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मानक

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Mazdoor Kisan Shakti Sangathan

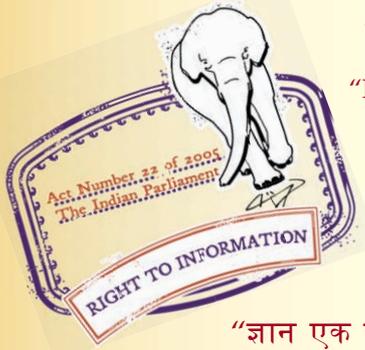
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 12894 (2002): Pulverized Fuel Ash-Lime Bricks - [CED 4: Building Limes and Gypsum Products]



“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”

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भारतीय मानक
ईंधन राख-चूने की ईंटें – विशिष्टि
(पहला पुनरीक्षण)

Indian Standard
PULVERIZED FUEL ASH-LIME
BRICKS — SPECIFICATION
(*First Revision*)

ICS 691.421.2 : [666.924 + 662.613.13]

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Building Lime and Lime Products Sectional Committee had been approved by the Civil Engineering Division Council.

This standard was first issued in 1990 covering modular size bricks of only four class designer that is 7.5, 10, 15 and 20.

Pulverized fuel ash commonly known as fly ash is a useful by-product from thermal power stations using pulverized coal as fuel and has considerable pozzolonic activity. This national resource has been gainfully utilized for manufacture of Pulverized fuel ash-lime bricks as a supplement to common burnt clay building bricks leading to conservation of natural resources and improvement in environmental quality.

Pulverized fuel ash-lime bricks are obtained from materials consisting of pulverized fuel ash in major quantity, lime and an accelerator acting as a catalyst. Pulverized fuel ash-lime bricks are generally manufactured by intergrinding or blending various raw materials which are then moulded into bricks and subjected to curing cycles at different temperatures and pressures. On occasion as and when required, crushed bottom fuel ash or sand is also used in the composition of the raw material. Crushed bottom fuel ash or sand is used in the composition as a coarser material to control water absorption in the final product. Pulverized fuel ash reacts with lime in presence of moisture to form a calcium-silicate hydrate which is a binder material. Thus pulverized fuel ash-lime brick is a chemically bonded bricks.

These bricks are suitable for use in masonry construction just like common burnt clay bricks. Production of pulverized fuel ash-lime bricks has already started in the country and it is expected that this standard would encourage its production and use on mass scale. This standard lays down the essential requirements of pulverized fuel ash-lime bricks so as to achieve uniformity in the manufacture of such bricks.

Further technological advancement in this field advocated inclusion of more class designation like 3.5, 5, 12.5, 17.5, 25 and 30 and non modular sizes. Various sizes, class designation and tolerances have been taken on the basis of IS 13757 that is for Burnt clay fly ash building bricks.

The composition of the Committee responsible for formulation of this standard is given in Annex A.

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.

AMENDMENT NO. 1 JULY 2011
TO
IS 12894 : 2002 PULVERIZED FUEL ASH-LIME
BRICKS — SPECIFICATION

(First Revision)

(Page 1, clause 2) — Delete the entry '3812 : 1981' along with its title.

(Page 1, clause 2) — Insert the following at the end:

'15648 : 2006 Pulverized fuel ash for lime pozzolana mixture applications — Specification'

(Page 2, clause 6.1) — Substitute the following for the existing:

'6.1 Pulverized Fuel Ash

Pulverized fuel ash shall conform to IS 15648.'

(CED 4)

Indian Standard
**PULVERIZED FUEL ASH-LIME
 BRICKS — SPECIFICATION**
(First Revision)

1 SCOPE

This standard lays down the requirements for classification, general quality, dimensions and physical requirements of pulverized fuel ash-lime bricks used in buildings.

NOTE — Pulverized fuel ash-lime bricks having wet compressive strength less than 30 N/mm^2 approximately 300 kgf/cm^2 are covered in this standard and for higher strength (see IS 2180 and IS 1077).

2 REFERENCES

The following Indian Standards 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 below :

<i>IS No.</i>	<i>Title</i>
712:1984	Specification for building limes (<i>third revision</i>)
1727:1967	Methods of test for pozzolanic materials (<i>first revision</i>)
3495	Methods of tests of burnt clay building bricks:
(Part 1): 1992	Determination of compressive strength (<i>second revision</i>)
(Part 2): 1992	Determination of water absorption (<i>second revision</i>)

*IS No.**Title*

(Part 3): 1992	Determination of efflorescence (<i>second revision</i>)
3812:1981	Specification for fly ash for use as pozzolana and admixture (<i>first revision</i>)
4139:1989	Specification for calcium silicate bricks (<i>second revision</i>)
5454:1978	Methods for sampling of clay burnt building bricks (<i>first revision</i>)

3 GENERAL REQUIREMENTS

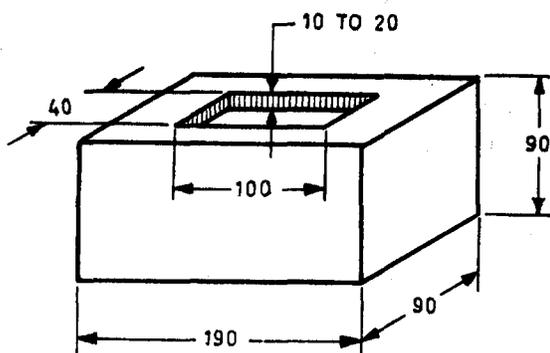
3.1 Visually the bricks shall be sound, compact and uniform in shape. The bricks shall be free from visible cracks, warpage and organic matters.

3.2 The bricks shall be solid and with or without frog 10 to 20 mm deep on one of its flat side. The shape and size of the frog shall conform to either Fig. 1A or Fig. 1B.

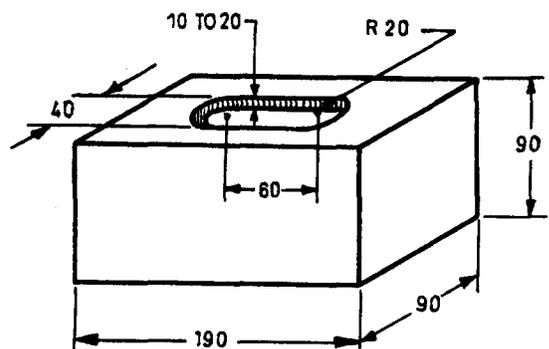
3.3 In case of non-modular size of bricks, frog dimensions shall be the same as for modular size bricks.

3.4 Hand-moulded bricks of 90 mm or 70 mm height shall be moulded with a frog 10 to 20 mm deep on one of its flat sides; the shape and size of the frog shall conform to either Fig. 1A or Fig. 1B (see 5.1.1 for *L*, *W* and *H*). Bricks of 40 or 30 mm height as well as those made by extrusion process may not be provided with frogs.

3.5 The bricks shall have smooth rectangular faces with sharp corners and shall be uniform in shape and colour.



1 A



1 B

All dimensions in millimetres.

FIG. 1 SHAPE AND SIZE OF FROGS IN BRICKS

4 CLASSIFICATION

4.1 Pulverized fuel ash-lime bricks shall be classified on the basis of average wet compressive strength as given in Table 1.

Table 1 Classes of Pulverized Fuel Ash-Lime Bricks

Class Designation	Average Wet Compressive Strength not Less Than	
	N/mm ²	kgf/cm ² (Approx)
(1)	(2)	(3)
30	30.0	(300)
25	25.0	(250)
20	20.0	(200)
17.5	17.5	(175)
15	15.0	(150)
12.5	12.5	(125)
10	10.0	(100)
7.5	7.5	(75)
5	5.0	(50)
3.5	3.5	(35)

5 DIMENSIONS AND TOLERANCES

5.1 Dimensions

5.1.1 The standard modular sizes of pulverized fuel ash-lime bricks shall be as follows (see Fig. 1A and 1B):

Length (L)	Width (W)	Height (H)
mm	mm	mm
190	90	90
190	90	40

5.1.2 The following non-modular sizes of the bricks may also be used (see Fig. 1A and Fig. 1B):

Length (L)	Width (W)	Height (H)
mm	mm	mm
230	110	70
230	110	30

5.1.2.1 For obtaining proper bond arrangement and modular dimensions for the brickwork, with the non-modular sizes, the following sizes of the bricks may also be used:

Length (L)	Width (W)	Height (H)
mm	mm	mm
70	110	70 ¹ / ₃ length brick
230	50	70 ¹ / ₂ width brick

5.2 Tolerances

The dimensions of bricks when tested in accordance with 5.2.1 shall be within the following limits per 20 bricks:

a) For Modular Size

Length	3 720 to 3 880 mm (3 800 ± 80 mm)
Width	1 760 to 1 840 mm (1 800 ± 40 mm)
Height	1 760 to 1 840 mm (1 800 ± 40 mm)
	(For 90 mm high bricks)
	760 to 840 mm (800 ± 40 mm)
	(For 40 mm high bricks)

b) For Non-modular Size

Length	4 520 to 4 680 mm (4 600 ± 80 mm)
Width	2 160 mm to 2 240 (2 200 ± 40 mm)
Height	1 360 mm to 1 440 (1 400 ± 40 mm)
	(For 70 mm high bricks)
	560 to 640 mm (600 ± 40 mm)
	(For 30 mm high bricks)

5.2.1 Twenty (or more according to the size of stack) whole bricks shall be selected at random from the sample selected under 8. All blisters, loose particles of clay and small projections shall be removed. They shall then be arranged upon a level surface successively as indicated in Fig. 2A, 2B and 2C in contact with each other and in a straight line. The overall length of the assembled bricks shall be measured with a steel tape or other suitable inextensible measure sufficiently long to measure the whole row at one stretch. Measurement by repeated application of short rule or measure shall not be permitted. If, for any reason it is found impracticable to measure bricks in one row, the sample may be divided into rows of 10 bricks each which shall be measured separately to the nearest millimetre. All these dimensions shall be added together.

NOTE — By the agreement between the purchaser and the manufacturer pulverized fuel ash-lime bricks may be manufactured in other sizes also. The tolerance requirements of length, width and height shall remain the same as given above.

6 MATERIALS

6.1 Pulverized Fuel Ash (Commonly Known as Fly Ash)

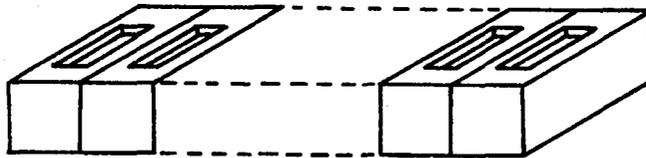
Pulverized fuel ash commonly known as fly ash shall conform to Grade 1 or Grade 2 of IS 3812.

6.2 Bottom Ash

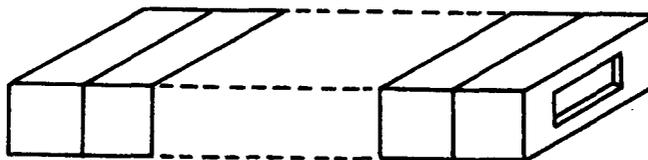
Bottom ash used as replacement of sand shall not have more than 12 percent loss on ignition when tested according to IS 1727.



2A Measurement of Length



2B Measurement of Width



2C Measurement of Height

FIG. 2 MEASUREMENT OF TOLERANCES OF COMMON BUILDING BRICKS

6.3 Sand

Deleterious materials, such as clay and silt in sand, shall preferably be less than 5 percent.

6.4 Lime

Lime shall conform to Class C hydrated lime of IS 712.

6.5 Additives

Any suitable additive considered not detrimental to the durability of the bricks such as gypsum, cement, etc, may be used.

7 PHYSICAL CHARACTERISTICS

7.1 Compressive Strength

The minimum average wet compressive strength of pulverized fuel ash-lime bricks shall not be less than the one specified for each class in 4.1 when tested as described in IS 3495 (Part 1). The wet compressive strength of any individual brick shall not fall below the minimum average wet compressive strength specified for the corresponding class of bricks by more than 20 percent.

NOTE — In case any of the test results of wet compressive strength exceed the upper limit for the class, the same shall be limited to the upper limit of the class for the purpose of averaging.

7.2 Drying Shrinkage

The average drying shrinkage of the bricks when tested by the method described in IS 4139, being the average

of three units, shall not exceed 0.15 percent.

7.3 Efflorescence Test

The bricks when tested in accordance with the procedure laid down in IS 3495 (Part 3), shall have the rating of efflorescence not more than 'moderate' up to Class 12.5 and 'slight' for higher classes.

7.4 Water Absorption

The bricks, when tested in accordance with the procedure laid down in IS 3495 (Part 2), after immersion in cold water for 24 h, shall have average water absorption not more than 20 percent by mass up to class 12.5 and 15 percent by mass for higher classes.

8 SAMPLING AND CRITERIA FOR CONFORMITY

8.1 Sampling and criteria for conformity of the bricks shall be as given in IS 5454.

9 MARKING

9.1 Each brick shall be marked in a suitable manner with the manufacturer's identification mark or initials.

9.2 BIS Certification Marking

The bricks may also be marked with the Standard Mark.

9.2.1 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 details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Building Limes and Lime Products Sectional Committee, CED 4

<i>Organization</i>	<i>Representative(s)</i>
Central Building Research Institute, Roorkee	DR C. L. VERMA (<i>Chairman</i>)
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Building Material and Technology Promotion Council, New Delhi	SHRI J. SENGUPTA SHRI V. K. SETHI (<i>Alternate</i>)
Central Building Research Institute, Roorkee (UP)	SHRI R. L. GUPTA SHRI S. K. MALHOTRA (<i>Alternate</i>)
Central Public Works Department, New Delhi	SUPTDG. ENGINEER (S&S) EXECUTIVE ENGINEER (S&S) (<i>Alternate</i>)
Central Road Research Institute, New Delhi	SHRI SATENDER KUMAR
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Dyerslime and Chemicals Pvt Ltd, Delhi	SHRI N. MACEDO
Fly Ash Mission, Department of Science and Technology, New Delhi	SHRI VIMAL KUMAR SHRI MUKESH MATHUR (<i>Alternate</i>)
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National Test House, Kolkata/Ghaziabad (U. P.)	SHRI D. K. KANUNGO SHRI R. KAPOOR (<i>Alternate</i>)
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Regional Engineering College, Warangal, Andhra Pradesh	PROF D. GANGADHARAN
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BIS Directorate General	SHRI S. K. JAIN, Director and Head (Civ Engg) [Representing Director General (<i>Ex-officio Member</i>)]

Member-Secretary

SHRI R. K. GUPTA

Joint Director (Civ Engg), BIS

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