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BUREAU OF INDIAN STANDARDS

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कटाई एवं संरक्षण के लिए उपकरण – गोल बेलर – भाग 2 कार्यनिष्पादन परिक्षण विधि

Draft ***Indian Standard***

EQUIPMENT FOR HARVESTING AND CONSERVATION — ROUND BALERS — PART 2 PERFORMANCE TEST METHOD

ICS 65.060.10

Agricultural Machinery and Equipment Sectional Committee, FAD 11

Last Date of Comments: **04 August 2023**

FOREWORD

(Formal clause would be added later)

A round baler is a farm machinery used to harvest and bale hay, straw, or other crop residues into round bales for storage or transportation. The machine consists of a pickup or gathering system that picks up the crop residue from the field and feeds it into a chamber, where it is compressed and wrapped with twine or netting to form a round bale. The finished bale is then ejected from the chamber and can be stored or transported to another location.

Round balers are a valuable tool for farmers, as they provide a convenient and efficient way to harvest and store forage crops. They can also help reduce labor costs and increase productivity, allowing farmers to focus on other important tasks on the farm.

This Indian Standard is being published in two parts. This standard (Part 2) covers the methods to test the performance of the tractor driven round baler. Part 1 covers the terminology and commerical specification for round balers and is an identical adoption of ISO 11450 : 1999 and its amendment no. 1 of 2016.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

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Draft Indian ***Standard***

EQUIPMENT FOR HARVESTING AND CONSERVATION — ROUND BALERS — PART 2 PERFORMANCE TEST METHOD

1 SCOPE

This standard covers the methods of performance testing of tractor driven round baler (trailed type).

2 REFERENCES

The Indian Standards listed below 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 therein.

IS No.	*Title*
FAD 11(22476) C/ ISO 11450 : 1999	Equipment for harvesting and conservation — Round balers — Part 1: Terminology and commercial specifications
IS 17231: 2019/ISO 730 : 2009	Agricultural wheeled tractors — Rear-mounted three-point linkage — Categories 1N, 1, 2N, 2, 3N, 3, 4N and 4
IS 4931: 1995	Agricultural tractors — Rear mounted power take off types 1, 2 and 3 (*third revision*)
IS 4905: 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
IS 5994 : 2022	Agricultural tractors — Test code (*fourth revision*)
FAD 11(22392) C/ IS0 3600 : 2022	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment - Operator's manuals – Content and format *(third revision of is 8132)*
IS 10743 : 1983	Method for determination of centre of gravity of agricultural tractors
IS 12239 (Part-1): 2018/ ISO 4254-1: 2013	Guide for safety and comfort of operator of agricultural tractors and power tiller — Part 1: General requirements (*second revision*)
FAD 11(22377) C/ ISO 789-3 : 2015	Agricultural tractors — Test procedures — Turning and clearance diameters (*second revision of IS 11859)*
ISO 11684 : 2023	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety labels — General principles

3 TERMS AND DEFINITIONS

For the purposes of this standard, the definition of various terms is given in FAD 11(22476)C shall apply.

4 SAMPLING AND GENERAL GUIDELINES

4.1 Specification Sheet

The manufacturer/applicant shall supply the specifications of the round baler consisting of the items listed in the specimen report given in Annex A as well as any additional data required to carry out the tests. The manufacturer shall also supply literature consisting of operational and maintenance manual, service manual and parts catalogue with the Baler. The literature should be in Hindi/English.

4.2 Selection of Sample

The baler shall either be selected at random (*see* IS 4905) from the production lot by the testing institute for commercial tests or shall be submitted by the applicant to the testing authority for confidential/initial commercial tests as the case may be. The Round Baler selected or submitted for test shall be completed with its usual accessories and in a condition generally offered for sale. The Round Baler shall be new and shall not be given any special treatment or preparation for test.

4.3 Assembling and Preliminary Adjustments

It would be the responsibility of the applicant to ascertain that round baler selected for testing is complete in all respects and necessary adjustments have been carried out in the presence of the representative of the testing institute.

4.4 Conditions for Checking of Dimensions

4.4.1 The Round baler shall be standing on a firm, level and horizontal surface.

4.4.2 The Round baler shall be stationary with its wheels and components in positions they would be as if the round baler was travelling in a straight line.

4.4.3 The pressure in pneumatic tyres shall be adjusted to the value recommended by the applicant for field work.

The tyres shall be new. The measurement of height of lugs shall be made at the center line of tyres.

4.4.4 Measurement conditions for various dimensions and characteristics as stipulated in FAD 11(22476) C shall also be followed.

5 SAFETY

5.1 Safety

5.1.1 Exposed moving parts like gear drives, chain drives, propeller shaft, bailing needle pedestal and other parts should be installed with shield, which should meet IS 12239 (Part 1).

5.1.2 Knot-tying device (if applicable) should be protected in way that it should have minimal exposure to the weather conditions (like rain) or external factors which may cause functional obstacles (trash accumulation). The protection (Guard/barrier/shield) should be easy to open, secured after opening and accessible to see operating condition of knot- tying device from the outside after closing.

5.1.3 Transmission mechanism like bale pickup unit, feeding unit and knot-tying device (If applicable) should be set with overload protection device and synchronous protective device; piston and bundling needle in the bundler machine should be installed with anti-bumping device; and the main transmission (gear) should be set with overrun clutch/dog clutch.

5.1.4 Electrical connection should be protected with proper insulation and fuses or other overload protection devices shall be installed in electrical circuits to prevent potential electrical hazards. Electrical cables shall be protected from frequent abrasive material contacts which may damage the cable insulation. Electrical cables shall be located so that no portion is in contact with the moving parts or sharp edges.

5.1.5 Nominal rotation frequency (RPM) and direction of rotation of the power input connection (marked by an arrow) shall be provided on the machine.

5.1.6 Safety signs shall be appropriately displayed when necessary to alert the operator and others of the risk of personal injury during normal operation and servicing. Safety signs shall conform to the requirements of ISO 11684.

In particular, safety signs shall be provided on the machine drawing attention to:

a) The crushing and shearing points when working with machine;

b) The crushing hazard when the bale ejection door is open;

c) The risk of contact with moving parts of the tying mechanism;

5.1.7 When it is necessary for the operator to work under raised parts (e.g. bale ejection door) of the machine in order to carry out maintenance or service, mechanical supports or hydraulic locking devices shall be provided to prevent inadvertent lowering. It shall be possible to control hydraulic locking devices and mechanical supports from outside the hazard zones.

a) Mechanical supporting devices shall withstand a load of 1.5 times the maximum static load to be supported.

b) Hydraulic locking devices shall be located on the hydraulic cylinder or connected to the hydraulic cylinder by rigid or flexible lines. In the latter case, the lines connecting the locking device to the hydraulic cylinder shall be designed to withstand a pressure at least four times the rated maximum hydraulic pressure.

NOTE — Verification of above may be demonstrated by manufacturer's design (e.g., design schematics or drawing)

5.2 Operator manual

The content and presentation shall be in accordance with FAD 11(22392) C.

Comprehensive instructions and information on all aspects of the safe use of the machine, including suitable clothing and personal protective equipment requirements and the need for training, if necessary, shall be provided by the manufacturer in the operator's manual.

In particular, the following information shall be provided:

a) That guards be closed before starting and/or resuming operation of the machine;

b) That the operator shut the engine and PTO off and wait for all movement to stop before approaching the baler

c) The procedure to be followed for the threading of the twine, when the twine breaks and the feeding of the twine in the knotter

d) The importance of regular maintenance of the baler and regular clearing of wrapped crop or tying material to reduce the possibility of fire

e) The hazards related to manually feeding the twine on to the bale to start the twine-tying process as the bale is rotating.

f) The procedures to be followed for changing the knives

g) Maximum travelling speed and ballast weight recommendation should be provided

6 TESTS

6.1 Laboratory Tests

6.1.1 *Specification Checking*

The specifications of the picker given by the applicant (*see* 4.1) shall be checked and reported in Annex A by the testing authority. While checking various dimensions, the conditions stipulated in **7.1** (summary of the field performance) shall be followed.

6.1.2 *Material Analysis*

The hardness and chemical analysis of critical components, such as twin cutting knife shall be made and reported in Annex B.

6.1.3 *Visual Observations and Checking of Provision for Adjustments*

The picker shall be subjected to thorough inspection with attention to bearings, drives and other moving parts, correctness of various adjustments, tightness of bolts and nuts, etc. The observation given in Annex C shall be recorded.

6.1.4 *Bale Ejection Door Performance Test/ Hydraulic Reliability:*

a) Park the baler on level ground.
b) Maintain the picking unit height (reel height) at least 150 mm from ground.
c) Connect the baler's hydraulic hoses with tractor's quick action couplers as prescribed by manufacturer.
d) Keep the tractor in stationery position, turn on the tractor and engage the tractor PTO. Maintain the PTO RPM as prescribed by manufacturer.
e) Open the bale ejection door by hydraulic operating direction control valve.
f) Open and close the door for 100 cycles and make observations as mentioned in Annex D.

6.1.4.1 *Requirements*

a) No leakage should occur in the hydraulic system when it's at the rated pressure.
b) The hydraulic relief valve should be flexible and reliable and can play the security role within the specified pressure of a±0.5 MPa.

6.1.5 *Turning Ability Test*

The test shall be carried out in accordance to FAD 11(22377) C. During the test the baler shall remain attached, and the bailing/reel unit shall be up to 150 mm above the ground level.

The data shall be recorded in E-1 of Annex E.

6.1.6 *Position of Centre of Gravity*

The test shall be conducted in accordance with IS 10743. However, during the test the bale chamber shall be fully filled.

The data shall be recorded in E-2 of Annex E.

6.1.7 *Components/Assembly Inspection*

The critical components like gear, chain sprocket and belts, bearings, hydraulic pumps and roller as may be decided by the testing authority, shall be partially dismantled after conducting all tests

including field tests. The observations listed under **10.1.1** to **10.1.11** of IS 5994 shall be made and reported in the format given in Annex E of IS 5994.

7 FIELD TESTS

7.1 Field Assessment

7.1.1 *Test Field Investigation and Measurement*

The observation given in Annex F shall be recorded.

7.1.2 *Test Field*

Measure the slope of the test area and observe and record the landform and landscapes. Investigate the category of the meadow, forage grass type, the ratio of different forage grasses and crop yield per acre, etc.

7.1.3 *Test Conditions*

7.1.3.1 Test site should comply with requirements for operation of baler machine (bundler machine). Size and terrain of the plot should be representative at local area.

7.1.3.2 Material variety, windrow characteristics, width and thickness of windrow, quality of windrow per meter and paving quality should comply with requirements in instructions of bundler machine (baler machine).

7.1.3.3 Moisture content of leguminous pasture and gramineous pasture should be in range of 17% - 23% while moisture content of wheat and rice straw and corn straw should be in range of 10% - 23% or based on Agro-climatic condition suitable for crop type and baler use, in the region, in consultation with test agency.

7.1.4 *Swath Character*

Take five swaths at random from the test area and measure the width, thickness, the quality per meter and the section. In the meanwhile, take the swath width as horizontal axis, and the swath thickness as vertical axis to draw a figure of swath section.

There should be three levels for assessment of the layout quality of swath:

a) First-rate swath – the plies are orderly, even and continuous.

b) Medium swath – the plies are relatively orderly, even and continuous, but some may be broken or packed too much.

c) Low-grade swath – the plies are in a mess, and the normal operation can be performed only after artificial settlement.

7.1.5 *Moisture Content of Swath*

Take samples not less than 100 g from the upper, middle and lower part of each swath section, and weigh them. Weigh them again after they are dried for 5 h at the constant temperature of 105℃. The moisture content of swath is calculated according to formula (1)

$$H_C = \frac{Gsc - Ggc}{Gsc} \times 100 \quad (1)$$

Where:

H_C is the moisture content of swath, in %;

Gsc is the mass of wet forage grass, in g:

Ggc is the mass of dry forage grass, in g.

7.1.6 *Grass Length After Harvest*

The grass length after harvest is the whole length of the left plant (except awn). For natural meadow, select more than 30 plants at random for each swath; for planting test field, select more than 10 plants at random for each swath. Measure its plant length for average.

7.1.7 *Determination of Working Quality*

Five bales shall be tested according to following items.

7.1.7.1 *Bale density, baling loses and density of bale*

Measure the width, diameter and quality of each bale respectively. Bale density is calculated according to formula (2)

$$P = \frac{G_k}{V_k} \quad (2)$$

Where:

P is the bale density, in kilogram per cubic meter (kg/m^3);

G_k is the bale mass, in kilogram (kg);

V_k is the bale volume, in cubic meter (m^3).

7.1.8 *Forage Grass Loss Rate*

7.1.8.1 *Pick-up loss rate*

The ratio of forage grass mass left behind by pick-up unit to the swath mass in the length to be measured is called pick-up loss rate. Measure four round trips take 10 m at random in each trip and weigh the swath (a row or line of grass) in this area, then collect and weigh the forage grass (with a length of over one third of average grass length) left behind. To calculate according to formula (3)

$$S_j = \frac{G_j}{G_t + G_j} \times 100 \quad (3)$$

Where:

S_j is the pick-up loss rate, in %;

G_j is the mass of forage grass left behind in 10 m, in kilogram (kg);

G_t is the swath mass in 10 m, in kilogram (kg).

7.1.8.2 *Bale forming loss rate*

The ratio of lost forage grass mass in bale forming chamber to swath mass in the whole length to be measured is called bale loss rate. Use a canvas to receive and weigh the scattered grass in bale forming chamber during the formation of a bale. Measure four round trips and calculate according to formula (4)

$$S_{cx} = \frac{G_{cs}}{G_k + G_{cs} + G_{jx} L_d} \times 100 \quad (4)$$

Where:

S_{cx} is the bale forming loss rate, in %;

G_{cs} is the lost forage grass mass in bale forming Chamber, in kilogram (kg);

G_{jx} is the forage grass mass left behind per meter, in kilogram per meter (kg/m);
L_d is the whole length to be measured, in meter (m),

G_k is the bale mass, in kilogram (kg)

7.1.8.3 *Total forage grass loss*

Forage grass loss rate is calculated according to formula (5)

$$S = S_j + S_{cx} \quad (5)$$

Where:

S is the total forage grass loss, in %,

S_{cx} is the bale forming loss rate, in %,

S*j* is the pick-up loss rate, in %.

7.1.8.4 *Bale forming rate*

The ratio of bale forming number to total bale number is called bale forming rate. At least 100 bales shall be measured (it can be carried out in combination with production test), calculate according to formula (6)

$$\beta = \left[\ {}^{I_Z}/_{I_C} \ \right] \times 100 \tag{6}$$

Where:

β is the bale forming rate, in %;

I_z is total bale number, in bale;

I_c is the bale forming number, in bale.

7.1.9 *Consumption of bale sling*

Measure the weight of bale sling (twine or rope quantity) for five bales and calculate according to formula (7)

$$G_s = \frac{10^3 \times G_{ks}}{G_k - G_{ks}} \times 100 \tag{7}$$

Where:

G_s is the weight of bale sling for one-ton forage grass, in kilogram per ton (kg/t);

G_{ks} is the weight of bale sling for one bale, in kilogram (kg)

G_k is the bale mass, in kilogram (kg)

7.1.10 *Determination of Dynamic Indices (Speed, Power consumption)*

Round baler shall work under full load during measurement, and then measure four round trips.

7.1.10.1 *Traction power of round baler*

Measure the average traction resistance before forming a bale in 30 meter and determine the passing time of the unit.

7.1.10.1.1 *Calculate the working speed according to formula (8)*

$$V = \frac{L}{T} \quad (8)$$

Where:

V is the forward speed, in meter per second (m/s);

L is the distance to be measured, in meter (m);

T is the time, in second (s).

7.1.10.1.2 *Calculate the traction/drawbar power according to formula (9)*

$$P_q = F_q \times V \quad (9)$$

Where:

P_q is the traction power, in kilowatt (kW);

F_q is the average traction/soil or ground resistance, in kilo newton (kN),

V is the forward speed, in meter per second (m/s)

7.1.10.1.3 *No-load power and transmission power of round baler*

Separately measure the PTO torque and rotating speed of tractor under no-load power and before forming a bale in 30 m.

7.1.10.1.4 *Calculate no-load power according to formula (10)*

$$P_k = \frac{M_k n_k}{9.55} \quad (10)$$

Where:

P_k is the no-load power, in kilowatt (kW);

M_k is the average torque of PTO under no load, in kilonewton meter (kN.m);

n_k is the average rotating speed of PTO under no load, in revolution per minute (r/min).

7.1.10.1.5 *Calculate transmission power according to formula (11)*

$$P_c = \frac{M_c n_c}{9.55} \quad (11)$$

Where:

P_c is the transmission power, in kilowatt (kW);

M_c is the average torque of PTO, in kilonewton meter (kN.m);

n_c is the average rotating speed of PTO, in revolution per minute (r/min.)

7.1.10.1.6 *Total power consumption of round baler*

Calculate the total power consumption of round baler according to formula (12)

$$P = P_q + P_c \quad (12)$$

Where:

P is the total power consumption of round baler, in kilowatt (kW)

P_c is the transmission power, in kilowatt (kW)

P_q is the traction power, in kilowatt (kW)

7.2 Ease of Operation and Handling

Observations shall be made on skill and intensity of effort required to operate various controls of the machine. Adequacy of accessibility of controls and visibility of the baling unit and instrumentation shall also be recorded. The note on operator's working condition, the ease of setting adjustment, routine maintenance and other similar features shall also be made.

7.3 Soundness of Construction

Observations shall be made of these features which adversely affect the operation and efficiency of machine in the field. All the breakdowns and defects occurring during field evaluation period shall be recorded. The modification which could bring about improvement in the quality of rate of work shall also be noted.

ANNEX A

(*Clause* 4.1)

BALER SPECIFICATION OF THE MACHINE (TO BE SUBMITTED BY MANUFACTURER)

A- 0 DETAILS OF THE MANUFACTURER

Sl. No.		
	Manufacturer	**:**
1	Website	:
2	Telephone Number	:
3	Fax Number	:
4	GST TIN Number	:
5	E-mail address	:
	Applicant	**:**
1	Website	:
2	Telephone Number	:
3	Fax Number	:
4	GST TIN Number	:
5	E-mail address	:

A- 1 SPECIFICATIONS

A-1.1 General Specifications of Machine

1. Name of the Machine :
2. Type :
3. Product Details
   a. Make :
   b. Model :
   c. Serial number :
   d. Manufacturers Address :
   e. Year of manufacturer :
4. Weight(kg) :
5. Power source :
6. Required power :

7. PTO speed (rpm) :
8. Suitable crop :

A-1.2 Prime mover used

1. Tractor :
2. Make & Model :
3. Chassis serial No :
4. Engine Serial No :

A-1.3 Construction Details

A-1.3.1 *Gear box*:

a. Make :
b. Type :
c. No. of teeth on gears
Drive :
Driven :
d. Reduction ratio (power input shaft to crown gear power output shaft) :
e. Oil capacity :
f. Oil grade :
g. Oil change period :
h. Method of driving :
j. Length of Splines (mm) :
k. No of Splines :
m. No of bearing & Location :

A-1.3.2 *Three-point linkage:*

Sl. No.	Particulars	As per IS 17231 (Cat-II) (mm)	As measured (mm)	Remarks
Upper Hitch Point				
i)	d1-Diameter of hitch pin hole			

ii)	b2-Width between outer face ofyoke			
iii)	b1-Width between inner face ofyoke			
Lower Hitch Point				
iv)	d2-Diameter of hitch pin			
v)	b3-Linch pin hole distance (Min)			
vi)	L-Lower hitch point span			
Other dimensions				
vii)	D- Día of Upper linch pin			
viii)	d- Día of Lower linch pin			
ix)	h- Mast height			

A-1.3.3 *Dimensions of implement Power Input Shaft (mm):*

Specification	As per IS 4931	As observed	Remarks
Nominal Speed (rpm)			
No of splines			
Direction of rotation			
DΦ			
dΦ			
a			
c			
B			
W			

A- 1.3.4 *Propeller Shaft (Cardan Shaft):*

Type: - Shielded telescopic (with two segments) having one universal joint on each segment with splined ends to insert the PTO of tractor and drive shaft of bevel box.

A- 1.3.4.1 *Length of the shaft (mm):*

Minimum **:**
Maximum **:**
Mass of shaft (kg) **:**

A- 1.3.4.2 *Propeller shaft insert dimensions:*

Sl. No	Notations	Dimension (mm)		Conformity to IS
		As per IS: 4931	As observed	
1	DΦ			
2	dΦ			
3	W			
4	B			

A- 1.3.5 *Pick-up/Feeding Mechanism:*

A- 1.3.5.1 *Pick-up unit*

Type :

Tine bar

No of tin bars :

Dimension of bars (Length x Diameter) (mm) :

Type of tine bars :

Reel assembly

Length of Reel assembly (mm) :

No. of **leaves** on reel :

Leaf dimension
(L x W x Thickness) (mm) :

Leaf material :

Tines

No. of tines on each bar :

Total tines on reel assembly :

Spacing between tines (mm) :

Tine Length (mm) :

Arrangement for raising andlowering reel assembly :

Distance from the ground level to tines (mm) – (apa)

Minimum :

No of teeth on Sprocket

Drive :

Driven :

Speed reduction ratio from rollershaft to pick-up shaft :

Method of Power Transmission :

Size of chain

Length (mm) :

Pitch (mm) :

Tension control :
Safety device :

A-1.3.5.2 *Feeding mechanism guide bar*

Type :
Details of guide bar size
Length (mm) :
Width (mm) :
MS hollow pipe size :
Length (mm) :
Width (mm) :
Horizontal MS rod size (mm)
Length (mm) :
Width (mm) :

A- 1.3.5.3 *Slide cover*

Type :
Material :
Thickness (mm) :

A- 1.3.6 *Baler Chamber*

Type :
No of Baling Roller :
Method of operations :
Number of strips in Bailing roller :
Method of operation :
Size of bale roller
Length (mm).apa :
Diameter (mm) :
Material :
Size of Strip
Length (mm) :
Width (mm) :
Method of drive to bale roller :
No. of teeth on main drive sprocket
Gear box crown sprocket (Drive) :
Roller sprocket (Driven) :
Speed reduction ratio to gearoutput shaft to roller shaft :

Provision for tension control :
Bale chamber size
Length (mm) :
Diameter (mm) :
Method of mounting of bale roller :
Safety device :

A- 1.3.7 *Wedging plate*

Type :
Size (mm) :
Length (Top) :
Length (Bottom) :
Height :
Method of operation :
Density adjustment mechanism
Type :

A-2 WRAPPING MECHANISM

A-2.1 Twine Supporting Stand

Type :
Twine bundle supporting stand size, m :

Length of pipe (mm) (curved) :
Diameter of pipe (mm) :
No. of twine :
Material of twine :

A-2.2 Twine Path

A-2.3 Winding Arm

Type :
Method of wrapping :

A-2.3.1 *Details of Winding Arm Unit:*

Type :
Method of drive :

A-3 BALE DISCHARGE MECHANISM:

Type :
Method of operation :

A-3.1 Bale Chamber Swings

Type :

A- 3.2 Bale Roll Out Mechanism

Type :
Method of operation :
Hydraulic cylinder size :
Piston length (mm) :
Diameter (mm) :
Stroke length (mm) :

A- 3.2.1 *Bale counter unit*

Type :
Method of operation :

A- 3.3 Hydraulic Mechanism:

Type :
Tank capacity (1lit) :
Oil changing period (hr) :
Recommended oil grade (apa) :

A- 3.3.1 *Hydraulic Pump:*

Make :
Type :
Model :
Method of drive :
No of teeth on drive sprocket :
No of teeth on driven sprocket :
Speed reduction ratio for drive shaft to drive shaft :

A- 3.3.2 *Hydraulic Cylinder:*

Type :
No. of cylinder :
Method of operation :

A- 3.4 Transport Wheels:

Type :
No. of wheels :
Size of wheel :
Method of drive :
Track width. mm :
Recommended tire pressure(kg/cm^2) (apa) :
Method of mounting :

A- 3.5 Supporting Stand for the Machine:

Type :

A- 3.5.1 *Size of supporting stand:*

Inner hollow pipe (welded support pipe)

Length (mm) :
Outer diameter (mm) :

Inner hollow pipe (welded support pipe)

Length (mm) :
Outer diameter (mm) :

Wheel material

Material :
Diameter (mm) :

A- 4 SAFETY DEVICES PROVIDED ON THE MACHINE:

Sl. No.	Assembly	Type of safety mechanism	Location
1	Reel assembly		
2	Bale roll assembly		
3	PTO shaft		
4	Twine chamber		
5	Safety cover		

A- 5 OVERALL DIMENSIONS:

Length (mm)	:
Width (mm)	:
Height (mm)	:
Total mass, kg	:

A- 6 TOTAL NUMBER OF LUBRICATING POINTS:

Greasing	:
Oiling	:
Grease cup/pipe	:

ANNEX B

(*Clause* 6.1.2)

MATERIAL OF CONSTRUCTION AND HARDNESS

B-1 DATA SHEET FOR MATERIAL OF CONSTRUCTION

Sl.No	Elements of composition	Knife(%)	Any other part
(1)	(2)	(3)	(4)
1	Carbon		
2	Manganese		
3	Phosphorus		
4	Sulphur		
5	Silicon		
6	Copper		
7	Nickel		
8	Chromium		
9	Tin		
10	Molybdenum		

B-2 HARDNESS OF KNIFE (HRC)

a) Hardened zone

1) Minimum

2) Maximum

b) Remainder zone

1) Minimum

2) Maximum

ANNEX C

(*Clause* 6.1.3)

DATA SHEET FOR VISUAL OBSERVATIONS AND PROVISION FOR ADJUSTMENTS

C-1 OBSERVATIONS

a) Adequacy of marking of inlets and outlets

b) Adequacy of protection of bearing against the ingress of dust

c) Adequacy of safety arrangements, especially at moving points

d) Provision of lubrication of moving parts

e) Provision for easy changing of components requiring frequent replacement

f) Provision for easy replacement and cleaning of spindles

g) Tightness of bolts and nuts and other fasteners

h) Provision of belt tightening

j) Other observations

C-2 PROVISION FOR ADJUSTMENTS

a) Reel height
b) Bale density
c) Bale ejection Time
d) Roller tensioner setting
e) twine refilling
f) any other setting mentioned by manufacturer

Testing Engineer

ANNEX D

DOOR PERFORMANCE AND RELIABILITY

(*Clause* 6.1.4)

a) Make and Model of the Baler:
b) Date of test:
c) Location of test:
d) Hydraulic Oil Temperature:
e) Rated hydraulic system pressure: Pressure relief valve pressure:
f) Prime mover Make and Model:
g) Adjustment made prior to the test conducted:

Cycles (100 cycles observation)	**Rated pressure**	**Time taken to open the door when lever actuated**	**Any leakage observe/ malfunctioning**
First cycle			
50^{th} Cycle			
100^{th} cycle			

ANNEX E

(*Clause* 6.1.5)

TURNING ABILITY TEST

E-1 TURNING ABILITY

a) Details of wheels' equipment:

b) Wheel track, mm

i) Drive wheel

ii) Steering wheel

c) Size and pressure of tires:

i) Drive wheel

ii) Steering wheel

d) Type of drive:

i) 2 wheel

ii) 4 wheel

e) Wheel base, mm

f) Test data

Description	Minimum Turning Diameter		Minimum Turning Space Diameter	
	Right Hand, m	Left Hand, m	Right Hand, m	Left Hand, m
With brakes applied				
With brakes released				

E-2 LOCATION OF CENTRE OF GRAVITY

a) Height above ground, mm

b) Forward distance from the vertical plane containing the axis of the rear wheels, mm

c) Distance from the median plane parallel to the longitudinal axis of picker bisecting the driving wheel track, mm

ANNEX F

(*Clause* 7.1.1)

FIELD PERFORMANCE DATA

F-1 FIELD PERFORMANCE

Sl. No.	Particulars	Performance test – I	Performance test - II	Performance test - III
(1)	(2)	(3)	(4)	(5)
1	Date of test			
2	Location			
3	Kind of field (upland/lowland)			
4	Crop			
5	Variety			
6	Harvesting method			
7	Harvester used			
8	Average standing stubble height in the field (cm)			
	Field moisture condition suitable for tractor maneuvering			
	Average loose straw length (cm)			
9	Average width of loose straw heaped in field after harvesting bycombine harvester (cm)			
10	Loose straw moisture content (%)			
11	Power source			
12	Tractor model			
13	Power available (hp)			
14	Engine speed (rpm)			
15	Gear used			
16	Average speed of operation (km/h)			
17	PTO speed corresponding to engine operating speed (rpm)			
18	Speed of pickup roller (rpm)			

19	Speed of chamber roller (rpm)
20	Working width of baler (cm)
21	Average size of bale (Height x Diameter) (cm)
22	Average weight of one bale (kg)
23	Percentage of variation in weight from the mean value of
24	Weight of bales
25	Average volume of one bale (m^3)
26	Bulk density of bale (kg/m^3)
27	No. of passes required to cover width of loose straw heaped in field operated by combine harvester
28	Loose straw weight/ m^3 before operation (gm)
29	Loose straw weight/ m^3 after operation (gm)
30	Straw recovery (%)
31	Straw Losses
32	Setting in twine winding used Sling/winding rope consumption
33	Medium - No. of winding/bale
34	Total operating time(h)
35	Time lost owing to
36	i) Shifting time from one field to another field (min) ii) Adjustment (min)
37	iii) Others (min)
	Actual operating time (hr)
	Field capacity (ha/hr)
	Field efficiency (%)

38	Time required for one hectare (hr)	
39	Bale output	
40	No. of bales (hr)	
41	Bales kg/hr	
42	Number of bales formed ha	
	Fuel consumption	
44	lit/h	
43	lit/ha	
44	Breakdown, repair, replacement of parts during test	
45	Operator	

F-2 BALER PERFORMANCE – QUALITY OF WORK

Sl. No.	**Weight of each bale (kg)**	**Percentage of variation in weight from the mean value of weight of bales**	**Weight of each bale (kg)**	**Percentage of variation in weight from the mean value of the weight of bales**	**Weight of each bale (kg)**	**Percentage of variation in weight from the mean value of the weight of bales**
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)						
ii)						
iii)						
iv)						
v)						
Mean value						