

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

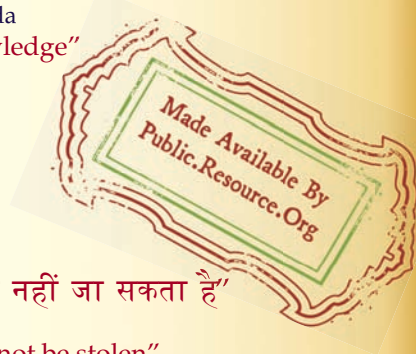
IS 11307 (1985): Cellular glass block and pipe thermal insulating [CHD 27: Thermal Insulation]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



Indian Standard
SPECIFICATION FOR
CELLULAR GLASS BLOCK AND
PIPE THERMAL INSULATION

UDC 666.1 — 431 — 405.8 : 662.998



© Copyright 1986

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR CELLULAR GLASS BLOCK AND PIPE THERMAL INSULATION

Thermal Insulation Materials Sectional Committee, CDC 37

Chairman

DR B. C. RAYCHAUDHURI

Representing

Indian Institute of Technology, Delhi

Members

SHRI U. C. AGRAWAL	Synthetic Foams Ltd, New Delhi
SHRI RAJEEVA KANSAL (<i>Alternate</i>)	
SHRI M. BALASUBRAMANIAM	BASF India Limited, Bombay
SHRI R. N. GANJOO (<i>Alternate</i>)	
CHEMIST & METALLURGIST	RDSO, Ministry of Railways, Lucknow
ASSTT RESEARCH OFFICER	
(CM-II) (<i>Alternate</i>)	
SHRI N. N. GOYAL	Fibreglass Pilkington Ltd, Bombay
SHRI G. K. TAKIAR (<i>Alternate</i>)	
SHRI A. K. GUPTA	Hyderabad Asbestos Cement Products Ltd, Hyderabad
SHRI K. V. GURUSWAMY	Indian Oil Corporation, New Delhi
SHRI R. K. LAKHANPAL (<i>Alternate</i>)	
SHRI A. V. HINGORANI	Steel Authority of India Ltd, Ranchi
SHRI B. S. VANKATARAMIAH	
(<i>Alternate</i>)	
SHRI I. K. KAPOOR	Directorate General of Technical Development, New Delhi
SHRI K. V. SAMPATH (<i>Alternate</i>)	
SHRI A. S. R. MURTHY	Ministry of Energy, New Delhi
SHRI S. M. C. PILLAI	National Thermal Power Corporation, New Delhi
SHRI RAM GOPAL (<i>Alternate</i>)	
DR M. PRASAD	Central Mechanical Engg Research Institute (CSIR), Durgapur
SHRI R. N. BANERJEE (<i>Alternate</i>)	
SHRI R. P. PUNJ	Punj Sons Pvt Ltd, New Delhi
SHRI J. K. CHOPRA (<i>Alternate</i>)	
SHRI P. K. REDDY	Mettur Beardsell Ltd, Madras
SHRI S. RAVINDRAN (<i>Alternate</i>)	

(Continued on page 2)

© Copyright 1986

INDIAN STANDARDS INSTITUTION

This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(Continued from page 1)

<i>Members</i>	<i>Representing</i>
DR H. C. ROY	Projects & Development India Ltd, Sindri
SHRI S. P. S. KHALSA (Alternate)	
SHRI R. SHANKARAN	Bharat Heavy Electricals Ltd, Hyderabad
SHRI D. S. UPADHYAYA (Alternate I)	
SHRI B. K. DUBEY (Alternate II)	
DR G. K. SHARMA	Indian Institute of Technology, Bombay
SHRI N. SRINIVAS	Lloyd Insulations (India) Pvt Ltd, New Delhi
SHRI C. P. KHANNA (Alternate)	
SHRI V. A. SURA	Newkem Products Corporation, Bombay
SHRI NIMISH V. SURA (Alternate)	
SHRI T. UDAYAKUMAR	PIBCO Ltd, New Delhi
SMT U. ROY (Alternate)	
DR V. V. VERMA	Central Building Research Institute (CSIR), Roorkee
SHRI S. P. JAIN (Alternate)	
SHRI V. P. WASAN	National Physical Laboratory (CSIR), New Delhi
SHRI K. N. BHATNAGAR (Alternate)	
SHRI SATISH CHANDER, Director (Chem)	Director General, ISI (Ex-officio Member)

Secretary

SHRI P. S. ARORA
Senior Deputy Director (Chem), ISI

Panel for Castable and Preformed Thermal
Insulation Products, CDC 37:P4

Convener

SHRI V. A. SURA Newkem Products Corporation, Bombay

Members

DR K. K. AGARWAL	Central Building Research Institute (CSIR), Roorkee
SHRI B. CHATTERJEE	Projects & Development India Ltd, Sindri
DR H. C. ROY (Alternate)	
SHRI N. R. GANJOO	BASF India Ltd, Bombay
SHRI B. JOSHI (Alternate)	
SHRI A. K. GUPTA	Hyderabad Asbestos Cement Products Ltd, Hyderabad
SHRI M. SAMBASIVA RAO (Alternate)	
SHRI C. L. KASLIWAL	Hindustan Housing Factory Ltd, New Delhi
SHRI B. L. MODI	Greek Insulations Chemicals Pvt Ltd, Bombay
SHRI K. A. SURA (Alternate)	
SHRI R. P. PUNJ	Punj Sons Pvt Ltd, New Delhi
SHRI J. K. CHOPRA (Alternate)	

(Continued on page 9)

Indian Standard

SPECIFICATION FOR CELLULAR GLASS BLOCK AND PIPE THERMAL INSULATION

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 24 June 1985, after the draft finalized by the Thermal Insulation Materials Sectional Committee had been approved by the Chemical Division Council.

0.2 In the preparation of this standard considerable assistance has been derived from ASTM C 552-73 'Standard specification for cellular glass block and pipe thermal insulation', published by the American Society for Testing and Materials.

0.3 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for cellular glass block and pipe thermal insulation intended for use on surfaces operating at temperatures between -200°C and 425°C .

2. TERMINOLOGY

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

3. REQUIREMENTS

3.1 General — The material shall consist of a glass composition that has been formed or cellulated under molten conditions, annealed, and set to form a rigid incombustible material with hermetically-sealed cells. The

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

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

material shall be trimmed into blocks of standard dimensions or commercial sizes. It shall not have visible defects that may adversely effect its service qualities.

3.2 Bulk Density — The average bulk density of the material shall be $160 \pm 15 \text{ kg/m}^3$ when tested in accordance with the method prescribed in 4 of IS:5688-1970*, except that drying is not necessary.

3.3 Thermal Conductivity — The average thermal conductivity of the material when tested as prescribed in IS:3346-1980† shall be as given below:

<i>Mean Temperature</i>	<i>Thermal Conductivity, Max</i>
°C	W/mK
150	0.082
65	0.064
0	0.048
—65	0.043

3.4 Compressive Strength — The average compressive strength of the material shall be not less than 520 kPa when tested in accordance with the method prescribed in 6 of IS:5688-1970* with the following exceptions.

3.4.1 It is not necessary to dry the specimens.

3.4.2 Each of the two parallel bearing surfaces of the specimens shall be plane. If necessary, rub them on a suitable abrasive surface to produce the required flat surface.

3.4.3 The test specimens shall preferably be $229 \times 305 \text{ mm}$ by nominal received thickness. The specimen shall be taken from any one of four equal area quadrants of the preformed block. The report shall include the sample size.

3.4.4 Cap both bearing surfaces of the specimens as follows: Coat one surface with molten asphalt pre-heated to $175 \pm 15^\circ\text{C}$ filling the surface cells to the extent that the coating application rate is approximately 1.2 kg/m^2 . Immediately press the hot coated block onto a precut piece of 0.73 kg/m^2 roofing felt paper, lying on a flat surface. Properly capped surfaces should be approximately plane and parallel. Set the specimens on edge, exposing both capped surfaces to room temperature for a minimum of 15 minutes to allow the asphalt to harden before testing.

NOTE—It has been found extremely convenient to employ a partially submerged roll for applying the asphalt.

*Methods of test for preformed block-type and pipe-covering type thermal insulation.

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

3.5 Flexural Strength — The average minimum flexural strength of the material shall be 410 kPa when tested in accordance with 5 of IS: 5688-1970* with the following exceptions.

3.5.1 It is not necessary to dry the specimens.

3.5.2 Place bearing bars 13×25 mm on top of the specified cylindrical bearing edges, with the 25-mm surface in contact with the specimens.

3.5.3 Place two thicknesses of medium-mass (0.5 mm thick) blotting paper between the bearing bars and the specimens.

3.5.4 Measure the distance between the supports from centre to centre of the bearing bars.

3.6 Water Absorption — The average water absorption by the material shall be not more than 0.6 percent by volume, when tested in accordance with the method prescribed in Appendix A.

3.7 Standard Shapes, Sizes and Dimensional Tolerances — Cellular glass block and pipe thermal insulation shall be supplied in form of flat blocks and pipe sections. Special shapes may also be supplied, as agreed to between the purchaser and the supplier.

3.7.1 Flat Blocks — Blocks shall be of rectangular sections and shall be true to form and dimension, the corners square and the sides and edges parallel. Sizes and thickness shall be as given below, and the tolerance on each nominal dimension shall be ± 1.6 mm.

Length	450 or 600 mm
Width	300 or 450 mm
Thickness	25, 40, 50, 60, 75, 100 or 125 mm.

3.7.2 Pipe Sections — Pipe sections shall be supplied, with or without facing as agreed to between the purchaser and the supplier, as hollow cylindrical shapes split in half lengthwise (in plane including the cylindrical axis) or as curved segments. The insulation shall be furnished in sections or segments of dimensions given below, and the tolerance on each nominal dimensions shall be ± 3.2 mm:

Length	450 or 600 mm
Diameter	To fit standard pipes of external dia up to 219 mm
Thickness	20, 25, 40, 50, 60, 75 or 100 mm.

NOTE—All thicknesses may not be available for a specific pipe diameter. Thickness greater than 100 mm may be furnished in two layers.

*Methods of test for preformed block-type and pipe-covering type thermal insulation.

3.7.3 Special Shapes — Dimensions and tolerances on nominal dimensions of special shapes shall be as agreed to between the purchaser and the supplier.

3.7.4 Uniformity — The local thickness of the insulation material at any point shall not vary from the average thickness by more than ± 3 mm.

4. PACKING

4.1 The material shall be packed as agreed to between the purchaser and the supplier.

5. MARKING

5.1 The material shall be marked with the following information:

- a) Name of the material;
- b) Manufacturer's name or trade-mark, if any;
- c) Shape and size;
- d) Quantity of material; and
- e) Details of facing, if any.

5.1.1 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 sampling shall be as prescribed in Appendix B.

A P P E N D I X A

(Clause 3.6)

DETERMINATION OF WATER ABSORPTION

A-1. PROCEDURE

A-1.1 Carefully measure the thickness, width, and length of a full-size cellular glass block, approximately $50 \times 300 \times 450$ mm and calculate the volume.

A-1.2 Carefully weigh the test specimen to the nearest gram, then submerge it horizontally under 25 mm of water maintained at $27 \pm 2^\circ\text{C}$. After submerging it for 2 h, set the specimen on end to drain for 10 min at the end of which time remove the excess surface water by hand with a sponge or blotting paper, and weigh the specimen immediately.

A-2. CALCULATION

A-2.1 Calculate the volume of water absorbed and express the water absorption as a percentage by volume based on the initial volume.

A P P E N D I X B

(*Clause 6.1*)

SAMPLING OF CELLULAR GLASS BLOCK AND PIPE THERMAL INSULATION

B-1. SCALE OF SAMPLING

B-1.1 Lot — All units of the insulation in a single consignment, containing material of the same shape, same size, similar dimensions and belonging to the same batch of manufacture, shall be grouped together and each such group shall constitute a lot.

B-1.2 For ascertaining the conformity of the material to the requirements of the specification, samples shall be tested from each lot separately.

B-1.3 The number of units to be selected from the lot depend on the size of the lot and shall be in accordance with Table 1.

B-1.3.1 These units shall be selected at random. In order to ensure the randomness of selection, procedures given in IS:4905-1968* may be followed.

B-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

B-2.1 General Requirements, Shape, Size and Dimensions — From each of the units selected from the lot according to col 1 and 2 of Table 1, an item shall be taken at random. Each of these items shall be examined for visual and dimensional characteristics given in 3.1, and 3.7. An item failing to satisfy any of these requirements shall be considered as defective. The lot shall be considered to have satisfied these requirements, if the number of defectives found in the sample is less than or equal to the corresponding acceptance number given in col 3 of Table 1. The lot having been found satisfactory for these requirements shall be further tested for bulk density and water absorption.

*Methods for random sampling.

**TABLE 1 SCALE OF SAMPLING AND PERMISSIBLE
NUMBER OF DEFECTIVES**

(Clause B-1.3)

NO. OF UNITS IN THE LOT	FOR GENERAL REQUIREMENTS SHAPE, SIZE AND DIMENSIONS		FOR BULK DENSITY AND WATER ABSORPTION		FOR COMPRES- SIVE STRENGTH AND FLEXURAL STRENGTH		FOR THERMAL CONDUCT- IVITY
	Sample Size	Accept- ance No.	Sample Size	Accept- ance No.	Sample Size	Accept- ance No.	Sample Size
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Up to 300	20	2	8	0	3	0	2
301 to 500	32	3	13	0	5	0	3
501 to 1 000	50	5	20	1	8	0	4
1 001 to 3 000	80	7	32	2	13	0	5
3 001 and above	125	10	50	3	20	1	6

B-2.2 Bulk Density and Water Absorption — The number of items given in col 4 of Table 1 shall be taken from those already tested and found satisfactory under B-2.1. These items shall be tested for bulk density (3.2) and water absorption (3.6). An item failing to satisfy any of these requirements shall be considered as defective. The lot shall be considered to have met these requirements, if the number of defectives found in the sample is less than or equal to the corresponding acceptance number given in col 5 of Table 1. The lot having been met these requirements shall be further tested for compressive strength and flexural strength (see B-2.3).

B-2.3 Compressive Strength and Flexural Strength — The number of items given in col 6 of Table 1 shall be taken from those already examined and found satisfactory under B-2.1. These items shall be tested for compressive strength (3.4) and flexural strength (3.5). Any item failing to meet any of these requirements shall be considered as defective. The lot shall be deemed to have met these requirements, if the number of defectives found in the sample is less than or equal to the corresponding acceptance number given in col 7 of Table 1. The lot which has been found to have met these requirements shall be finally tested for thermal conductivity (see B-2.4).

B-2.4 Thermal Conductivity — The number of items given in col 8 of Table 1 shall be taken from those already examined and found satisfactory under B-2.1. The lot shall be declared as conforming to the requirements of the specification if none of the sample tested for thermal conductivity fails, otherwise not.

(Continued from page 2)

*Members**Representing*

SHRI H. V. SHAH	Mona Chemicals, Bhavnagar
SHRI R. I. PATEL (<i>Alternate</i>)	
SHRI R. SHANKARAN	Bharat Heavy Electricals Ltd, Hyderabad
SHRI A. SHARIF	Fibreglass Pilkington Ltd, Bombay
SHRI G. K. TAKIAR (<i>Alternate</i>)	
SHRI N. SRINIVAS	Llyod Insulations (India) Pvt Ltd, New Delhi
SHRI C. P. KHANNA (<i>Alternate</i>)	
SHRI B. G. SHIRKE	Siporex India Ltd, Pune
SHRI R. T. PAWAR (<i>Alternate</i>)	

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>	<i>Definition</i>
Force	newton	N	1 N = 1 kg. m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²