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IS 4098 (1983): lime-pozzolana mixture [CED 4: Building Limes and Gypsum Products]



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REAFFIRMED

SPECIFICATION FOR LIME-POZZOLANA MIXTURE

(First Revision)

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SPECIFICATION FOR LIME-POZZOLANA MIXTURE

(First Revision)

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AMENDMENT NO. 1 JANUARY 1987

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IS:4098-1983 SPECIFICATION FOR LIME-POZZOLANA MIXTURE

(First Revision)

(Page 4, clause 3.1, first sentence) -Substitute the following for the existing matter:

'Lime-pozzolars mixture shall be manufactured either by intergrinding Classx C hydrated line (see IS:712-1984⁵) and pozzolarm, such as calcined clay (see IS:1344-1981^{II}) or fly ash (see IS:3812-1981⁵) or rice husk ash in suitable proportions in a ball or tube mill, or by blending the ingradients in the form of powder to comply with the requirements of this specification.'

(Rage 4, foot-note with 'i' murk) - Substitute 'third revision' for 'second revision'.

(HDC 4)

AMENDMENT NO. 2 SEPTEMBER 1991

TO

IS 4098 : 1983 SPECIFICATION FOR LIME-POZZOLANA MIXTURE

(First Revision)

(*Page 4, clause 2.0, line 2*) — Substitute 'IS $6508 : 1988^*$ ' for 'IS $6508 : 1972^+$ ' and 'IS 4305 : 1967' for 'IS 4305 : 1972'.

(Page 4, foot-note with ' \dagger ' mark) — Insert '(first revision)' at the end.

[*Page* 6, *Table* 2, *Sl* No. (i), *col* 6] — Substitute 'IS 4031 (Part 1): 1988^a' for 'IS 4031 : 1968^a'.

[Page 6, Table 2, Sl No. (ii), col 6] — Substitute '18 6932 (Part 11) : 1983†' for ''''.

[Page 6, Table 2, Sl No. (iii) (a) and (b), col 6] — Substitute '15 4031 (Part 7): 1988;' for '15 4031 : 1968 (Cl 9)'.

(Page 6, Table 2, Note, line 3) -- Substitute '6.2.4 of 15 4031 (Part 3): 1988§' for '5.2.4.4 of 15 4031 : 1968•'.

[Page 6, Table 2, Sl No. (iv), col 6] — Substitute '18 4031 (Part 13): $1988\parallel$ ' for '''.

[Page 6, Table 2, Sl No. (v), col 6] — Substitute 'IS 4031 (Part 3): 1988‡' for "".

(Page 6, Table 2, 'foot-note marked with '*' mark) — Insert the following foot-notes for the existing foot-note:

||Methods of physical tests for hydraulic cement : Part 13 Measurement of water retentivity of masonry cement (*first revision*).

^{*}Methods of physical tests for hydraulic cement: Part 1 Determination of fineness by dry sieving (*first revision*).

[†]Methods of tests for building limes : Part 11 Determination of setting time of hydrated lime.

[‡]Methods of physical tests for hydraulic cement : Part 7 Determination of compressive strength of masonry cement (*first revision*).

[§]Methods of physical tests for hydraulic cement : Part 3 Determination of soundness (*first revision*).

AMENDMENT NO. 3 JULY 2011 TO IS 4098 : 1983 SPECIFICATION FOR LIME-POZZOLANA MIXTURE

(First Revision)

[*Page* 4, *clause* **3.1**, *line* 3 (*see also Amendment No.* 1)] — Substitute 'pulverized fuel ash conforming to IS 15648 : 2006¶' *for* 'flyash (*see* IS : 3812-1981¶)'.

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

'¶ Specification for pulverized fuel ash for lime pozzolana mixture application.'

[*Page* 5, *Table* 1, *Sl No* (i), *col* 3] — Substitute '2' for '5'.

[Page 5, Table 1, Sl No (ii), col 4] — Substitute the following for the existing:

'IS 1514 : 1990*'

(*Page 5, Table 1, footnote marked **) — Substitute the following for the existing:

'Method of sampling and tests for quicklime and hydraulic lime (first revision).'

[Page 6, Table 2, Sl No. (i), col 6] — Substitute the following for the existing:

'IS 4031 (Part 1) : 1996*'.

[Page 6, Table 2, Sl No. (iii)(a), col 6] — Substitute the following for the existing entry:

'IS 4031 (Part 6) : 1988†'.

Amend No. 1 to IS 4098 : 1983

(1)	(2)	(3)	(4)	(5)	(6)
c)	At 90 days, Min	8	4	1.5	"

(Page 6, Table 2, footnote marked *) — Substitute the following for the existing:

[Page 6, Table 2, Sl No (iii)(b)] — Insert the following new row after the existing:

** Methods of physical tests for hydraulic cement : Part 1 Determination of fineness by dry sieving (second revision).

† Methods of physical tests for hydraulic cement : Part 6 Determination of compressive strength of hydraulic cement (other than masonry cement) (*first revision*).'

(CED 4)

Reprography Unit, BIS, New Delhi, India

Indian Standard SPECIFICATION FOR LIME-POZZOLANA MIXTURE

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 28 October 1983, after the draft finalized by the Building Limes Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Lime-pozzolana mixture which is essentially a mixture of lime and pozzolana could be used as an alternate cementing material to ordinary Portland cement for certain categories of work like masonry mortar and plaster, foundation concrete, levelling coarse under floors, road and airfield bases, precast building blocks (including light weight blocks), paving blocks, soil stabilization and as filler in water bound macadam in road construction. Hence the production and marketing of properly mixed, ready to use and properly packaged dry mixtures of lime-pozzolana of specified strength would go a long way in making available a standardized product that could be safely used in construction as a substitute for Portland cement in places mentioned above.

0.3 Lime pozzolana mixtures are normally manufactured by intergrinding the ingredients in a mill or by blending in the form of powder. The hardening of lime pozzolana mixture depends upon the lime reactivity of the pozzolana and in general is slower than that of cement, but is satisfactory for most of the normal uses. Higher the lime reactivity of pozzolana, guicker will be the rate of setting and hardening of the lime pozzolana mixture. Where improved early strength is required, the rate of hardening can be accelerated by adding gypsum. This is done by intergrinding in the manufacturing stage in the mill or by blending the mixture and the gypsum in the form of powder of required fineness, adopting suitable measures to ensure a uniform mixture. This standard has been prepared with a view to lay guidance in respect of production and use of lime-pozzolana mixture and to lay down its requirements to ensure the availability of such mixtures in standardized form.

0.4 This standard, first published in 1967, was intended to bring out a long felt uniformity in the variety of practices being followed towards manufacture and use of this product. This revision has been prepared with a view to incorporate improvements found necessary in the light of usage of the standard. In this revision, the methods of tests to assess the qualitative requirements have been removed and reference has been drawn to those Indian Standards in which these methods are covered. Reference has also been drawn of latest Indian Standards and attempt has been made to make the standard performance based. Additional chemical requirements have been included in order to ensure meaningful control over the mixture.

0.5 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 a 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 covers the requirements of lime-pozzolana mixture for use in construction works.

2. TERMINOLOGY

2.0 For the purpose of this standard the following definition in addition to those given in IS : 6508-1972[†] and IS : 4305-1972[‡] shall apply.

2.1 Pozzolana — An essentially silicious material which while in itself possessing no cementitious properties will, in finely divided form and in the presence of water, react with calcium hydroxide at ordinary temperature to form compounds possessing cementitious properties.

3. MANUFACTURE

3.1 Lime-pozzolana mixture shall be manufactured either by intergrinding Class. C hydrated lime (see IS: 712-19738) and pozzolana such as burnt clay (see IS : 1344-1981) or flyash (see IS : 3812-1981) in suitable proportions in a ball or tube mill, or by blending the ingredients in the form of powder to comply with the requirements of this specification. Type IV mineral gypsum (see IS: 1290-1973**) not

^{*}Rules for rounding off numerical values (revised).

⁺Glossary of terms relating to building lime.

Glossary of terms relating to pozzolana. Specification for building limes (second revision).

Specification for calcined clay pozzolana (second revision).

[&]quot;Specification for fly ash for use as pozzolana and admixture (first revision). **Specification for mineral gypsum (second revision).

exceeding 5 percent may be added to the mixture during intergrinding or blending to help in reducing the final setting time and also for improving early strength.

NOTE - The lime reactivity value of pozzolanas when tested in accordance with the procedure given in IS : 1727-1967* shall not be less than 4 N/mm* (40 kgf/cm*).

4. TYPES

4.1 Lime - Pozzolana mixture shall, be supplied in the following three types and shall conform to the requirements specified in 5:

Type	Use
LP 7	For masonry mortars up to Grade MM 0.5, and for foundation concrete.
LP 20	For masonry mortars up to Grade MM 2 and for foundation concrete.
LP 40	For masonry mortars up to Grade MM 5.

NOTE --- See IS : 2250-1981⁺ for different grades of mortar.

5. CHEMICAL REQUIREMENTS

5.1 Lime-pozzolana mixtures shall conform to the requirements given in Table 1.

			-
SL No.	CHARACTERISTIC	Requirement	Reference to Method of Test
(1)	(2)	(3)	(4)
i)	Free moisture content, percent, Max	5	Appendix A
ii)	Free lime, percent, Min	22	IS: 1514-1959*
iii)	Carbon dioxide, percent, Max	5	IS : 6932 (Part II)- 1973†
iv)	Sulphate content, percent, Max	3	IS: 1727-1967‡
v)	Magnesium oxide, percent, Max	8	IS : 1727-1967‡

TABLE 1 CHEMICAL REQUIREMENTS

*Methods of sampling and test for quick lime and hydrated lime.

*Methods of tests for building limes: Part II Determination of Carbon dioxide content.

[‡]Methods of test for pozzolanic materials (first recision).

*Methods of tests for pozzolanic materials (first revision). †Code of practice for preparation and use of masonry mortar (first revision).

6. PHYSICAL REQUIREMENTS

6.1 Lime-pozzolana mixtures shall conform to the physical requirements given in Table 2.

SL No.	CHARACTERISTIC	REQUIREMENT Type of Mixture			REFERENCE TO METHOD OF TEST
		LP40	LP20	LP7	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Fineness, percent retained on 150- micron IS Sieve	15	15	-	IS : 4031-1908*
ii)	Setting time, hours				
	a) Initial, Min	2	2	2	**
	b) Final, Max	24	36	4 8	,,
iii)	Compressive strength: average compressive strength of not less than 3 mortar cubes of size 50 mm compos- ed of one part of lime pozzolana mixture and 3 parts of standard sand by weight, N/mm ³				
	a) At 7 days, Min	2	1	0.3	IS: 4031-1968* (CI9)
	b) At 28 days, Min	4	2	0.7	" (Cl9)
iv)	Water retention, flow after suction of mortar composed of one part of lime-pozzolana and 3 parts of standard sand by weight, percent of original flow, Min	65	65	65	,,
v)	Soundness, autoclave expansion, percent, Max	1	1	1	

Nore — For determination of soundness by autoclave test specimens of limepozzolana mixture shall remain in the moulds in the moist room for a period of 72 hours instead of 24 hours as specified in 5.2.4.4 of IS : 4031-1968*.

*Methods of physical test for hydraulic cement.

7. STORAGE

7.1 The lime-pozzolana mixture shall be stored in such a manner as to permit easy access for inspection and identification, and in a suitable weather-tight building to protect the mixture from dampness and to minimize warehouse deterioration.

8. DELIVERY

8.1 The lime-pozzolana mixture shall be packed in bags (jute, multiply paper, HDPE or cloth) bearing the manufacturer's name or his registered trade mark, if any. The type and net mass of the mixture shall be legibly and indelibly marked on each bag. Bags shall be in good condition at the time of delivery.

8.1.1 Similar information shall be provided in the deilvery advice during bulk supply.

8.2 The bags or packages may also be marked with the ISI Certification Mark.

Norz — 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.

8.3 The net mass of each bag shall be 50 kg. The permissible tolerance on the mass of mixture supplied in bags shall be \pm 2.5 percent per bag with an overall tolerance of \pm 0.5 percent for wagon load of 20 to 25 tonnes.

9. SCALE OF SAMPLING AND CRITERION FOR CONFORMITY

9.1 The procedure for sampling and the criterion for conformity shall be as given in Appendix B.

APPENDIX A

[Table 1, Item (i)]

MEHTOD OF TEST FOR FREE MOISTURE CONTENT OF LIME-POZZOLANA MIXTURE

A-1. PROCEDURE

A-1.1 A weighed sample of lime-pozzolana mixture shall be dried to constant mass in an oven at 105° to 110°C.

A-2. CALCULATION

A-2.1 The percentage of free moisture shall be calculated to the nearest 0.1 as follows:

Moisture content, percent = $\frac{A}{B} \times 100$

where

A = loss of mass after drying, and

B = mass of sample taken originally.

APPENDIX B

(Clause 9.1)

B-1. GENERAL

B-1.1 A sample or samples for testing may be taken by the purchaser or his authorised representative.

B-2. SAMPLE SIZE

B-2.1 When samples are taken for test purposes, each shall weigh at least 2 kg. Individual test samples on which all tests are to be conducted shall weigh at least 5 kg.

B-3. PROCEDURE FOR SAMPLING

B-3.1. Lime pozzolana mixture samples shall be taken by any one of the methods specified in **B-3.1.1** to **B-3.1.3**.

B-3.1.1 Sampling Small Quantities — Each sample for testing shall consist of a mixture of approximately equal proportions selected from at least 12 different bags or other packages when the mixture is not loose. When

the number of bags or packages is less than 12, portions shall be selected from each bag or package. Every care shall be taken during the selection to obtain a fair average sample. The final sample shall weigh at least 5 kg. The sample thus collected shall be stored in an air-tight container for being forwarded to an approved laboratory.

B-3.1.2 Sampling Large Quantities -- From large quantities, samples may be drawn by any of the methods described in **B-3.1.2.1** and **B-3.1.2.2**. In each case the samples collected by small increments shall be rapidly mixed in a place free from draught, and thereafter stored in air-tight container of 7 kg capacity. In case of dispute, at least two such containers shall be filled, one sent to an approved laboratory and the other kept as a reference sample by the supplier.

B-3.1.2.1 From Conveyor Delivering to Bulk Storage or Discharging from Bulk Storage — One sample of not less than 2.5 kg shall be taken from each 15 bags or 50 tonnes or parts thereof passing over the conveyor, or from discharge openings of bulk storage by taking small samples at regular intervals, either by scoops or by automatic samplers.

B-3.1.2.2 From Bulk storage by Means of Proper Sampling Tubes — When the method described in **B-3.1.2.1** cannot be applied, and when thedepth of mixture to be sampled does not exceed 3 m, samples may be obtained by suitable tubes inserted vertically to the full depth of the mixture. Samples so taken shall be obtained from points well distributed over the area of storage.

B-3.1.3 In all other cases, samples shall be taken from each 50 bags or portion thereof in the lot and mixed to form test samples. In the case of samples from trucks where the mixture is being trucked from one mill, it is permissible to combine the samples from several trucks to form a test sample each representing not more than 1 000 bags.

B-4. TESTS

B-4.1 The sample or samples shall be subjected to all the tests prescribed in 5 and 6.

B.5 CRITERIA FOR COMFORMITY

B-5.1 Any sample which fails to comply with any of the requirements shall be considered as not conforming to the standard.

BUREAU OF INDIAN STANDARDS

Headquarters :	
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 1	10002
Telephones : 3 31 01 31, 3 31 13 75 Telegrams : M (Common to	anaksanstha all Offices)
Regional Offices	Telephone
*Western ; Manakalaya, E9 MIDC, Marol, Andheri (East) BOMBAY 400093	6 32 92 95
†Eastern: 1/14 C. I. T. Scheme VII M. V. I. P. Road, Maniktola, CALCUTTA 700054	36 24 99
Northern : SCO 445-446, Sector 35-C CHANDIGARH 180036	{2 18 43 3 16 41
Southern : C. I. T. Campus, MADRAS 600113	$\begin{cases} 41 \ 24 \ 42 \\ 41 \ 25 \ 19 \\ 41 \ 29 \ 18 \end{cases}$
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