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भारतीय मानक

जल सह छत की फिनिश के लिए चूना कंक्रीट विन्यास – रीति संहिता

(दूसरा पुनरीक्षण)

Indian Standard

LAYING LIME CONCRETE FOR A WATERPROOFED ROOF FINISH — CODE OF PRACTICE

(Second Revision)

UDC 691·322 : 699·82 : 692·4 : 006·76

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Price Group 3

Waterpoofing and Damp-Proofing Sectional Committee, CED 41

FOREWORD

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

Lime concrete, apart from its use as a structural material in several situations in building construction, is also used for a waterproofed roof finish. The introduction of pozzolanic materials, such as burnt brick pozzolana in lime concrete and compaction to maximum density enhances the waterproofing effect. This standard is intended to provide guidance with respect to preparation and use of the lime concrete for waterproofing of roofs on the basis of existing knowledge and experience.

This standard was first published in 1965 and revised in 1980. Since then a number of standards referred in this standard have been revised necessitating the need of this second revision.

In this revision following modifications have been done:

1) Materials used for lime concrete have been specified as per latest version of the relevant Indian Standard.
2) Preparation of lime concrete has been elaborated to bring it in line with IS 2541 : 1991 Code of practice for preparation and use of lime concrete.
3) Recommendation for roof finish for extreme climatic condition has been added.
4) All other references have been updated for the benefit of the user.

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 that of the specified value in this standard.

Indian Standard

LAYING LIME CONCRETE FOR A WATERPROOFED ROOF FINISH — CODE OF PRACTICE

(Second Revision)

1 SCOPE

This standard covers the preparation and laying of lime concrete for a waterproofed finish on a flat roof surface.

2 REFERENCES

The Indian Standards listed at Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply.

3.1 Flat Roof

A practically level roof surface with only a small slope for purpose of drainage; the term is used in contrast with pitched or sloped roof.

3.2 Roof Finish

The top part of a flat roof which contributes protection and durability to it, without itself being a structural or supporting element in the roof.

4 GENERAL

For efficient planning, design and laying of the waterproofing finish the basic information, design considerations and preparation of roof surface shall be as given in IS 3067 : 1988.

5 MATERIALS

5.1 Lime

As far as possible class C line (fat line) in the form of hydrated lime conforming to IS 712 : 1984 shall be used. Quick lime shall be slaked in accordance with IS 1635 : 1975.

5.2 Pozzolanic Material

Calcined clay pozzolana shall conform to IS 1344 : 1981. Lime pozzolana mixture when used shall conform to LP 40 of IS 4098 : 1983.

5.3 Coarse Aggregate

Coarse aggregate for use in lime concrete having maximum size of 25 mm shall be broken brick (burnt clay) aggregates conforming to IS 3068 : 1986 or natural stone aggregates conforming to IS 383 : 1970 depending upon the situation of use.

5.4 Water

Water used for both mixing and curing concrete shall be clean and free from injurious amounts of deleterious materials. Sea water shall not be used. Potable water is generally considered satisfactory for mix.

6 PREPARATION OF LIME CONCRETE

6.1 Mortar for Concrete

One part of slaked lime and two parts of burnt brick pozzolana (or lime pozzolana mixture) by volume shall be mixed on a water tight platform. This shall then be sprinkled with the required quantity of water and shall be well ground in a mill or using mechanical grinder. Hand pounding may be done for small quantity. If hydrated lime is used adjustments shall be made in the proportion in accordance with IS 2250 : 1981.

6.2 Coarse Aggregate

If coarse aggregate contains excessive dirt it shall be washed and well drained before use. Burnt clay or other porous coarse aggregate shall be thoroughly soaked in water for a period not less than six hours before use in concrete mix.

6.3 Mixing

Lime concrete may be hand mixed or small hand operated mixer may be used. For larger quantities the use of mechanical mixer would be desirable.

6.3.1 *Hand Mixing*

6.3.1.1 Mixing shall be done on a clean water tight platform of sufficient size to provide ample mixing area. The platform shall have tight close joints so that there is no leakage of water or mortar through them and mixing tool does not strike the joints while in operation.

6.3.1.2 Coarse aggregate and lime-pozzolana mortar in the proportion of $2\frac{1}{2}$: 1 parts by volume shall be used. Coarse aggregate shall be slaked to an even surface on the platform and lime pozzolana mortar prepared as per **6.1** shall then be evenly spread over the aggregate and the whole thoroughly mixed water in just sufficient quantity shall be applied with a sprinkler, to enable the mortar to adhere to each piece of aggregate. The mixing shall be done by turning it over and over several times, until all the particles of aggregate are covered with mortar and a concrete of uniform appearance and consistency is obtained.

6.3.2 *Machine Mixing*

Two and a half parts by volume of clean saturated surface dry coarse aggregate shall first be fed into the mixer and then one part by volume of lime. Pozzolana mortar as per **6.1** shall then be added to the mixer and the content mixed well. Mixing shall be continued until there is a uniform distribution of the material. Final adjustment of water, to obtain concrete of required consistency may be made by adding clean water, if necessary, and turning the ingredients in the mixer.

NOTE — Lime concrete may also be prepared by mixing the aggregate inclusive of brick dust obtained during breaking with slaked lime in the same proportions by volume as in **6.3.2**. The aggregate shall be thoroughly soaked before use.

6.4 The lime concrete shall be used in the work within 36 hours of the preparation of lime mortar if burnt clay pozzolana is incorporated (*see* IS 2541 : 1974).

NOTE — Addition of 12 kg of washing soap and 4 kg of alum in each cubic metre of lime concrete dissolved in water will improve the waterproofing quality of the lime concrete.

7 LAYING

7.1 The roof surface shall be prepared as given in **4**.

7.2 Laying of lime concrete shall be started from a corner of the roof and proceed diagonally towards centre and other sides considering the slopes required for draining the rain-water smoothly. The average thickness of lime concrete shall not be less than 100 mm. In case the thickness is more than 100 mm each layer shall not be more than 100 to 125 mm.

If the roof is fat, slope not less than 1 in 60 shall be given. However, in case of heavy rainfall area slope of 1 in 40 is recommended. The minimum compacted thickness of the concrete layer shall, however, be nowhere less than 50 mm.

7.3 After the lime concrete is laid, it shall be initially rammed with a rammer weighing not more than 2 kg and the finish brought to the required evenness and slope. Alternately bamboo strips may be used for the initial ramming. Further consolidation shall be done using wooden THAPIES with rounded edges. The workmen will sit close together, and beat the surface lightly and in rhythm and move forward gradually. The beating will normally have to be carried on for at least seven days until the THAPI makes no impression on the surface and rebounds readily from it when struck.

NOTE — The ramming and compacting of lime concrete may also be done by a tamping machine which has been developed by Central Building Research Institute, Roorkee and is commercially available.

7.3.1 If the surface during the process of compaction becomes too uneven that water lodges in pools, the surface shall be pricked up and fresh lime concrete spread and consolidated as is necessary so as to ensure proper slopes and levels are being maintained with adequate bonding between old and new concrete by sprinkling requisite quantity of lime water (1 part of putty and 3 to 4 parts of water) with any of the solution prepared under **7.3.3**.

7.3.2 Special care shall be taken to properly consolidate the concrete at its junction with the parapet wall.

7.3.3 During compaction by hand-beating the surface shall be sprinkled liberally with lime water (1 Part of putty and 3 to 4 parts of water) and small proportion of sugar solution (*see* Note 1) or a solution prepared by soaking in water the dry nuts of Terminalia chebula (*see* Note 2) for obtaining improved waterproofing of the concrete. On completion of beating, the mortar that comes on the top shall be smoothened with a trowel or float, if necessary, with the addition of sugar solution and lime putty.

NOTES

1 The sugar solution is prepared in the northern parts of the country by mixing about 3 kg of jaggery and 1½ kg of BAEL fruit to 100 litres of water by boiling.

2 The solution of Terminalia chebula (KADUKAI) may be prepared as follows:

The dry nuts shall be broken to small pieces and allowed to soak in water. The general practice is to have a proportion 600 g of KADUKAI, 200 g of jaggery and 40 litres of water for 10 m² work. This solution is brewed for 12 to 24 hours. The resulting liquor is decanted and used for the work.

3 In some areas, METHI, jaggery and hemp are added while preparing and laying lime concrete.

7.4 Curing

The lime concrete after compaction shall be cured for a minimum of 10 days or until it hardens by covering with a thin layer of grass or straw which shall be kept wet continuously.

7.5 Treatment of Junction Between Roof Finish and Parapets

All along the junction of the roof surface with the masonry of the parapet wall, a strip of lime concrete fillet shall be laid and finished smooth. Typical details of treatment at junction between lime concrete water proofed roof finish and masonry and RCC parapet walls are illustrated in Fig. 1 and 2 respectively.

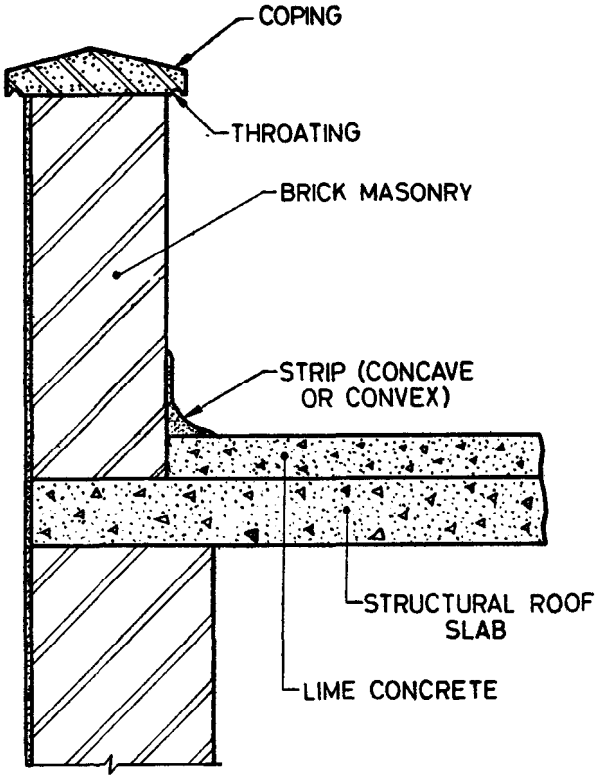
8 FINISH

8.1 In case of accessible roof finish one layer of burnt clay flat terracing tiles [*see* IS 2690 Part 1) : 1975 and IS 2690 (Part 2) : 1975] may be laid over a thin layer of lime mortar. However, in the extreme condition where there is considerable expansion and contraction, two layers of tiles may be put on the top of lime pozzolana concrete. The tiles should be joined with non-shrinking impervious mortar by adding suitable integral waterproofing admixtures or 5 percent used engine oil by weight of cement and finished neat.

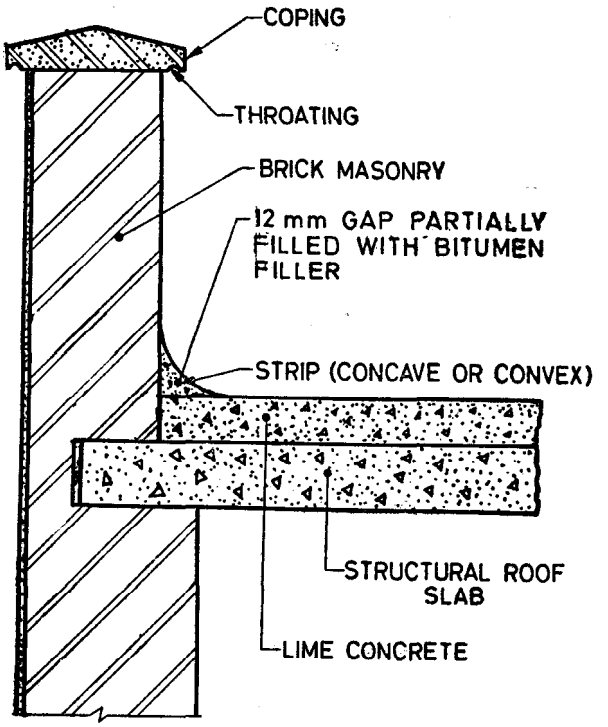
8.2 The protection against water penetration for the roof finish is enhanced by efficient drainage of surface water.

8.2.1 For this purpose, the slope of the terrace with lime concrete and tile finish shall not be less than 1 in 60 and the slope in the case of plain lime concrete finish shall not be less than 1 in 50.

8.2.2 For every 40 m² of roof area, one 100 mm diameter rain water pipe shall be provided.

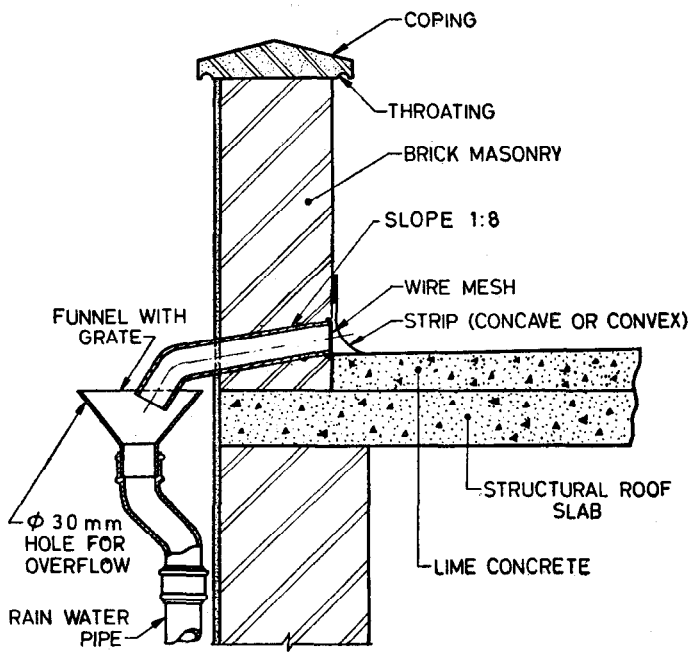


1A Structural Roof Slab and Lime Concrete Finish Extending to the Full Width of Wall

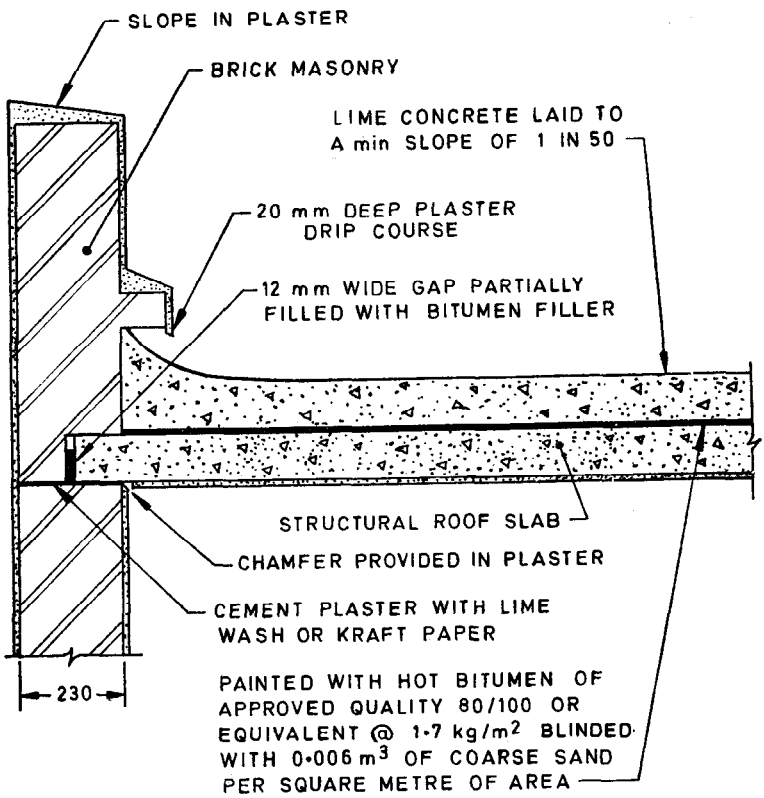


1B Structural Roof Slab and Lime Concrete Finish not Extending to the Full Width of Wall

FIG. 1 DETAIL AT JUNCTION BETWEEN LIME CONCRETE WATERPROOFED ROOF FINISH AND PARAPET WALL (*Contd*)

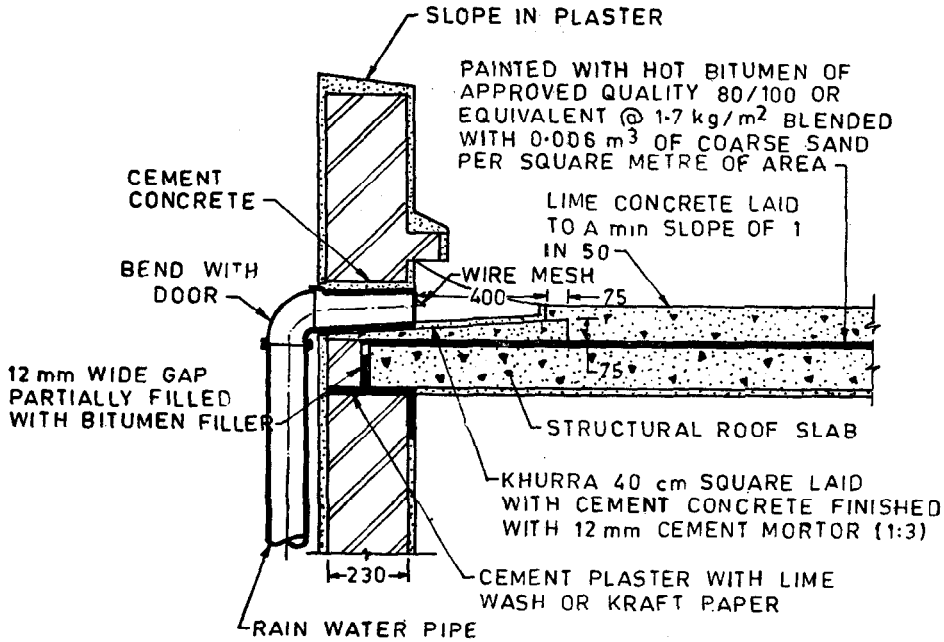


1C Detail Showing Arrangement of Downpipe for 1A



1D Junction of Roof with Parapet Wall (Alternate Arrangement)
All dimensions in millimetres.

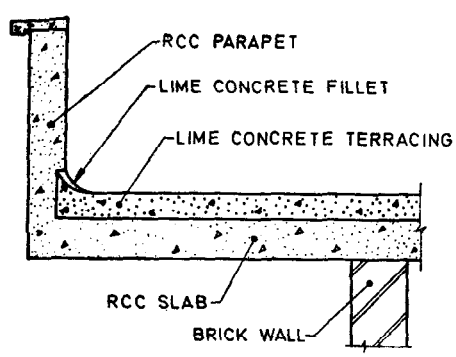
FIG. 1 DETAIL AT JUNCTION BETWEEN LIME CONCRETE WATERPROOFED ROOF FINISH AND PARAPET WALL (*Contd*)



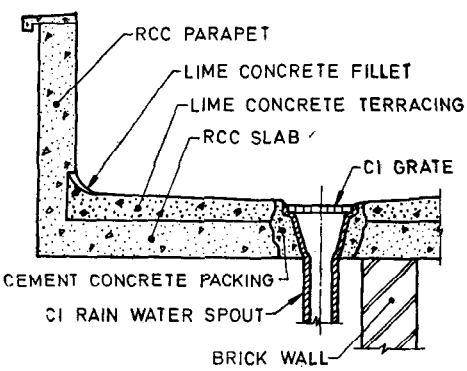
1E DETAIL OF KHURRA FOR 1D

All dimensions in millimetres.

FIG. 1 TYPICAL DETAILS AT JUNCTION BETWEEN LIME CONCRETE WATERPROOFED ROOF FINISH AND MASONRY PARAPET WALL



2A Junction Between Roof Slab and RCC Parapet



2B Details of Roof Slab and Rain Water Pipe

FIG. 2 TYPICAL DETAILS AT THE JUNCTION BETWEEN LIME CONCRETE WATERPROOFED ROOF FINISH AND RCC PARAPET WALL

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*	*IS No.*	*Title*
383 : 1970	Coarse and fine aggregates from natural sources for concrete (*second revision*)	2690 (Part 1) : 1975	Burnt clay flat terracing tile : Part 1 Machine made (*first revision*)
712 : 1984	Building limes (*third revision*)	2690 (Part 2) : 1975	Burnt clay flat terracing tile : Part 2 Hand made (*first revision*)
1344 : 1981	Specification for calcined clay pozzolana (*second revision*)		
1635 : 1975	Code of practice for field slaking of building lime and preparation of putty (*first revision*)	3067 : 1988	Code of practice for general design details and preparatory work for damp-proofing and waterproofing of buildings
2250 : 1981	Code of practice for preparation and use of masonry mortars (*first revision*)	3068 : 1986	Broken brick (burnt clay) coarse aggregates for use in lime concrete (*first revision*)
2541 : 1991	Code of practice for preparation and use of lime concrete (*first revision*)	4098 : 1983	Lime-pozzolana mixture (*first revision*)

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