भारतीय मानक

Indian Standard

IS 18482 : 2023

वस्त्रादि — थोक सामग्री की पैकेजिंग के लिए सैंडविच बहिर्वेधन लैमिनेटेड पॉलीप्रोपाइलीन (पी पी) की बुनी हुई बोरियाँ — विशिष्टि

Textiles — Sandwich Extrusion Laminated Polypropylene (PP) Woven Sacks for Packaging Bulk Commodities — Specification

ICS 55.080: 59.080.01

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Textile Materials Made from Polyolefins (Excluding Cordage) Sectional Committee, TXD 23

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Textile Materials Made from Polyolefins (Excluding Cordage) Sectional Committee had been approved by the Textiles Division Council.

Plastic woven sacks are commonly used for packaging and storage of food grain, sugar, cement, fertilizers, seeds, chemicals, and other bulk commodities. This standard has been prepared taking into consideration the increased consumption of sandwich extrusion laminated woven sacks for packaging bulk commodities. Advantages of these laminated sacks are outstanding aesthetics, excellent print image quality, good printability for multicolour graphic images, ability to print “scan able” UPC barcodes, high gloss surface, partial waterproofing property, improved barrier to gases, high tensile strength, and good dimensional stability.

The composition of the Committee responsible for the formulation of this standard is given in Annex G.

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.

Indian Standard

TEXTILES — SANDWICH EXTRUSION LAMINATED POLYPROPYLENE (PP) WOVEN SACKS FOR PACKAGING BULK COMMODITIES — SPECIFICATION

1 SCOPE

1.1 This Standard prescribes requirements of polypropylene (PP) woven sacks sandwich extrusion laminated with printed BOPP film or PP Nonwoven fabric for packaging bulk commodities such as, rice, wheat, soya beans, grains, pulses, cereals, sago, tapioca, coffee beans, dried fruits and nuts, seeds, flour, milk powder, sugar, salt, animal feedstuff, chemicals, detergents, cement, wall putty and, fertilizer, etc. This standard covers sacks of nominal filling capacities 5 kg, 10 kg, 20 kg, 25 kg, 30 kg, 40 kg and 50 kg.

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

1.3 This standard does not cover sacks produced from PP woven fabric sandwich extrusion laminated with paper.

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 these standards.

3 TERMINOLOGY

For this Standard, the following definitions shall apply.

3.1 Barrier Film — Multilayer films, designed to be impervious to gas (water vapor, oxygen, nitrogen, carbon dioxide or aroma) migration.

3.2 BOPP Film — A thin film of polypropylene produced by biaxial orientation process.

3.3 Fabric Tube — Woven fabric in the form of a cylindrical tube. The tubular fabric may be circular seamless woven fabric produced on a circular weaving loom or a flat woven fabric fabricated into a cylindrical tube by longitudinal joining of fabric edges which are overlapped and welded to form a tube using heat sealing, ultrasonic welding, hot air welding and hot melt glue bonding and combination thereof. The longitudinal weld usually positioned near gusset area for better aesthetics.

3.4 Flat Sack — A sack manufactured from non-gusseted flattened woven fabric tube.

3.5 Flexible Laminate — A composite flexible material made of multiple layers of films, metallized film and or film with aluminum foil, so that the composite material achieve improved gas barrier, strength, stiffness or other useful properties from the use of differing materials.

3.6 Gusset — A fold inserted in longitudinal and/or lateral edges of fabric tube.

3.7 Gusset Depth — The width of gusset fold at longitudinal and/or lateral edges of the fabric tube or sack.

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

3.9 Laminated Woven Sack — A flexible container made essentially from tubular woven fabric and sandwich extrusion laminated with printed BOPP film or with PP nonwoven fabric and closed at bottom, with an open top or closed at both ends with a valve for filling, usually at top corner.

3.10 Liner — A bag produced from flexible film, placed inside the sack to protect the material usually from moisture, and to make it easier to remove the material from outer sack. These liners are designed for use with outer sack.

3.11 Open Mouth Sack — Flat tube of defined cut length, closed at bottom end by folding and stitching with open top end.

3.12 Perforation — Holes pierced through the laminated fabric sack walls to facilitate air release during filling or bagging process.

3.13 Pinch Bottom Sack — Gusseted sack, sealed with glue at bottom and top. These sacks when filled, form brick like shape and hence, can be stacked to higher heights. As these sacks does not involve stitching and thus not susceptible to pilfering.

3.14 Plastic Woven Sack — A flexible container made essentially from tubular woven fabric, flat or gusseted, and closed at least at one end and with an open top or closed at both ends with a valve for filling, usually at top corner.

3.15 PP Nonwoven Fabric — A fabric having flat, porous web structure made of polypropylene staple fibers or continuous spun filaments, bonded together by entangling mechanically, thermally, or chemically to impart strength to the web.

3.16 Sandwich Extrusion Lamination — In sandwich extrusion lamination, the BOPP film or non-woven fabric is lamination bonded to raffia woven fabric using a thin molten film of polymer as bonding medium sandwiched between film and the raffia woven fabric.

4 SACK TYPES

Based on the nominal filling capacity in kg, the woven laminated sacks are classified as follows:

a) *Type* I — Small size sacks having filling capacity of 5 kg;
b) *Type* II — Small size sacks having filling capacity of 10 kg;
c) *Type* III — Medium size sacks having filling capacity of 20 kg;
d) *Type* IV — Medium size sacks having filling capacity of 25 kg;
e) *Type* V — Medium size sacks having filling capacity of 30 kg;
f) *Type* VI — Large size sacks having filling capacity of 40 kg; and
g) *Type* VII — Large size sacks having filling capacity of 50 kg.

5 MANUFACTURE

5.1 Raw Materials

Raw materials PP used for the manufacture of tape shall conform to the requirements specified in IS 10910, excluding overall migration.

NOTES

1 Manufacturer may use recycled waste of PP without compromising the performance of the woven sack. The sacks shall comply to the requirements as specified in this standard.

2 All materials used for manufacturing laminated woven sacks shall be chosen in such a way that recycling and reprocessing of used and discarded sacks is promoted.

5.2 Fabric

5.2.1 The fabric used in the manufacture of sandwich extrusion laminated sacks shall be woven as a tube on a circular loom from tapes having 2.5 mm ± 5 percent tape width, conforming to IS 6192 for PP tapes.

5.2.2 Linear density of tapes of all type of sacks and mesh size of the fabric shall be as follows:

a) For sack Type I and Type II, the average linear density of tapes shall be minimum 63.3 Tex (570 Denier) and, the fabric shall be 40 × 40 mesh;
b) For sack Type III, Type IV and Type V, the average linear density of tapes shall be minimum 82.2 Tex (740 Denier) and, the fabric shall be 40 × 40 mesh; and
c) For sack Type VI and Type VII, the average linear density of tapes shall be minimum 101.1 Tex (910 Denier) and, the fabric shall be 40 × 40 mesh.

NOTE — Fabric mesh is the number of warp tapes and weft tapes per decimetre or 100 mm.

The linear density of tape shall be calculated by the method specified in Annex C of IS 6192.

5.2.3 Denier of tape used in the manufacture of woven fabric shall be subjected to the following tolerances on agreed or declared denier:

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

5.2.4 The construction of fabric shall be as given in Table 1. The unlaminated fabric mass, in gram per square metre (GSM), determined as per the method given in Annex B, shall be minimum 50 for Type I and Type II; shall be minimum 65 for sack Type III, Type IV and Type V; and shall be minimum 80 for sack Type VI and Type VII. A tolerance of ± 3 percent shall be applicable on agreed or declared GSM.

5.3 Sandwich Extrusion Lamination

5.3.1 For PP tubular fabric, before converted into sacks, shall be sandwich extrusion laminated on one side or at both sides with reverse printed BOPP film or printed PP nonwoven fabric as per buyer's requirements.

5.3.1.1 *BOPP film extrusion lamination*

5.3.1.1.1 The mass of BOPP film shall be minimum 12 GSM, chemically treated and/or corona treated to improve extrusion lamination processing. If required by the buyer, the film may be with special effects like pearl finish, metallized, high gloss, high COF gloss, high COF matte, plain matte finish, matte metallized, holographic, and multicolour printed.

5.3.1.1.2 Polypropylene coating mass for sandwich extrusion lamination of BOPP film with base PP woven fabric shall be minimum 15 GSM.

5.3.1.1.3 The total mass of BOPP film laminated woven fabric shall be minimum 77 GSM for sacks of Type I and Type II; shall be minimum 92 GSM for sack Type III, Type IV and Type V; and shall be minimum 107 GSM for sacks of Type V and Type VI.

5.3.1.2 *PP nonwoven fabric extrusion lamination:*

5.3.1.2.1 The mass of nonwoven fabric shall be minimum 20 GSM and if required by the buyer, with special effects like, coloured or multicolour printed.

5.3.1.2.2 Polypropylene coating mass for sandwich extrusion lamination of nonwoven fabric with base PP woven fabric shall be minimum 15 GSM.

5.3.1.2.3 The total mass of nonwoven laminated woven fabric shall be minimum 85 GSM for sacks of types I and II; shall be minimum 100 GSM for sacks Type III, Type IV and Type V; and shall be minimum 115 GSM for sacks of Type V and Type VI.

5.3.2 For specific applications, laminated sacks can be provided with see through viewing window to see the actual product packed. The size and shape of the viewing window shall be as agreed between buyer and seller.

5.3.3 To facilitate the extrusion lamination process, the addition of Low Density Polyethylene (LDPE) and small quantity of polyolefin elastomers in extrusion lamination formulation may be used. The extrusion lamination overhang at both edges shall be trimmed uniformly and the overhang shall be minimum 5 mm and not be more than 10 mm after trimming.

5.3.4 *Printing*

As agreed between buyer and seller, BOPP film or non-woven fabric shall be printed in mono or multicolour using offset lithography, flexography, rotogravure, or digital printing process. The sack shall be printed with print registration mark, top stitching registration mark and identification mark of sack manufacturer using suitable ink for tracking of sacks.

5.3.5 *Perforating*

If required and as agreed between buyer and seller, perforations shall be carried out on laminated fabric tube before converting into sacks. Perforations facilitate release of entrapped air from sack during bag filling process.

5.4 Sack

5.4.1 The sack shall be produced either from tubular woven laminated fabric and cut to the required length or from a tube fabricated from flat woven laminated fabric. The hot wire, hot knife or ultrasonic and laser techniques shall be used for fabric cutting. The longitudinal centre seam for tube fabricated from flat woven fabric shall be positioned at the edge or near gusset of the sack.

5.4.1.1 *Centre seam*

The flat woven laminated fabric shall be fabricated into a cylindrical tube by longitudinal joining of fabric edges which are overlapped and joined to form a tube using stitching or heat sealing, ultrasonic welding, hot air welding, hot melt glue bonding and combination thereof.

NOTE — The fabric in the form of tube is an intermediate product of woven sack fabrication process. Stitching, hot air welding, hot melt glue bonding and ultrasonic sealing processes are commonly employed to form a centre-sealed cylindrical fabric tube.

5.4.1.2 *Bottom seam*

5.4.1.2.1 The stitching of bottom seam shall be single or double row of chain stitch type (*see* IS 10789) as per buyer requirements. 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. For single row stitch, the stich shall be minimum 8 mm from the bottom edge of sack. For double row stitch, two rows of stitches shall be separated from each other by minimum 5 mm and the outer stitch shall be minimum 8 mm from the bottom edge of the sack. The number of stitches/dm shall be 12 ± 2. The stitching shall be uniform and without any missing stitch, loose thread, or a knot.

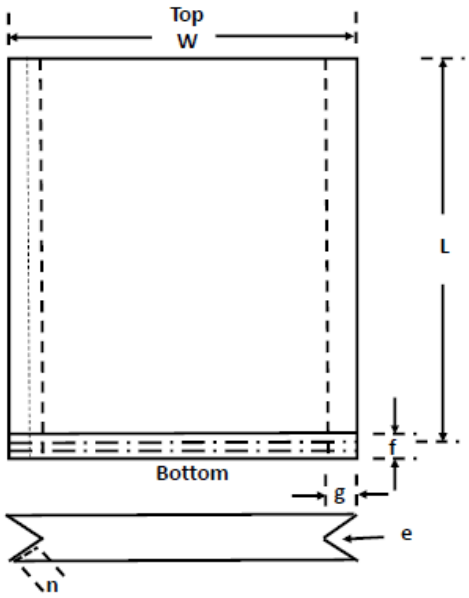
5.4.1.2.2 The material used for stitching shall be polypropylene tapes, multifilament yarn, spun yarn twisted thread, or fibrillated tape yarn suitable for the purpose, having breaking load not less than 90 N. For sacks intended for packaging powder material, bulky filler yarn can also be used along with stitching thread to avoid oozing of material from the stitch holes. For UV stabilized sacks, the material for stitching shall be UV stabilized.

5.4.1.2.3 As agreed between buyer and seller, the bottom closure may also be formed using heat sealing, ultrasonic welding, hot air welding, hot melt glue bonding and combination thereof. For bottom pinch (without bottom fold) sacks, the weld seam line shall be minimum 8 mm from the bottom edge of sack. For gusseted sacks, the bag bottom can be of various types, such as, pinch bottom, block bottom and bottom gusseted.

5.4.2 The cylindrical tube may be longitudinal gusseted at both sides and lateral gusseted at bottom or combination thereof. Fig. 1 show typical dimensional designations for gusseted sack. For packaging of powder materials and sacks with liner, pillow type (without gusset) sacks are preferred.

5.4.3 If required by the buyer, Type I and Type II sacks shall be provided with handles at bag mouth or at bag bottom, one on either side, so that the filled sacks can be easily and conveniently carried like handbags. Handle shall be made of either same fabric as used for the bag or from narrow woven fabric straps. If agreed between buyer and seller, D-cut handle or plastic molded handle can be used. The handle strength shall be appropriate to hold and carry the filled bag. The handle ends shall be jointed to the mouth of the bag, making it looks like as inverted U as shown in Fig. 2. As agreed between buyer and seller, handles shall be jointed to sack using stitching, heat sealing, ultrasonic welding, hot air welding, hot melt glue bonding and combination thereof.

NOTE — Type I and Type II sacks with carry handle promote reuse of emptied sacks for other less critical applications and support circularity and sustainability.



Key

Sack length (bottom seam to top) (*L*); sack width (*W*); gusset (*e*); gusset depth (*g*); overlap width for centre seam (*n*); bottom fold length (*f*); dotted line over bottom fold '*f*' indicate bottom seam.

FIG. 1 DIMENSIONAL DESIGNATIONS OF GUSSETED SACK

FIG. 2 TYPE 1 AND TYPE 2 BAGS WITH TOP HANDLE

5.4.4 Commonly used sack dimensions for different filling capacity and for packing of various commodities are provided in Table 2. The data provided in Table 2, is for guidance purposes and not to be construed as the specification for sack dimensions.

5.4.5 *Liner*

5.4.5.1 As agreed between the buyer and seller, the sack shall be provided with a loose liner of virgin polypropylene or polyethylene material. The length and width of the loose liner shall be minimum 100 mm more than the length and width of sack. The bottom seal of loose liner shall be at least 25 mm from the bottom edge. If required by the buyer, liner top may be hemmed stitched to the top open edge of the sack. The thickness of liner shall be minimum 35 micron and tested in accordance with **A-2** of IS 2508. The liner material and the length, width, thickness and colour of liner shall be as required or specified by the buyer. However, tolerance on the declared thickness of the liner shall be ± 10 percent.

5.4.5.2 For sacks intended for packaging moisture-sensitive materials, use of liners made from multilayer barrier films, metallized films or film-Aluminum foil laminates may be used. If required and as agreed between buyer and seller, liners can be perforated to facilitate air removal during bag filling process.

5.4.5.3 The liner shall be free from pin holes (except for air removal perforations), patches, tears, blisters, and any other visible defects. Polypropylene or polyethylene material used for manufacture of the liner shall conform to the requirements specified in IS 10910 or IS 10146, respectively, excluding overall migration.

6 REQUIREMENTS

6.1 Sack Dimensions, Sack Mass, and Mass of Bale

6.1.1 The bag samples shall be free from tear, puncture hole oil/soil stains. The fabric mesh, fabric mass per square metre (GSM) and the sack dimensions shall be determined in accordance with the method given in Annex B. The tolerance as given in Table 1 shall apply.

6.1.2 The mass of a 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 a sack determined as per Annex C.

6.2 Breaking Strength of Fabric

6.2.1 The breaking strength and elongation at break of fabric shall be measured in accordance with IS 1969 (Part 1). The average breaking strength of fabric at length wise and width wise shall be determined separately.

6.2.2 For stitch strength or weld seam strength determination, specimen shall be prepared according to IS 9030. It shall be ensured that the stitch or weld seam portion remains in the midpoint of the test sample length.

6.2.3 The samples selected for fabric breaking strength and bottom stitch, or weld seam strength tests shall be free from defects in visual inspection. The tests shall be carried out on the fabric sample taken from centre portion of the sack.

6.3 UV Resistance Test

As agreed between buyer and seller, sacks shall be manufactured from UV stabilized raffia fabrics. The UV stabilized laminated fabric shall have minimum 50 percent retention of the initial 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 D.

6.4 Drop Impact Testing of Filled Sacks

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

6.5 Ash Content

The laminated 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.

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

Table 1 Requirements of Laminated Woven Sacks

(*Clauses* 5.2.4, 6.1.1, 6.5, 6.6 *and* 8.4)

Sl No.	Characteristic	Sack Types							Tolerance	Method of test, Ref. to
		I	II	III	IV	V	VI	VII		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	Dimensions (*see* Notes 2 and 3)									Annex B
	a) Inside length (mm)	As per buyer and seller agreement (Refer Table 2)							$^{+20}_{-10}$ mm	
	b) Inside width (mm)	As per buyer and seller agreement (Refer Table 2)							$^{+20}_{-10}$ mm	
	c) Gesset width (mm)	As per buyer and seller agreement (Refer Table 2)							$^{+20}_{-10}$ mm	
ii)	Warp per dm	40	40	40	40	40	40	40	± 2	Annex B
iii)	Weft per dm	40	40	40	40	40	40	40	± 2	Annex B
iv)	Mass of laminated fabric (GSM) *Min*, (*see* Note 1)									Annex B
	a) BOPP film	77	77	92	92	92	107	107	—	
	b) PP Nonwoven fabric	85	85	100	100	100	115	115		
v)	Average breaking strength of laminated fabric (Cut strip method, 50 mm [(1)]) *Min*, N [(2)] (kgf)									IS 1969 (Part 1)
	a) Length wise	589 (60)	589 (60)	687 (70)	687 (70)	687 (70)	785 (80)	785 (80)	—	
	b) Width wise	589 (60)	589 (60)	687 (70)	687 (70)	687 (70)	785 (80)	785 (80)	—	
vi)	Breaking strength of bottom and centre seam (Cut strip method), *Min*, N [(2)] (kgf),	294 (30)	294 (30)	324 (33)	324 (33)	324 (33)	353 (36)	353 (36)	—	IS 9030
vii)	Elongation at break of fabric, *Avg*, percent (*see* Note 5)									IS 1969 (Part 1)
	a) Length wise	15 to 25	15 to 25	15 to 25	15 to 25	15 to 25	15 to 25	15 to 25	—	
	b) Width wise	15 to 25	15 to 25	15 to 25	15 to 25	15 to 25	15 to 25	15 to 25	—	
viii)	Ash content, *Max*, percent	-								Annex F
	a) For UV stabilized sacks	2.2	2.2	2.2	2.2	2.2	2.2	2.2	—	
	b) For non-UV stabilized sacks	6	6	6	6	6	6	6	—	

NOTES

1 The buyer and seller may agree to the laminated fabric mass other than those specified in Table 1. However, the mass (GSM) of (1) unlaminated woven fabric, (2) BOPP film, (3) PP nonwoven fabric, and (4) Coating, all shall comply with the minimum specified mass as stated in **5.2.4**, **5.3.1.1** and **5.3.1.2**. The fabric mass shall be determined as per the method given in Annex B.

2 Table 2, provides guidelines for typical sack dimensions corresponding to bag filling capacities for various commodities. Sack dimensions can vary according to the material to be packed and its bulk density. For gusseted sacks, the gusset depth (*g*) shall be specified in the test report.

3 The buyer and seller can agree to the sack dimensions as specified in Table 2, or other than those specified in Table 2, however, the tolerances as specified in Table 1 shall apply.

4 The mass of sack shall be calculated as per the method given in Annex C. The tolerances on mass of an individual sack shall be ± 6 percent.

5 Elongation at break for perforated fabric (lengthwise and widthwise) of all types of sacks shall be 10 percent to 20 percent.

(1) Cut strip method. Sample width = 50 mm, Gauge length = 200 mm.
(2) 1 N = 0.102 kgf (approximately).

Table 2 Typical Sack Dimensions, Filling Capacity for Various Commodities

(*Clause* 5.4 *and Table* 1)

Laminated Woven Sacks for Retail Packaging								
Sl No.	**Sack Types**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**
		W × g × L [(1)]	W × g × L	W × g × L	W × g × L	W × g × L	W × g × L	W × g × L
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Wheat	235 × 70 × 440	300 × 80 × 510	380 × 110 × 635	380 × 110 × 695	380 × 110 × 810	430 × 130 × 860	460 × 150 × 960
ii)	Rice	235 × 70 × 440	300 × 80 × 510	380 × 110 × 635	380 × 110 × 695	380 × 110 × 810	430 × 130 × 860	460 × 150 × 960
iii)	Pulses (Toor dal, Moong dal)	235 × 70 × 440	300 × 80 × 510	380 × 110 × 635	380 × 110 × 695	380 × 110 × 810	430 × 130 × 860	460 × 150 × 910
iv)	Chana dal	235 × 70 × 480	300 × 80 × 525	380 × 110 × 685	380 × 110 × 735	380 × 110 × 850	430 × 130 × 910	460 × 150 × 960
v)	Cereals	235 × 70 × 440	300 × 80 × 510	380 × 110 × 635	380 × 110 × 695	380 × 110 × 810	430 × 130 × 860	460 × 150 × 960
vi)	Soyabeans	300 × 80 × 480	330 × 100 × 560	380 × 110 × 810	380 × 110 × 840	430 × 130 × 840	[(2)]	
vii)	Wheat flour	235 × 70 × 460	300 × 80 × 565	380 × 110 × 735	380 × 110 × 840	430 × 130 × 840		460 × 150 × 1 010
viii)	Besan	300 × 80 × 460	330 × 100 × 660	380 × 110 × 840	430 × 130 × 840	560 × 150 × 960		560 × 150 × 1 100
ix)	Sugar				380 × 110 × 775			
x)	Milk powder	300 × 80 × 550						
xi)	Coffee beans							
xii)	Dried fruits and Nuts	235 × 70 × 460	300 × 80 × 530		380 × 110 × 810	430 × 130 × 840		
xiii)	Seed (Paddy, Soyabeans, etc)	300 × 80 × 480	330 × 100 × 560	380 × 110 × 810	380 × 110 × 840	430 × 130 × 840		
xiv)	Animal feed (Makai bhardo)				380 × 110 × 760		460 × 150 × 1 010	510 × 150 × 1 050
xv)	Animal feed (Kapasia Khod dan)				430 × 110 × 840		510 × 150 × 1 100	560 × 150 × 1 100
xvi)	Wall putti	235 × 70 × 460	300 × 80 × 565	330 × 100 × 710			380 × 110 × 835	
xvii)	White cement	235 × 70 × 460	300 × 80 × 565	330 × 100 × 710			380 × 110 × 835	
xviii)	Fertilizer	235 × 70 × 440	300 × 80 × 510	380 × 110 × 635	380 × 110 × 695		430 × 130 × 860	460 × 150 × 910

[(1)] W = Bag width, g = Gusset width, L = Bag length, (all dimensions in mm)

[(2)] Blank cell in the Table indicates the corresponding bag dimension is not commonly used in the market and hence bag dimension data are not available.

7 ATMOSPHERIC CONDITIONS FOR SAMPLE CONDITIONING AND TESTING

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

8 SAMPLING AND CRITERIA FOR CONFORMITY

8.1 All sacks packed in bales, having same construction, and produced under similar conditions of production and delivered to a buyer shall be grouped together to constitute a lot.

8.2 Conformity of lot to the requirements of standard shall be determined based on tests carried out on samples selected from it.

8.3 The number of samples to be selected depends on the size of lot and the number of bales to be sampled, shall be in accordance with col (1) and col (2) of Table 3. The number of sacks to be selected from the bales sampled shall be in accordance with col (3) of Table 3 for visual inspection, warp and weft per decimetre, fabric mass, sack mass and sack dimensions requirements and col (4) of Table 3 for breaking strength of fabric, seam strength and elongation at break requirements. The samples shall be selected in accordance with col (5) of Table 3 for determination of drop impact strength and ash content. If applicable, the samples shall also be selected in accordance with col (5) of Table 3 for determination of breaking strength of fabric after UV radiation and weathering test.

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 (tear, puncture hole, oil/soil stains), warp and weft per decimetre, fabric mass, sack mass and sack dimensions shall be maximum 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 the tolerance of ± 6 percent on an 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, widthwise and seam strength shall not be less than the value specified in Table 1, and none of the individual sack values shall be more than 10 percent below the specified value;

d) None of the sample sacks shall have percentage elongation outside the specified range given in Table 1;

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

f) None of the sacks shall fail in drop impact test; and

g) None of the sample sacks shall have ash content outside the specified range given in Table 1.

Table 3 Sample Size for Conformity Tests

(*Clause* 8.3)

Sl No.	No. of Sacks in a Lot	No. of Bales to be Sampled	Sample Size for Visual Inspection, Warp and Weft per Decimetre, Fabric Mass, Sack Mass and Sack Dimension Requirements	Sample Size for breaking Strength of Fabric, Breaking Strength of Seam and Elongation at break Requirements	Sample Size for Drop impact Test, Ash Content and breaking Strength of fabric After Exposure to UV radiation and weathering Test Requirements
(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 bales in a consignment exceeds 500, the same shall be split into number of lots, each comprising maximum of 500 bales.

9 PACKING, MARKING AND STORAGE

9.1 Packing

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

9.2 Marking on Sacks

9.2.1 The sack shall be marked with the following information:

a) Name of the sack manufacturer;
b) Identification mark of sack manufacturer;
c) Recycling logo; and
d) Any other information as required by the law in force.

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

a) Name of the 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 clause **7.2.1** of IS 14534.

2 The logo shall be clearly visible on the sack, either compatible with the artwork of the buyer or in black colour.

9.4 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.

9.5 Storage

Finished sacks or bales of sacks 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.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 1964 : 2001	Textiles — Methods for determination of mass per unit length and mass per area of fabrics (*second revision*)
IS 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*)
IS 2508 : 2016	Polyethylene films and sheets — Specification (*third revision*)
IS 6192 :2023	Textiles — Monoaxially oriented high density polyethylene (HDPE) and polypropylene (PP) tapes — Specification (*third revision*)
IS 6359 : 2023	Methods for conditioning of textiles (*first revision*)
IS 9030 : 1979	Method for determination of seam strength of jute fabrics including their laminates
IS 10146 : 1982	Specification polyethylene for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 10789 : 2000/ ISO 4915 : 1991	Textiles — Stitch types — Classification and terminology (*first revision*)
IS 10910 : 1984	Specification for polypropylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 14534 : 2023	Plastics — Recovery and recycling of plastics waste — Guidelines (*second revision*)

ANNEX B

(*Clauses* 5.2.4, 6.1.1 *and Table* 1)

METHOD OF TEST FOR SACK DIMENSIONS, WARP AND WEFT PER DECIMETRE AND FABRIC MASS

B-1 METHOD OF TEST FOR SACK LENGTH AND SACK WIDTH

B-1.1 Lay each sack as selected in Table 2, flat on a table. Render it free from creases and wrinkles and measures the inside length (L), inside width (W), gusset depth (g), overlap width for centre seam (n) and bottom fold length (f), about the middle to the nearest 1 mm using suitable measuring scale.

B-1.2 RESULTS

The mean of 10 readings shall be reported as the final dimension. A tolerance of ± 10 mm for inside length and width on target value, and $^{+\ 10}_{-\ 5}$ mm for gusset width on target value shall be permissible.

B-2 METHOD OF TEST FOR WARP AND WEFT PER DECIMETRE

B-2.1 Count the warp and weft at two places of each sack as selected in Table 2, with a suitable gauge, measuring 100 mm. Care should be taken to avoid counting same set of warp or weft threads more than once. Determine the average warp/dm and weft/dm of each sack under test.

B-2.2 RESULTS

The mean of 10 readings shall be reported as the final fabric mesh. A tolerance of ± 2 tapes per decimetre of target value shall be permissible.

B-3 METHOD OF TEST FOR FABRIC MASS DETERMINATION

B-3.1 Lay each sack as selected in Table 2, flat on a table. Render it free from wrinkles and cut the fabric using (100 × 100) mm template (*see* IS 1964). Weigh '*W*' the cut piece sample nearest to 0.1 g and compute the mass of fabric for one square metre by the formula as follows:

$$\text{GSM of the fabric} = W \times 100$$

B-3.2 RESULTS

The mean of 10 readings shall be reported as the mean fabric mass per square metre in (GSM). A tolerance of ± 3 percent on the target value shall be permissible.

ANNEX C

(*Clauses* 5.2.2, 6.1.2 and *NOTE* 4 under *Table* 1)

METHOD FOR CALCULATION OF MASS OF SACK

C-1 Total mass of gusseted sacks with bottom stitch comprises of:

a) Mass of fabric; and

b) Mass of stitching thread.

C-2 Calculate the mass of sack with the help of the following formula as the case may be:

a) Mass of fabric:

Mass of tubular fabric (single-fold stitching)

$$M = (L + f) \times [2\ (W + 2g) + n] \times m \times 10^{-6}$$

b) Mass of stitching tape or thread

$$m_t = (L_t \times T) \times 10^{-6}$$

where

M = Mass of sack in g;

L = Length of sack in mm (measured for bottom stitch to top);

f = Fold length in mm;

W = Width of sack in mm;

g = Depth of gusset in mm;

n = Overlap width in mm (applicable for tube fabricated from flat fabric with centre seam);

m = Mass of fabric in grams per square metre (g/m^2);

m_t = Mass of stitching thread in g;

L_t = Length of stitching thread in mm (for centre stitch and bottom stitch as applicable); and

T = Linear density of stitching thread in tex.

NOTES

1 Bottom fold length (*f*) shall be taken for calculation as 35 mm for double row stitch; 19 mm for single row stitch; 13 mm for double row pinch weld seam and 8 mm for single row pinch weld seam. The pinch weld seam does not require bottom folding.

2 For bottom gusseted bags, the bottom fold length (*f*) shall be taken as ¾ of gusset width.

3 For block bottom bags, the bottom fold length (*f*) shall be taken as equal to the gusset width.

ANNEX D

(*Clause* 6.3)

UV RESISTANCE TEST

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

D-2 TEST CONDITIONS

D-2.1 The test shall be carried out with fluorescent UV-lamp, Type B (313 nm or its equivalent). The duration of the test shall be 192 h (that is, eight days) in continuous mode.

D-2.2 The test cycle shall be: 8 h at 60 °C ± 3 °C with UV-radiation alternating with 4 h at 50 ± 3 °C with condensation. Irradiance level throughout the test shall be maintained at $0.63\ ^{+0.04}_{-0.00}$ W/m^2.

D-3 TEST PROCEDURE

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

D-3.2 Expose the specimen alternately to ultraviolet light and condensation in respective test cycle in continuous mode for total 192 h. The type of fluorescent UV lamp, the timing of the UV and condensation exposure and the temperature of UV exposure and condensation shall be as specified in **D-2**.

D-3.3 Determine the average breaking strength of fabric separately after UV exposure as mentioned in **D-3.2**.

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

Percent retention of original breaking strength =

$$\frac{b}{a} \times 100$$

where

a = Average breaking strength before UV exposure as obtained in **D-3.1**; and

b = Average breaking strength after UV exposure as obtained in **D-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 test specimen is exposed to the cooling influence of ambient room air.

ANNEX E

(*Clause* 6.4)

DROP IMPACT TEST FOR FILLED SACKS

E-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 applications such as repeated handing and drop impacting of sack undergoing during loading, unloading, and stacking operations.

E-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.

E-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 metre (two times for face side and two times for back side);

b) Height of drop = 1.8 metre (one time for left edge and one time for right edge); and

c) Height of drop = 1.8 metre (one time for bottom edge and one time for top edge).

As given in Fig. 3, 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.

E-4 CRITERION 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 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.

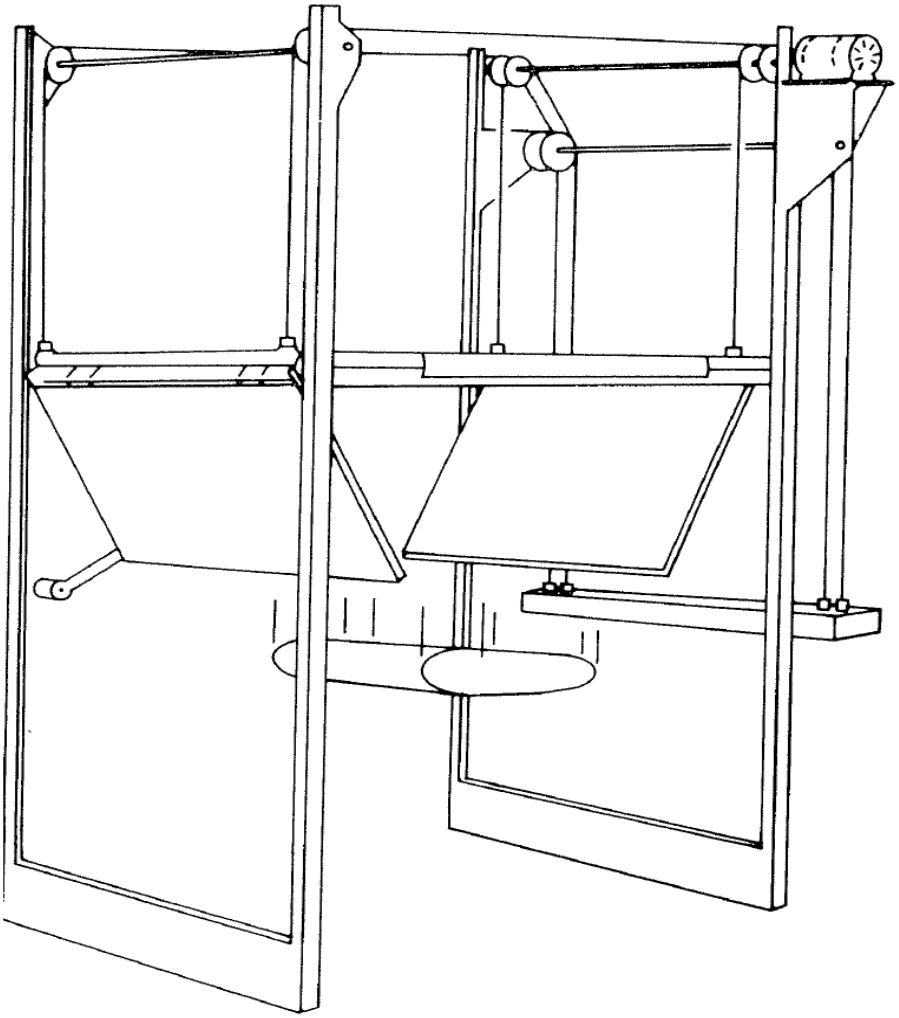


FIG. 3 EXAMPLE OF APPARATUS FOR DROP IMPACT TEST FOR WOVEN SACKS

ANNEX F

(*Clause* 6.5, *Table* 1)

DETERMINATION OF ASH CONTENT

F-1 PRINCIPLE

The procedure is used to find out the inorganic residue in 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 each sample.

F-2 APPARATUS

F-2.1 Weighing Balance — accurate to 0.001 g

F-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.

F-2.3 Bunsen burner

F-2.4 Silica triangle and tripod

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

F-2.6 Desiccator — containing an effective drying agent (for example silica gel) that does not react chemically with ash components.

F-2.7 Gloves and crucible holder

F-3 SAFETY

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

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

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

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

F-4 PROCEDURE

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

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

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

F-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.

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

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

F-4.7 Keep the crucible in the muffle furnace for another half an h, cool it in a desiccator and weigh it again. Repeat the procedure until the constant mass is obtained.

F-5 CALCULATIONS

$$\text{Ash content, percent} = \frac{\text{Weight of ash}}{\text{Weight of raffia fabric or tape sample}} \times 100$$

ANNEX G

(*Foreword*)

COMMITTEE COMPOSITION

Textile Materials Made from Polyolefins (Excluding Cordage) Sectional Committee, TXD 23

Organization	*Representative(s)*
Indian Institute of Packaging (IIP), Mumbai	DR TANWEER ALAM (***Chairperson***)
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