IS : 6598 - 1972

Reaffirmed 1980

Indian Standard

(Reaffirmed 1995)

SPECIFICATION FOR CELLULAR CONCRETE FOR THERMAL INSULATION

(Second Reprint OCTOBER 1987)

UDC 662.998:666.973.6

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

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November 1972

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SPECIFICATION FOR CELLULAR CONCRETE FOR THERMAL INSULATION

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SPECIFICATION FOR CELLULAR CONCRETE FOR THERMAL INSULATION

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 June 1972, after the draft finalized by the Thermal Insulation Materials Sectional Committee had been approved by the Chemical Division Council.

0.2 Cellular concrete is a versatile thermal insulation material on account of its light weight and high thermal insulation. Its versatility is due to its resistance to sulphate action, resistance to alternate cooling and thawing (when high pressure steam cured) and due to its resistance to penetration of water.

0.3 When cast *in-situ*, it can be applied over flat roofs as thermal insulation material.

0.4 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.

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1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for cellular concrete for thermal insulation.

2. TYPES AND GRADES

2.1 Types — There shall be two types of the material depending on the manner of manufacture, namely:

Type 1 — High pressure steam cured (autoclaved) material in the form of precast blocks.

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

Type 2 — Materials cured under natural conditions (that is, under ambient pressure and temperature) by water. The material may be either cast *in-situ* or may be in the form of precast blocks.

2.2 Grades — Each of these two types of the material shall have three grades, namely:

Grade A — Light weight cellular concrete;

Grade B — Medium weight cellular concrete; and

Grade C — Heavy weight cellular concrete.

3. MATERIALS

3.1 Aggregate — A variety of silicious fines, such as ground quartz, sand, shale, fly ash and granulated slag may be used in the manufacture of cellular concrete.

3.2 Binders — Portland cement conforming to IS : 269-1967* or lime shall be used.

3.3 Gassing Agents — Organic foaming agents based on resin soap, glue, surface active agents, or fine aluminium powder, zinc, dust, calcium carbide, calcium hypochlorite, etc, may be used for gassing the concrete.

3.4 Water — The water used for making the concrete shall be clean and free from any matter injurious to the durability of cellular concrete.

4. REQUIREMENTS

4.1 Description — Cellular concrete is a light weight concrete formed by producing gas or air bubbles in a cement slurry or a cement-sand slurry.

4.2 Density — The average bulk density of the three grades of the material shall be as given below when tested in accordance with the method prescribed in **4** of IS : 5688-1970†:

Grade	*Density*
A	Up to 300 kg/m^3
B	301 to 400 kg/m^3
C	401 to 500 kg/m^3

*Specification for ordinary, rapid-hardening and low heat Portland cement (*second revision*).

†Method of test for preformed block-type and pipe covering-type thermal insulation.

4.3 Crushing Strength — The crushing strength of dry cellular concrete shall be as given below when tested in accordance with the method as prescribed in **6** of IS : 5688-1970*:

Grade	*Strength, kg/cm²*	
	Type 1	Type 2
A	7·0	4·5
B	12	6·0
C	20	9·0

4.4 Capillary Absorption — The capillary absorption shall not exceed 20 percent in case of Type 1 cellular concrete when tested in accordance with the method prescribed in Appendix A.

4.5 Thermal Conductivity — The thermal conductivity of the material shall be as given below when determined in accordance with the method prescribed in IS : 3346-1966†:

Grade	*Thermal Conductivity in mW/cm deg at 50°C Mean Temperature, Max*
A	0·7
B	0·85
C	1·0

4.6 Dimensions — The dimensions of the Type 1 and Type 2 precast cellular concrete blocks shall be either 50 or 60 cm in length; 20, 25 or 30 cm in width; and 7·5, 10, 15, 25 or 40 cm in thickness.

4.6.1 A tolerance of ± 3 percent shall be allowed on width and height and ± 1 percent on thickness.

5. MARKING

5.1 Each block shall be marked with the manufacturer's identification mark or initials and the type and grade of the material.

5.1.1 Each block may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard 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 BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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

†Method for the determination of thermal conductivity of thermal insulation materials two slab, guarded hot-plate method).

6. SAMPLING

6.1 The method of sampling shall be as prescribed in Appendix B.

APPENDIX A

(*Clause* 4.4)

CAPILLARY ABSORPTION TEST

A-1. TEST SPECIMENS

A-1.1 Three test specimens 4 × 4 cm base and 16 cm height shall be prepared.

A-2. PROCEDURE

A-2.1 Dry the specimens in an oven at 105 ± 5°C and weigh them. Place them on their bases in a water-bath with the water level 1 cm above the base of the specimen. The specimen shall be weighed a few times during the test. Allow them to stand for 48 hours in the water and determine their masses.

A-3. CALCULATION

$$\text{Capillary absorption, percent by mass} = \frac{w}{W} \times 100$$

where

w = increase in mass in g of the specimen, and

W = mass in g of the specimen after drying.

APPENDIX B

(*Clause* 6.1)

SAMPLING OF CELLULAR CONCRETE BLOCKS

B-1. LOT

B-1.1 In a consignment, cellular concrete of the same type and grade and manufactured approximately in the same period shall be grouped to form a lot. If it is in the form of blocks, a lot shall be made up of not more

than 1 000 blocks. If the material is *in-situ*, not more than 10 tonnes of material shall constitute a lot. If the material is transported in lorries and received as such, the material in a lorry (or vehicle) load may conveniently be termed as a lot.

B-2. SCALE OF SAMPLING

B-2.1 Each lot shall be tested for all the requirements of this specification.

B-2.2 If the material is received in bulk, samples shall be drawn from different portions so as to be representative of the lot. It is recommended that at least 20 increments, each weighing about 1 kg be taken from the bulk and kept for conducting various tests.

B-2.3 If the lot is made up of precast blocks, the number of blocks to be sampled depends upon the size of the lot and shall be in accordance with col 1 and 2 of Table 1.

B-2.3.1 The sample blocks shall be selected at random with the help of random number tables. For guidance IS : 4905-1968* may be referred.

TABLE 1 SCALE OF SAMPLING FOR CELLULAR CONCRETE BLOCKS

(*Clause* B-2.3)

Lot Size	Sample Size (Blocks to be Sampled)	Permissible No. of Defectives (Visual and Dimensional Requirements)
N	*n*	*a*
(1)	(2)	(3)
Up to 100	5	0
101 to 300	8	0
301 ,, 500	13	0
501 ,, 1 000	20	1

B-3. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

B-3.1 Visual and Dimensional Requirements — In respect of visual and dimensional characteristics (**4.6**), the sample blocks selected according to **B-2** shall be examined. The lot shall be accepted only if the number of defective blocks in the sample does not exceed the permissible number (*a*) given in col 3 of Table 1.

B-3.2 Preparation of Samples for Other Tests — In case of the material in bulk form, the increments shall be grouped into four portions

*Methods for random sampling.

and the material in each portion shall be combined thoroughly to give a test sample. There will thus be four test samples to be used for different tests. In the case of precast blocks four test samples shall be prepared from the sample blocks selected under **B-2.**

B-3.3 Density and Crushing Strength — Four tests shall be conducted for each of the two characteristics on test samples or blocks mentioned in **B-3.2.** No failure shall occur if the lot is to be accepted.

B-3.4 Thermal Conductivity — One test shall be conducted for this characteristics on test samples prepared under **B-3.2.** The test shall not fail for acceptance of the lot.

B-3.5 Capillary Absorption — One test shall be conducted on any one of the test samples and the lot shall be accepted if the test result complies with the requirement in **4.4.**

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Reprography Unit, ISI, New Delhi, India

AMENDMENT NO. 1 AUGUST 1981

TO

IS:6598-1972 SPECIFICATION FOR CELLULAR CONCRETE FOR THERMAL INSULATION

Alterations

(*Page 4, clause 4.2*) - Substitute the following for the existing clause:

'4.2 Density - The average bulk density of the three grades of the material shall be as given below when tested in accordance with the method prescribed in 4 of IS:5688-1970†:

Grade	*Density*, kg/m^3
A	Up to 320
B	321 to 400
C	401 to 500 '

(*Page 5, clause 4.3*) - Substitute the following for the existing clause:

'4.3 Crushing Strength - The crushing strength of dry cellular concrete shall be as given below when tested in accordance with the method prescribed in 6 of IS:5688-1970*:

Grade	*Strength, Min, kg/cm*^{2}	
	Type 1	Type 2
A	7.0	2.5
B	12.0	4.5
C	20.0	8.0 '

(CDC 37)

Reprography Unit, ISI, New Delhi, India

AMENDMENT NO. 2 AUGUST 2000
TO
IS 6598 : 1972 SPECIFICATION FOR CELLULAR CONCRETE FOR THERMAL INSULATION

[*Page* 4, *clause* **4.2** (*see also Amendment No.* 1)]— Substitute the following for the existing clause:

'**4.2 Density** — The average bulk density of the material shall be as given below when tested in accordance with the method prescribed in 4 of IS 5688 : 1982† :

Grade	*Density, kg/m*^{3}
A	Minimum 320
B	321 to 400
C	401 to 500'

(*Page* 4, *footnote marked* †) — Substitute the following for the existing footnote:

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

[*Page* 5, *clause* **4.3** (*see also Amendment No.* 1, *line* 3)] — Substitute '5688 : 1982*' *for* 'IS : 5688 - 1970*'.

(*Page* 5, *footnote marked* '*') — Substitute the following for the existing footnote:

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

(CHD 27)

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