IS : 9142 - 1979

Indian Standard

(Reaffirmed 1997)

SPECIFICATION FOR ARTIFICIAL LIGHTWEIGHT AGGREGATES FOR CONCRETE MASONRY UNITS

(First Reprint OCTOBER 1990)

UDC 666.972.125:693.54

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

Gr 2 *August* 1979

Indian Standard

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Indian Standard

SPECIFICATION FOR ARTIFICIAL LIGHTWEIGHT AGGREGATES FOR CONCRETE MASONRY UNITS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 22 March 1979, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 One of the methods of producing lightweight concrete is by using lightweight aggregates. The essential characteristic of lightweight aggregate is its high porosity which results in a low apparent specific gravity. Some lightweight aggregates occur naturally and others are manufactured. This standard specifies the requirements of artificial lightweight aggregates. The lightweight aggregates covered in this standard are used for manufacture of concrete masonry units (*see* IS : 3590-1966*).

0.2.1 The detailed requirements of cinder aggregates which are also artificial lightweight aggregates used for manufacture of precast blocks, are given in IS : 2686-1977†.

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.

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1. SCOPE

1.1 This standard covers the requirements of artificial lightweight aggregates, such as foamed blast furnace slag, bloated clay aggregate, sintered fly ash aggregate and cinder aggregate intended for use in concrete masonry units in which prime consideration is lightness in mass.

*Specification for load bearing lightweight concrete blocks.
†Specification for cinder aggregates for use in lime concrete (*first revision*).
‡Rules for rounding off numerical values (*revised*).

2. GENERAL CHARACTERISTICS

2.1 General types of artificial lightweight aggregates covered by this standard are the following:

a) Aggregates prepared by expanding molten blast furnace slag in limited amount of water or jets of steam, by bloating of clays and shales at high temperature or by sintering of fly ash; and

b) Cinder aggregates conforming to Class C of IS : 2686-1977*.

2.2 The aggregates shall be composed, predominantly of lightweight cellular and granular inorganic material.

3. GRADING

3.1 The grading of the aggregate, that is, its particle size distribution as obtained by sieve analysis shall be as given in Table 1.

TABLE 1 GRADING REQUIREMENTS FOR LIGHTWEIGHT COMBINED AGGREGATES FOR CONCRETE MASONRY UNITS

Sl No.	Size Designation	Percentages (by Mass) Passing IS Sieves						
		20 mm	12·5 mm	10 mm	4·75 mm	2·36 mm	1·18 mm	300 microns
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Fine aggregate (4·75 to 0 mm)	—	—	100	85-100	—	40-80	10-35
ii)	Coarse aggregate (12 5 to 4·75 mm)	100	90-100	40-80	0-20	0-10	—	—
	(10 to 2·36 mm)	—	100	80-100	5-40	0-20	—	—
iii)	Combined fine and coarse aggregate (10 mm to 0)	—	100	90-100	65-90	35-65	—	10-25

4. BULK DENSITY

4.1 The dry loose bulk density of combined aggregate shall not exceed 1 100 kg/m^3.

4.2 Uniformity of Mass — The bulk density of successive supplies of lightweight aggregate shall not differ by more than 10 percent from that of the sample submitted for acceptance tests.

*Specification for cinder aggregates for use in lime concrete (*first revision*).

5. DELETERIOUS SUBSTANCES

5.1 Lightweight aggregates shall not contain excessive amounts of deleterious substances, as determined by the limits described in **5.1.1** to **5.1.3.**

5.1.1 *Organic Impurities* — Lightweight aggregates, upon being subjected to the test for organic impurities, that produce a colour darker than the standard colour shall be rejected, unless it can be demonstrated that the discolouration is due to small quantities of materials not harmful to the concrete.

5.1.2 *Clay Lumps* — The amount of clay lumps shall not exceed 2 percent by dry mass.

5.1.3 *Loss on Ignition* — Loss on ignition of aggregates except cinder aggregates shall not exceed 4 percent by dry mass. For cinder aggregates, loss on ignition shall be as specified in IS : 2686-1977*.

6. CONCRETE MAKING PROPERTIES

6.1 Concrete specimens containing lightweight aggregate under test shall meet the requirements specified in **6.1.1** and **6.1.2.**

6.1.1 *Drying Shrinkage* — The drying shrinkage of concrete specimens prepared and tested in accordance with **7.7** shall not exceed 0·10 percent.

6.1.2 *Sulphate Content* — The sulphate content of lightweight aggregate shall not be more than one percent when expressed as sulphuric anhydride (SO_3) by mass.

7. METHODS OF SAMPLING AND TEST FOR AGGREGATE PROPERTIES

7.1 Sampling — The sampling of lightweight aggregates shall be done in accordance with IS : 2430-1969†.

7.2 Grading — Grading of sample of lightweight aggregate shall be done in accordance with the provisions given in IS : 2386 (Part I)-1963‡.

7.3 Bulk Density (Loose) — The aggregate shall be tested in oven-dry conditions according to the requirements given in 3 of IS : 2386 (Part III)-1963§.

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*Specification for cinder aggregates for use in lime concrete (*first revision*).

†Methods for sampling of aggregates for concrete.

‡Methods of test for aggregates for concrete: Part I Particle size and shape.

§Methods of test for aggregates for concrete: Part III Specific gravity, density, voids, absorption and bulking.

7.4 Orangic Impurities — The aggregate shall be tested in accordance with IS : 2386 (Part II)-1963*.

7.5 Clay Lumps — Clay lumps in aggregate shall be determined as described in IS : 2386 (Part II)-1963*.

7.6 Loss on Ignition — Loss on ignition of the aggregate shall be determined by the method described in **4.2** of IS : 4032-1968†.

7.7 Drying Shrinkage — The drying shrinkage of concrete shall be determined according to the method given in IS : 3590-1966‡.

7.8 Sulphate Content — The sulphate content of sample shall be determined as specified in IS : 4032-1968†.

8. SUPPLIER'S CERTIFICATE AND COST OF TESTS

8.1 The supplier shall satisfy himself that the material complies with the requirements of this standard and, if requested, shall supply a certificate to this effect to the purchaser.

8.2 If the purchaser requires independent tests to be made, the sample for such tests shall be taken before or immediately after delivery, according to the option of the purchaser and the tests carried out in accordance with this standard and on the written instructions of the purchaser.

8.3 The supplier shall supply free of charge the material required for tests.

8.4 The cost of tests carried out under **8.2** shall be borne by:

a) the supplier, if the results show that the material does not comply with this standard; and

b) the purchaser, if the results show that the material complies with this standard.

*Methods of test for aggregates for concrete : Part II Estimation of deleterious materials and organic impurities.

†Method of chemical analysis of hydraulic cement.

‡Specification for load bearing lightweight concrete blocks.

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