Preliminary Draft Standard

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDRADS

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भारतीय मानक मसौदा

Draft Indian Standard

AGRO TEXTILES – HIGH DENSITY POLYETHYLENE (HDPE) WOVEN BHUSA BAGS– SPECIFICATION

Technical Textiles for Agro-tech Applications Sectional Committee, TXD 35	Last date for receipt of comments is 1st August 2024

AGRO TEXTILES — HIGH DENSITY POLYETHYLENE (HDPE) WOVEN BHUSA BAG —SPECIFICATION

1 SCOPE

This standard prescribes constructional and other requirements for high density polyethylene (HDPE) woven bhusa bags for storing wheat straw (bhusa).

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provision 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 in Annex A.

3 TERMINOLOGY

For the purpose of this standard the following definitions shall apply.

3.1 Bhusa Bag — Bhusa bag is a specially designed outer layer coated HDPE fabic storage bag used to transport, store the wheat straw (bhusa). It is provided with a discharge tube at the bottom to take out required quantity of bhusa for use.

3.2 Discharge Tube — Tubular HPDE fabric layer stitched to the discharge hole of bhusa bag to facilitate the easy discharge of wheat straw.

4 MATERIALS

4.1 HDPE Tapes

Tapes shall be manufactured from HDPE granules (see IS 6192), which shall be UV stabilized by adding suitable UV stabilizer (*see Note*). The finished bhusa bag shall meet the requirements of UV stability and colour fastness to light as given in Table 1. The width of the tape used in the fabric shall be 2.00 mm minimum and linear density of the tape shall be 700 Denier minimum.

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NOTE — Carbon black or black master batch shall not be used for UV stabilization.

4.2 HDPE Fabric

Bhusa bag shall be manufactured by using suitable HDPE woven fabric manufactured in tubular form on a circular loom (*see IS* 6899) so that finished bag meets the requirements given in Table 1 and **5.2**.

4.3 Lamination

4.3.1 The tubular HDPE fabric shall be laminated with the low density polyethylene (LDPE) or suitable combination of LDPE and linear low density polyethylene (LLDPE) melt of coating grade on outer side having thickness not less than 25 microns and the coating shall be suitably UV stabilized by incorporating UV stabilizer (*see* Note under **4.1**). The coating film along with colour master batch to get the desired shade shall be such that the finished bhusa bag meets the requirements of UV stability and colour fastness to light as given in Table 1.

4.3.2 A 2-layer laminated fabric is produced using a combination of single layers of HDPE fabric and 1-layers of coating film for bhusa bags.The lamination on the outer side as given above shall be such that the finished bhusa bag meets the requirements given in Table 1.

4.4 Cord Beading

A Polypropylene rope beading of minimum 2.0 mm diameter shall be provided along the top periphery edges of the bhusa bag for reinforcement.

5 MANUFACTURE

5.1 General design of the bhusa bag may be as shown in Fig. 1.

5.2 Construction

5.2.1 The bhusa bag shall be constructed by cutting the tubular laminated pieces of woven fabric according the desired slandered capacity of the bhusa bag.A hole is cut into the main tubular laminated fabric to provide a discharge hole. The discharge tube is stitched on to the discharge hole using a double row of chain stitch with a multifilament yarn.

The bottom edges of the tubular fabric is stitched with a laminated fabric of same quality as tubular fabric using a double row of chain stitch multifilament yarn and with a folded hem of minimum 3 cm.
The top edges of the bhusa bag shall be hemmed by heat sealing/stitching along with a polypropylene rope of minimum 2 mm diameter placed inside the hem as reinforcement. The width of the top hem shall be minimum 30 mm. A protective top flap/canopy shall be stitched to one side of the top edge.

5.2.2 Bhusa bag shall be provided with a discharge hole of minimum 300 mm diameter. The multifilament yarn used for stitching of bhusa bag shall have a minimum liner density of 2000 denier.

FIG. 1 GENERAL DESIGN OF A BHUSA BAG

6 REQUIREMENTS

The laminated HDPE fabric used to manufacture bhusa bag shall meet the requirements as given in Table 1. Besides the bhusa bag shall meet the requirements stated in **5.2**.

Table 1 Requirements of Bhusa Bag Made from HDPE Woven Fabrics

(*Clauses* 4.1, 4.2, 4.3, 5.2 *and* 6)

Sl No.	**Characteristic**	**Requirements**	**Method of Test, Ref to**
(1)	(2)	(3)	(5)
i)	Mass, g/m², *Min*	175	IS 1964
ii)	Breaking strength before UV exposure, N, *Min*	1 000 (Warp) 750 (Weft)	IS 1969
iii)	Elongation at break, percent	20 ± 5	IS 1969
iv)	Retention of breaking strength after UV exposure, N, *Min*	85 percent of original actual value (fabric)	Annex B and IS 1969
v)	Seam strength before UV exposure, N, *Min*	65 percent of original actual value (fabric)	IS 1969
vi)	Seam strength after UV exposure, N, *Min*	85 percent of original actual value	Annex B and IS 1969

vii)	Tear strength, N, *Min*	150 (Warp) 150 (Weft)	IS 14293
viii)	Puncture strength, N, *Min*	300	Annex C
ix)	Environmental stress cracking test	There shall be no evidence of stress cracking	Annex D
x)	Resistance to chemicals, change in the mass,percent, *Max*	0.1 percent	Annex E
xi)	Colour fastness to artificial light *(See Note)*	4 or better	IS 105(Part B02) (Xenon lamp method)

6.1 Dimensions

The dimensions of the bhusa bag shall be as given in tables 2. Bhusa bags of other capacity and dimensions may also be manufactured as agreed to between the buyer and the seller. The nominal capacity of bhusa may either be 400 kg , 600 kg or 800 kg.

Table 2 Bhusa Bags Dimensions

(*Clause 6.1*)

S.No	**Characteristic**	**Requirements**			**Tolerance, percent**
		Type 1	Type 2	Type 3	
(1)	(2)	(3)	(4)	(5)	(6)
1	Main body height, mm	1650	2700	3220	+3
2	Main body diameter, mm	3000	3000	3000	
3	Discharge tube length, mm	1200	1200	1220	-1
4	Discharge tube diameter, Min , mm	300	300	300	

7 MARKING

7.1 Each bag shall be legibly marked with the following information at one corner on one side either with tag or by printing on it with the ink:

a) Name and address of the manufacturer,
b) Dimensions and capacity, and
c) Year of manufacture.

7.2 BIS Certification Marking

7.2.1 The high density polyethylene woven bhusa bags conforming to the requirements of thus standard may be certified as per the conformity assessment schemes under the provision of Bureau of Indian Standards Act , 2016 and the rules and regulations framed there under, and the products may be marked with the Standard Mark.

8 PACKING

The bhusa bags shall be packed as agreed to between the buyer and the seller.

9 SAMPLING

9.1 Lot

The quantity of bhusa bag of same size, capacity and mass (g/m^2) manufactured under similar conditions and delivered to a buyer against one dispatch note shall constitute a lot.

9.2 Unless otherwise agreed to between the buyer and the seller, the number of bags to be selected at random from a lot shall be as given in col 3 of Table 3.

10 NUMBER OF TEST SPECIMENS AND CRITERIA FOR CONFORMITY

Number of test specimens and criteria for conformity shall be as given in Table 4.

Table 3 Scale of Sampling

(*Clause* 9.2)

Sl No.	No. of Bags in Lot	Sample Size	Sub-sample Size	Permissible No. of Defective bags
i)	Up to 50	3	2	0
ii)	51 to 150	5	2	0
iii)	151 to 300	8	3	1
iv)	301 to 500	13	5	2
v)	501 and above	20	5	3

Table 4 Number of Test Specimens and Criteria for Conformity

(*Clause* 10)

Sl No.	Characteristic	No. of bags/Test Specimens	Criteria for Conformity
i)	Dimensions, average mass (g/m^2), manufacture and material	According to col 3 of Table 3	The defective bags do not exceed the corresponding number given in col 5 of Table 3
ii)	All other requirements	According to col 4 of Table 3	The test specimens shall meet

			the requirements as given in Table 1

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS NO.	*Title*
1964 : 2001	Textiles — Methods for determination of mass per unit length and mass per unit area of fabrics (*second revision*)
1966 : 1975	Methods for determination of bursting strength and bursting distention of fabrics — Diaphragm method (*first revision*)
1969 (Part-2):2018	Textiles-Tensile properties of fabric Part 2 determination of maximum force using the grab method
6192 : 1994	Textiles — Monoaxially oriented high density polyethylene tapes — Specification (*second revision*)
6899 : 1997	Textiles — High density polyethylene (HDPE) woven fabrics — Specification (*second revision*)
(Part 8) : 2023	Accelerated ageing
7940 : 1976	Methods for determining resistance to penetration by water of fabrics by static pressure head test
7941 : 1976	Method for determining water repellency of fabrics by cone test
13162 (Part 3):2021	Geotextiles – Methods of test : Part 3 Determination of thickness at specified pressures
IS/ISO 105 (Part B02):2014	Textiles-Test for colour fastness Part B02 colour fastness to artificial light: xenon arc fading test

ANNEX B

[*Table* 1, *Sl No*. (iv) *and* (vi)]

UV RESISTANCE TEST

B-1 TEST SPECIMENS

The test specimens for breaking and seam strength shall be cut from the sample as specified in IS 1969 for modified grab test.

B-2 TEST CONDITIONS

B-2.1 The test shall be carried out with fluorescent UVB lamp (313 nanometer or its equivalent).

B-2.2 The duration of the test shall be 144 h (that is 6 days).

B-2.3 The test cycle shall be 8 h at 60 + 3ºC with UV radiation alternating after 4 h at 50 + 3ºC with condensation.

B-2.4 Irradiation level throughout the test shall be maintained at 0.63 ± 0.03 W/m².

B-3 TEST PROCEDURE

B-3.1 Determine the original average breaking strength and seam strength of bag specimens separately as per the modified grab test specified in IS 1969.

B-3.2 Expose the specimens alternately to ultraviolet light alone and to condensation in one respective cycle.

B-3.2.1 The type of fluorescent UV lamp, the timing of the UV exposure and the temperature of condensation shall be specified in **B-2**.

B-3.3 Determine the average breaking strength and seam strength of the specimens separately after UV exposure as mentioned above.

B-3.4 Determine the percent retention of original strength and seam strength as follows:

$$\text{Percent retention of original breaking strength or seam strength} = \frac{b}{a} \times 100$$

Where,

a = average breaking strength or seam strength before UV exposure as obtained in **B-3.1**, and

b = average breaking strength or seam strength after UV exposure as obtained in **B-3.3**.

NOTES
1 The UV source is an array of fluorescent lamps (with lamp emission concentrated in the UV range).
2 Condensation is produced by exposing the test surface to a heated, saturated mixture of air and water vapour, while the reverse side of the test specimen is exposed to the cooling influence of ambient room air.

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ANNEX C
[*Table* 1, *Sl No*. (viii)]

TEST METHOD FOR INDEX PUNCTURE RESISTANCE

C-1 PRINCIPLE

A test specimen is clamped without tension between circular plates of a ring clamp attachment secured in a tensile testing machine. A force is exerted against the centre of the unsupported portion of the test specimen by a solid steel rod attached to the load indicator until rupture of the specimen occurs. The maximum force recorded is the value of puncture resistance of the specimen.

C-2 APPARATUS

C-2.1Tensile/Compression Testing Machine, of the constant-rate-of extension (CRE) type.

C-2.2 Ring Clamp Attachment, consisting of concentric plates with an open internal diameter of 45 ± 0.025 mm capable of clamping the test specimen without slippage. A suggested clamping arrangement is shown in Fig. 2. The external diameter is suggested to be 100 ± 0.025 mm. The diameter of the six holes used for securing the ring clamp assembly is suggested to be 8 mm and equally spaced at a radius of 37 mm. The surfaces of these plates can consist of grooves with a-rings or coarse sandpaper bonded onto opposing surfaces.

C-2.3 Solid Steel Rod, with a diameter of 8 ± 0.01 mm having a flat end with a 45° × 0.8 mm chamfered edge contacting the test specimen's surface (see Fig. 2 and 3).

C-3 SAMPLING

C-3.1 Laboratory Sample

For the laboratory sample take a swatch extending the full width of the product, of sufficient length along the selvage from each sample roll so that the requirements of **C-3.2** can be met.

C-3.2 Test Specimens

Select from the laboratory sample, sufficient number of samples each having a minimum diameter of 100 mm to facilitate clamping. Space the specimens along a diagonal on the unit of the laboratory sample. Take no specimens nearer the selvage or edge of the bag.

C-4 CONDITIONING

Bring the specimens to moisture equilibrium in the atmosphere for testing bags (65 ± 5 percent relative humidity and 27 ± 2°C temperature). Equilibrium is considered to have been reached when the increase in the mass of the specimen, in successive weightings made at intervals of not less than 2 h, does not exceed 0.1 percent of the mass of the specimen.

C-5 PROCEDURE

C-5.1 Select the load range of the tensile/compression testing machine such that the rupture occurs between 10 and 90 percent of the full-scale load.

C-5.2 Centre and secure the specimen between the holding plates ensuring that the test specimen extends to or beyond the outer edges of the clamping plates.

C-5.3 Test at a machine speed of 300 ± 10 mm/min until the puncture rod completely ruptures the test specimen.

NOTE — The rate of testing specified is not an indication of the performance of the specimen for its end use.

C-6 CALCULATION

Calculate the average puncture resistance and standard deviation for all tests as read directly from the recording instrument.

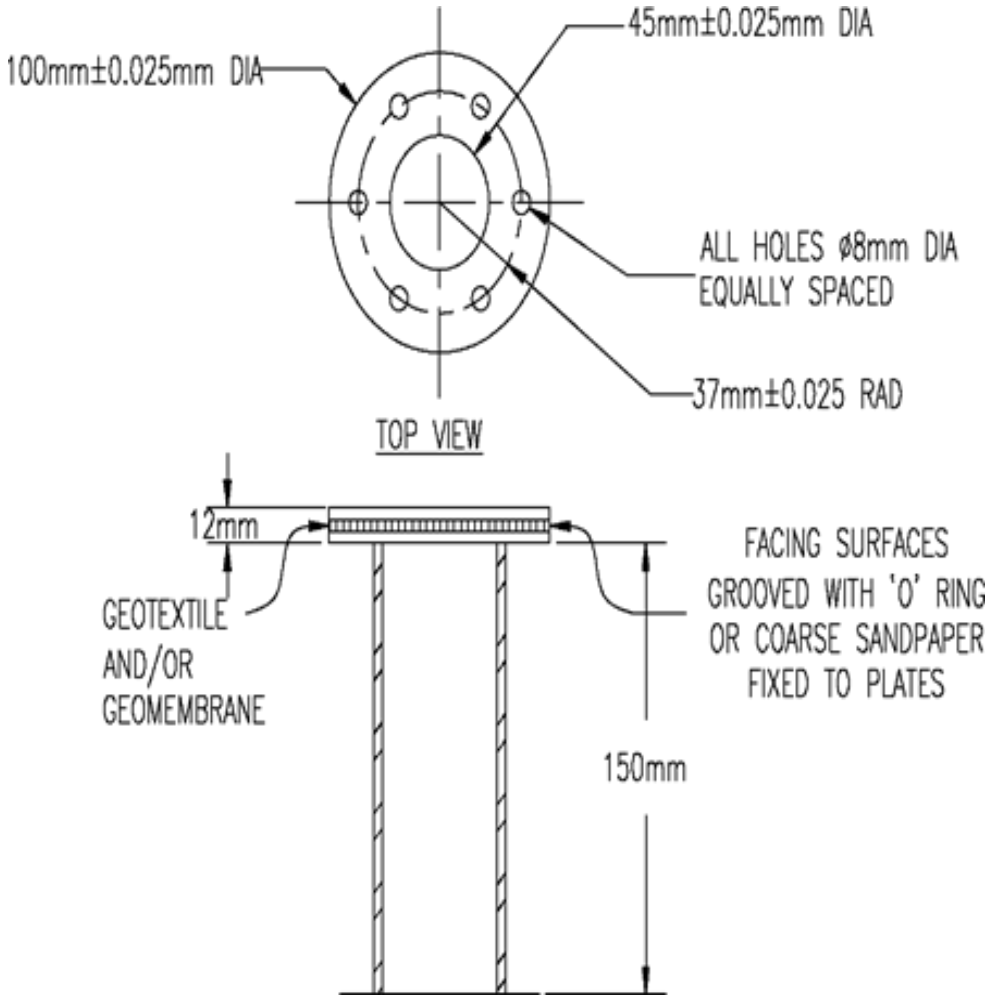

FIG. 2 TEST FIXTURE DETAIL (NOT TO SCALE)

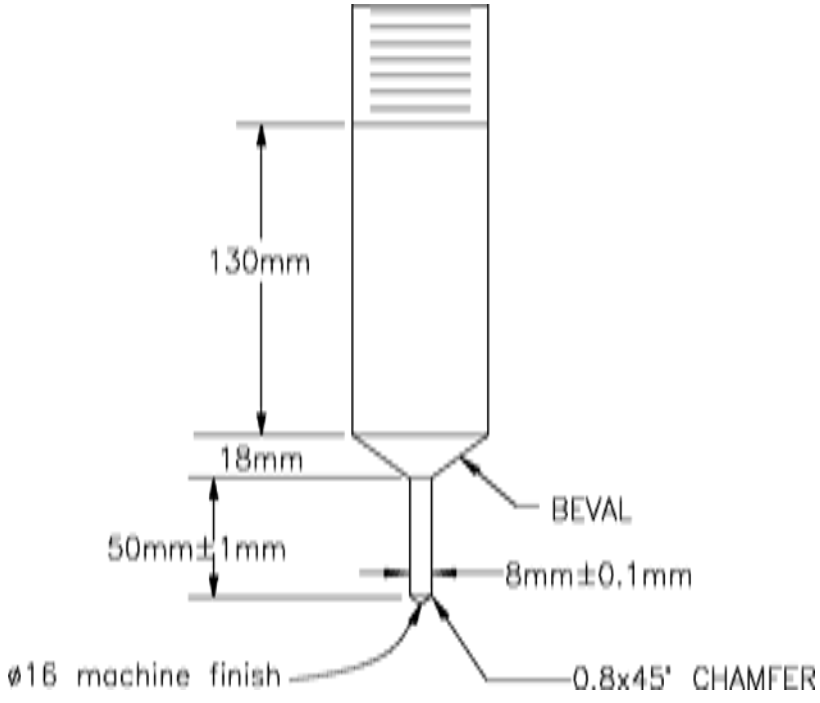

FIG. 3 TEST PROBE DETAIL (NOT TO SCALE)

ANNEX D

[Table 1, *Sl No.* (ix)]

METHOD OF TEST FOR RESISTANCE TO ENVIRONMENTAL STRESS CRACKING

D-1 APPARATUS

An air oven controlled at 60 ± 2ºC.

D-2 TEST LIQUID

A 0.5 percent aqueous solution of polyoxyethylatednonylphenol.

NOTE — Teepol B 300 has been found suitable.

D-3 TEST SPECIMEN

The test specimens shall be cut from the bag and shall have a length of 150 ± 3 mm and width of 50 ± 3 mm.

D-4 PROCEDURE

The test specimen shall be dipped in the test liquid contained in a beaker at 27 ± 2°C. The beaker along with test specimen shall be kept in the oven at 60 ± 2°C for 48 h. The test specimen shall then be inspected for cracks, the test specimen being sectioned where necessary.

ANNEX E

[*Table* 1, *Sl No*. (x)]

TEST FOR RESISTANCE TO CHEMICAL ACTION

E-1 TEST SPECIMEN

The test specimens shall be cut from the bag and shall have a length of 150 ± 3 mm and width of 50 ± 3 mm.

E-2 PROCEDURE

For test in each solution as mentioned herein under below, three specimens each of length of 150 ± 3 mm and width of 50 ± 3 mm taken from three position of bag shall be cleaned, wiped dry and weighed and then totally immersed without prior conditioning in each of 10 percent aqueous solution of sulphuric acid, hydrochloric acid, sodium hydroxide, sodium chloride and ammonium

hydroxide at ambient temperature for 72 h separately. After the specified time, the specimens shall be removed from each solution, washed in running water for 5 min, dried with a clean cloth and re-weighed immediately.

E-3 ASSESSMENT OF RESULT

The average change in mass of all three specimen in each solution shall not exceed the value given in Table1.