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**SPECIFICATION FOR  
EXPANDED POLYSTYRENE FOR THERMAL  
INSULATION PURPOSES**

*( First Revision )*

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

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**( Reaffirmed 1989 )**

# *Indian Standard*

## SPECIFICATION FOR EXPANDED POLYSTYRENE FOR THERMAL INSULATION PURPOSES

### *( First Revision )*

Thermal Insulation Materials Sectional Committee, CDC 37

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*Indian Standard*  
SPECIFICATION FOR  
EXPANDED POLYSTYRENE FOR THERMAL  
INSULATION PURPOSES  
( *First Revision* )

**0. FOREWORD**

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 15 December 1984, after the draft finalized by the Thermal Insulation Materials Sectional Committee had been approved by the Chemical Division Council.

**0.2** Expanded polystyrene has many uses, such as thermal insulation and shock protective packaging. Its properties can be varied widely in the process of manufacture to meet both general and specific demands.

**0.3** This standard was first published in 1968. However, keeping in view the development of testing facilities in the country and its varied applications, the Committee responsible for the preparation of this standard decided to revise it. In this revision the range of temperature in which the product is recommended for use has been changed from  $-200^{\circ}$  to  $80^{\circ}\text{C}$  to  $-150^{\circ}$  to  $80^{\circ}\text{C}$ . Besides, additional test for moisture absorption has been incorporated. Similarly, determination of thermal conductivity has now been prescribed to be determined at  $0^{\circ}\text{C}$  and  $10^{\circ}\text{C}$ , respectively instead of  $50^{\circ}\text{C}$  to get a more practical idea of this important property.

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final values, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified values in this standard.

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**1. SCOPE**

**1.1** This standard prescribes the requirements and the methods of sampling and test for expanded polystyrene in the form of rough shapes,

\*Rules for rounding off numerical values ( *revised* ).

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finished boards and blocks, and pipe sections/segments for thermal insulation primarily for use in refrigeration and building applications in the temperature range  $-150^{\circ}$  to  $80^{\circ}\text{C}$ .

**2. TERMINOLOGY**

**2.1** For the purpose of this standard, the definitions of the terms, symbols and units given in IS : 3069-1965\* shall apply.

**3. TYPES**

**3.1** There shall be two types of expanded polystyrene as follows:

*Type 1* — Non-self extinguishing type

*Type 2* — Self extinguishing type ( see **4.5.1** )

**4. REQUIREMENTS**

**4.1 Bulk Density** — The bulk density of the material, calculated at nominal thickness, excluding facing, shall be 15, 20, 25, 30 or 35  $\text{kg/m}^3$ , when tested in accordance with the method prescribed in 4 of IS : 5688-1982†. A tolerance of  $\pm 5$  percent shall be allowed on bulk density.

**4.2 Dimensions**

**4.2.1 Size** — In the case of finished boards, the size shall be  $1.0 \times 0.5$  m or as agreed to between the purchaser and the supplier. Also, the size for pipe sections/segments shall be 1.0 m or 0.5 m in length, unless otherwise agreed to between the purchaser and the supplier.

**4.2.2 Thickness** — The material shall be supplied in thicknesses of 15, 20, 25, 40, 50, 60, 75 and 100 mm unless otherwise agreed to between the purchaser and the supplier.

**4.2.3 Tolerance** — The tolerance on the dimensions of the finished boards, blocks and pipe sections/segments shall be as given below. For other shapes, they shall be as agreed to between the purchaser and the supplier.

<i>Finished Boards and Blocks</i>	<i>Tolerance</i>
Length, width and thickness	$\pm 2$ mm
 <i>Pipe Laggings</i>	
Outside diameter	$\pm 3$ mm
Inside diameter	$\pm 2$ mm

\*Glossary of terms, symbols and units relating to thermal insulation materials.

†Methods of test for preformed block-type and pipe-covering type thermal insulation ( first revision ).

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**4.3 Thermal Conductivity** — The thermal conductivity at 0 and 10°C, respectively of the material shall not exceed the values given below when determined in accordance with the method prescribed in IS : 3346-1980\*.

Bulk Density kg/m <sup>3</sup>	Thermal Conductivity <sup>*</sup> mW/cm °C	
	0°C	10°C
15.0	0.34	0.37
20.0	0.32	0.35
25.0	0.30	0.33
30.0	0.29	0.32
35.0	0.28	0.31

NOTE — To convert values from mW/cm deg to kcal/m h deg or *vice versa*, the following conversion factors are used:

Kilocalories	Milliwatts
m hr °C	cm °C
1	11.6300
0.085 985	1

**4.4** The material of both the types shall also comply with the requirements given in Table 1.

**TABLE 1 REQUIREMENTS FOR EXPANDED POLYSTYRENE**

Sl. No.	CHARACTERISTIC	REQUIREMENTS AT VARIOUS NOMINAL APPARENT DENSITIES, kg/m <sup>3</sup>					METHOD OF TEST REF TO CL No. IN APPENDIX
		15	20	25	30	35	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Compressive strength at 10 percent deformation, in kg/cm <sup>2</sup> , <i>Min</i>	0.7	0.9	1.1	1.4	1.7	A
ii)	Cross-breaking strength, in kg/cm <sup>2</sup> , <i>Min</i>	1.4	1.6	1.8	2.2	2.6	B
iii)	Water vapour permeance, in g/m <sup>2</sup> ·24 h, <i>Max</i>	50	40	30	20	15	C
iv)	Thermal stability, percent, <i>Max</i>	1	1	1	1	1	D
v)	Moisture absorption, percent	2	1	1	1	1	E

\*Method for the determination of thermal conductivity of thermal insulation materials ( two slab, guarded hot-plate method ) ( *first revision* ).

**IS : 4671 - 1984****4.5 Special Requirements for Type 2 Only**

**4.5.1 Flammability** — The material shall be of self extinguishing type when tested by the method prescribed in Appendix F.

**5. PACKING AND MARKING**

**5.1 Packing** — The material shall be packed as agreed to between the purchaser and the supplier.

**5.2 Marking** — The package shall be legibly marked with the following information:

- a) Name of the manufacturer and recognized trade-mark, if any;
- b) Type of the material;
- c) Dimensions and nominal apparent density of the material; and
- d) Batch number.

**5.2.1** The material may also be marked with the ISI Certification Mark.

**NOTE** — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act, and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

**6. SAMPLING**

**6.1** The method of drawing representative samples of the material and criteria for conformity shall be as prescribed in Appendix G.

**A P P E N D I X A**  
[ *Table 1, Item ( i )* ]**DETERMINATION OF COMPRESSIVE STRENGTH AT  
TEN PERCENT DEFORMATION****A-1. TEST SPECIMEN**

**A-1.1** The test specimen shall be 200 × 200 mm and 50 ± 1 mm thick. The specimen may be prepared by plying up boards not less than 15 mm thick.

**IS : 4671 - 1984****A-2. NUMBER OF TEST SPECIMENS**

**A-2.1** Carry out the determination on five test specimens cut at random from different portions of the test sample.

**A-3. CONDITIONING**

**A-3.1** Condition the test specimens at a temperature of  $27 \pm 2^\circ\text{C}$  for at least 24 hours before testing.

**A-4. APPARATUS**

**A-4.1** Any suitable compression testing machine, capable of operating at a constant rate of motion of the movable head, may be used. It is recommended that one platen may be self-aligning and the dimensions of both platens may be larger than the test specimens so as to give an overlap.

**A-4.2** A load indicating mechanism, which will permit measurement of load to an accuracy of  $\pm 2$  percent.

**A-4.3** A deformation indicating mechanism which will permit measurement to an accuracy of  $\pm 5$  percent of the measured deformation.

**A-4.4** A micrometer dial gauge, callipers or rule suitable for measuring the test specimen to an accuracy of  $\pm 0.5$  percent.

**A-5. PROCEDURE**

**A-5.1** Place the test specimen centrally between two parallel plates of the compression testing machine and compress it at a rate of  $5.0 \pm 0.5$  mm per minute until the test specimen is reduced to 90 percent of its original thickness. Note the maximum load reached during the reduction in thickness.

**A-6. CALCULATION**

**A-6.1** The compressive strength at 10 percent deformation shall be calculated by dividing the load by the original cross-sectional area of the test specimen.

**A-7. REPORT**

**A-7.1** The mean of the five determinations shall be reported as the compressive strength at 10 percent deformation.



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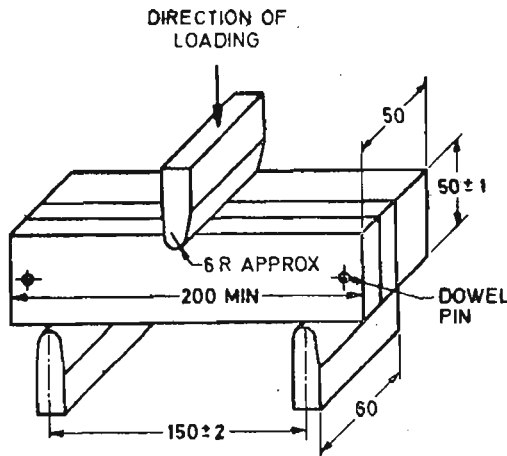
## APPENDIX B

### [ Table 1, Item (ii) ]

### DETERMINATION OF CROSS-BREAKING STRENGTH

#### B-1. TEST SPECIMEN

**B-1.1** The test specimen shall be a rectangular bar not less than 200 mm long. The width and thickness of the test specimen shall be  $50 \pm 1$  mm. The specimen may be prepared by plying up boards not less than 15 mm thick. The load shall be applied, parallel to the plies. The plies may be held together by tape, dowel pins or similar means applied outside the test area, but no adhesive shall be applied to the faces of the plies ( see Fig. 1 ).



All dimensions in millimetres

**FIG. 1 ARRANGEMENT OF TEST SPECIMEN AND LOADING FOR CROSS-BREAKING STRENGTH**

#### B-2. NUMBER OF TEST SPECIMENS

**B-2.1** Carry out the determination on five test specimens cut at random from different portions of the test sample.

#### B-3. CONDITIONING

**B-3.1** Condition the test specimens at a temperature of  $27 \pm 2^\circ\text{C}$  for at least 24 hours before testing.

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**B-4. PROCEDURE**

**B-4.1** Determine the mean width and mean thickness of each specimen by taking the mean of three measurements evenly spaced along the length. If the width or thickness of any specimen varies by more than 1.0 mm along the length, the specimen shall be rejected. Place the specimen symmetrically across two parallel supporting blocks. The contact edges of the supporting blocks shall have a radius of approximately 6 mm and shall not be less than 50 mm long. The distance between the lines of contact of the supports with the specimen shall be  $150 \pm 2$  mm. Apply a load uniformly across the width of the specimen blocks by means of a third block parallel to and midway between the supporting blocks. This is effected by the use of any suitable compression testing machine. The loading block shall act upon the bar at a substantially constant speed of 25 mm per minute. Increase the load steadily so that the specimen fractures and note the load in kilograms at fracture to an accuracy of  $\pm 2$  percent.

**B-5. CALCULATION**

**B-5.1** Cross-breaking strength, in  $\text{kg/cm}^2 = \frac{1.5 W L}{B D^2}$

where

$W$  = load in kg at fracture,

$L$  = distance in cm between supports,

$B$  = mean width in cm of specimen, and

$D$  = mean thickness in cm of specimen.

**B-6. REPORT**

**B-6.1** The mean of the five determination shall be reported as the cross-breaking strength of the test sample material.

## APPENDIX C

[ Table 1, Item (iii) ]

**DETERMINATION OF WATER VAPOUR PERMEANCE****C-0. GENERAL**

**C-0.1** Water vapour permeance of the material is determined for a specimen 50 mm thick. The test shall be carried out at a temperature of  $38.0 \pm 0.5^\circ\text{C}$  with relative humidity of  $90 \pm 2$  percent on one side of the specimen and less than 2 percent on the other side.

**IS : 4671 - 1984****C-1. TEST SPECIMEN**

**C-1.1** The test specimen shall be cylinder of  $50 \pm 1$  mm in height. The diameter shall be such that the specimen can be pushed into the beaker used for test without undue compression on the sides of the specimen. For test specimen less than 50 mm thick, plying up without the use of adhesive, is permissible. It is cut from the board by a sharp-edged, thin hollow cylindrical steel cutter. The flat faces shall be lightly sanded unless they have been freshly cut by means other than a hot wire.

**C-2. NUMBER OF TEST SPECIMENS**

**C-2.1** Carry out the determination on five test specimens cut at random from different portions of the sample.

**C-3. APPARATUS**

**C-3.1 250-ml Glass Beaker** — of approximately 65 mm internal diameter.

**C-3.2 Humidity Cabinet** — maintained at  $38 \pm 0.5^\circ\text{C}$  and  $90 \pm 2$  percent relative humidity.

**C-4. REAGENTS**

**C-4.1 Sealing Wax** — The wax compound used for sealing shall be stable and non-absorbent to water vapour and shall not be brittle at room temperature. It shall strongly adhere to the beaker and the specimen. A suitable composition is a mixture of 90 parts of microcrystalline wax, such as paraffin wax and 10 parts of suitable non-reactant plasticizer, for example, polyethylene film scrap, shredding, etc. The melting point of the sealing wax shall be below  $75^\circ\text{C}$ .

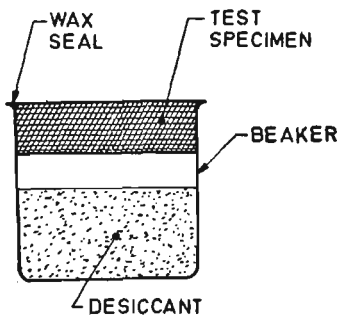
**C-4.2 Anhydrous Calcium Chloride****C-5. PROCEDURE**

**C-5.1** Fill the beaker with anhydrous calcium chloride to about 6 mm below the expected position of the underside of the specimen. The weight of the desiccant shall be at least ten times the total expected take up of water during the test. Insert the specimen in the beaker so that the flat surface of the test specimen remaining exposed to the atmosphere is in level with the tip of the beaker rim. Seal the test specimen in position by running the melted sealing wax around the inner rim of the beaker (see Fig. 2) care being taken not to contaminate the exposed flat surface of the specimen. The temperature of the wax shall not be high enough to soften the specimen. Weigh accurately each assembly to 0.001 g and place it in the humidity cabinet. Weigh successively at intervals of 24

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hours and plot cumulative weight increase against time until at least three points ( excluding the point of origin ) lie on a straight line.

**NOTE** — The beaker shall be kept out of the humidity cabinet for the same length of time and under the same conditions at each successive weighing.



**FIG. 2 ARRANGEMENT OF SPECIMEN FOR WATER VAPOUR PERMEANCE TEST**

### C-6. CALCULATION

**C-6.1** Water vapour permeance ( WVP ) shall be calculated from the slope of the straight line drawn as nearly as possible through those points on the graph which represent a substantially constant rate of gain.

**C-6.2** Water vapour permeance, in  $\text{g/m}^2$  in 24 hours =  $\frac{240 W}{A T}$

where

$W$  = weight increase in milligrams,

$A$  = area of the test specimen in  $\text{cm}^2$ , and

$T$  = time for weight increase in hours.

### C-7. REPORT

**C-7.1** The mean of five determinations shall be reported as the water vapour permeance of the test sample material.

## APPENDIX D

### [ Table 1, Item (iv) ]

### DETERMINATION OF THERMAL STABILITY

#### D-1. TEST SPECIMEN

**D-1.1** The test specimen shall be a rectangular bar of  $300 \times 75 \times 25$  mm and shall be prepared by a fine saw or sharp knife.

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**D-2. NUMBER OF TEST SPECIMENS**

**D-2.1** Carry out the determination on five test specimens cut at random from different portions of the test sample.

**D-3. CONDITIONING**

**D-3.1** Condition the test specimens at a temperature of  $27 \pm 2^\circ\text{C}$  for at least 24 hours before testing.

**D-4. PROCEDURE**

**D-4.1** Mark the test specimen at approximately 250 mm apart, on the central line of the specimen. Place the test specimen flat on an expanded metal shelf in air-circulating oven maintained at  $80 \pm 1^\circ\text{C}$ . Keep the test specimen for seven days. Remove the test specimen after this period from the oven and condition at  $27 \pm 2^\circ\text{C}$  for at least 2 hours. Measure the distance between the gauge marks.

**D-5. CALCULATION**

**D-5.1** Thermal stability, percent =  $100 \frac{l}{L}$

where

$l$  = change in length of the specimen in millimetres, and

$L$  = original length of the specimen in millimetres.

**D-6. REPORT**

**D-6.1** The mean of five determinations shall be reported as the thermal stability of the test sample material.

**APPENDIX E**

[ *Table 1, Item (v)* ]

**DETERMINATION OF WATER ABSORPTION**

**E-0. GENERAL**

**E-0.1** This method covers the determination of water absorption of rigid cellular plastics by measuring the change in the buoyant force resulting from immersion of a specimen under a 50 mm head of distilled water for 7 days. Corrections are specified to take into account any change in volume of the specimen and also to correct for the volume of water in the cut surface cells of the specimen. Water absorption is expressed as a percentage by volume as it is of significance in use of cellular plastics.

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**E-1. TEST SPECIMEN**

**E-1.1 Dimensions** — The test specimens for cellular plastics shall be cubes with edges of  $50 \pm 50$  mm. The distance between two faces shall not vary more than 1 percent (tolerance for parallelism).

**E-1.2 Preparation and Conditions** — Free the specimens from any moulding skin, cut their faces with a mechanical saw, machine them, if necessary, without modifying the original structure of the product and remove any dust.

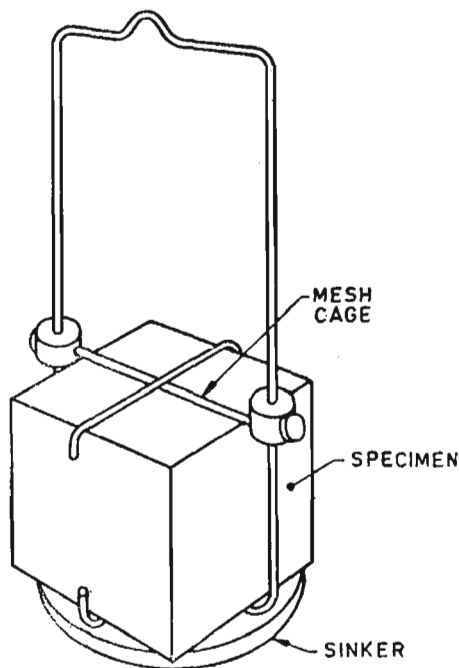
Dry the specimens in a desiccator at room temperature until the results of two successive weighings at intervals of at least 12 h, do not vary more than 1 percent of their mean.

**E-1.3 Number of Specimen** — At least three specimens should be tested.

**E-2. APPARATUS**

**E-2.1 Balance** — accurate to 0.01 g.

**E-2.2 Mesh Cage** — made of a stainless material not attacked by distilled water and large enough to contain the specimens. A sinker of approximately 125 grams in mass (to compensate for the upthrust of the test specimens) shall be attached to the base of the cage. The cage shall be fitted with a means of suspending it from the balance (see Fig. 3).



**FIG. 3 SPECIMEN PLACED IN THE MESH CAGE**

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**E-2.3** Cylindrical vessel, approximately 3 litres in volume, 120 mm in diameter and 240 mm in height.

**E-2.4 Distilled Water** — de-aerated.

**E-2.5** Low-permeability plastic film, for example, polyethylene.

**E-3. PROCEDURE**

**E-3.1** Fill the cylindrical vessel with de-aerated distilled water at room temperature. Weigh the specimen to the nearest 0.01 gram ( mass ml ). Immerse the assembled cage, remove any bubbles, attach it to the balance and determine the apparent mass (  $m^s$  ) to the nearest 0.01 gram.

**E-3.1.1** Place the specimen in the cage, reimmerse the cage so that the distance between the surface of water and the base of the specimen is approximately 100 mm. Remove obvious air bubbles from the specimen with a brush or by agitation.

**E-3.1.2** After 7 days or other agreed immersion period, determine the apparent mass (  $m^s$  ) to the nearest 0.01 gram of the submerged cage containing the specimen. Between weighing, cover the cylindrical vessel with a low permeability plastic film.

**E-3.2** After the immersion period, if the specimen shows no evidence of non-uniform deformation proceed as follows.

**E-3.2.1** Remove the specimen from water and remeasure its dimensions. The correction for uniform swelling of the specimen  $S_0$  is:

$$S_0 = \frac{V_1 - V_0}{V_0}$$

where

$V_0$  = the original volume of the specimen ( **E-4.1** ),

$$V_1 = \frac{d_1 \cdot l_1 \cdot b_1}{1000}$$

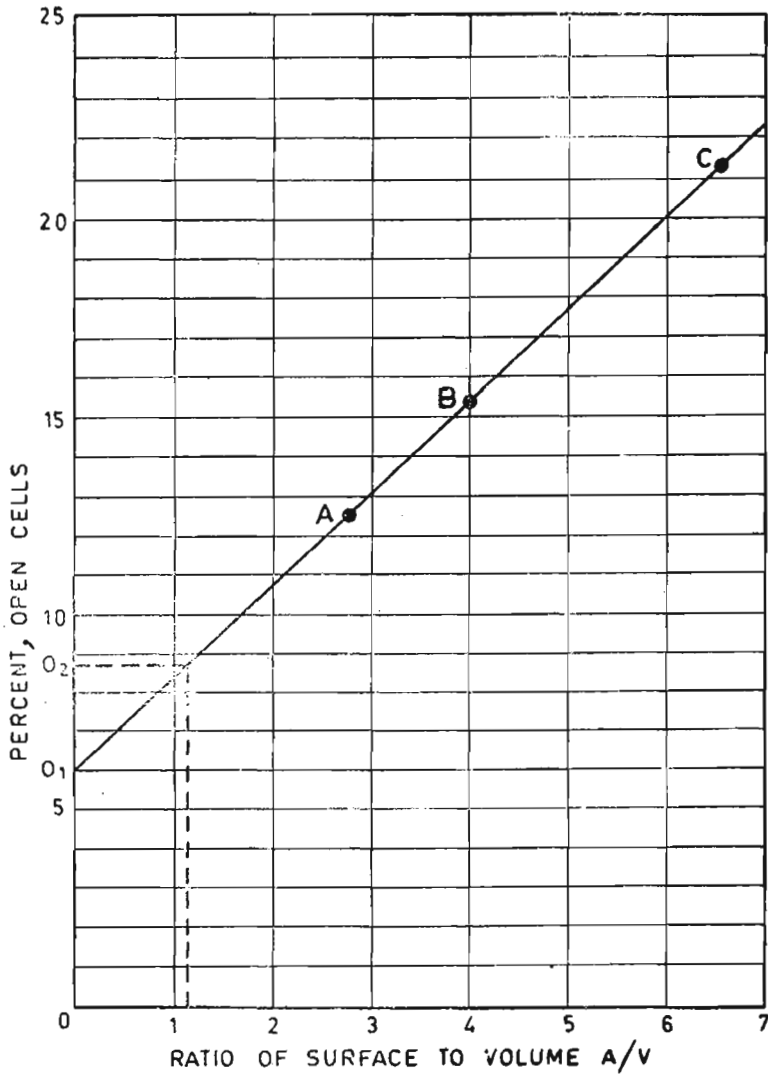
$d_1$  being the specimen thickness in millimetres after immersion,

$l_1$  being the specimen length in millimetres after immersion, and

$b_1$  being the specimen width in millimetres after immersion.

**E-3.2.2** For the correction of the volume of water in the cut surface cells, proceed as follows.

**E-3.2.2.1** Determine the percentage of open cell as a function of the ratio of surface to volume of the specimen for at least three specimens obtained from the same original sample of material as the water absorption specimens ( *see* Fig. 4 ).



(A is the specimen total surface area in square centimetres; V is the specimen volume in cubic centimetres.)

FIG. 4 PERCENTAGE OF OPEN CELLS AS A FUNCTION OF THE SURFACE TO VOLUME RATIO OF THE SPECIMEN



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**E-3.2.2.2** From this graph, determine the correction factor  $C$  for cut surface cells as follows.

Read of  $\theta_1$  = percentage open cells for ratio of surface to volume.

Read of  $\theta_2$  = percentage open cells for ratio of surface to volume of water absorption specimen  $\frac{A}{V_0}$  ( see **E-4.1** and **E-4.2** )

$$C = \frac{\theta_2 - \theta_1}{100}$$

**E-3.3** If the specimens show any evidence of non-uniform deformation, proceed as follows.

**E-3.3.1** Obtain a cylindrical vessel similar to the one described in **E-2.3** but fitted with an overflow. Fill this vessel with water until it runs from the overflow. When the water level has stabilised, place a graduated receptacle of at least 150 ml capacity under the overflow. This receptacle must be capable of allowing the volume of water deposited in it to be measured to  $\pm 0.5$  ml.

**E-3.3.2** Remove the specimen and cage from the original vessel. Allow to drain for approximately 2 minutes ( until the surface water has drained ). Carefully immerse the specimen and cage in the filled vessel and determine the volume of water displaced (  $V_2$  ). Repeat this procedure with the empty cage to determine its volume (  $V_3$  ). The combined swelling and surface correction factor is:

$$S_1 = \frac{V_2 - V_3 - V_0}{V_0}$$

where

$V_0$  = is the original volume of the specimen obtained in **E-4.1**.

**E-4. CALCULATION**

**E-4.1** Calculate the original volume of the specimen.

$$V_0 = \frac{d.l.b}{1\ 000}$$

where

$V_0$  = the original specimen volume in cubic centimetres;

$d$  = the original specimen thickness, in millimetres;

$l$  = the original specimen length, in millimetres; and

$b$  = the original specimen width, in millimetres.

**IS : 4671 - 1984****E-4.2** Calculate the surface area of the specimen.

$$A = \frac{(l.b + l.d + b.d)}{50}$$

where

 $A$  = the original surface area in square centimetres.**E-4.3** Calculate the water absorption, expressed as a percentage by volume ( $WA_v$ ).**E-4.3.1** If the specimen has not deformed non-uniformly and the procedures in **E-3.2** were followed:

$$WA_v = \frac{m_s + (1 + S_0 - C) V_0 - (m_1 + m_2)}{V_0} \times 100$$

**E-4.3.2** If the specimen deformed and the procedure in **E-3.3** was used:

$$WA_v = \frac{m_s + (1 + S_1) V_0 - (m_1 + m_2)}{V_0} \times 100$$

**E-5. TEST REPORT****E-5.1** The test report shall include the following:

- Description of material including density,
- The method of obtaining the test specimen,
- The number of specimens used,
- The individual results and mean expressed as a percentage by volume,
- The correction procedures used and their magnitude expressed as a percentage by volume, that is,

$$S_0 \times 100$$

$$S_1 \times 100$$

$$C \times 100$$

- The time of immersion, and
- If evaluated, a graph of absorption against time.

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## **APPENDIX F** ( *Clause 4.5.1* )

### **TEST FOR FLAMMABILITY**

#### **F-1. TEST SPECIMEN**

**F-1.1** The test specimen shall be  $200 \times 25 \times 10$  mm. It may be prepared by means of a fine toothed saw or by hot wire, and shall be marked with lines at 50 and 75 mm from one end.

#### **F-2. NUMBER OF TEST SPECIMENS**

**F-2.1** Carry out the test on five test specimens cut at random from different portions of the test sample.

#### **F-3. CONDITIONING**

**F-3.1** Condition the test specimens at a temperature of  $27 \pm 2^\circ\text{C}$  and  $65 \pm 5$  percent relative humidity for at least 48 hours before testing.

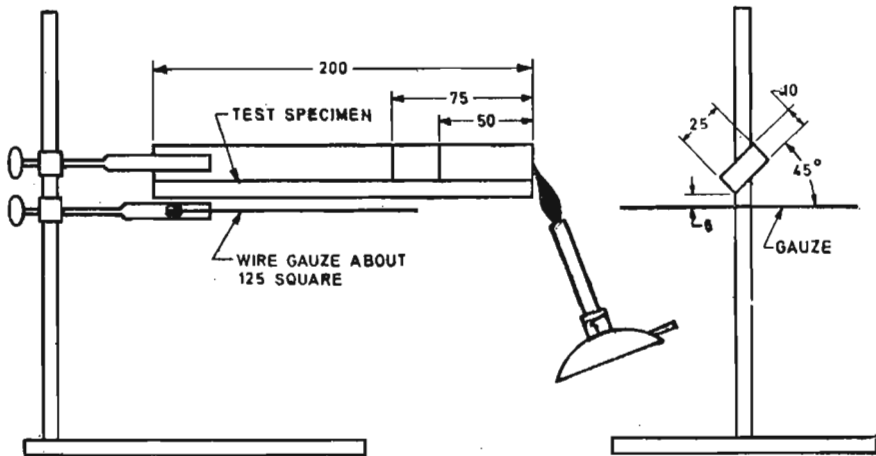
#### **F-4. PROCEDURE**

**F-4.1** The specimen shall be tested in a draught-free atmosphere. Clamp the specimen in a rigid support ( *see* Fig. 3 ), at the end farthest from the 60-mm mark, with its longitudinal axis horizontal and traverse axis inclined at  $45^\circ$  to the horizontal. Clamp 1-mm aperture wire gauze, 125 mm square 6 mm below the edge of the specimen. Place a 10-mm barrel Bunsen burner fitted with 50 mm nominal width batts wing top and gas supply. The non-luminous flame without central core shall be about 2 cm long. The Bunsen burner shall be held in such a way that its level shall be below the plane of the wire gauze. The Bunsen burner shall be held at an angle ( approximately  $45^\circ$  ) and parallel to the slope of the specimen to prevent the material dripping into the tube. Maintain the flame in contact with the specimen until the specimen burns or melts away to the 50-mm mark. Then remove the flame immediately. If the specimen does not burn beyond the second mark, it shall be classed as self-extinguishing.

#### **F-5. REPORT**

**F-5.1** If all the five test specimens do not burn beyond the second mark, the material shall be reported self-extinguishing.

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All dimensions in millimetres.

FIG. 5 SPECIMEN UNDER FLAMMABILITY TEST

**APPENDIX G**  
( Clause 6.1 )

**SAMPLING OF EXPANDED POLYSTYRENE FOR THERMAL INSULATION PURPOSES**

**G-1. SCALE OF SAMPLING**

**G-1.1 Lot** — In a single consignment all the items of the same type, shape and dimensions belonging to the same batch of manufacture shall be grouped together to constitute a lot.

**G-1.2** For the purpose of judging conformity to the requirements of this specification each lot shall be considered separately. The number of sample items for this purpose shall depend on the size of the lot and shall be in accordance with col 1 and 2 of Table 2.

**G-1.3** The sample items shall be taken at random from the lot. In order to ensure randomness of selection, random number tables shall be used. In case random number tables are not available, the following procedure may be adopted:

Starting from any item count all the items in the lot as 1, 2, 3, ..... up to  $r$  and so on in one order. Every  $r$ th item thus counted shall be withdrawn as sample item,  $r$  being the integral part of  $N/n$  where  $N$  is the number of items in the lot and  $n$  is the number of sample items to be selected.

**IS : 4671 - 1984****TABLE 2 SCALE OF SAMPLING***( Clause G-1.2 )*

NUMBER OF ITEMS IN THE LOT	NUMBER OF SAMPLE ITEMS	PERMISSIBLE NUMBER OF DEFECTIVE SAMPLE ITEMS
<i>N</i>	<i>n</i>	<i>a</i>
(1)	(2)	(3)
Up to 25	3	0
26 ,, 100	5	0
101 ,, 300	8	0
301 ,, 1 000	13	0
1 001 ,, 3 000	20	1
3 001 and above	32	2

**G-2. NUMBER OF TEST AND CRITERIA FOR CONFORMITY**

**G-2.1** All the sample items selected from the lot in accordance with **G-1.2** and **G-1.3** shall be tested for all the requirements of this specification. Any item failing in one or more of the requirements shall be regarded as defective.

**G-2.2** The lot shall be declared as conforming to the requirements of this specification if the number of defective sample items does not exceed the corresponding permissible number ' *a* ' given in col 3 of Table 2.

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