इंटरनेट मानक

Disclosure to Promote the Right To Information

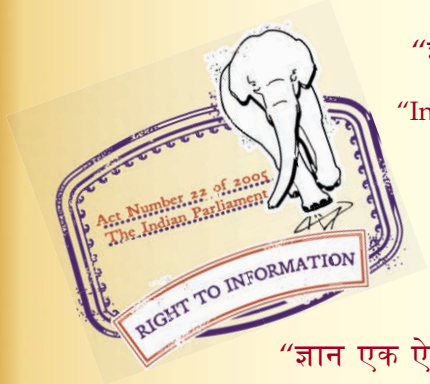
Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 2394 (1984): Code of practice for application of lime plaster finish [CED 5: Flooring, Wall Finishing and Roofing]

"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"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

PROTECTED BY COPYRIGHT

IS : 2394 - 1984
(Reaffirmed 2001)

Indian Standard

CODE OF PRACTICE FOR APPLICATION OF LIME PLASTER FINISH

(First Revision)

UDC 69·002·54 : 693·61

© *Copyright* 1984

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

Gr 5

October 1984

Indian Standard

CODE OF PRACTICE FOR APPLICATION OF LIME PLASTER FINISH

(First Revision)

Flooring and Plastering Sectional Committee, BDC 5

Chairman

SHRI O. P. MITTAL
S-252 Panchsila Park
New Delhi 110017

Members	*Representing*
SHRI S. K. BANERJEE SHRI P. R. DAS (*Alternate*)	National Test House, Calcutta
SHRI N. BORALINGIAH	Builder's Association of India Limited, Bombay
SHRI DINESH A. CHOKSHI SHRI RASIKLAL A. CHOKSHI (*Alternate*)	M/s Arcoy Industries, Ahmedabad
DEPUTY DIRECTOR (ARCH) DEPUTY DIRECTOR (B & S) (*Alternate*)	Research, Designs and Standards Organization (Ministry of Railways), Lucknow
DIRECTOR RESEARCH OFFICER (MATERIAL TESTING DIVISION) (*Alternate*)	Maharashtra Engineering Research Institute, Nasik
DR V. S. GUPTA	The Fertilizer (Planning and Development) India Limited, Sindri (Bihar)
SHRI K. V. GURUSWAMY SHRI G. V. PANGARKAR (*Alternate*)	Indian Oil Corporation Limited, New Delhi
SHRI S. C. KAPOOR SHRI A. C. KAPOOR (*Alternate*)	M/s Modern Tiles & Marble, New Delhi
BRIG D. R. KATHURIA	The Institution of Engineers (India), Calcutta
SHRI K. E. S. MANI SHRI RAMESH D. PATEL (*Alternate*)	The Bhor Industries Limited, Bombay
DR MOHAN RAI DR R. K. JAIN (*Alternate*)	Central Building Research Institute (CSIR), Roorkee
SHRI M. V. MURUGAPPAN SHRI R. SRINIVASAN (*Alternate*)	M/s Coromandal Prodorite Pvt Ltd, Madras

(*Continued on page* 2)

© *Copyright* 1984
INDIAN STANDARDS INSTITUTION
This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(*Continued from page* 1)

Members	*Representing*
SHRI RANJIT SINGH	Ministry of Defence (DRDO), New Delhi
SHRI K. A. SUVRASKAR (*Alternate*)	
SHRI O. P. RATRA	National Buildings Organization, New Delhi
SHRI D. B. SEN	Indian Institute of Architects, Bombay
SHRI S. B. SHIROMANY (*Alternate*)	
SHRI J. K. K. SINGHANIA	Engineer-in-Chief's Branch, New Delhi
MAJ S. P. SHARMA (*Alternate*)	
SHRI P. SRINIVASAN	The Concrete Association of India, Bombay
SHRI G. R. JOSHI (*Alternate*)	
SUPERINTENDING ENGINEER	Public Works Department, Government of Tamil Nadu
EXECUTIVE ENGINEER (*Alternate*)	
SUPERINTENDING SURVEYOR OF WORKS (CZ)	Central Public Works Department (CDO), New Delhi
SURVEYOR OF WORKS (CZ) (*Alternate*)	
SHRI G. RAMAN, Director (Civ Engg)	Director General, ISI (*Ex-officio Member*)

Secretary

SHRI A. K. AVASTHY
Assistant Director (Civ Engg), ISI

Cement Concrete Flooring and Other Miscellaneous Works Subcommittee, BDC 5 : 7

Convener

SHRI O. P. MITTAL
S-252, Panchsila Park
New Delhi 110017

Members	
SHRI N. BORALINGIAH	Builder's Association of India, Bombay
SHRI S. C. KAPOOR	Modern Tiles & Marble, New Delhi
SHRI A. C. KAPOOR (*Alternate*)	
DR MOHAN RAI	Central Building Research Institute (CSIR), Roorkee
SHRI B. S. GUPTA (*Alternate*)	
SHRI M. P. PATKAR	Central Public Works Department, New Delhi
SURVEYOR OF WORKS (AVN) (*Alternate*)	
SHRI G. C. SHARMA	Indian Institute of Architects, Bombay
SHRI NARESH KOCHAR (*Alternate*)	
SHRI P. N. TALWAR	The Northern India Tiles Corporation, New Delhi
SHRI W. N. TALWAR (*Alternate*)	
SHRI M. G. VIRMANI	Engineer-in-Chief's Branch, Army Headquarters, New Delhi
SHRI S. K. MALIK (*Alternate*)	

Indian Standard

CODE OF PRACTICE FOR APPLICATION OF LIME PLASTER FINISH

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 31 July 1984, after the draft finalized by the Concrete, Flooring and Plastering Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Lime plaster and allied finishes are commonly used in this country for internal finishes as well as for external renderings. But the practice regarding the selection of materials, preparation, thickness of coats and methods of application vary considerably from region to region and the large experience existing with various construction departments is reflected in the specifications they have developed. It is the object of this standard to cover comprehensively and provide guidance for the practice of lime plaster finish suitable to Indian conditions with respect to availability of materials and equipment and conditions of exposure. The Sectional Committee responsible for formulating this standard has also taken into consideration the various specifications presently being followed by the Central and State Public Works Department, the Military Engineering Service and other construction agencies and reports of the National Buildings Organization.

0.3 This standard was first published in the year 1965. In the present revision use of Portland slag cement conforming to IS : 455-1976* and Portland pozzolana cement conforming to IS : 1489-1976† have been included. Use of fly ash as pozzolana has also been included.

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.

*Specification for Portland slag cement (*third revision*).

†Specification for Portland pozzolana cement (*second revision*).

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

0.5 This standard is one of a series of Indian Standards covering plaster finishes. Other standards published in the series are:

IS : 1661-1972 Code of practice for application of cement and cement-lime plaster finishers (*first revision*)

IS : 2402-1963 Code of practice for external rendered finishes

1. SCOPE

1.1 This standard covers application of lime plaster finish to walls, ceilings, columns and similar surfaces on backgrounds suitable for receiving lime plaster finish.

1.2 Recommendations are laid down with regard to the preparation of surface to receive plaster and the number of coats to be applied on different surfaces under various conditions. Different materials and their proportioning with lime for preparation of mortar for different coats are also included.

1.3 The application of this standard, is restricted to only those types of plastered finishes in which lime constitutes the main binding material.

2. TERMINOLOGY

2.0 For the purpose of this standard, the definitions of terms given in IS : 10403-1983* and IS : 6508-1972† shall apply.

3. NECESSARY INFORMATION

3.1 In the selection of materials for plaster and in their mixing and application, information is necessary on the following points and detailed consideration shall be given to them before starting plaster work:

a) Types of surface over which it is proposed to apply plaster so that constructional details may be suitably adopted to them and the amount of subsequent preparation necessary before plastering may be minimized.

b) Area and types of finish required together with sufficient details of the nature of the surface to be plastered.

c) Details of finish at junctions with doors, windows and other openings, ceilings, linings, etc, and at all corners;

*Glossary of terms relating to building lime finishes.

†Glossary of terms relating to building lime.

d) Types of cornice, arris and return treatments desired, and of dado treatment where required;

e) Details of scaffoldings (staging) for access to work in the correct sequence together with provision for adequate protection of adjacent surfaces during plastering operations, particularly in ceiling work;

f) Details of fixing accessories to be embedded in the plaster;

g) Types of surface or decorative finish to be applied over the plaster and detailed information on the compatibility of the plaster with the proposed decorative finish; and

h) Rainfall and climatic conditions.

3.2 All information required in **3.1** shall be made available to those who are responsible for the plastering work. Necessary drawings and instructions for preparatory work shall also be given.

3.3 Arrangement shall be made for the proper exchange of information between those engaged in plastering and all others whose work will affect or will be affected.

4. PROGRAMME OF WORK IN RELATION TO PLASTERING

4.1 Operations Before Plastering — Building operations, such as construction of brick and block walls, the encasement of steel columns and beams with concrete, etc, requiring subsequent plastering, shall be so programmed that they are sufficiently cured and dry to receive the plaster without subsequent damage to plaster or decoration.

4.1.1 All service pipes, conduits, cables, etc, to be embedded in masonry work and covered with plaster shall be completed and suitably protected against corrosion, where necessary, before plastering is begun and the time of plastering shall be scheduled accordingly.

4.2 Operations During Plastering — Where other building operations are required to proceed simultaneously with plastering, special care shall be taken to programme the work so as to cause the minimum amount of interference.

4.3 Plastering operations shall be so scheduled as to allow sufficient interval between successive coats.

4.4 Operations After Plastering — Care shall be taken to ensure that subsequent building operations do not cause damage to the plaster work.

This may be achieved by careful programming and by the avoidance of last minute alternations in the design or in the sequence of work.

5. MATERIALS, TOOLS AND ACCESSORIES

5.1 The following materials, conforming to relevant Indian Standards shown against them, shall be used:

Name	*Conforming to*
a) Lime	IS : 712-1973[1]
b) Pozzolana	IS : 1344-1981[2] and IS : 3812-1981[3]
c) Sand	IS : 1542-1977[4]
d) Cement	IS : 269-1976[5], IS : 455-1976[6] IS : 1489-1976[7]
e) Wood lath, Timber	IS : 1331-1971[8]

5.2 The following materials, wherever used shall conform to the relevant Indian Standards shown against them:

a) *Lime Putty* — This shall be obtained by slaking lime with water in accordance with IS : 1635-1975[9].

b) *Water* — The water used for mixing and curing shall conform to the requirements given in **4.3** of IS : 456-1978[10]

c) *Natural Fibres* — Natural fibres, such as *Munj*, jute, hemp, coconut fibre, hair, if necessary, may be used as admixtures with plasters. They shall be clean and free from oil.

5.3 Tools used for plaster work may be in conformity with IS : 1630-1984[11].

---

[1]Specification for building limes (*second revision*).

[2]Specification for calcined clay pozzolana (*second revision*).

[3]Specification for fly ash for use as pozzolana and admixture (*first revision*).

[4]Specification for sand for plaster (*first revision*).

[5]Specification for ordinary and low heat Portland cement (*third revision*).

[6]Specification for Portland-slag cement (*third revision*).

[7]Specification for Portland-pozzolana cement (*second revision*).

[8]Specification for cut sizes of timber (*second revision*).

[9]Code of practice for filed slaking of building lime and preparation of putty (*first revision*).

[10]Code of practice for plain and reinforced concrete (*third revision*).

[11]Specification for Mason's tools for plaster work and pointing work (*first revision*).

6. STORAGE OF MATERIALS

6.1 Lime, cement and sand shall be stored as given in IS : 4082-1977* and IS : 7969-1975†.

7. CARE OF TOOLS AND ACCESSORIES

7.1 Cleanliness of the tools is very important as contamination with set material can seriously affect the performance as well as reduce the affective life of tools.

7.1.1 All tools shall be cleaned by scrapping and washing at the end of each day's work, or after use. Metal tools shall be cleaned and greased after each operation. All tools shall be examined and thoroughly cleaned before plastering is begun.

7.2 Scaffolding (Staging) — Wooden ballies, planks, treatles and other scaffolding materials shall be sound and in accordance with local building regulations. It shall be thoroughly examined before erection and tested before use. Steel scaffolding, if used shall conform to IS : 2750-1964‡ and used as in IS : 3696 (Part I)-1966§.

8. DESIGN CONSIDERATIONS

8.1 Suitability of Lime Plaster

8.1.1 Lime plasters are characterized by high workability and are generally suited for internal surfaces. Lime mixes have a long working time, a slow rate of strength development and reasonable strength.

8.1.2 Lime plastered finishes are not suitable for external surfaces in areas of heavy rainfall, very damp places and in places where extreme water tightness is required.

8.1.3 Plastering mixes, based on hydraulic, semi-hydraulic or fat limes may be successfully used both for undercoats and finishing coats, provided proper attention is paid to proportioning of various ingredients and workmanship. The plaster hardens by drying and by recarbonation. This is a slow process and during the early stages after application the plaster is rather sensitive to shock and vibration.

---

*Recommendations on stacking and storage of construction materials at site (*first revision*).

†Safety code for handling and storage of building materials.

‡Specification for steel scaffoldings.

§Safety code for scaffolds and ladders: Part 1 Scaffolds.

8.2 Resistance to Knocks and Abrasion — Resistance of lime plaster to knocks and abrasion is not high but it can be increased by the use of coarser grades of fine aggregate and natural fibres in the plaster mix. Resistance can also be improved by gauging lime plaster with cement.

8.3 Suitability for Surface Finishes — Lime plastered surfaces are specially suitable for receiving finishes, such as white wash, colour wash, distemper, because of better adhesive properties of lime plastered surfaces. However, where cement-based paints are to be applied, lime plastered surfaces are not suitable.

8.4 Corrosive Effect on Metals — Metals in contact with lime plaster are liable to corrosion. However, when lime-cement plaster of rich mix, say 1 : 1 : 6 is used it would have lesser corrosive effect on iron and steel.

8.5 Suitable Combination of Under-Coats, Finishing Coats and Characteristics of Plastering Mixes — As a general rule, any coat of plaster shall not be stronger than the base or the previous coat. Under-coats and finishing coats shall be reasonably related to one another and to the structural background in regard to density and strength on the one hand and as liability to expansion or contraction during setting and drying on the other.

8.6 Number of Coats — For normal backgrounds, one coat is adequate for ordinary finish and two coats for high class finish. However, in special situations or where background is very rough and uneven, three coats may be necessary.

8.6.1 Cases where the nature of location of background influences the choice with regard to the number of coats are as follows:

a) Wood lathing normally requires three-coat plaster finish for satisfactory results,

b) Three coats of plaster may be necessary for finishing uneven stone masonry, and

c) In case of plastering on ceiling and soffit, generally one coat will be sufficient but for ceilings of floors or roofs constructed with rough stone slabs which are not adequately dressed and where there are undulations in the surface two coats will be necessary.

8.6.2 The range of coats normally employed for different backgrounds are as follows:

Brickwork (Internal and external)	1 or 2
Stonework (Internal and external)	2 or 3
Concrete blocks	1 or 2
Wood laths	2 or 3
Soffits and ceilings	1 or 2

8.7 Thickness of Plastering — The thickness for plaster work exclusive of key or dubbing out shall generally be as given in Table 1.

TABLE 1 THICKNESS FOR PLASTER WORK

(*Clause* 8.7)

Sl No.	Type of Work	First Coat	Second Coat	Third Coat
(1)	(2)	(3)	(4)	(5)
		mm	mm	mm
i)	Brick masonry:			
	a) Single-coat work	15	—	—
	b) Double-coat work	10	10	—
ii)	Stone masonry	15	10	—
iii)	Stone masonry (very rough surface)	15	10	10

8.8 Surface Finish — Plasters shall be finished to a smooth surface.

8.9 Effect of Atmospheric Conditions — The ideal conditions for application of plaster are gentle warmth coupled with moderate ventilation. Extremes of all kinds should be avoided as far as possible. The effect of prevailing weather at the time of plastering or during the setting, drying and hardening period is similar for lime plaster as for cement or cement lime plaster (*see also* IS : 1661-1972*).

9. GENERAL PRECAUTIONS IN PLASTERING

9.1 Roughness — The roughness of background improves the bond of plaster. This is particularly important in case of soffits and ceilings. A

*Code of practice for application of cement and cement-lime plaster finishing (*first revision*).

smooth surface may be roughened by wire brushing, if it is not hard; or by hacking if it is hard. After roughening the surface care shall be taken to moisten the surface sufficiently before plastering otherwise, the freshly exposed surface may tend to absorb considerable amount of water from the plaster. In case of special backgrounds, wood lath, expanded metal lathing, wire netting, etc, may be fixed to provide key to the plaster.

9.2 Surface Cleaning — The background surface shall be thoroughly brushed to remove dust, loose particles of mortar, etc, or efflorescence where it has occurred.

9.3 Dubbing — Dubbing may be necessary where the background is very uneven and that unevenness cannot be made up in regular courses of plastering. The process of dubbing consists in filling the holes and depressions with mortar of the same mix as for the first coat. The patches of plaster thus done are left rough so that the subsequent coat of plaster would stick to it.

9.4 Suction Adjustment — Suction is the force by which the plaster is held on the surface after it is laid by the plaster's trowel and until it has hardened. Without the aid of suction, plaster would creep and slide down due to its own weight. On the other hand, very strong suction withdraws all moisture from the plaster and makes it weak, porous and friable. Careful adjustment of suction is, therefore, very necessary for good plastering and may be achieved by wetting the backing suitably if it is dry. However, too much water makes it impossible to keep the mortar in position till it sets; therefore, the wall shall not be socked but only damped evenly before applying the plaster. If the surface becomes dry in spots, such areas be moistened again to restore uniform suction. A fog-spray may be used for this work. As far as possible plaster work shall be so planned, that it is done when the surface of the sides of buildings to be plastered are in shade.

9.5 Control of Cracking — The main reasons for cracking of plaster are as follows:

a) Quick drying of the mortar due to hot weather and low atmospheric humidity,

b) When a strong mix has been used on a weak background,

c) Lack of bond with the background,

d) Masonry underneath has not undergone initial shrinkage,

e) Lack of proper raking of joints, and

f) Discontinuity in backgrounds, such as change from wall to ceiling from concrete to brick work, from clay brick work to concrete block work, etc.

9.5.1 In case of discontinuity backgrounds, the best treatment would be to separate the two portions by a neat cut through the plaster at the junction. In the case of discontinuity from wall to ceiling, a cornice that would permit slight movement without cracking may advantageously be introduced. If it is not proposed to provide a cornice, a straight cut through the plaster or a groove joint at the junction may be provided.

9.5.2 In load bearing construction, cracks are also caused in the top floor partitions due to roof movement by variation in temperature. Development of such cracks shall be prevented by isolating the top of partition from the roof slab. To achieve this, plastering shall not be carried over the junctions of partition walls with the roof slab.

9.5.3 When plaster is applied to provide an unbroken surface over board or slab background, the plaster coat bridging the joints is subject to higher stresses and any movement in the background will show by cracks along the joints. To avoid this, the plaster is reinforced at the joints by fixing jute scrim or suitable wire gauge. This treatment may still be ineffective if large changes in humidity take place and if thin board backgrounds with high moisture movement are used.

9.6 Avoidance of Surface Crazing — Surface crazing is due to excessive shrinkage caused by drying. The mortar tends to shrink on hardening, but is restrained by bond with the background which is practically immune from movement of brick or stone. The restraint to shrinkage causes tensile stress in the plaster which is maximum at the skin. If the shrinkage is great, these failures develop into cracks which exist through the whole depth of the plaster. In order to prevent this formulation, it is necessary to limit the differences in shrinkage and thereby reduce the tensile stress to within safe limits.

9.6.1 Attention to the following points will reduce surface crazing to a minimum:

a) Use of well-graded sand and suitable proportion of various ingredients for mortar,

b) Thorough grinding of mortar and thorough mixing of different constituents,

c) Proper addition of solutions and other materials to improve the bending properties of mortar,

d) Observance of adequate time intervals between successive coats so that each successive coat undergoes a portion of its shrinkage before the next coat is applied and thus reduces the skin tension in the preceding coat,

e) Proper workmanship as regards application of different coats, and

f) Avoidance of quick drying in initial stages.

9.7 Working Periods with Regard to Setting Properties of Mortars — Plastering work shall be completed before the setting process for the mortar has started. All mortars shall be used as soon as possible after grinding, preferably on the same day. If eminently hydraulic lime (Class A) is present as an ingredient, the mortar shall be used within 4 h after grinding. Lime pozzolana mortar shall be used within 24 h of grinding.

10. PRELIMINARY WORK

10.1 A preliminary inspection shall be made to ensure that the surfaces are in a suitable condition for plastering, particularly with regard to their evenness and dryness. If dubbing out is necessary, it should be done in advance, so that an adequate time interval may be available before the application of the first undercoat.

10.2 Plastering operations shall not be started until necessary fixtures, such as frames of doors, windows, etc, are completed and all pipes and conduits to be embedded in the wall are installed so that there is no necessity to cut the plaster.

11. PREPARATION OF BACKGROUND FOR APPLICATION OF LIME PLASTER

11.1 For durability of plaster it is vital to obtain a satisfactory bond between the background and the first plaster coat and also to ensure that the bond is maintained subsequently. Necessary preparation of the background shall be done to fulfil the requirements mentioned in **11.2** to **11.4.**

11.2 Except for rough and uneven surfaces all joints in the brick masonry on the fair side shall be raked out to depth of not less than 12 mm while the mortar in the joints is still green. All joints in the brick and concrete block masonry shall be raked out.

11.3 Roughening and cleaning of the background surface shall be carried out as in **9.1** and **9.2.** Where necessary dubbing shall be carried out as explained in **9.3.**

11.4 The masonry shall be allowed to dry out for sufficient period so that initial drying shrinkage is fairly complete and suction adjustment is possible during plastering (*see* **9.4**). The background should be

moistened before the application of plaster. Differential movements between the background and the plaster due to moisture change will cause cracking of the plaster, as explained in **9.5**. Major part of such movements shall be allowed to set in before the plaster is applied, as for example, by giving in the case of moisture movement sufficient drying interval to the background. In concrete construction backing shall be properly done for good adhesion of the plaster to the background. Hollow concrete blocks and foam concrete blocks shall only be lightly wetted before the application of plaster.

12. PREPARATION OF LIME MORTARS FOR PLASTERING

12.1 Proportioning — Materials to be used in the preparation of lime mortar shall be measured by volume-gauge boxes. Proportioning of lime shall be done by measurement of volume as lime putty. In case the measurement is done on quick lime or hydrated/dry-slaked lime, their quantity shall be such as to yield the required volume of lime, putty.

NOTE — The lime in mortar mixes is assumed to be measured as lime putty. If it is measured as hydrated dry slaked lime, the proportion of lime in any mix shall be slightly higher than that is indicated, and a suitable adjustment shall be made as indicated in **12.1.1**.

12.1.1 The actual mass of hydrated lime which a putty contains may be determined by using the following formula:

$$M_h = \frac{G}{G-1}\,(M_p - 1\,000)$$

where

M_h = mass of dry hydrate,
G = specific gravity of hydrate, and
M_p = mass of puty.

12.1.2 The recommended mix proportions for lime mortars for plaster work shall be as given in Table 2.

12.1.3 *Quantity of Water* — The quantity of water required varies depending upon the quantity of lime, the proportion of the mix, nature of aggregates and also the weather.

12.2 Grinding

12.2.1 Lime putty and sand in the specified proportions shall be mixed with or without the addition of water on a dry water-tight mixing platform. The material shall then be fed into the mortar mill with the required addition of water and ground in accordance with **12.2.3**.

TABLE 2 RECOMMENDED MIX PROPORTIONS

(*Clause* 12.1.2)

Sl No.	Type of Coat	Mix Proportion by Volume	Class of Lime Conforming to Appendix in IS : 712-1973*
(1)	(2)	(3)	(4)
i)	Dubbing and first coat (both for external and internal surfaces)	1 lime: 2 to 3 sand *or* 1 lime: 1 pozzolana: 1 to 2 sand *or* 1 lime: 2 to 3 pozzolana (for first coat in the case of two coat work)	A and B C C
ii)	Second coat	1 lime: 1 pozzolana: 2 to 3 sand	C
iii)	*Neeru* finishing coat	Lime and fine sand ground in equal proportions	C

*Specification for building limes (*second revision*).

12.2.2 If dry material is used, the dry-slaked hydrated lime and sand in specified proportions shall be mixed dry first and shall then be fed into the mortar mill with the required additions of water and ground in accordance with **12.2.3.**

12.2.3 The mortar shall be raked continuously during grinding, particularly in the angular edges of the masonry lined mortar mill. Water may be added during grinding as required but care shall be taken not to add more water than required to bring the material to the required consistency. The mixing shall be done till every particle of aggregate is coated uniformly with cementitious material. The mortar shall be ground for not less than 180 rev in the mortar mill.

12.2.4 The mortar shall be used as soon as possible after grinding. As a rule, mortar shall be used on the day it is made. Lime mortar and lime pozzolana mortar remaining unused for over 72 and 24 h respectively shall be rejected and removed from the site. All lime mortars after grinding shall be kept damp and shall never be allowed to go dry. This may be ensured by covering the ground mortar with wet sacks or by any other suitable means. Partly set and dried mortar shall not be retempered for use.

12.2.5 *Mixing of Lime Pozzolana Mortars* — Lime either as dry-slaked/ hydrated lime or in the form of putty shall first be mixed with the pozzolana in specified proportion and ground in the mortar mill with addition of required quantities of water. Where specified sand shall then be added to the mix and mixing and grinding repeated till every particle of the aggregate gets uniformly coated with cementitious material. Lime pozzolana mortar shall be used within 24 h after being mixed.

NOTE 1 — To improve the binding properties of mortar, *gugal* (*armyres agal locha*) at the rate of 1·5 kg/m³ of mortar may be added to the mortar for the first and second coat when it is being ground. Also a solution of *gur* at the rate of 25 g of water may also be added to the mortar when it is being worked before plastering.

NOTE 2 — Fibrous materials, such as cattle hair, hemp, coconut or vegetable fibre, etc, may also be added at the rate of 1 kg/m³ of mortar to improve its adhesive and binding properties which are specially required for undercoats.

13. APPLICATION OF LIME PLASTER

13.0 General — It is an advantage to plaster the ceiling first and then to plaster the walls starting from the top and working downwards. This will permit the removal of scaffolding as early as possible.

13.1 To ensure even thickness and a true surface, plaster about 150 mm × 150 mm shall be first applied, horizontally and vertically, at not more than 2·0 m intervals over the entire surface to serve as gauges. The surfaces of these gauged areas shall be applied in a unifrom surfaces slightly more than the specified thickness. This shall be beaten with thapies to ensure thorough filling of the joints and then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally the surface shall be finished off true with a trowel or wooden float to a smooth or a sandy granular texture. Excessive trowelling or overworking the float shall be avoided. During this process a solution of lime putty shall be applied on the surface to make the latter workable. All corners, arrises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arrises, junctions, etc, shall be carried out with proper templates to the sizes required.

13.1.1 In suspending work at the end of the days, the plaster shall be left cut clean to line both horizontally and vertically. When recommending the plastering the edge of the old work shall be scrapped clean and wetted with lime putty before plaster is applied to the adjacent areas to enable the two to properly joint together. Plastering work shall be closed at the end of the day on the body of wall and not nearer than 150 mm to any corners or arrises. It shall not be closed on the body of

feature such as plaster bands and cornices nor at the corners or arrises. There shall be no horizontal joints in plaster work on parapet tops and copings, as these invariably lead to leakages. No portion of the surface shall be left out initially to be patched up later on.

13.1.2 Some times, ends of scaffolding ballies have to be housed in the wall which is being treated with plaster. In such cases, after the ballies are taken out, holes left in the wall shall be filled up with brick and mortar and the patch plastered up true, even and smooth in conformity with the rest of the wall so that no sign of any patch work shows out.

13.2 One Coat Plaster Work

13.2.1 Masonry walls on which plaster is to be applied directly, shall be clean and dry with the joints raked to a depth of at least 12 mm before applying the first coat. The surface shall be damped evenly to control suction which is an essential treatment for securing first class work. The plaster shall be of specified thickness and carried out to the full length of wall on to the natural breaking points like doors and windows.

13.2.2 The mortar used for plastering shall be stiff enough to cling and hold when laid; for ceilings the mix is required to be stiffer than that used for walls, on soffits the mortar shall be laid in long even spreads outwards from the operator overlapping each trowel full and using sufficient pressure to force it into intimate contact with the background. On walls the mortar shall be laid in long even spreads upwards and across, overlapping each trowel full, using sufficient pressure to force it into intimate contact with the background.

13.2.3 On relatively smooth background the mortar may have to be dashed on to ensure adequate bond for it when applied with a trowel. Dashing of the first coat aids in securing intimate bond by excluding air which might otherwise be trapped behind the plaster. The dashing of the first coat shall be done using a strong whipping motion at right angles to the face of the wall.

13.2.4 The plaster shall be laid in a little more than the required thickness and levelled with a wooden float. The plaster shall be trowelled hard and tight forcing it into joints to obtain a good bond and surface rubbed smooth with a plaster's trowel.

13.2.5 The plaster shall be water cured as described in **14.**

13.3 Two Coat Plaster Work

13.3.1 *First Coat* — The first coat of the specified thickness shall be applied in a manner similar to one coat plaster mentioned in **13.2.**

Before the first coat hardens its surface shall be beaten up by edges of wooden tapers and close dents shall be made on the surface. This helps the plaster in several ways : the cracks are closed, the mortar is compacted and driven home into the joints and the dents serve as a key to the subsequent coat. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon weather conditions. The surface shall not be allowed to dry during this period.

13.3.2 *First Coat on Wooden Lath and Metal Lathing* — The mortar shall be stiff enough to cling and hold when laid and shall then be applied by laying and spreading diagonally across the lath work overlapping each trowel full and using sufficient pressure to force it through the lath work to enable it to lap on the other side. The material shall be laid as uniformly as possible. The average thickness shall not exceed 10 mm. This coat shall be allowed to stand to get firm before denting.

13.3.3 *Second Coat* — The second coat shall be completed to the specified thickness in exactly the same manner as for the first coat. The finshing coat shall be laid with a mason's trowel to an average thickness of 5 mm.

13.3.4 Curing shall be done as described in **14.**

13.4 Three Coat Plaster Work — The first two coats shall be applied in a manner as explained in **13.2** and **13.3.** The third coat shall be completed to the specified thickness in the same manner as for the second coat and shall be cured as described in **14.**

14. CURING

14.1 Curing shall be started 24 h after finishing the plaster. The plaster shall be kept wet for a period of 7 days. During this period it shall be suitably protected from external damages. The dates of plaster shall be legibly marked on the various section of the walls so that curing for the specified period thereafter can be watched.

15. SPECIAL FINISHES

15.1 Madras Plaster — This is a special plaster finish applied in three or more coats to obtain a smooth polished surface in places where shell lime and fine sand are easily available.

15.2 First Coat — The first coat of lime plaster shall be applied to the wall as specified in **13.2.** This shall be allowed to set for 2 or 4 days and then the surface scoured thoroughly in diagonal lines crossing each other. The plaster shall be kept constantly watered till it is nearly set and then the second and third coats may be applied as in **15.3** and **15.4.**

15.3 Second Coat — One coat, about 5 mm thick, of the mix specified in **15.3.1** shall be applied and brought to an exact level surface with long wooden floats or where required, with curved moulds. The surface of the undercoat shall be watered, if necessary, before applying this coat.

15.3.1 The mix shall consists of the following:

	Parts by Volume
Shell lime (slaked)	12
Fine white sand	9
Powdered marble	1

The sand shall be ground very fine. The marble also shall be ground fine and sifted through muslin. The materials shall be mixed with water and kept in a heap, well wetted for 2 days.

15.4 Third Coat — The same mix as used for the second coat shall be ground on flat stone slabs with stone rollers to the consistency of fine river mud and applied to a thickness of about 2 mm over the second coat, be wetted before hand.

The surface of the third coat shall be polished first with trowels and then with very hard smooth stones. While the polishing operation is in progress soap stone powder contained in the muslin bags shall be dusted on the surface. The operation shall be continued till a high smooth polish is obtained.

15.5 Curing shall be done as explained in **14**.

16. REPAIRS

16.1 Cutting — The mortar of the patch where the existing plaster has cracked, crumbled and sounds hollow when tapped gently on the surface shall be removed. The patch shall be cut out to a square or rectangular shape at the places marked on the wall. The edges shall be undercut slightly to provide a dove-tailed key for the patch plaster.

16.2 Preparation of Surface — The masonry joints which become exposed after removal of old plaster shall be racked out to a minimum depth of 12 mm in the case of brick work and 20 mm in the case of stone work. The raking shall be carried out uniformly with a racking tool and loose mortar dusted off. The surface of the masonry shall then be scrubbed with wire brushes to clean it of all mortar. The surface shall then be thoroughly washed with water and kept wet before plastering is commenced.

With regard to concrete surfaces the same shall be thoroughly scrubbed with wire brushes after the plaster has been cut out and surface washed and cleaned.

16.3 Application of Plaster — The method of application shall be as described for one coat plaster work (*see* **13.2**). The surface shall be finished even and flush with the old surrounding plaster.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 $kg.m/s^2$
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress,	pascal	Pa	1 Pa = 1 N/m^2

INDIAN STANDARDS INSTITUTION

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 26 60 21, 27 01 31 **Telegrams: Manaksanstha**
(Common to 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
Southern : C.I.T. Campus, MADRAS 600113	41 24 42
Northern : B69 Phase VII, Industrial Focal Point, S.A.S. NAGAR 160051 (Punjab)	8 73 28

Branch Offices:	
'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMADABAD 380001	2 63 48 2 63 49
'F' Block, Unity Bldg, Narasimharaja Square, BANGALORE 560002	22 48 05
Gangotri Complex, Bhadbhada Road, T. T. Nagar, BHOPAL 462003	6 27 16
22E Kalpana Area, BHUBANESHWAR 751014	5 36 27
5-8-56C L. N. Gupta Marg, HYDERABAD 500001	22 10 83
R14 Yudhister Marg, C Scheme, JAIPUR 302005	6 98 32
117/418 B Sarvodaya Nagar, KANPUR 208005	4 72 92
Patliputra Industrial Estate, PATNA 800013	6 23 05
Hantex Bldg (2nd Floor), Rly Station Road, TRIVANDRUM 695001	32 27

Inspection Office (With Sale Point):

Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005	5 24 35

*Sales Office in Bombay is at Novelty Chambers, Grant Road, Bombay 400007 — 89 65 28

†Sales Office in Calcutta is at 5 Chowringhee Approach, P.O. Princep Street, Calcutta 700072 — 27 68 00

Printed at Arcee Press, New Delhi, India