

BHUTAN STANDARD
Tractors– Test Code (Part 2)



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Foreword

This Bhutan Standards for Tractors–Test Code was adopted by Bhutan Standards Bureau after the draft finalization by the Mechanical Engineering Technical Committee and endorsed by BSB Board. The standard was prepared by Agriculture Machinery Certification Program, Agriculture Machinery Center under Department of Agriculture, MoAF. To confirm the values and test procedures, a few sample of machines was tested in the field as well as in the laboratory and also endorsed by AMC Technical Committee and put up proposal to BSB for further deliberation.

Bhutan Standard

Tractor – Test Code (Part 2)

1. Scope

This test code specifies the test methods for riding type tractor, power ranging above 14 hp wheel tractors.

2. Normative References

The following document is indispensable for application of this document. For dated references, only the edition cited shall be applied. For undated references, the latest edition of the referenced document shall also apply (including any amendment).

ISO 789-3:2015(E)-Agriculture tractor- Test procedure

ISO 3965:1990(E)- Methods of determination of maximum speed of tractors

ISO 5697: 1982(E)- Determination of braking performance

ISO 5349-1:2001(E)-General requirement- Mechanical vibration

OECD code 01-10 – Agriculture Tractor code

BTS xxx: 2020 – Tractors – Basic Requirements

3. Classification of Tractors

Classifications of tractor are based on types of drive

a) Four -Wheel type of tractors

These are commonly used for agricultural purpose. They can run fast and wheel tires absorb a certain amount of field shocks. These tractors are usually fitted with four wheels. These tractors are used for major farm operation, pulling and lifting purposes. These can be further divided as:

1) Two-wheel drive

Two axled tractors with a drive train that allows two wheels to be driven.

2) Four-wheel drive

Two axled tractors with a drive train capable of providing torque to all of its wheels simultaneously.

4. Terms and Definitions

For the purposes of this standard, the terms and definitions given in BTS XXX:2023 Tractor-Basic Requirements (Part 1) shall apply:

4.1 Others

Any additional verifications that may be required to be undertaken for enhancing the precision of any test items.

4.2 Water splashing

Water splashing is a condition verified during the water proof test. When the tractor is operated in the water tank designed for water proof test as per the requirement of operation test procedures, water will be splashed from wheel and rotary unit to axle and transmission.

5. General condition of test

5.1 The tractor for the test shall be new.

5.2 The tractor manufacturer or supplier shall provide specification of tractor consisting of items listed in Annexure A, as well as any further data required.

5.3 The tractor shall not be operated in a way that it is not in accordance with the manufacturers published instruction unless specifically required by test criteria.

5.4 The fuel and lubricants shall be use in accordance with the manufacturer's recommendation or else can select the applicable range of product available.

5.5 The tractor subjected to test shall be run as per the manufacturer's recommendations.

5.6 The tractor subjected to the test shall be adjusted as per the manufacturer's indication.

5.7 The measuring instruments shall be inspected and calibrated prior to measurement and shall have the minimum scale and accuracy.

5.8 The radiator, oil sump, hydraulic and other reservoir shall be filled as per manufacturer's specification.

6 Test Items and Methods

6.1 Verification of structure

The objective of this test is to confirm the specifications of tractor given by the manufacturer. The items shall be verified are as per the Annex "A".

6.2 Safety test

The objective of this test is to ascertain the safety features of the tractor. It shall be performed as given below,

- a) Verify safety devices.
- b) Check the caution labels.
- c) Check the instruction manual.
- d) Others

6.3 Noise test

The objective of this test is to determine that the noise of the tractor is under safe limit or not at varying engine revolution. It shall be performed by,

- a) At operator's position
 - i) Controlling the throttle position (Idle, middle and full throttle state).

- ii) Shall be measured at a position of 50 mm away from operator's ear. The operator should be seated properly.
- b) Affecting zone
 - i) Controlling the throttle position (Idle, middle and full throttle state).
 - ii) The microphone shall be placed 1.2 m above ground and at a distance of 7.5 m from the axis of forward movement of the tractor.

6.3.1 The following conditions shall be maintained to perform this test

- a) The measurement shall be made without load in a sufficiently silent and open zone.
- b) Ambient noise shall not exceed 10 decibels.

6.4 Vibration test

The objective of this test is to ascertain the intensity of the vibration while operating at varying acceleration. It shall be performed by: -

- a) Controlling the throttle position (Idle, middle and full throttle state).
- b) Magnitude of vibration shall be measured from steering.

6.4.1 The following conditions shall be maintained to perform this test

- a) The measurement shall be without load.
- b) The transducer (accelerometer) shall be mounted rigidly on steering.

6.5 Service Braking performance test

The objective of this test is to ascertain the braking performance to prevent from accident while plying on road for transportation. It shall be performed by measuring following item:

- a) Stopping distance (m)

6.5.1 The following conditions shall be maintained to perform this test

- a) The roadway shall be straight and allow the maximum speed of 20km/h to be maintained for a minimum test distance of 100 m.
- b) The surface shall be dry, smooth concrete or similar finish and clean.
- c) The surface shall not have more than 15% slope in the direction of travel and not more than 15% slope at right-angles to the direction of travel.

6.6 Maximum travelling speed test

The objective of this test is to compare the travelling speed specified by manufacturer. It shall be performed by measuring following items,

- a) Run the tractor over a distance of at least 100m first in one direction on the test roadway and then in the opposite direction engaging the reverse gear.
- b) The time interval for a point on the machine to traverse 100m shall be recorded.

6.6.1 Test condition

- a) The roadway shall be straight and allow the maximum speed to be maintained for a minimum test distance of 100 m.
- b) The surface shall be dry, smooth concrete or similar finish and clean.
- c) The surface shall not have more than 15% slope in the direction of travel and not more than 15% slope at right-angles to the direction of travel.

6.7 Minimum turning test

The objective of this test is to recommend the minimum size of field for field operation. It shall be performed by:

- a) Minimum turning test without brake
 - 1) Keep steering on full right-hand lock, at a speed not exceeding 2 km/h for at least one complete turn, until it is established that the minimum turning circle is being described.
 - 2) Measure minimum turning diameter and minimum clearance diameter.
 - 3) Respectively repeat on full left-hand lock steering.
- b) Minimum turning test with brake
 - 1) Keep steering on full right-hand lock with right brake pedal applied, at a speed not exceeding 2 km/h for at least one complete turn, until it is established that the minimum turning circle is being described.
 - 2) Measure minimum turning diameter and minimum clearance diameter.
 - 3) Respectively repeat on full left hand lock steering with left brake pedal applied.

6.7.1 The following conditions shall be maintained to perform this test

- a) The tractor subjected to the test shall be run at the speed of 2 km/h.
- b) The measurement shall be at full right-hand steering lock and left-hand steering lock.
- c) The surface of the ground shall be clean and dry.
- d) The tire pressure shall be as per manufacturer's specification.

6.8 Hydraulic lift performance test

The objective of this test is to verify the maximum lifting as per the specification prescribed. It shall be performed by:

- a) Verify the lifting capacity by adding every 50 kg until the specified load to the maximum position of lifting.

6.8.1 The following condition shall be maintained to perform this test

- a) Base of the test frame shall be horizontal by adjusting the length of upper link of three linkages with the lower link.
- b) The position control lever of the tractor should be placed to the end of operating range.
- c) The maximum load ranging shall be as per the manufacturer's indication

6.9 Operation test

The objective of this test is to assess the ease of operation and adaptability to cultivation with available implements. It shall be performed by:

- a) Field operation with available implements.
- b) Road operation test will be with trailer attached.

6.9.1 Following conditions shall be maintained to perform this test

- a) The manufacturer's specification and instruction manual shall be followed for fitting the accessories and any other adjustments.
- b) For cultivation, agriculture field of appropriate size shall be selected.
- c) The trailer shall be loaded as per the manufacturer's indication.
- d) The tractor shall be tested by at least two operators.
- e) The depth of field operations shall be as per standard requirement.

6.9.2 The items to be measured or investigated are as follows

- a) Field condition
- b) Ease of attaching implements
- c) Working depth and width of implements
- d) Travelling speed
- e) Field Capacity
- f) Fuel Consumption
- g) Ease of handling
- h) Noise during normal operation
- i) Vibration during normal operation
- j) Others

6.10 Water proof test

The objective of this test is to confirm proof performance of tractor. It shall be performed under the following conditions:

- a) The tractor shall be equipped for puddling implements.
- b) The test shall be conducted in a tank designed for the test
- c) The base of the wheel shall be submerged about 400mm below the water surface
- d) Wheel speed shall be set equivalent to about 6km/h in forward travelling speed and PTO speed shall be set to maximum.
- e) The test shall be conducted continuously for 2 hours.

6.10.1 Items to be investigated are: -

- a) Inspection of the transmission oil in transmission and auxiliary case for water.
- b) Others

6.11.1 Inspection after disassembling

If any abnormalities are observed during any of the above tests, causes may be investigated by disassembling the specific parts.

Annex A (Normative)
(Clause 6.1)
Specification Sheet for Tractor

A. Tractor

- a) Model:
- b) Make:
- c) Serial number:
- d) Overall dimensions (mm):
 - Length:
 - Width:
 - Height:
- e) Weight (kg):
- f) Wheel tread distance:
 - a) Front:
 - b) Rear:
- g) Ground clearance:
- h) Wheelbase distance:

B. Engine

- a) Type of combustion:
- b) Number of cylinders:
- c) Make:
- d) Model:
- e) Serial number:
- f) Rated engine power: (.....Hp/.....rpm).

C. Fuel system

- a) Type of fuel feed system:
- b) Fuel tank capacity:
- c) Type of fuel:

D. Air cleaner

- a. Type:

E. Exhaust system

- a. Direction:

F. Lubrication system

- a. Oil sump capacity:

G. Cooling system

- a. Type:

H. Electrical system

- a. Lights (watt, voltage):

I. Power transmission system

- a. Clutch:

- b. Steering:
- c. Number of speed:
 - i) Forward:
 - ii) Reverse:
- d. Sub-shift speed:
 - i) High:
 - ii) Low:
- e. Hydraulic port:
- f. P.T.O Speed:
- g. Nominal speed at rated engine speed at highest gear (km/h):

J. Parking brake

- a. Type:

K. Tyre

- a. Size:
 - a) Front:
 - b) Rear:
- b. Ply rating:
 - a) Front:
 - b) Rear:

L. Safety

- a) ROPS:
- b) FOPS:
- c) Hydraulic lock:
- d) Differential lock:
- e) Hydraulic lift capacity:
- f) Counter weight:

Bibliography

[1] OECD Code 2, 2019, Standard code for the official testing of agricultural and forestry tractor performance

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