in accordance with Annex A. In case of puddling test, the ingress of water and/or mud in critical components and assemblies of tractor as given in IS 11082 shall be reported. The engine lubricant and coolant (water) consumption shall be measured for all field trials and reported as average hourly consumption for entire test duration.

## 4 HAULAGE TEST

**4.1** The haulage test shall be carried out with two wheel and/or four wheel trailers at the gross trailer loads recommended by the manufacturer.

**4.2** The haulage test shall be conducted on a level tar macadam track and having gradients not exceeding 8 percent at certain short lengths.

**4.3** The tractor shall be ballasted in accordance with the recommendations of the manufacturer/applicant. The inflation pressure shall be maintained as recommended by the manufacturer for road work.

**4.4** The test consisting of equal test run in both the directions shall be conducted under identical conditions. The total distance covered in both the directions of test run shall be minimum of 40 km. Minimum two trials each with two and four-wheel trailers shall be conducted; and range of the average test observations shall be reported. In case the tractor is not capable of four-wheel trailer, it shall be tested with two-wheel trailer only.

**4.5** The gears selected shall be appropriate for the satisfactory and safe operation. The speed can be reduced by reducing the engine speed as and when necessary while conducting the test.

**4.6** The observations/data shall be recorded according to Annex B.

**ANNEX A**  
(Clauses 3.2 and 3.4.6)

**DATA SHEET FOR RECORDING FIELD OPERATION DATA**

**A-1 SITE OF TEST FIELD**

**A-2 SIZE OF FIELD**

- a) Length, m
- b) Width, m

**A-3 FIELD CONDITIONS**

- a) Type of soil;
- b) Levelness of field and slope, percent;
- c) Last crop grown;
- d) Details of tillage operations, if any, after the harvest of last crop;
- e) Types of weeds and intensity;
- f) Soil moisture, percent, in case of puddling test (depth of water), mm;
- g) Bulk density of soils;
- h) Cone index; and
- j) Any other field conditions influencing tractor performance.

**A-4 FIELD OPERATION DATA**

- a) Engine speed, rev/min
  - 1) At no load
  - 2) On load
- b) Type of operation:
  - 1) Disc ploughing
  - 2) Mouldboard ploughing
  - 3) Disc harrowing
  - 4) Tilling with cultivator
  - 5) Other operation
- c) Width of headland and method of ploughing/ tilling

- d) Average operating speed, km/h
- e) Average width and depth:
  - 1) Width, mm
  - 2) Depth, mm
- f) Average draft of implement, kN
- g) Average wheel slip, percent
- h) Average wheel sinkage during puddling operation, mm
- j) Total duration of test, h
- k) Stoppage and reasons of stoppage
- m) Total duration of work, h
- n) Net duration of work, h
- p) Total area covered, ha
- q) Time required, h/ha
- r) Area covered, ha/h
- s) Fuel consumed, l/h and l/ha
- t) Engine lubricating oil consumption, ml/h
- u) Coolant consumption, ml/h
- v) Ambient temperature, °C
- w) After completion of the test the assemblies/ components described in IS 11082 may be inspected for ingress of water and mud
- y) General observations:
  - 1) Brief specification of implements used
  - 2) Point of hitch and its height (in case of trailed implement)
  - 3) Ease of steering
  - 4) Stability of hydraulic system
  - 5) Unusual noise and vibration, if any, observed during operation

**ANNEX B**  
(Clause 4.6)

**DATA SHEET FOR HAULAGE TEST**

**B-1 TRAILER DETAIL**

- a) Brief specification of trailer used
- b) Make and model
- c) Type
- d) Size of platform

- e) Unladen mass of the trailer, t
- f) Gross mass of the trailer, t
- g) Distance between rear wheel centre of tractor and rear wheel centre of the trailer, mm
- h) Wheel base of the trailer (in 2 axle trailers), mm

### IS 9253 : 2013

- j) Tyre size and inflation pressure
- k) Height of hitch above ground level, mm

#### B-2 TRACTOR DETAILS

- a) Tyre size and inflation pressure
- b) Ballasting of the tractor
- c) Wheel track, mm:
  - 1) Front
  - 2) Rear
- d) Height of the hitch above the ground level, mm
- e) Mass of the tractor, kg
- f) Wheel base, mm

#### B-3 TEST RESULTS

- a) Date of test

- b) Total distance travelled, km
- c) Total duration of test, h
- d) Net duration of run, h
- e) Average speed of travel, km/h
- f) Fuel consumption:
  - 1) Total fuel consumed, litre
  - 2) Hourly consumption, litre/h
  - 3) Specific, cc/km/t
- g) General observations:
  - 1) Effectiveness of brakes
  - 2) Manoeuvrability of tractor-trailer combination
  - 3) Front lifting
  - 4) Visibility condition and any part of the tractor which is making obstacle in visibility, if any

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## Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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