Wide Circulation Draft

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft For Comments Only Doc: TXD 23 (27931) **WC**

April 2025

(*Not to be reproduced without permission of BIS or used as Indian Standard*)

भारतीय मानक मसौदा

वस्त्रादि - 25 किग्रा पॉलीमर सामग्री पैक करने के लिए उच्च घनत्व पॉलीएथिलीन (एच. डी. पी. ई.)/पॉलिप्रोपिलीन (पी. पी.) के बुने हुए बोरे - विशिष्टि

(*पहला पुनरीक्षण*)

Draft *Indian Standard*

TEXTILES — HIGH DENSITY POLYETHYLENE (HDPE)/ POLYPROPYLENE (PP) WOVEN SACKS FOR PACKAGING OF 25 kg POLYMER MATERIALS — SPECIFICATION

(First Revision)

ICS 55.080; 65.080

Textile Materials made from Polyolefin Sectional Committee TXD 23	Last date for comments **27 May 2025**

FOREWORD

(*Formal clauses will be added later***)**

This standard was originally published in 2017 to specify the constructional and performance requirements of High Density Polyethylene (HDPE)/ Polypropylene (PP) woven sacks for packaging of 25 kg polymer materials in powder and granulated form, extrusion pelleted compounded materials and master batches. This standard was developed taking into consideration the increased consumption of plastic woven sacks for packaging of polymer materials.

This revision of the standards is being made to align with the current manufacturing practices and for addressing the sustainability aspects by incorporating the following major changes:

i) The clause raw material has been modified;

ii) An additional clause ‘Type’ to classify the woven sack in Type I and Type II varieties for packaging of polymers in granulated form and powder form respectively has been incorporated;
iii) Requirement for width of HDPE/PP tapes for Type II woven sack has been modified;
iv) Figure for illustrating typical dimensional designation for Type I and Type II sacks has been incorporated;
v) Requirement for number of chain stitch and number of folds at bottom seam for Type II sacks has been modified;
vi) Recommendation for promoting the use of defective or rejected or waste HDPE/PP woven fabric and sacks as a packaging material has been incorporated;
vii) The tolerance of relative humidity for atmospheric conditioning and testing of specimens has been modified;
viii) The test methods for determination of sack dimensions, ends and picks per decimeter, fabric mass, and mass of sack have been modified;
ix) The recommended sustainable practices to be followed in the manufacturing of HDPE/PP woven sacks has been specified;
x) BIS certification marking has been modified; and
xi) References to the Indian Standards have been updated.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final values, observed or calculated, expressing the results of tests, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off values should be the same as that of the specified values in this standard.

Draft Indian Standard

TEXTILES — HIGH DENSITY POLYETHYLENE (HDPE)/ POLYPROPYLENE (PP) WOVEN SACKS FOR PACKAGING OF 25 kg POLYMER MATERIALS — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard prescribes requirements of HDPE/PP woven sacks suitable for packaging of 25 kg polymer materials in powder and granulated form, extrusion pelleted compounded materials and master batches.

1.2 This standard defines terminology commonly used, sack description, sack dimensions, fabric construction details, testing and analysis and, performance criteria for sacks.

2 REFERENCES

The standards listed in Annex A 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 in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

3.1 Gusset — A fold inserted in longitudinal edges of woven fabric tube or sack.

3.2 Gusseted Sack — A sack manufactured from a gusseted woven fabric tube.

3.3 Open Mouth Sack — Flat tube closed at one end by folding and stitched bottom.

3.4 Pillow Sack — A sack manufactured from non-gusseted flat tube of woven fabric.

3.5 Plastic Woven Sack — A flexible container made essentially from tubular woven fabric and closed at bottom with open top. The circumference of tube shall be ≥ 500 mm and ≤ 2 000 mm.

3.6 Tube — Circular woven fabric in the form of a flattened cylinder cut into prescribed lengths.

4 TYPE

The sacks shall be of following types depending upon the form of polymer materials:

a) Type I — Sacks for packaging of polymer materials available in granulated form; and
b) Type II — Sacks for packaging of polymer materials available in powder form.

5 MANUFACTURE

4.1 Raw Material

4.1.1 The high density polyethylene (HDPE) or polypropylene (PP) used for manufacture of tape shall be virgin and conform to the requirements specified in IS 10146 or IS 10910 respectively excluding overall migration.

4.1.2 As agreed between buyer and seller, the functional additives, such as antioxidants, UV stabilizers, pigments and fillers (calcium carbonate) may be added for improved fabric properties. All materials used for manufacturing of woven sacks shall be chosen in such a way that the reprocessing is promoted.

> NOTE — White colour sacks may be used to promote recycling, recover, reuse and thereby supporting circular economy. Differentiation of sacks used for packaging various polymer types, in this case, may be achieved by different coloured band printing or introducing longitudinal coloured strips, either using printing or through weaving-coloured tapes.

4.2 Tapes

The HDPE/PP tapes used in the manufacturing of HDPE/PP woven sacks shall conform to IS 6192. The tapes shall have a width of 2.5 mm for Type I and of 3.0 mm for Type II woven sacks with the tolerance of ± 5 percent. The tapes shall have the linear density of 900 deniers for Type I and of 1080 deniers for Type II woven sacks. The denier of HDPE/PP tapes used in the manufacture of woven fabric shall be subjected to the following tolerances:

a) ± 10 percent on individual value, and
b) ± 5 percent on average.

4.3 Fabric

The fabric used in the manufacture of HDPE/PP woven sacks shall be woven as a tube on circular loom. The fabric shall have a mesh size of 10 × 10 per inches. For specific applications, necessitating higher fabric mesh, the tape linear density shall be maintained accordingly. The mass of un-laminated fabric shall be 79 g/m^2 for Type I and be 94 g/ m^2 for Type II with a tolerance of ± 3 percent, when tested in accordance with the test method laid down in Annex B. The construction particulars of fabric shall be as given in Table 1.

4.3 Sacks

4.3.1 Type I woven sacks shall be produced from either gusseted or flat tubular fabric, based on the agreement between the buyer and seller, which shall be woven as tube on a circular loom and cut to the required length. Gusseted tubular fabric shall be used for production of gusseted sacks, whereas, flat tubular fabric shall be used for production of pillow type sacks. For sacks with liner, pillow type sacks should be preferred.

4.3.2 The Type II sacks shall be produced from flat tubular fabric woven as tube on a circular loom. The flat tubular fabric shall be used for production of pillow type sacks.

4.3.3 *Bottom Seam*

4.3.1.1 *Type I Sacks*

The stitching of the bottom seam shall be done with single rows of chain stitch (*see* IS 10789) which shall be located at a distance of minimum 10 mm from the bottom edge of the sack. The stitching shall be done with single fold over seam to a depth of minimum 25 mm, so that the stitches pass through a minimum of four layers of the fabric. The number of stitches/dm shall be 14 ± 2. The stitching shall be uniform without any missing stitch, loose thread or knot.

4.3.1.2 *Type II Sacks*

The stitching of bottom seam shall be done with two rows of chain stitch (*see* IS 10789). The two rows of stitches shall be separated from each other by minimum 5 mm and the outer stitch row shall be minimum 8 mm from outer or bottom edge of the sack (*see* figure 1). The Stitching shall be done with double fold over seam where each fold shall be made to a depth of minimum 25 mm and seam shall pass through six layers of fabric. The number of stitches/dm shall be 14 ± 2. The stitching shall be uniform without any missing stitch, loose thread or knot. The Type II woven sacks may use bulky filler yarn or cord to avoid oozing of material from stitch holes. If so agreed between the buyer and seller, kraft paper strip may also be used during bottom seam stitching.

4.3.1.3 The material used for stitching shall be HDPE/PP tape as used in the fabric or any other multifilament twisted thread or spun yarn suitable for the purpose, having breaking load not less than 90 N. For UV stabilized sacks, the material for stitching shall be UV stabilized tape, thread or yarn.

NOTE — A typical dimensional designation for Type I and Type II Sacks is shown in Figure 1.

4.4 Lamination

If required by the buyer, the fabric woven on circular loom before manufacture into sacks may be laminated by coating with LDPE/LLDPE for HDPE sack and PP/ LDPE for PP sack of uniform

thickness. The lamination overhang at both edges shall be trimmed uniformly and the overhang shall be minimum 5 mm and not more than 10 mm after trimming.

4.5 Liner

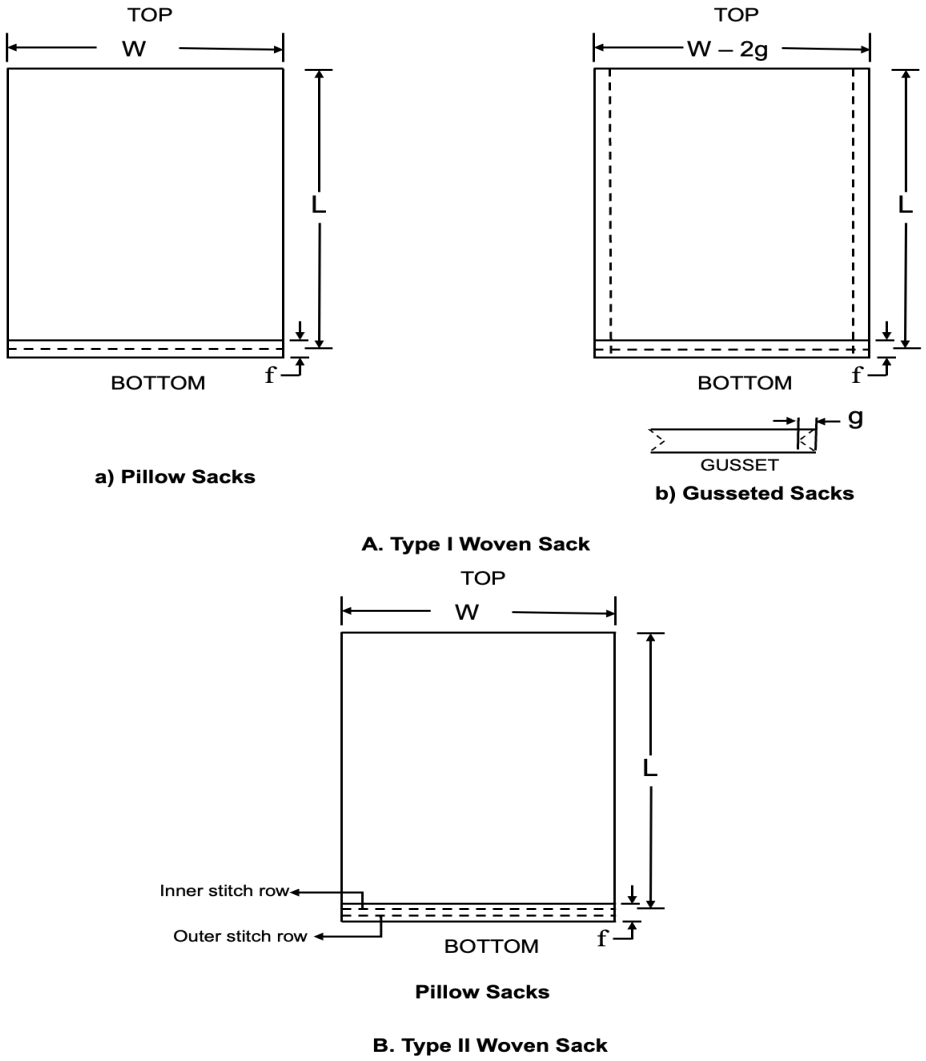
4.5.1 For moisture sensitive materials, if required by the buyer, the sacks shall be provided with loose liner of LDPE/ LLDPE/HMHDPE conforming to IS 10146 excluding overall migration. The width of the loose liner shall be minimum 20 mm more than the width of the sack. The thickness of the loose liner, when tested in accordance with Annex C of IS 2508 shall be minimum 50 microns. The length of the liner shall be as required by the buyer. The bottom closure of the loose liner shall be at least 25 mm from the bottom edge.

4.5.2 The liner shall be free from pin holes (except for air removal holes provided for packaging of certain materials), patches, tears, blisters and any other visible defects.

4.6 Capacity

The HDPE/PP woven sack shall have the nominal filling capacity of 25 kg.

4.7 The HDPE/PP woven sacks may be manufactured by following the sustainable practices as laid down in Annex C.



Keys:
L — Sack length (from inner stitch row of bottom seam to sack top)
W — Sack width
g — width of gusset
F — Bottom fold length
Dotted lines over bottom fold 'f' indicate bottom seam.

FIG.2 DIMENSIONAL DESIGNATIONS OF TYPE I AND TYPE II WOVEN SACKS

5 REQUIREMENTS

5.1 Mass of Bale

The mass of bale of sacks (excluding packing materials) shall be within ± 3 percent of the mass calculated by multiplying the number of sacks with the mass of sack specified in Table 1.

5.2 The sacks shall also conform to the requirements specified in Table 1.

Table 1 Requirements of HDPE/PP Woven Sacks for Packaging Polymer Materials
(*Clauses* 4.3, 5.1, 5.2, 5.3 and 5.4)

Sl No.	Characteristic	Requirement		Tolerance	Method of Test, Ref to
		Type I	Type II		
(1)	(2)	(3)		(4)	(5)
i)	Dimensions, mm (*see* Note 1) a) Length of sack (*L*), (from bottom stitch to top) b) Width of sack (*W*) c) Width of gusset (2 × *g*)	 875 560 130	 800 560 -	 ± 10 mm ± 10 mm +10/-5 mm	Annex B
ii)	Ends per dm (*see* Note 1)	40	40	± 2	Annex B
iii)	Picks per dm (*see* Note 1)	40	40	± 2	Annex B
iv)	Mass of sack, g (*see* Notes 2) a) Sack without liner b) Sack with liner	 80 125	 95 140	± 6 percent	Annex D
v)	Average breaking strength of fabric [Ravelled strip method, 325 mm × 70mm[1])] *Min*, N[2]) (kgf): a) Lengthwise b) Widthwise	 834 (85) 834 (85)	 834 (85) 834 (85)	 - -	IS 1969 (Part 1)
vi)	Breaking strength of bottom seam (Ravelled strip method), *Min*, N[2]) (kgf)	390 (39.7)	390 (39.7)	-	IS 9030
vii)	Elongation at break of fabric (Ravelled strip method), percent: a) Lengthwise b) Widthwise	 15 to 25 15 to 25	 15 to 25 15 to 25	 - -	IS 1969 (Part 1)
viii)	Drop impact strength	No Failure	No Failure	-	Annex E
ix)	Ash content, Max, percent a) For UV stabilized sacks b) For non- UV stabilized sacks	 2.2 6	 2.2 6	 - -	Annex F

NOTES

1 The dimensions of sack given in Table 1 is suggestive. Fabric mesh and sack dimensions may vary according to the material to be packed and its bulk density. The buyer and the seller may agree to the mesh and sack dimensions other than those specified in Table 1. However, tolerances as specified in Table 1 shall apply. In case of gusseted sacks, the width of sacks shall be measured after opening of gusset.

2 The mass of sack given in Table 1 did not include mass of lamination and is suggestive. The mass of sack with dimensions other than those specified shall be calculated by the method given in Annex D. The tolerances on mass of individual sack shall be ± 6 percent

3 The buyer and the seller may agree to the unlaminated fabric mass per square metre other that those specified in **4.3** and the fabric mesh other than those specified in Table 1. However, the tolerance on agreed weight of the unlaminated fabric shall be ± 3 percent and tolerance on agreed ends per dm and picks per dm shall be ± 2.

[1] Width after ravelling = 50 mm, Gauge length = 200 mm.
[2] 1 N = 0.102 kgf (approximately).

5.3 Drop Impact Testing of Filled Sacks

The filled sacks, when tested for drop impact strength, according to the method given in Annex E, shall meet the requirements as specified in Table 1.

5.4 Ash Content

The woven sack fabric, when tested for ash content in accordance with the test procedure given in Annex F, shall meet the requirements as specified in Table 1.

5.5 UV Resistance

If agreed to between the buyer and the seller, the sacks shall be manufactured from UV stabilized HDPE/PP fabrics. The UV stabilized woven fabric shall have at least 50 percent retention of the original breaking strength when tested after the same has been exposed to UV radiation and accelerated weathering in accordance with the test method given in Annex G.

6 PRINTING, PACKAGING AND MARKING

6.1 Printing on Sacks

The sacks shall be printed with identification mark of sack manufacturer along with the information as required by the buyer using offset lithography, flexography, gravure or digital printing process using suitable inks. The print shall be legible and shall have good ink adhesion with fabric surface.

NOTE — Printing inks based on polyamide resins, has been found most suitable for this application

6.2 Packaging

6.2.1 The sacks shall be packed to form a bale suitably wrapped and secured. The bale shall contain 250 or 500 sacks or as agreed to between the buyer and the seller.

6.2.2 Use of rejected or defective or waste HDPE/PP fabrics and sacks should be promoted to be used as a wrapping layer for packaging purposes.

6.3 Marking on Bales

The bales shall be marked with the following information:

a) Name of the manufacturer;

b) Type of sacks;
c) Number of sacks;
d) Gross weight;
e) Net weight;
f) Month and year of manufacture;
g) Lot or Batch Number
h) Identification mark;
i) Recycling logo; and
j) Any other information as required by the law in force.

NOTE — Each sack shall be marked with a recycling logo as shown below. While marking the symbol, the respective basic raw material name corresponding to polymer identification number shall be indicated below the symbol in accordance with IS 14534.

6.4 BIS Certification Marking

The sacks conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the sacks may be marked with the Standard Mark.

7 ATMOSPHERIC CONDITIONS FOR SAMPLE CONDITIONING AND TESTING

Prior to test, the specimens shall be conditioned to moisture equilibrium from dry side in the standard atmosphere of (65 ± 4) percent relative humidity and (27 ± 2) ℃ temperature as laid down in IS 6359.

8 SAMPLING AND CRITERIA FOR CONFORMITY

8.1 Lot

All the HDPE/PP woven sacks packed in bales of the same construction produced under similar conditions of production and delivered to a buyer shall be grouped together to constitute a lot.

8.2 The conformity of lot to the requirements of standard shall be determined on the basis of tests carried out on the samples selected from it.

8.3 The number of samples to be selected depends on the size of the lot and the number of bales to be sampled shall be in accordance with col 2 and col 3 of Table 2. The number of sacks to be selected from the bales sampled shall be in accordance with col 4 of Table 2 for visual inspection, dimensions, ends, picks and mass requirements, and shall be in accordance with the col 5 of Table

2 for breaking strength of fabric before exposing to UV-radiation, breaking strength of bottom seam and percent elongation at break requirements. The samples shall be selected in accordance with col 6 of Table 2 for determination of breaking strength of fabric after UV-radiation exposure (if applicable), drop impact strength and ash content.

8.4 Criteria for Conformity

The lot shall be considered as conforming to the requirements of the standard, if the following conditions are satisfied:

a) The number of defective sacks in case of visual inspections, ends, picks and dimensions is up to 10 percent of the sample size subject to rounding off the fraction to next higher integer.

b) None of the sack or bale of 500 sacks weighs less than the respective lower specified limit after allowing tolerance of ± 6 percent on individual sack and ± 3 percent on a bale of 500 sacks, higher weight may be accepted.

c) The average breaking strength of fabric in both lengthwise and widthwise is not less than the value specified and none of the individual sack value is more than 10 percent below the specified value. The test samples selected for breaking strength shall be free from defects in visual inspection, dimensions, ends, picks and mass requirements. The tests shall be carried out on the fabric sample taken from centre portion of the sack.

d) The average breaking strength of bottom seam is not less than the value specified and none of the individual sack value is more than 10 percent below the specified value. The test samples selected for seam strength shall be free from defects in visual inspection, dimensions, ends, picks and mass requirements and test carried on the centre portion.

e) If applicable, none of the sack sample after exposing to UV radiation and weathering shall have breaking strength less than 50 percent of the original value of unexposed samples.

f) None of the sack shall fail in drop impact strength test.

g) None of the sample sack shall have percentage elongation and ash content outside the specified range.

Table 2 Sample Size and Criteria for Conformity

(*Clause* 8.3)

Sl No.	No. of HDPE/PP Sacks in a Lot	No. of Bales to be Sampled	Sample Size for Visual Inspection, Dimensions,	Sample Size for Breaking Strength of HDPE/PP Fabric before Exposing to	Sample Size for Breaking Strength of HDPE/PP Fabric

			Ends, Picks and Mass Requirements	**UV Radiation, Breaking Strength of Seam and Elongation at Break Requirements**	**after Exposing to UV Radiation, Drop Impact Strength and Ash Content**
(1)	(2)	(3)	(4)	(5)	(6)
i)	Up to 25 000	3	12	8	1
ii)	25 001 to 50 000	5	20	10	2
iii)	50 001 to 100 000	8	32	13	3
iv)	100 001 to 250 000	12	48	18	4
NOTE — If the number of the bales in a consignment exceeds 500, the same shall be split into number of lots each comprising maximum of 500 bales.					

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
1964 [TXD 01 (26867)]	Textiles — Mass per unit length and Mass per area of fabrics — Methods of Test (*third revision*)
1969 (Part 1) : 2018 ISO 13934-1 : 2013	Textiles — Tensile properties of fabrics – Part 1 Determination of maximum force and elongation at maximum force using the strip method (*fourth revision*)
2508 : 2024	Polyethylene films and sheets - Specification (*Third Revision*)
6192 : 2023	Textiles — Monoaxially oriented high density polyethylene tapes – Specification (*second revision*)
6359 : 2023	Textiles — Method for conditioning of textiles (*first revision*)
9030 : 2024	Textiles — Method for determination of seam strength of jute fabrics including their laminates
10146 : 1982	Specification for polyethylene for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
10789 : 2000	Textiles - Stitch Types - Classification and Terminology
10910 : 1984	Specification for polypropylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 14534 : 2023	Plastics – Recycling and recovery of plastics – Guidelines (*second revision*)

ANNEX B

[*Clause* 4.3, *Table* 1, Sl No. (i) to (iii)]

METHOD OF TEST FOR SACK DIMENSIONS, ENDS AND PICKS PER DECIMETRE AND MASS OF FABRIC

B-1 METHOD OF TEST FOR SACK DIMENSIONS

B-1.1 Principle

A sack as a test specimen is laid on a flat table top and measure the inside length, inside width and width of gusset (in case of gusseted sacks) of the sack at three different locations i.e. center, right and left end of sack using a steel tape.

B-1.2 Apparatus

B-1.2.1 *Steel tape* – capable to measure the length with an accuracy of 0.5 cm.

B-1.3 Procedure

B-1.3.1 Lay each sack flat on a table. Render it free from creases and wrinkles.

B-1.3.2 Measure the inside length (l), inside width (w) and width of gusset (g) at minimum three different places i.e. center, right and left end of sack to the nearest 0.5 cm. In case of gusseted sacks, inside width of the sack shall be measured after opening of the gusset.

B-1.3.3 The minimum five sacks shall be tested for conforming a sample.

B-1.3.4 Determine the average inside length, average inside width and average width of gusset of each sack under test.

B-1.4 Results

B-1.4.1 Average inside length, average inside width and average width of gusset of each sack shall be reported. Sample shall be declared as conforming only if all the sack shall conform to the declared value of inside length and inside width with their specified tolerances. In case of gusseted sacks, the width of gusset of each sack shall conform to its requirement as specified in Table 1.

B-2 METHOD OF TEST FOR ENDS AND PICKS PER DECIMETER

B-2.1 Principle

A sack as a test specimen is laid on a flat table top and measure the ends per decimeter and picks per decimeter at two different places of the sack using a measuring scale.

B-2.2 Apparatus

B-2.2.1 *Suitable Counting Gauge* – capable to measure the number of ends and picks per decimeter (100 mm) with a maximum error of ± 1 percent.

B-2.3 Procedure

B-2.3.1 Lay each sack flat on a table. Render it free from creases and wrinkles.

B-2.3.2 Count the ends and picks at two places of each sack, with a suitable counting gauge measuring 100 mm. Care shall be taken to avoid counting same set of warp or weft threads more than once.

B-2.3.3 At least 5 sacks shall be tested for conforming the sample.

B-2.3.4 Determine the average ends/dm and picks/dm of each sack under test.

B-2.4 Results

B-2.4.1 Average ends/dm and picks/dm of each sack shall be reported. Sample shall be declared as conforming only if all the sack shall conform to the requirement of ends per decimeter and picks per decimeter as specified in Table 1 with their specified tolerances.

B-3 METHOD OF TEST FOR FABRIC MASS

B-3.1 Principle

A fabric sample is laid flat on a table top without any folds, creases or wrinkles. The fabric sample is marked with an area of 100 mm square and then cut precisely to give test specimen. The cut portion of fabric i.e. test specimen is weighed in grams and multiplied with 100 to give fabric mass in gram per square metre.

B-3.2 Atmospheric Conditioning and testing

Prior to test, the specimens shall be conditioned to moisture equilibrium from dry side in the standard atmosphere of (65 ± 4) percent relative humidity and (27 ± 2) °C temperature or as laid down in IS 6359.

B-3.3 Apparatus

B-3.3.1 *Scissor or Fabric Cutter* – capable of cutting the fabric to the desired dimensions with an accuracy of ± 1 mm.

B-3.3.2 *Electronic Balance* – capable of weighing the specimens with an accuracy of 0.1gm.

B-3.4 Procedure

B-3.4.1 Lay each fabric sample flat on a table top and render it free from folds, creases and wrinkles.

B-3.4.2 Mark the fabric for 100 mm square area and cut precisely to give the test specimen.

B-3.4.3 The test specimen i.e. cut portion of fabric is weighed, in grams, using an electronic balance.

B-3.4.4 Compute the fabric mass in gram per square metre by multiplying the obtained weight of test specimen with 100.

B-3.4.5 The mean of 10 such readings shall be taken over a length of not less than 2 metre and reported as mean fabric mass in grams per square metre.

B-3.5 Results

The fabric sample and specimen is found to be conforming only if the individual and mean fabric mass in gram per square meter comply to the declared value of Fabric mass along with their tolerances.

ANNEX C

(*Clause* 4.7)

RECOMMENDED SUSTAINABLE PRACTICES FOR MANUFACTURING OF HIGH-DENSITY POLYETHYLENE (HDPE)/POLYPROPYLENE (PP) WOVEN SACKS

G-1 The following sustainable practices may be followed in the manufacturing of high-density polyethylene/polypropylene woven sacks:

G-1.1 Use of renewable energy sources such as solar or wind power energy should be promoted in the manufacturing of HDPE/PP woven sacks which will reduce the carbon footprint.

G-1.2 Integration of closed-loop water systems with the water bath to be used for cooling of extruded plastic sheets and washing processes to reduce water consumption and avoid contamination of waste water.

G-1.3 Optimization of design and cutting patterns of HDPE/PP woven sacks to minimize the production of scrap and offcuts (Pre-Consumer Wastes) in the industry.

G-1.4 Any scrap materials and offcuts generated during production of HDPE/PP woven sacks shall be recycled for manufacturing of other plastic products.

G-1.5 Use of eco-friendly additives or UV stabilizers may be preferred in the formulation of recipe for manufacturing of HDPE/PP tapes.

G-1.6 Use of energy-efficient production lines and machineries to minimize energy consumption and to prevent wastes of energy during extrusion, weaving, lamination and other stages of HDPE/PP woven sack manufacturing.

ANNEX D

(*Table* 1 Sl. No. (iv), *Note* 2)

TEST METHOD FOR DETERMINATION OF MASS OF SACK

E-1 Principle

A finished woven sack as a test specimen is laid on a weighing balance in the folded form and the mass of the finished woven sack in grams is measured.

E-2 Atmospheric Conditioning and Testing

Prior to test, the specimens shall be conditioned to moisture equilibrium from dry side in the standard atmosphere of (65 ± 4) percent relative humidity and (27 ± 2) °C temperature or as laid down in IS 6359.

E-3 Apparatus

E-3.1 Electronic Balance - capable of weighing the specimens with an accuracy of ± 1gm.

E-4 Procedure

E-4.1 A finished woven sack, as a test specimen, is placed on an electronic balance in the folded form.

E-4.2 Measure the mass of finished woven sack in grams with an accuracy of ± 1gm.

E-4.3 Test at least 10 specimens and calculate the average mass of finished woven sack in grams.

E-5 Results

E-5.1 The sample is found to be conforming if the average and each individual readings of mass of sack comply with the declared value of mass of sack with their tolerances as specified in Table 1.

E-6 Theoretical Calculation for Mass of Sacks (Optional)

E-6.1 Total mass of sacks comprises of:

a) Mass of fabric;
b) Mass of stitching tape or threads;
c) Mass of lamination (If applicable);
d) Mass of Liner (If applicable); and
d) Mass of printing ink, as per artwork.

e) Mass of kraft paper strip (if applicable).

E-6.2 Calculate the mass of sacks with the help of the following formula as the case may be:

a) Mass of tubular fabric:
Double fold stitching = $(L + 60\ \text{mm}) \times 2W \times M \times 10^{-6}$
Single fold stitching = $(L + 35\ \text{mm}) \times 2W \times M \times 10^{-6}$

b) Mass of stitching tape or thread = $L_1 \times T \times 10^{-6}$

c) Mass of lamination (If applicable):

Double fold stitching = $(L + 60\ \text{mm}) \times 2\ (W + 5\ \text{mm}) \times M_1 \times 10^{-6}$

Single fold stitching = $(L + 35\ \text{mm}) \times 2\ (W + 5\ \text{mm}) \times M_1 \times 10^{-6}$

d) Mass of Liner (if applicable):

Double fold stitching = $(L + 60\ \text{mm}) \times 2\ (W + 20\ \text{mm}) \times t \times \rho \times 10^{-6}$

Single fold stitching = $(L + 35\ \text{mm}) \times 2\ (W + 20\ \text{mm}) \times t \times \rho \times 10^{-6}$

Where,

L = length of sack, in mm;
L_1 = approximate length of stitching tape or thread, in mm;
W = width of sack, in mm;
M = Mass of fabric, in g/m^2;
T = linear density of stitching tape in tex;
M_1 = mass of lamination, in g/m^2;
t = thickness of liner in micron; and
ρ = density of liner material in g/cm^3.

ANNEX E

[*Clause* 5.3 *and Table* 1, *Sl No*. (viii)]

DROP IMPACT TEST FOR FILLED SACKS

C-1 PRINCIPLE

The test procedure is used to determine the drop impact performance of filled sack. This test simulates the sack performance in end-use application such as repeated handing and drop impacting of sack undergoing during loading, unloading and stacking operations.

C-2 FILLING OF SACK FOR TESTING

Sacks shall be filled with material with which they are intended to be used or, if this is not possible, with a similar material to provide the same degree of filling. The bulk density and mass of this similar filling material, if used, shall be within ± 2 percent of the values of the material with which the sack is actually intended to be used.

C-3 DROP IMPACT TESTING OF SACKS

C-3.1 Drop test shall be carried out using suitable sack drop mechanism. Each sack shall be dropped from a height of 1.8 m for the test requirements as specified below:

a) Height of drop = 1.8 m (two times for face side and two times for back side),
b) Height of drop = 1.8 m (one time for left edge and one time for right edge), and
c) Height of drop = 1.8 m (one time for bottom edge and one time for top edge).

C-3.2 As given in Fig. 2, place the sack under test centrally on the platform which is within ± 2 percent of the predetermined drop height as defined by the distance between the lowest point of the sack at the time of drop release and the nearest point of the impact surface.

C-4 CRITERIA FOR PASSING THE TEST

After each drop there shall be no rupture or loss of contents. A slight discharge, for example, from closures or from micro perforations, upon impact shall not be considered a failure of the sack provided that no further leakage occurs after the sack has been raised clear of the ground.

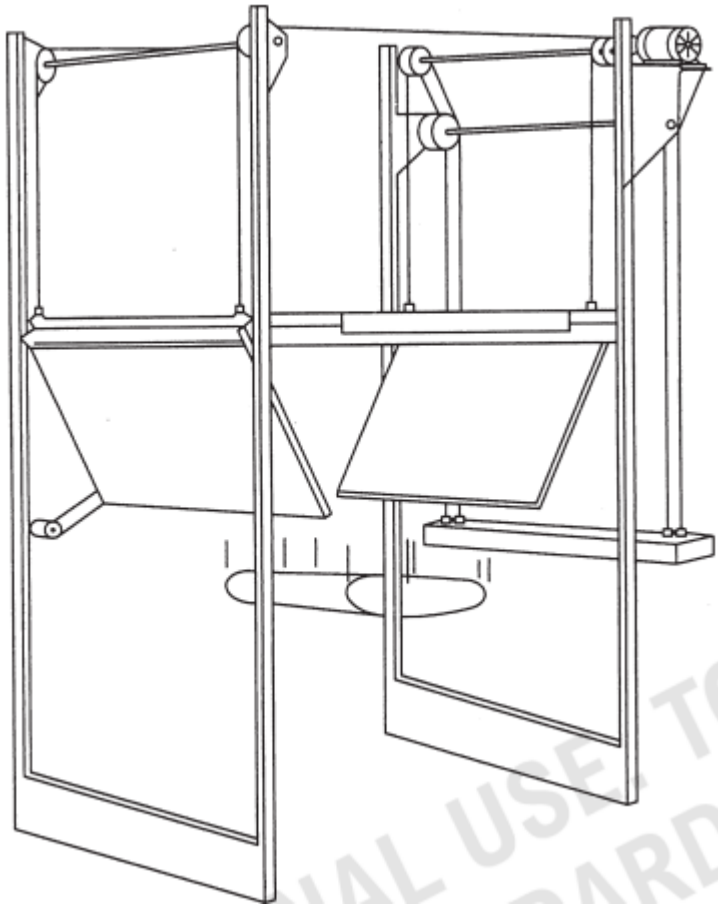


FIG. 2 APPARATUS FOR DROP IMPACT TEST FOR WOVEN SACKS

ANNEX F

[*Clause* 5.4 *and Table* 1, *Sl No*. (ix)]

DETERMINATION OF ASH CONTENT

D-1 PRINCIPLE

The procedure is used to find out the inorganic residue in raffia tape/fabric sample by ashing it in a muffle furnace. A weighed amount of tape/fabric sample is heated to 590°C. The polymer sample (organic portion) is burnt at 590°C until constant mass of inorganic matter is obtained. The residue (inorganic matter) is reported in terms of percentage ash content in a given sample.

D-2 APPARATUS

D-2.1 Weighing Balance, accurate to 0.001 g.

D-2.2 Silica Crucibles, sufficient volume to accommodate 3 g of sample in such a way that level of the sample after filling the crucible does not cross half the height of crucible.

D-2.3 Bunsen Burner

D-2.4 Silica Triangle and Tripod

D-2.5 Muffle Furnace, capable of being controlled thermostatically at 590 ± 10 °C.

D-2.6 Desicator, containing an effective drying agent (for example silica gel) that does not react chemically with ash components.

D-2.7 Gloves and Crucible Holder

D-3 SAFETY

D-3.1 Burn the sample in an effectively ventilated hood.

D-3.2 Keep the hood closed and do not inhale the fumes of combustion.

D-3.3 Wear gloves and use sample (crucible) holder, to introduce crucible in the furnace.

D-3.4 Sample should be folded properly to accommodate it in silica crucible.

D-4 PROCEDURE

D-4.1 Heat the clean crucible at 590 ± 10°C for 10 to15 min and cool it in a desicator.

D-4.2 Weigh the empty crucible to nearest 0.001 g.

D-4.3 Weigh about 3 g of raffia tape/fabric sample in the crucible (nearest to 0.001 g).

D-4.4 Heat the crucible directly on bunsen burner so that the sample burns slowly and loss of ash is avoided. Continue burning until no more smoke is evolved.

D-4.5 Transfer the crucible in the muffle furnace, which is already maintained at approximately 590°C and keep the crucible inside for about 2 h.

D-4.6 Remove the crucible from the furnace and cool it to the room temperature in a desicator. Weigh it and record the weight to accuracy of 0.001 g.

D-4.7 Keep the crucible in the muffle furnace for another half an hour, cool in a desicator and weigh again. Repeat the procedure until constant mass is obtained.

D-5 CALCULATIONS

$$\text{Percent ash content} = \frac{Weight\ of\ ash}{Weight\ of\ raffia\ or\ tape\ sample} \times 100$$

ANNEX G

(*Clause* 5.5)

TEST METHOD FOR DETERMINATION OF UV RESISTANCE

F-1 To determine the effect of UV radiation and weathering on the breaking strength, the HDPE/PP woven fabric shall be exposed as given in **F-2** and **F-3**.

F-2 TEST CONDITION

F-2.1 The test shall be carried out with fluorescent UV- lamp Type B (313 nm or its equivalent).

F-2.2 The duration of the test shall be 192 h (that is, eight days) in continuous mode.

F-2.3 The test cycle shall be: 8 h at 60 ± 3°C with UV-radiation alternating with 4 h at 50 ± 3°C with condensation. Irradiance level throughout the test shall be maintained at 0.63 (+0.04/-0) W/m^2.

F-3 TEST PROCEDURE

F-3.1 Determine the original average breaking strength of fabric as per the test method specified in IS 1969 (Part 1).

F-3.2 Expose the specimens alternately to ultraviolet light and condensation in respective test cycle in continuous mode for total 192 h.

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

F-3.3 Determine the average breaking strength of the fabric separately after UV exposure as mentioned above.

F-3.4 Determine the percent retention of original strength as follows:

Retention of original breaking strength, percent = $\frac{b}{a} \times 100$

Where,

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

b = average breaking strength after UV exposure as obtained in **F-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 vapors, while the reverse side of the test specimen is exposed to the cooling influence of ambient room air.