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भारतीय मानक मसौदा

वस्त्रादि — उर्वरकों की भराई के लिए उच्च घनत्व पोलीइथाइलीन (एच. डी. पी. ई.) / पोलीप्रोपाइलीन (पी. पी.) के बोरे — विशिष्टि

(*सातवां पुनरीक्षण*)

Draft *Indian Standard*

TEXTILES — HIGH DENSITY POLYETHYLENE (HDPE)/POLYPROPYLENE (PP) WOVEN SACKS FOR PACKAGING FERTILIZERS — SPECIFICATION

(Seventh Revision)

ICS 55.080; 65.080

Textile Materials made from Polyolefin Sectional Committee TXD 23	Last date for comments **14 May 2025**

FOREWORD

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

This standard was first published in the year 1981 and subsequently revised in 1985, 1989, 1999, 2003, 2016.and 2021. This standard was revised in 2021 to incorporate the 45kg capacity HDPE/PP woven sacks for packaging of neem coated urea fertilizer along with the requirement for drop impact strength filled sacks with its test method and also to modify the requirement for thickness of loose liner.

This standard has been revised again to incorporate the following major changes:

a) Scope of the standard has been modified;
b) A new variety of HDPE/PP woven sacks for packaging of fertilizers with nominal filling capacity of 40 kg has been incorporated;
c) The clause 'Type' has been modified;
d) A figure for illustrating typical dimensional designation for gusseted sacks has been incorporated;
e) The clause 'Lamination' has been modified;
f) The recommendation for promoting the use of defective or rejected or waste HDPE/PP woven fabric and sacks as a packaging material has been incorporated;
g) The tolerance of relative humidity for atmospheric conditioning and testing of specimens has been modified;
h) The test method for determination of 'Sack Dimensions', 'Ends and Picks per Decimeter', 'Fabric Mass', and 'Mass of Sack' has been modified;
i) The sustainable practices recommended to be followed in the manufacturing of HDPE/PP woven sacks has been specified;
j) All Amendments issued has been incorporated; and
k) References to Indian Standards has 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 FERTILIZERS — SPECIFICATION

(Sixth Revision)

1 SCOPE

This standard prescribes the requirements of HDPE/ PP woven sacks with 40 kg, 45 kg and 50 kg nominal filling capacity for packaging of Neem coated urea fertilizers, NPK (Nitrogen, Phosphorus and Potassium) fortified grade fertilizers, Sulphur coated urea fertilizers and other grades of fertilizers, either produced indigenously or imported in bulk and repacked in sacks.

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 TYPES

3.1 Based on packaging capacity, the HDPE/PP woven sacks shall be classified as under:

a) Type I — HDPE/PP sacks having nominal filling capacity of 40 kg for packaging of fertilizers;
b) Type II — HDPE/PP sacks having nominal filling capacity of 45 kg for packaging of fertilizers; and
c) Type III — HDPE/PP sacks having nominal capacity of 50 kg for packaging of fertilizers.

3.2 Neem coated urea fertilizers shall be packed in Type II woven sacks i.e. with nominal filling capacity of 45 kg.

4 MANUFACTURE

4.1 Raw Material

4.1.1 The High density polyethylene (HDPE) or polypropylene (PP) used for manufacture of tapes shall conform to the requirements specified in IS 10146 or IS 10910 respectively, excluding overall migration. 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 fertilizer 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 Fabric

The fabric used in manufacture of sacks shall be woven as a tube on circular loom from HDPE/PP tapes having width of 2.5 mm (tolerance of ± 5 percent) conforming to IS 6192. If agreed to between the buyer and the seller, the fabric may be made from UV stabilized tapes. For sacks of Type I, Type II and Type III, the linear density of tapes shall be 1 000 denier and, fabric shall be of 10 × 10 mesh. The denier of tape 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.

The unlaminated fabric mass, when tested as per the method given in Annex B, shall be as specified in Table 1 with a tolerance of ± 3 percent.

4.3 Sacks

The sacks shall be produced from tubular fabric 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 packaging specific fertilizer materials in powder form and sacks with liner, pillow type sacks are preferred. Figure 1 shows typical dimensional designations for pillow (non-gusseted) and gusseted sack.

4.4 Liner

4.4.1 If required by the buyer, sack shall be provided with a loose tubular liner of LDPE/LLDPE/HMHDPE/ HDPE. The length of liner shall be as per the agreement between the buyer and the seller. The width of liner shall be minimum 20 mm more than the width of sack. The thickness of liner, when tested in accordance with Annex B of IS 2508 shall be minimum 50 μm.

4.4.2 The liner shall be free from pin holes (except for air removal holes), patches, tear, blisters and any other visible defects. The plastic material used for the liner shall be virgin.

4.4.3 The bottom seal of loose liner shall be at least 25 mm from the bottom edge.

4.5 Lamination

If required by the buyer, woven fabric may be laminated by coating with LDPE/LLDPE for HDPE fabric and PP/LDPE for PP fabric of uniform thickness. The mass of lamination shall be as agreed to between buyer and seller; however, it shall be minimum 23 g/m2. The lamination overhang at both edges of flat fabric shall be trimmed uniformly and the overhang shall be minimum 5 mm and shall not be more than 10 mm after trimming. The plastic material used for the lamination of the tubular sack shall be virgin.

4.6 Bottom Seam

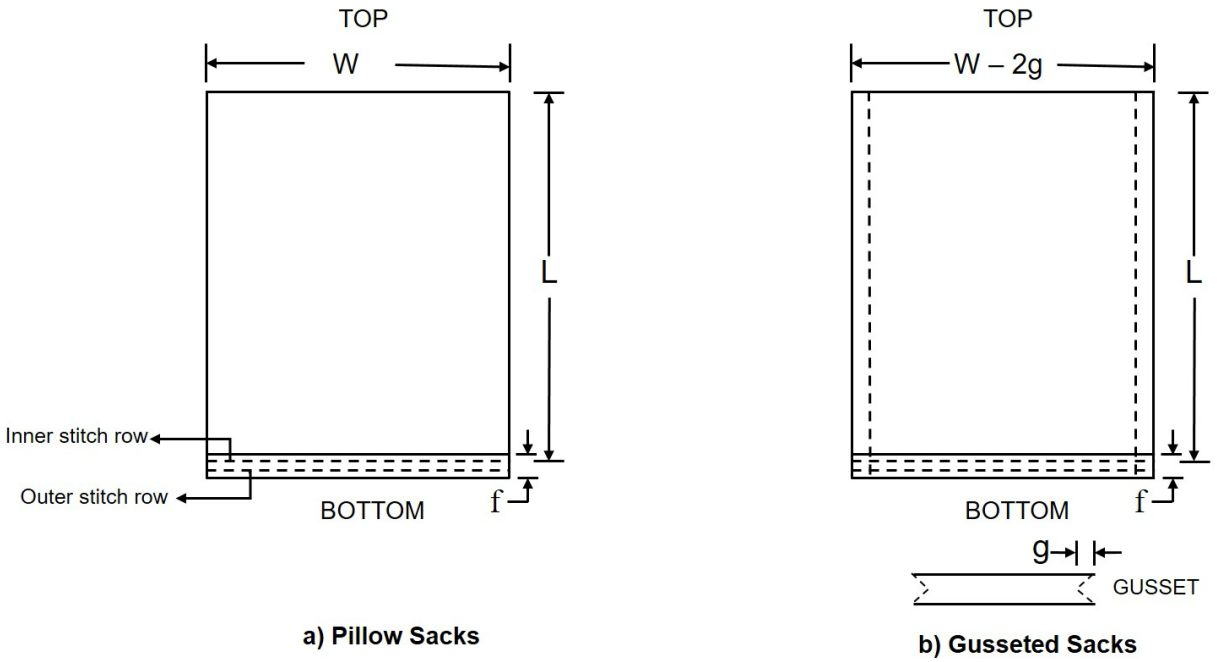
4.6.1 The stitching of bottom seam shall be done with two rows of chain stitches (see IS 10789). The two rows of stitches at bottom seam shall be separated from each other by minimum 5 mm and the outer stitch row shall be minimum 8 mm from outer or bottom edge of the sack. The stitching shall be done with double fold over seam, each to a depth of minimum 25 mm, so that the stitches pass through a minimum of six layers. In case of gusseted sacks and sacks with liner, the bottom seam stitching with single fold over seam to a depth of minimum 25 mm so that the stitches pass through a minimum of four layers, may be permitted based on the agreement between buyer and the seller. The number of stitches/dm shall be 12 ± 2.

4.6.2 The material used for stitching shall be polyethylene or polypropylene multifilament yarn, spun yarn twisted thread or fibrillated tape yarn suitable for the purpose, having breaking load not less than 90 N (see Note). For sacks intended for packaging powder material, bulky filler yarn may be used to avoid oozing of material from stitch holes. For UV stabilized sacks, the material for stitching shall be UV stabilized. Stitching shall be uniform without any loose thread or knot.

> NOTE — For breaking load testing of stitching thread, the nominal gauge length or the initial distance between the clamps before start of test, shall be 200 mm. The test shall be carried out at the rate of traverse of 300 ± 15 mm/min.

4.7 Mouth of the Sack

The mouth of sack shall be completely open and the tapes at top edge shall not fray.



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. 1 DIMENSIONAL DESIGNATIONS OF PILLOW AND GUSSETED SACK

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

5 REQUIREMENTS

5.1 The HDPE/PP woven sacks shall conform to the requirements specified in Table 1.

5.3 Visual Inspection Test

Woven sack fabric shall be uniform in colour, texture and finish. The fabric shall be free from holes, tear or cuts. The bottom stitching shall be free from missing stitch and/or missing thread.

5.4 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 an individual sack as agreed by the buyer and the seller.

5.5 Breaking Strength of Fabric

5.5.1 The breaking strength and elongation at break of fabric shall be determined in accordance with IS 1969 (Part 1). The average breaking strength of fabric at lengthwise and widthwise shall be determined separately.

5.5.2 To determine widthwise lamination joint strength for laminated sacks, the test specimen shall be drawn from side edges of sack and parallel to the bottom edge of sack. It shall be ensured that the lamination joint portion remains in the midpoint of test specimen length during tensile testing.

5.5.3 For bottom seam strength determination, specimen shall be prepared according to IS 9030. It shall be ensured that the seam portion remains in the midpoint of the test specimen length during tensile testing.

5.5.4 The samples selected for fabric breaking strength and bottom seam strength tests shall be free from defects in visual inspection, dimensions, mesh and mass requirements. The tests shall be carried out on fabric sample taken from the center portion of sack.

5.6 Ash Content

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

5.7 Drop Impact Testing of Filled Sacks

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

5.8 UV Resistance

If so agreed to between the buyer and the seller, sacks shall be manufactured from UV stabilized HDPE/PP material. The woven fabric made from UV stabilized tapes shall have minimum 50 percent retention of the original breaking strength, when tested after the same has been exposed to UV radiation and accelerated weathering as per the test method given in Annex F.

Table 1 Requirements of HDPE/PP Woven Sacks produced with virgin HDPE/PP polymers for Packaging of Fertilizers

(*Clauses* 5.1, 5.3, 5.5 *and* 5.6)

Sl No.	Characteristic	Requirement			Tolerance	Method of Test, Ref to
		Type I	Type II	Type III		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Dimensions (*see* Note 1)					
	a) Inside length, *L* , mm	As agreed to between the buyer and the seller	As agreed to between the buyer and the seller	As agreed, to between the buyer and the seller	$^{+20}_{-10}$ mm	Annex B
	b) Inside width, *W*, mm					Annex B
	- For low density Fertilizers	580	600	600	$^{+20}_{-10}$ mm	
	- For High Density Fertilizers	560	-	560	$^{+20}_{-10}$ mm	
	c) Width of gusset, *g*, mm (in case of gusseted sacks)	130	130	130	$^{+10}_{-5}$ mm	Annex B
ii)	Ends per dm	40	40	40	± 2	Annex B
iii)	Picks per dm	40	40	40	± 2	Annex B
iv)	Mass of fabric, g/m^2 (*see* Note 2)					Annex B
	a) Unlaminated sacks	88	88	88	± 3	
	b) Laminated sacks	111	111	111	± 3	
v)	Mass of sack, g, *Min* (*see* Note 3)	As agreed to between the buyer and the seller	As agreed to between the buyer and the seller	As agreed to between the buyer and the seller	± 6 Percent	Annex E
vi)	Average breaking strength of fabric (ravelled strip method, 325 mm × 70 mm)[1)], *Min*, N[2)] (kgf)					IS 1969 (Part 1)
	~~a)~~ Lengthwise	900 (91.8)	900 (91.8)	900 (91.8)	—	
	~~b)~~ Widthwise	900 (91.8)	900 (91.8)	900 (91.8)	—	
	~~c)~~ Widthwise (Lamination joint - for laminated sacks)	900 (91.8)	900 (91.8)	900 (91.8)	—	
vii)	Breaking strength of bottom seam (ravelled	400 (40.8)	400 (40.8)	400 (40.8)	—	IS 9030

	strip method), Min, N[2)] (kgf)					
viii)	Elongation at break of fabric, percent					IS 1969 (Part 1)
	a) Lengthwise	15 to 25	15 to 25	15 to 25	—	
	b) Widthwise	15 to 25	15 to 25	15 to 25	—	
ix)	Ash content, Max, percent					Annex C
	a) For UV stabilized sacks	2.2	2.2	2.2	—	
	b) For non- UV stabilized sacks	6	6	6	—	
x)	Drop impact strength (*see* Note 4)	No failure	No failure	No failure	—	Annex D

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

NOTES

1 The sack width and width of gusset for Type I, Type II and Type III as given in Sl. No. (i) (b) and (c) are suggestive. The sack length may vary with material bulk density. These sack dimensions provide for optimum free space of minimum of 20 percent of length when measured along the surface of the fabric from mouth stitch line of the sack, up to the surface level of the contents.

2 Buyer and the seller may agree to the mass of fabric other than that specified in Table 1. However, the agreed mass per square meter of unlaminated fabric and laminated fabric shall comply with a tolerance of ± 3 percent as stated in **4.2** and **4.5**.

3 The theoretical method of calculating the mass of the sacks is given in Annex E for guidance.

4 Drop impact strength performance of filled sack depend on many factors including top stitch quality. Various factors, such as, top stitching needle size, needle quality, number of stitches per inch, stitching thread quality and free volume available in the filled sack after top stitching, decide the drop impact performance of sack, specifically, if the sack failure is observed at or near the top stitch. Bagging machine operators are recommended to use 12 stitches per dm for top stitch and maintain free volume approximately 20 percent of total filling volume. Necessary care shall be taken by the bagging machine operators to optimize top stitching parameters to avoid unwarranted drop impact failure of filled sack.

6 PRINTING, PACKAGING, MARKING AND STORAGE

6.1 Printing on Sacks

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

6.2 Packaging

6.2.1 The sacks shall be packed to form a bale using a wrapping layer of HDPE/PP woven fabric produced with HDPE/PP polymers and suitably secured. The bale shall contain 500 sacks or multiple thereof.

6.2.2 Rejected or defective or waste HDPE/PP woven fabrics and sacks should be promoted to be used as a wrapping layers for packaging purposes.

6.3 Marking on Bales

The bale wrap cover shall be marked or labelled with the following information:

a) Name of sack manufacturer;
b) Type and size of sacks;
c) Month and year of manufacture;
d) Number of sacks in a bale;
e) Gross weight;
f) Net weight; and
g) Any other information as required by the law in force.

NOTES

1 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.
2 Each product shall also be marked with swachh bharat logo, clearly visible at bottom of the sack, either compatible with the art work of the buyer or in black colour for printing the sack.

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.

6.5 Storage

Finished sacks or bales shall be stored in cool and dry place, covered warehouse at temperature below 50°C and protected from direct sunlight, smoke, fumes, open flame and radiation.

7 ATMOSPHERIC CONDITIONS FOR 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.

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 based on the test carried out on 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 column 2 and column 3 of Table 2. The number of sacks to be selected from the bales sampled shall be in accordance with column 4 of Table 2 for visual inspection, ends and picks per decimeter, sack dimensions, fabric mass and the mass of sack requirements. The samples shall be selected in accordance with column 5 of Table 2 for breaking strength of fabric before exposing to UV radiation in lengthwise and widthwise directions, breaking strength of lamination joint at edges in case of laminated sacks, breaking strength of bottom seam and percent elongation at break requirements. The samples shall be selected in accordance with column 6 of Table 2 for determination of ash content and drop impact strength of filled sacks requirements. If applicable, the samples shall also be selected in accordance with column 6 of Table 2 for determination of breaking strength of fabric after UV radiation and weathering test.

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, Ends, Picks and	Sample Size for Breaking Strength of HDPE/PP Fabric before Exposing to UV Radiation, Breaking Strength of Seam.	Sample Size for Breaking Strength of HDPE/PP Fabric after Exposing to UV Radiation

			Mass Requirements	Elongation at Break Requirements and Strength of lamination joint at edges	and weathering, Ash Content and Drop Impact Strength
(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 (1 Bale = 500 sacks)					

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 and picks per decimeter and sack 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 and 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 lengthwise, widthwise, bottom seam and lamination joint strength in case of laminated sacks is not less than the value specified in Table 1 and none of the individual bag value is more than 10 percent below the specified value. The samples selected for breaking strength tests shall be free from defects in visual inspection, dimensions, ends and picks and fabric mass requirements;

d) None of the sample sacks shall have percentage elongation outside the specified range;

e) None of the sample sacks shall have ash content higher than the specified maximum value;

f) None of the sample sacks show failure during drop impact strength testing; and

g) If applicable, none of the HDPE/PP sack samples after exposing to UV radiation and weathering shall have breaking strength less than 50 percent of the original breaking strength value.

ANNEX A
(Clause 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
1964 : 2025	Textiles — Mass per unit length and mass per unit area of fabrics — Methods for test (*third revision*)
1969 (Part 1) : 2018	Textiles — Tensile properties of fabrics: Part 1 Determination of maximum force and elongation at maximum force using the strip method (*fourth revision*)
2508 : 2016	Polyethylene films and sheets — Specification (*third revision*)
6192 : 2023	Textiles — Monoaxially oriented high density polyethylene (HDPE)/ Polypropylene (PP) tapes — Specification (*third revision*)
6359 : 2023	Method for conditioning of textiles (*first revision*)
9030 : 2024	Textiles - Seam Strength of Jute Fabrics including their Laminates - Methods of Test (*first revision*)
10146 : 1982	Specification of polyethylene for its safe use in contact to foodstuffs, pharmaceuticals and drinking water
10789 : 2000	Textiles — Stitch types — Classification and terminology (*first revision*)
10910 : 1984	Polypropylene and its copolymer for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
14534 : 2023	Plastics — Guidelines for the recovery and recycling of plastics waste (*second revision*)

ANNEX B

[Clauses 4.2, 4.5 and Table 1, Sl No. (i) to (iv)]

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 × 100 mm square and then cut precisely. The cut portion of fabric is weighed in grams and multiplied with 100 to 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 × 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 as specified in Table 1.

ANNEX C

[Clause 5.5 and Table 1, Sl No. (ix)]

DETERMINATION OF ASH CONTENT

C-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.

C-2 APPARATUS

C-2.1 Weighing Balance, accurate to 0.001 g.

C-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.

C-2.3 Bunsen Burner

C-2.4 Silica Triangle and Tripod

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

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

C-2.7 Gloves and Crucible Holder

C-3 SAFETY

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

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

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

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

C-4 PROCEDURE

C-4.1 Heat the clean crucible at 590 ± 10°C for 10 to 15 min and cool it in a desicator.

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

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

C-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.

C-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.

C-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.

C-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.

C-5 CALCULATIONS

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

ANNEX D

[Clause 5.6 and Table 1, Sl No. (x)]

DROP IMPACT TEST FOR FILLED SACKS

D-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.

D-2 FILLING SACKS 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 filling material, if used, shall be within ± 2 percent of the values for the material to be packed with which the sack is intended to be used.

D-3 DROP IMPACT TESTING OF SACKS

Drop testing 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 follows:

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

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.

D-4 CRITERION FOR PASSING THE TEST

After each drop there shall be no rupture or loss of contents. A slight discharge, from closures or from 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.

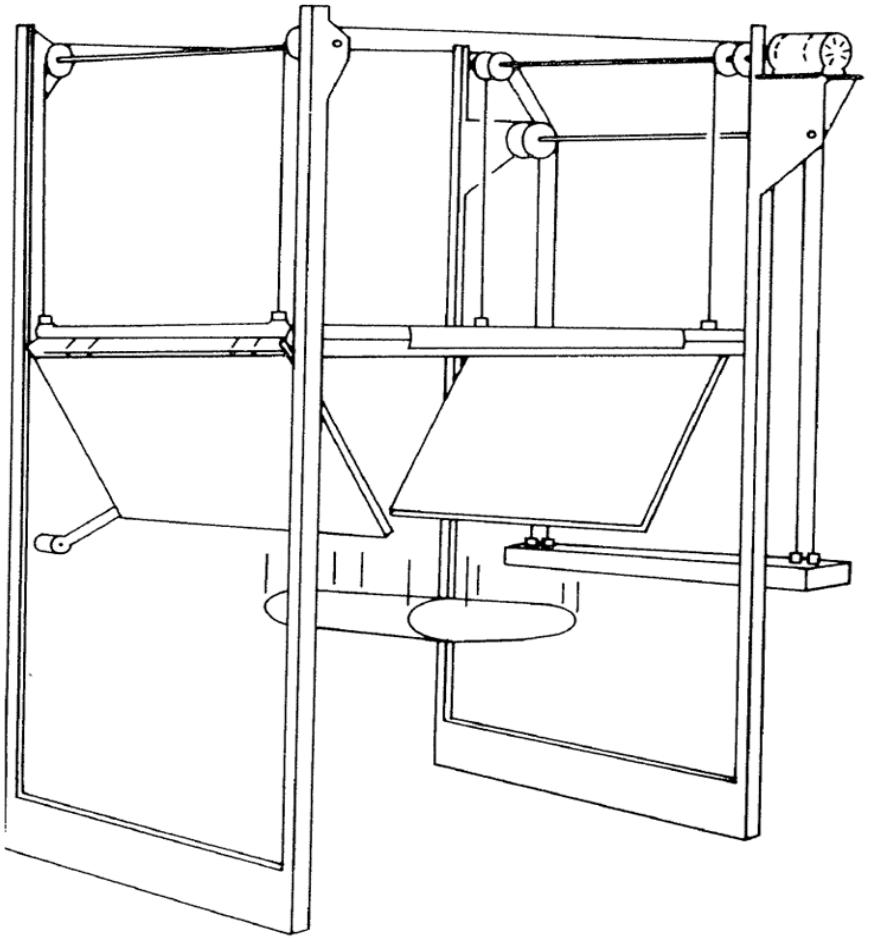


FIG. 2 EXAMPLE OF APPARATUS FOR DROP IMPACT TEST FOR WOVEN SACKS

ANNEX E

[(Table 1, Note 3)

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 (For Guidance Only)

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-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 = $(L + 55 \text{ mm}) \times 2W \times M \times 10^{-6}$
   Single fold stitching = $(L + 30 \text{ mm}) \times 2W \times M \times 10^{-6}$
b) Mass of stitching tape or thread = $L_1 \times T \times 10^{-6}$
c) Mass of lamination:
Double fold stitching = $(L + 55 \text{ mm}) \times 2 (W + 5 \text{ mm}) \times M_1 \times 10^{-6}$
Single fold stitching = $(L + 30 \text{ mm}) \times 2 (W + 5 \text{ mm}) \times M_1 \times 10^{-6}$
d) Mass of printing ink, as per artwork
e) Mass of Liner (If applicable)

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; and
M = mass of lamination, in g/m^2.

ANNEX F
(*Clause* 5.7)

UV RESISTANCE TEST

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.

ANNEX G

(*Clause* 4.8)

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.

G-1.7 Attempt should be made to move towards white bags with minimalistic printing as excessive colour and printing ink usage contributes to air and water pollution, as well as waste generation. It also increases energy consumption and soil contamination