*भारतीय मानक*
***Indian Standard***

**IS 16709 : 2017**
**(Reaffirmed 2022)**

# वस्त्रादि — 50 किग्रा सीमेंट पैकिंग हेतु, बुने हुए, लेमिनेटेड पोलीप्रोपाइलीन ( पी.पी. ) से निर्मित ब्लाक बाटम वाल्व बोरियाँ — विशिष्टि

# Textiles — Polypropylene (PP) Woven, Laminated, Block Bottom Valve Sacks for Packaging of 50 kg Cement — Specification

ICS 55.080; 65.080



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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 Textile Division Council.

Plastic woven sacks are being used for packaging and storage of cement, fertilizers, chemicals and other bulk commodities. This standard has been formulated taking into consideration the increased consumption of block bottom valve sacks made from polypropylene woven laminated raffia fabrics for packaging of cement. These sacks have additional advantages of less environment pollution at the time of packing and transportation, reduced loss of cement during subsequent handling of sacks, resistant to ingress of moisture, pilferage proof packaging, better stackability and better aesthetics.

The composition of the Committee responsible for the formulation of this standard is given at Annex H.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard*

# TEXTILES — POLYPROPYLENE (PP) WOVEN, LAMINATED, BLOCK BOTTOM VALVE SACKS FOR PACKAGING OF 50 kg CEMENT — SPECIFICATION

## 1 SCOPE

This standard prescribes the requirements of block bottom valve sacks made from PP woven laminated fabric for packaging, storage and distribution of 50 kg cement.

## 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 GENERAL TERMS AND DEFINITIONS

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

**3.1 Air Permeability —** Volume of air flowing or passing through the perforated walls of the sack at designated air pressure in unit time.

**3.2 BOPP Film —** Biaxially oriented polypropylene film.

**3.3 Heat Sealing or Heat Welding —** Joining together of fabric by the application of heat to close the tube at both ends to form a closure.

**3.4 Lamination —** Extrusion coating of thin film of polymer on woven fabric surface to improve barrier to moisture vapor.

**3.5 Open Mouth Sack —** Flat tube closed at one end by folding, forming and heat welded bottom in a hexagonal shape. It is an intermediate product during block bottom sack manufacturing process.

**3.6 Overlap —** Areas of a fabric tube which are superposed. Bottom or top of the sack are formed in to closure by overlapping areas of the transverse edges of a tube which are superposed and heat welded.

**3.7 Patch —** Rectangular strip of a woven fabric with both side lamination, heat welded to ends of a sack to strengthen top and bottom closures

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

**3.9 Plastic Woven Sack —** A flexible container made essentially from tubular woven fabric closed at least at one end with open top or closed at both end with valve for filling, usually at top corner.

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

**3.11 Valve —** A spout in the form of a flattened tube, normally situated at one corner of the top closure of the sack through which the sack is filled, and which, after filling, does not readily allow reverse flow of the filled contents.

**3.12 Valve Sleeve —** An insert of woven fabric with both side lamination, incorporated at one corner of the top closure to form filling valve.

**3.13 Valved Sack —** Tube closed at both ends by folding, forming and heat welding the ends in a hexagonal shape and provided with a valve for filling, usually at top corner. It is a finished product of block bottom sack manufacturing process.

**3.14 Weld Strength —** The force required to de-laminate the heat welded joint formed of folded tube ends and a patch.

## 4 DIMENSIONAL DESIGNATIONS OF SACK

This part of the standard specifies a method for measuring and expressing the dimensions of empty sacks as shown in Fig. 1.

### 4.1 Description of Sack Parameters

**4.1.1** *Sack Length, a*

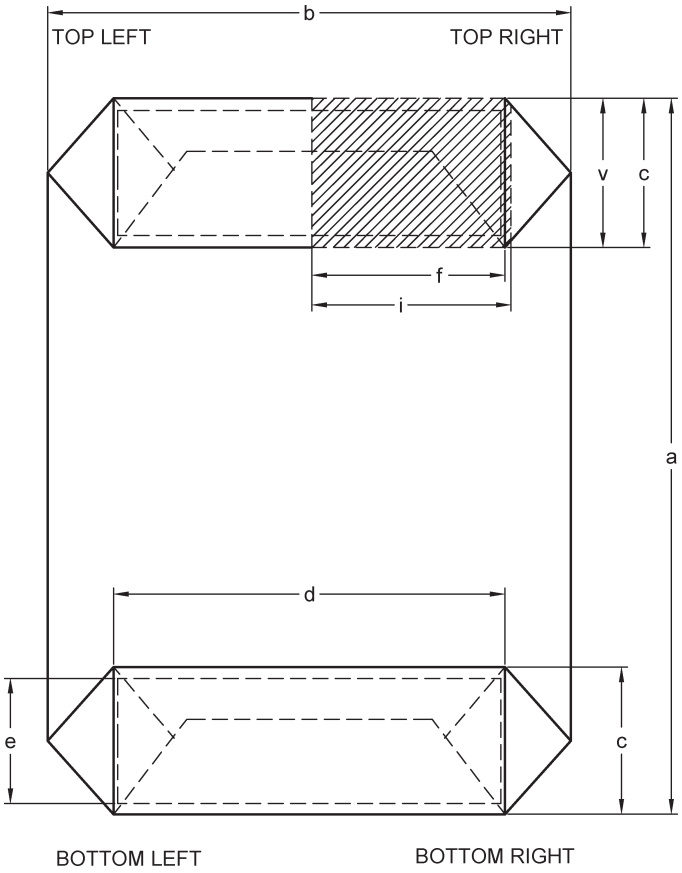
Distance between the transverse edges of the flat sack, measured at the centre, perpendicular to the bottom.

**4.1.2** *Sack Width, b*

Distance between the longitudinal edges of the flat sack, measured at the centre, parallel to the bottom.

**4.1.3** *Top Closure Width and Bottom Closure Width, c*

Distance between the two edge-folds at top and at bottom, measured at the centre, parallel to the sack length.




KEY:

| | | | |
|---|---|---|---|
| a | Sack Length | $e_b$ | Patch Height (Bottom Closure) |
| b | Sack width | $e_t$ | Patch Height (Top Closure) |
| f | Valve Length | c | Closure width (Top and Bottom) |
| v | Valve Sleeve width | $d_t$ | Patch Length (Top Closure) |
| l | Valve Sleeve Length | $d_b$ | Patch Length (Bottom Closure) |

FIG. 1 DIMENSIONAL DESIGNATIONS OF SACK

**4.1.4** *Patch Length, d*

Longitudinal dimension of the patch at top closure, dt and at bottom closure, db, measured at the centre, parallel to the sack bottom.

**4.1.5** *Patch Height, e*

Transverse dimension of the patch at top closure, et and at bottom closure, eb, measured at the centre, perpendicular to the sack bottom.

**4.1.6** *Length of Valve, f*

Distance between the top-right edge-fold of the rectangular portion of the top closure of the sack and the innermost edge of the valve sleeve, measured parallel to the bottom.

**4.1.7** *Width of Valve Sleeve, v*

Internal dimension of the valve sleeve, measured at the sleeve center, parallel to the sack length. Width of valve sleeve, *v* shall be equal to closure width *c*.

**4.1.8** *Length of Valve Sleeve, i*

Longitudinal dimension of valve sleeve, parallel to the bottom.

### 4.2 Description of Sack Parts

Following indications help to identify the various parts of the sack:

a) *Filling end* — The open or valved end. Usually top side of sack.

b) *Closed end* — The sealed or non-valved end. Usually bottom side of sack.

c) *Face side* — The side containing the front side print.

d) *Back side* — The side opposite the front side print.

e) *Valve position* — With the front-side print upright, when viewed from front, the valve position shall be described as top or bottom, left or right, as shown in Fig. 1.

## 5 MANUFACTURE

### 5.1 Raw Material

The plastic raw material, polypropylene used for the manufacturing of tubular sacks shall be virgin and conform to the requirements specified in IS 10910 excluding overall migration.

### 5.2 Fabric

The fabric used in the manufacture of block bottom woven sacks shall be woven as a tube on circular loom. The woven fabric weight shall be 63 g/m$^2$ minimum and of mesh 8 × 8 per inch in accordance with the tape width. The tape shall be of linear density 900 denier and 3.0 mm ± 0.1 mm width, conforming to IS 11197. The denier of PP tape used in the manufacture of woven sacks shall be subjected to the following tolerances:

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

The construction particulars of fabric shall be as given in Table 1.

### 5.3 Sack

The sacks shall be produced from tubular woven, laminated and perforated fabric cut to the required length. The sack shall be closed at top and bottom with a filling valve at top as shown in Fig. 1.

**5.3.1** *Top and Bottom Closures*

The top and bottom hexagonal closures shall be formed by overlapping both ends of tube as shown in Fig.1. A rectangular piece of both side laminated fabric patch shall be superimposed over the overlapped closure ends and heat welded.

**5.3.2** *Filling Valve for Sacks*

For forming of a filling valve, a small sleeve or tube usually made of both side laminated fabric shall be integrated to the top closure as shown in Fig.1, and heat welded. The valve shall be attached at one corner of the top of the sack.

### 5.4 Lamination

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 4 mm. If required by the buyer, woven and laminated tubular fabric before conversion into sacks may be further laminated from outer side with reverse printed Biaxially Oriented Polypropylene (BOPP) film of minimum thickness 15 g/m$^2$.

### 5.5 Perforation

The laminated fabric shall be perforated to facilitate release of entrapped air during cement filling. The perforation shall be distributed uniformly on the laminated fabric to ensure smooth and easy release of air during cement filling.

### 5.6 Capacity

The sack shall have the nominal filling capacity of 50 kg.

## 6 REQUIREMENTS

### 6.1 Mass of Bale

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

### 6.2 Breaking Strength of Fabric and, Top and Bottom Closures

**6.2.1** The breaking strength and elongation at break of fabric shall be tested in accordance with IS 1969 (Part 1). The ravelled strip samples selected for breaking strength test shall be free from any defects in visual inspection, dimensions, ends, picks and mass requirements. The test shall be carried out on fabric samples taken from center portion of the sack. The average breaking strength of fabric at lengthwise and widthwise shall not be less than the value specified in Table 1.

**6.2.2** For determining the weld strength of top and bottom closures, specimen shall be prepared in accordance with IS 1969 (Part 1) and Annex C. It shall be ensured that the patch weld portion remains in the middle of test sample length. The average weld strength of top and bottom closure shall not be less than the value specified in Table 1.

### 6.3 Drop Impact Testing of Filled Sacks

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

### 6.4 Ash Content

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

### 6.5 Air Permeability

The perforated woven sacks shall be tested for air permeability in accordance with the test procedure given in Annex F. Special test equipment are available to measure rate of air flow, from which the air permeability of sack is determined. The average value shall be reported as air permeability in m$^3$/h at 50 mbar air pressure and shall meet the requirements specified in Table 1.

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

**Table 1 Requirements of PP Block Bottom Woven Sacks for Packing Cement**
(*Clauses* 5.2 *and* 6.1 to 6.6)

| Sl No. | Characteristic | Requirement | Tolerance | Method of Test, Ref to |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| i) | Dimensions, mm (*see* Notes 1 and 2) | | | Annex B |
| | a) Sack length (*a*) | 630 | ± 5 mm | |
| | b) Sack width (*b*) | 500 | +10/-5 mm | |
| | c) Closure width, top and bottom (*c*) | 110 | ± 5 mm | |
| | d) Patch length (top closure) ($d_t$) | 385 | ± 5 mm | |
| | e) Patch height (top closure) ($e_t$) | 105 | ± 5 mm | |
| | f) Patch length (bottom closure) ($d_b$) | 385 | ± 5 mm | |
| | g) Patch height (bottom closure) ($e_b$) | 105 | ± 5 mm | |
| | h) Valve length (*f*) | 150 | ± 5 mm | |
| | j) Valve sleeve width (*v*) | 110 | ± 5 mm | |
| | k) Valve sleeve length (*i*) | 155 | ± 5 mm | |
| ii) | Ends per dm | 32 | ± 1 | Annex B |
| iii) | Picks per dm | 32 | ± 1 | Annex B |
| iv) | Mass of sack, g (*see* Notes 2 and 3) | 82 | ± 6 percent | IS 1964 |
| v) | Average breaking strength of fabric (Ravelled strip method, 325 mm × 70mm[1]) *Min,* N[2] (kgf): | | – | IS 1969 (Part 1) |
| | a) Lengthwise | 650 (66.3) | – | |
| | b) Widthwise | 600 (61.2) | | |
| vi) | Weld strength of top and bottom closure, *Min,* N[2] (kgf) | 600 (61.2) | – | IS 1969 (Part 1) and Annex C |
| vii) | Elongation at break of fabric (Ravelled strip method), percent : | | | IS 1969 (Part 1) |
| | a) Lengthwise | 15 to 25 | – | |
| | b) Widthwise | 15 to 25 | – | |
| viii) | Drop impact strength | No failure | – | Annex D |
| ix) | Ash content, *Max,* percent | 4 | – | Annex E |
| x) | Air Permeability at 50 mbar, $m^3/h$ | 70 – 100 | – | Annex F |

NOTES
**1** The buyer and the seller may agree to dimensions other than those specified above. However, tolerances as specified in Table 1 shall apply.
**2** The mass of sacks with dimensions other than those specified shall be calculated by the method given in Annex G. Annex G is given for guidance only.
**3** The weight per square meter shall be minimum 63 $g/m^2$ for woven fabric, minimum 23 $g/m^2$ for coating and minimum 15 $g/m^2$ for BOPP film. For BOPP film laminated fabrics, the total fabric weight per square meter shall be determined based on the fabric weight, the film weight and the coating weight.

[1] Gauge length = 200 mm, Sample width after ravelling = 50 mm, with minimum 16 complete tapes.
[2] 1 N = 0.102 kgf (approximately).

## 7 PRINTING, PACKING AND MARKING

### 7.1 Printing

The sacks shall be printed with identification mark of sack manufacturer along with the information as required by the buyer using suitable inks, by flexography or rotogravure printing.

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

### 7.2 Packaging

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.

### 7.3 Marking on Sacks

The bales shall be marked with the following information:

a) Name of the 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;
h) Recycling logo; and
j) Any other information as required by the law in force.

NOTE — Each sack shall be marked with visible recycling logo at a space on bottom of the sack compatible with the art work of the buyer for printing the sack.



### 7.4 BIS Certification Marking

The sacks may also be marked with the Standard mark.

**7.4.1** The use of the Standard mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and rules and regulations made thereunder. The details of the conditions under which a license for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 8 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 ± 2 percent relative humidity and 27 ± 2°C temperature as laid down in IS 6359.

## 9 SAMPLING AND CRITERIA FOR CONFORMITY

### 9.1 Lot

All the 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.

**9.2** 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.

**9.3** 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 col 5 of Table 2 for breaking strength of fabric, elongation at break, weld strength of top and bottom closure, drop impact resistance, ash content and air permeability.

### 9.4 Criteria for Conformity

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

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

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

c) The average breaking strength in both lengthwise, widthwise and weld strength of top and bottom closure shall not be less than the value specified in Table 1, and none of the individual sack value shall be more than 10 percent below the specified value. The test samples selected for breaking strength and weld strength shall be free from defects in visual inspection, dimensions, ends, picks and mass requirements. The tests shall be carried out on the fabric sample taken from center portion of the sack.

d) None of the sack shall fail in drop impact test and ash content requirement.

e) None of the sample sacks shall have percentage elongation and air permeability outside the specified range given in Table 1.

**Table 2 Sample Size**
(*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 Fabric, Elongation at Break, Weld Strength of Top and Bottom Closures, Drop Impact Resistance, Ash Content and Air Permeability Requirements |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| i) | Up to 2 5000 | 3 | 12 | 8 |
| ii) | 25 001 to 50 000 | 5 | 20 | 10 |
| iii) | 50 001 to 100 000 | 8 | 32 | 13 |
| iv) | 100 001 to 250 000 | 12 | 48 | 18 |

# ANNEX A

(*Clause* 2)

## LIST OF REFERRED INDIAN STANDARDS

| *IS No* | *Title* | *IS No* | *Title* |
|---|---|---|---|
| 1964 : 2001 | Textiles — Methods for determination of mass per unit length and mass per area of fabrics (*second revision*) | | strength of jute fabrics including their laminates |
| 1969 (Part 1) : 2009 | Textiles — Tensile properties of fabrics — Determination of maximum force and elongation at maximum force : Part 1 Strip method ( *third revision* ) | 10146 : 1982 | Specification of polyethylene for its safe use in contact to foodstuffs, pharmaceuticals and drinking water |
| | | 10910 : 1984 | Polypropylene and its copolymer for its safe use in contact with foodstuffs, pharmaceuticals and drinking water |
| 6359 : 1971 | Method for conditioning of textiles | | |
| 9030 : 1979 | Method for determination of seam | 11197 : 1985 | Specification for monoaxially oriented polypropylene tapes |

# ANNEX B

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

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

### B-1 METHOD OF TEST FOR SACK DIMENSIONS

Lay each sack as selected in Table 2, flat on a table. Render it free from creases and wrinkles and measure the sack length ($a$), sack width ($b$), closure width (top and bottom) ($c$), patch length (top closure) ($d_t$), patch height (top closure) ($e_t$), patch length (bottom closure) ($d_b$), patch height (bottom closure) ($e_b$), valve length ($f$), valve sleeve width ($v$) and valve sleeve length ($i$) as shown in Fig. 1, about the middle to the nearest 1 mm.

### B-2 METHOD OF TEST FOR ENDS AND PICKS PER DECIMETRE

Count the ends and picks at two places of each sack as selected in Table 2, with a suitable gauge measuring 50 mm. Care shall be taken to avoid counting same set of warp or weft threads more than once. Determine the average ends/dm and picks/dm of each sack under test.

# ANNEX C

[*Clause* 6.2.2, *Table* 1, *Sl No.* (vi)]

## SAMPLE PREPARATION FOR TOP AND BOTTOM CLOSURE PATCH WELD STRENGTH TEST USING CUT STRIP METHOD

### C-1 CUT STRIP METHOD

This test method is generally used to determine the top and bottom closure patch weld strength of the perforated, laminated, woven fabrics in which revelling of tapes is difficult.

### C-2 SAMPLE PREPARATION

From the sack sample, two sets of test specimens of required size shall be cut, one set from the top closure and other from the bottom closure. Ensure that test specimens are free of any visible defects.

### C-3 SAMPLE DIMENSIONS

Specimen shall be prepared according to procedure given in IS 1969 (Part 1). *See* Fig. 2 for the dimensions of the specimen. Cut the specimen of size 350 mm length and 50 mm width and ensure minimum 16 complete tapes in the specimen. The tensile test shall be carried out using gauge length of 200 mm and cross head speed of 100 mm/min. It shall be ensured that the patch weld portion remains in the middle of test sample length.

### C-4 TEST REPORTING

The test results shall be reported as weld strength of top and bottom closure patch, in N (kgf).

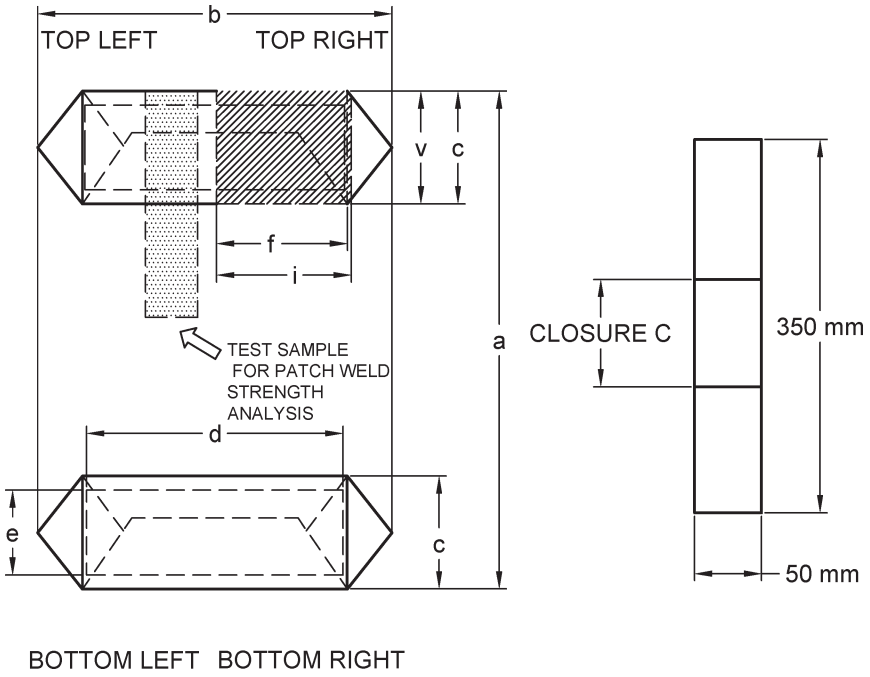



FIG. 2 TEST SPECIMEN FOR TOP AND BOTTOM CLOSURE PATCH WELD STRENGTH TEST

# ANNEX D

[*Clause* 6.3, *Table* 1, *Sl No.* (viii)]

## 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 OF SACK FOR TESTING

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

### D-3 DROP IMPACT TESTING OF SACKS

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

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

**D-3.2** 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.

### D-4 CRITERIA FOR PASSING THE TEST

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

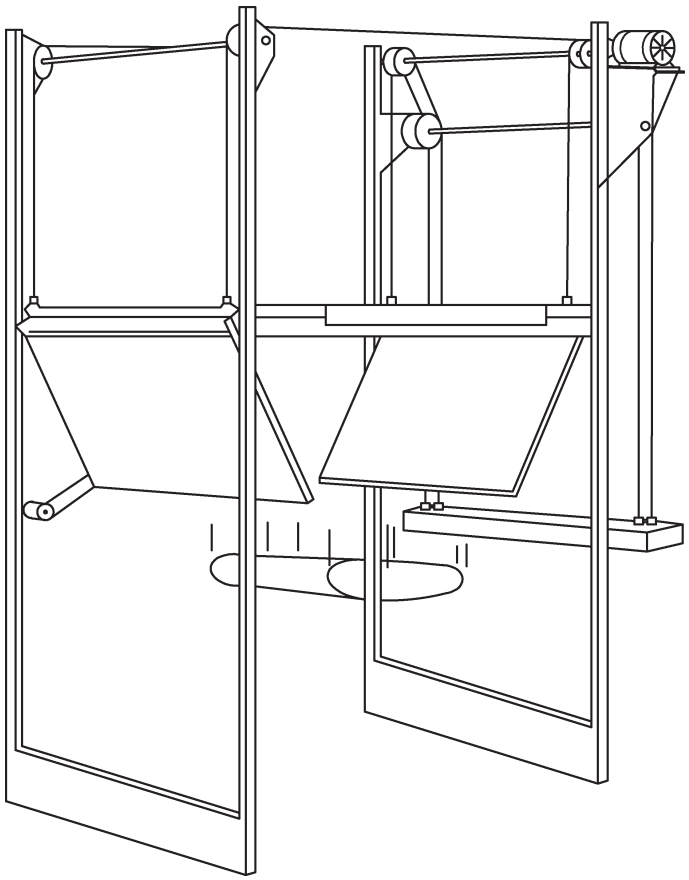


FIG. 3 APPARATUS FOR DROP IMPACT TEST

# ANNEX E

[*Clause* 6.4, *Table* 1, *Sl No.* (ix)]

## DETERMINATION OF ASH CONTENT

### E-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.

### E-2 APPARATUS

**E-2.1 Weighing Balance**, accurate to 0.001 g.

**E-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.

**E-2.3 Bunsen Burner**

**E-2.4 Silica Triangle and Tripod**

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

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

**E-2.7 Gloves and Crucible Holder**

### E-3 SAFETY

**E-3.1** Burn the sample in an effectively ventilated hood.

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

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

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

### E-4 PROCEDURE

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

**E-4.2** Weigh the empty crucible to nearest 0.001 g.

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

**E-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.

**E-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.

**E-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.

**E-4.7** Keep the crucible in the muffle furnace for another 30 min, cool in a desicator and weigh again. Repeat the procedure until constant mass is obtained.

### E-5 CALCULATIONS

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

# ANNEX F

[*Clause* 6.5, *Table* 1, *Sl No.* (x)]

## DETERMINATION OF AIR PERMEABILITY

### F-1 PRINCIPLE

This test method covers the determination of the air permeability by measuring the rate of air flow passing perpendicularly through the perforated walls of a woven sack under a prescribed air pressure differential between the two surfaces. From this rate of air flow, the air permeability of the fabric is determined.

### F-2 TEST APPARATUS

The testing apparatus as shown in Fig. 4, shall be connected with an air pressure generating system and shall have air flow regulating valve, air quantity measuring device and spout with inflatable (swell) tube suitable for testing of woven sacks with valve size 90-120 mm. The pressure shall be adjustable up to a minimum of 50 mbar with a tolerance ± 0.1 mbar.

### F-3 TEST PROCEDURE

**F-3.1** Prior to test, the specimen sacks shall be conditioned to moisture equilibrium from dry side in the standard atmosphere of 65 ± 2 percent relative humidity and 27 ± 2°C temperature.

**F-3.2** For testing air permeability the empty sack shall be placed by hand to the spout of the testing unit as shown in Fig. 4.

**F-3.3** Tighten the sack on the spout using the swell tube, so that there is no loss of air at the valve.

**F-3.4** The test air pressure shall be reached within 15 s after the beginning of the test. The test measurements shall be taken within 10 s after reaching the desired test pressure.

**F-3.5** The temperature and pressure of test air shall be 27 ± 2°C and 50 mbar, respectively.

### F-4 TEST REPORTING

Air permeability in $m^3$ per hour at 50 mbar air pressure shall be reported.

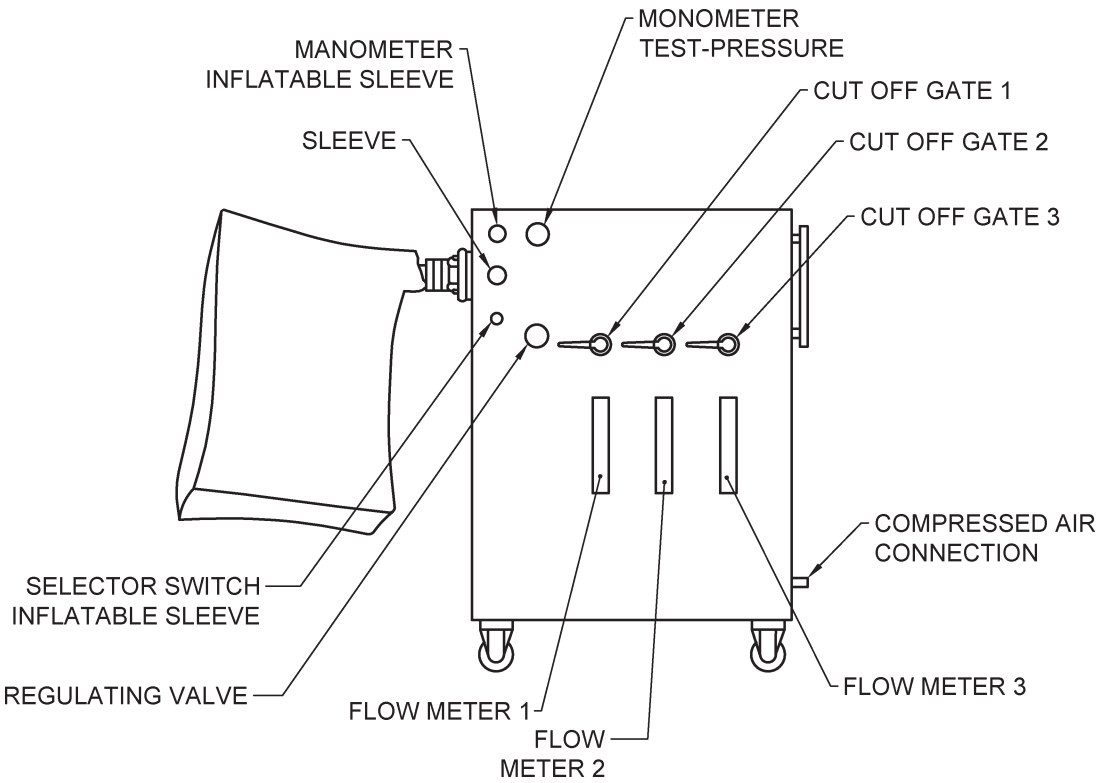



FIG. 4 APPARATUS FOR AIR PERMEABILITY TESTING

# ANNEX G

(*Table* 1, *Note* 2)

## METHOD FOR CALCULATION OF MASS OF SACK

### G-1 MASS OF SACK

Total mass of sacks comprises of the following:

a) Mass of fabric,
b) Mass of top and bottom patch,
c) Mass of valve sleeve, and
d) Mass of total lamination {*see* **G-1.1** [(d) + (e) + (f)]}.

**G-1.1** Calculate the mass of sack with the help of following formula as the case may be:

a) Mass of tubular fabric
$= \{(a + c + 20)\} \times 2b \times M \times 10^{-6}$
b) Mass of closure patch
$= \{(d_t \times e_t + d_b \times e_b)\} \times M \times 10^{-6}$
c) Mass of valve sleeve
$= \{(v + 5) \times 2 \times i\} \times M \times 10^{-6}$
d) Mass of lamination for Tube
$= \{(a + c + 20)\} \times 2\,(b + 4) \times M_1 \times 10^{-6}$
e) Mass of lamination for patch
$= \{ 2 \times (d_t \times e_t + d_b \times e_b)\} \times M_1 \times 10^{-6}$
f) Mass of lamination for sleeve
$= \{ 2 \times (v + 5) \times 2 \times i \} \times M_1 \times 10^{-6}$

where

$a$ = sack length;
$b$ = sack width;
$c$ = closure height;
$M$ = mass of fabric, in g/m$^2$;
$M_1$ = mass of lamination, in g/m$^2$;
$d_t$ and $d_b$ = patch length (top and bottom closure);
$e_t$ and $e_b$ = patch height (top and bottom closure);
$i$ = valve sleeve length; and
$v$ = valve sleeve width.

(All dimensions in millimetres.)

### G-2 TEST REPORTING

Mass of sack = [(a) + (b) + (c) + (d) + (e) + (f)], in g.

# ANNEX H

(*Foreword*)

## COMMITTEE COMPOSITION

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

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# AMENDMENT NO. 1 JANUARY 2021

# TO

# IS 16709 : 2017 TEXTILES — POLYPROPYLENE ( PP ) WOVEN, LAMINATED, BLOCK BOTTOM VALVE SACKS FOR PACKAGING OF 50 KG CEMENT — SPECIFICATION

(*Page* 3, *clause* **5.2**, *sentence* 2) — Substitute the following for the existing sentence:

'The woven fabric weight shall be 63 g/m$^2$ with a tolerance of ± 3 percent and of mesh 8 × 8 in accordance with the tape width.'

(*Page* 4, Note 3 under *Table* 1) — Substitute the following for the existing note:

**'3** The weight per square meter shall be 63 g/m$^2$ with a tolerance of ± 3 percent for woven fabric, minimum 23 g/m$^2$ for coating and minimum 15 g/m$^2$ for BOPP film. For BOPP film laminated fabrics, the total fabric weight per square meter shall be determined based on the fabric weight, the film weight and the coating weight.'

(TXD 23)

Publication Unit, BIS, New Delhi, India