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भारतीय मानक मसौदा

वस्त्रादि — आटे की भराई के लिए उच्च घनत्व पोलीइथाइलीन (एच डी पी ई)/ पोलीप्रोपाइलीन (पी पी) की बुनी हुई बोरियां — विशिष्टता

(आई एस 12100 का पहला पुनरीक्षण)

Draft *Indian Standard*

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

(First Revision of IS 12100 *)*

ICS 55.080; 65.080

Textile Material Made from Polyolefins Sectional Committee TXD 23	Last date for comments **14 May 2025**

FOREWORD

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

This standard was first published in 1987. This standard was published based on the request received from "AGMARK" to specify the constructional and performance requirement of HDPE woven sacks for packaging of flour with the nominal capacity of 5 Kg, 10 Kg, 25 Kg and 50 Kg.

This revision has been made in the light of experience gained since its publication and to incorporate the following major changes:

a) Title of the standard has been modified;
b) Scope of the Standard has been modified;
c) The requirement for HDPE/PP tape linear density, in denier, and Fabric mass, in grams per square meter, has been modified;

d) Requirement for breaking strength of the fabric before exposure to UV radiation and weathering has been modified;
e) Requirement for breaking strength of the bottom seam has been modified;
f) Requirement for ash content has been incorporated;
g) The marking requirements for environment friendly recycling logo on the bags has been incorporated;
h) 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;
i) The tolerance of relative humidity for atmospheric conditioning and testing of specimens has been modified;
j) The test method for determination of 'Sack Dimensions', 'Ends and Picks per Decimeter', 'Fabric Mass', and 'Mass of Sack' has been modified;
k) Method of test for UV radiation and weathering has been modified;
l) The sustainable practices recommended to be followed in the manufacturing of HDPE/PP woven sacks has been specified;
m) Sampling and criteria for conformity has been modified;
n) Amendment to the Indian Standard has been incorporated; and
o) References to the 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 OF FLOUR — SPECIFICATION

1 SCOPE

This standard prescribes requirements of HDPE/PP woven sacks suitable for packaging all types of edible flour with nominal capacity of 5 kg, 10 kg, 25 kg, and 50 kg.

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 these standards.

3 TYPES

The HDPE/PP woven sacks for packaging of flour shall be of the following types depending upon the nominal filling capacity:

a) Type I — Sacks having nominal filling capacity of 5 kg;
b) Type II — Sacks having nominal filling capacity of 10 kg;
c) Type II — Sacks having nominal filling capacity of 25 kg; and
d) Type IV — Sacks having nominal filling capacity of 50 kg.

4 MANUFACTURE

4.1 Raw Material

High Density Polyethylene (HDPE) or Polypropylene (PP) used for manufacture of stretched raffia tapes shall conform to the requirements specified in IS 10146 or IS 10910 respectively. As agreed between buyer and seller, the functional additives like antioxidants, UV stabilizers, pigments, and fillers (Calcium carbonate) may be added to raw material HDPE and PP for improved fabric properties. All materials used for the manufacturing of woven sacks shall be chosen in such a way that the reprocessing of used and discarded woven sacks is promoted.

4.2 Fabric

The fabric used in the manufacture of HDPE/PP woven sacks shall be woven as a tube on circular looms from HDPE/PP tapes having width of 2.5 mm (with a tolerance of ± 5 percent) conforming to IS 6192, and linear density of 94 tex (850 denier) for Type I, Type II, and Type III and of 111

tex (1000 denier) for Type IV. The fabric shall be of mesh size 10 × 10. The denier of HDPE/PP tape used in the manufacture of woven fabrics/sacks shall be subjected to the following tolerances:

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

The construction of fabric shall be as given in Table 1. The woven fabric mass in grams per square meter determined as per Annex B, shall be minimum 75 g/m^2 for sack Type I, Type II and Type III and of minimum 88 g/m^2 for sack type IV.

NOTE — Fabric mesh is the number of warp tapes and weft tapes per inches or 25 mm.

4.2.1 Lamination of the Fabric

If so agreed to between the buyer and the seller, the tubular fabric woven on circular loom before manufacture into sacks shall be laminated on outer side by coating with combination of PP and LDPE film of uniform thickness and mass of minimum 23 g/m^2. The plastic raw material used for the lamination shall be virgin and confirm to IS 10910 for PP (excluding overall migration) and confirm to IS 10146 for LDPE (excluding overall migration). The overhang trim of lamination at both edges shall not be more than 5 mm. The lamination shall be free from pin holes, patches, tears, blisters and any other visible defects.

4.3 Sack

The sacks shall be produced from fabric woven as a tube on a circular loom and cut to the required length.

4.3.1 *Bottom Seam*

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 shall be minimum 8 mm from the outer edge of the sacks. The Stitching shall be done with either single or double fold over seam, based on the agreement between the buyer and seller, to a depth of minimum 25 mm, so that the stitches pass through a minimum of 4 layers (in case of single fold) or 6 layers (in case of double fold) of the fabric. The number of stitches per decimetre shall be 14 ± 2.

4.3.1.1 The material used for stitching shall be HDPE/PP tape or any other suitable thread having a minimum breaking strength of 90 N when tested in accordance to IS 1670. For UV stabilized sacks, the material for stitching shall be UV stabilized HDPE/PP tape as used in the fabric or any other UV stabilized thread/multifilament yarn suitable for the purpose. The stitching shall be uniform and without any loose thread or knot.

4.3.2 *Liner*

If so agreed between buyer and seller, the sack may be supplied with loose liner of plastic materials such as LDPE or LLDPE or HMHDPE or HDPE or PP based on the requirement from the buyer. The liner should be at least 10 percent more in length and width of the sack dimensions. Thickness of the liner shall not be less than 50 microns when tested in accordance with Annex A of IS 2508. The tolerance on the declared thickness of the liner shall be ± 10 percent.

4.3.2.1 The loose liner shall be free from pin holes, patches, tears, blisters and any other visible defects. The polymer used for loose liner shall be made from virgin material.

4.3.3 *Mouth of the Sack*

The mouth of the sack should be selvedged, hemmed or heat cut, so that the tapes do not fray. Hemming shall be with a fold of minimum 5 mm and tapes shall not fray. The mouth of the sack should be completely open.

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

5 REQUIREMENTS

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

5.2 Sack Dimensions

The sacks shall be free from tear, puncture, hole, oil/soil stains. The fabric mesh (Ends/dm, Picks/dm) and the sack dimensions shall conform to the requirements with respective tolerances as specified in Table 1, when determined in accordance with the method given in Annex B.

5.3 Mass of Bale

The mass of bale of sacks (excluding packaging materials) shall be within ± 3 percent of the mass calculated by multiplying the number of sacks in a bale with the mass of sack determined as per Annex E.

5.4 Breaking Strength of Fabric and Bottom Seam

5.4.1 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 in length wise and width wise directions shall be determined separately and shall conform to the requirements as specified in Table 1.

5.4.2 For determination of the breaking strength of bottom seam, the specimen shall be prepared and tested in accordance with IS 9030. It shall be ensured that the stitch or weld seam portion

remains in the midpoint of the test sample length. The specimen shall conform to the requirements as specified in Table 1.

5.4.3 The samples selected for breaking strength of fabric and bottom seam strength 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.

5.5 UV Resistance

If so agreed between the buyer and seller, the sacks may 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 in accordance to the test procedures laid down in Annex E.

Table 1 Requirements of HDPE/PP Woven Sacks for Packaging of Flour
(*Clauses* 4.2, 5.1, 5.2, 5.3, and 5.4)

Sl No.	**Characteristic(s)**	**Requirement(s)**				**Tolerance**	**Method of Test, Ref. to**
		Type I	Type II	Type III	Type IV		
(1)	(2)	(3)	(4)	(5)	(8)	(9)	(10)
i)	Dimensions in cm (*see* Notes 1 and 2) a) Inside length b) Inside width	 43 30	 65 44	 81 51	 100 57	 (+2/-1) cm (+2/-1) cm	Annex B
ii)	Ends/dm	40				± 2	
iii)	Picks/dm	40				± 2	
iv)	Mass of sack, g (*see* Note 1 and 3)	55	62	72	135	± 6%	Annex D
v)	Average breaking strength of fabric (revelled strip method, 325 mm × 70 mm)[1]) *Min*, N[2]) (kgf) a) Lengthwise b) Widthwise	 735 (75) 735 (75)			 900 (91.8) 900 (91.8)	 - -	IS 1969 (Part 1)
vi)	Average breaking strength of bottom seam (revelled strip method), *Min*, N[2]) (kgf)	295 (30)			400 (40.8)	-	IS 9030
vii)	Elongation at break of fabric, (revelled strip method), *Min*, percent : a) Lengthwise b) Widthwise	 15 to 25 15 to 25				 - -	IS 1969 (Part 1)
viii)	Ash content, *Max*, percent a) For UV Stabilized sacks b) For Non-UV Stabilized sacks	2.2 6				-	Annex C

NOTES

1 The specified dimensions provide for optimum free space of minimum 20 percent of length when measured along the surface of the fabric from mouth-stitch line of the sacks up to the surface level of contents. Bag manufacture shall provide suitable printed marking on the sack as a guideline for top folding and stitching.

2 The dimensions of HDPE/PP woven sacks and the mass of sack as given in the Sl. No. (i) is only for guidance purpose. The tolerances specified would apply on agreed dimensions and mass of sacks. The mass of sacks may be calculated by the method given in Annex E and same is given for guidance.

3 The mass of sack shall be based on fabrics weighing 75 g/m^2 for Type I, II, and III, and 88 g/m^2 for Type IV.

[1)] Width after ravelling = 50 mm, Gauge length = 200 mm.

[2)] 1 N = 0.102 kgf (approximately).

6 ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

6.1 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.

6.2 Test shall be carried out in a standard atmosphere as mentioned in **7.1** (*see also* IS 196).

7 PRINTING, MARKING AND PACKING

7.1 Printing on Sacks

The sacks shall be printed with food grade printing inks with identification mark of sack manufacturer along with the information as required by the buyer.

7.2 Marking

7.2.1 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.

7.2.2 The bales shall be marked or labelled with the following information:

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

NOTE — Each sack shall be compulsorily marked with visible recycling logo as given below at a space on bottom of the bag compatible with the art work of the buyer for printing the sack and on the bale.

7.2.3 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.

7.2.3.1 Each bale may also be marked with the Standard Mark.

7.3 Packaging

7.3.1 The sacks shall be packed to form a bale using a layer of HDPE/PP woven fabric and suitably secured. The bale shall contain 500 sacks or multiple there of or as agreed to between the buyer and the seller.

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

7.4 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**.**

8. **SAMPLING AND CRITERIA FOR CONFORMITY**

8.1 Lot

All the sacks of the same construction in a consignment shall be grouped together to constitute a lot.

8.2 The conformity of the lot to the requirements of the standard shall be determined on the basis of the test 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 should be selected in accordance with the col 6 of Table 2 for determination of breaking strength of fabric after UV-radiation exposure and ash content.

Table 2 Sample Size and Criteria for Conformity

(*Clause* 9.3)

Sl. No.	No. of Sacks in a Lot	No. of Bales to be Sampled	Sample Size for Visual Inspection, Dimensions, Ends, Picks and Mass Requirements	Sample Size for Breaking Strength of HDPE/PP Fabric before Exposing to UV Radiation, Breaking Strength of Seam and Elongation at Break Requirements	Sample Size for Breaking Strength of HDPE/PP Fabric after Exposing to UV Radiation Requirement and Ash Content
(1)	(2)	(3)	(4)	(5)	(6)
i)	Up to 25 000	3	12	8	1
ii)	25001 to 50 000	5	20	10	2
iii)	50001 to 100 000	8	32	13	3
iv)	100001 and above	12	48	18	4

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 can 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 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, picks and mass requirements.

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

e) 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 value.

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

ANNEX A
(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
10146 : 1982	Specification of polyethylene for its safe use in contact to foodstuffs, pharmaceuticals and drinking water
10789 : 2000 / ISO 4915 : 1991	Textiles - Stitch Types - Classification and Terminology
10910 : 1984	Polypropylene and its copolymer for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
196 : 2024	Atmospheric conditions for testing (*second 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*)
6192 : 2023	Textiles — Monoaxially oriented HDPE and PP tapes — Specifications (*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*)

ANNEX B

[*Clauses* 4.2, *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 × 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 5.1 and Table 1, Sl No. (viii)]

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 ± 0.2) 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.

NOTE – Constant mass is said to be achieved when there is no progressive change in mass greater than 0.l percent in successive exposures of at least 30 min duration.

D-4.8 Carry out this test on at least one more specimen by repeating the procedure as laid down in **D-4.1** to **D-4.7.**

C-5 CALCULATIONS

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

ANNEX D

[Clause 5.1, 5.3 and Table 1 Sl. No. (iv)]

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, and
c) Mass of lamination (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 = $(L + 55\ mm) \times 2W \times M \times 10^{-6}$
   Single fold stitching = $(L + 30\ mm) \times 2W \times M \times 10^{-6}$

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

c) Mass of lamination:

Double fold stitching = $(L + 55\ mm) \times 2\ (W + 5\ mm) \times M_1 \times 10^{-6}$

Single fold stitching = $(L + 30\ mm) \times 2\ (W + 5\ mm) \times M_1 \times 10^{-6}$

a) Mass of printing ink, as per artwork

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_1= mass of lamination, in g/m^2.

ANNEX E
(*Clause* 5.5)

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 F

(*Clause* 4.4)

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

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

F-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.

F-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.

F-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.

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

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

F-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.

F-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