Draft Indian Standard

PAINTING OF CONCRETE, MASONRY AND PLASTER SURFACES – CODE OF PRACTICE

PART 1 OPERATIONS AND WORKMANSHIP

(*First Revision)*

F O R E W O R D

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

This standard was first published in 1966 and this is the first revision of the standard. In this revision the following changes have been effected:

a) Referred Indian Standards have been updated.

b) 'Oil Paint' which was the terminology used earlier has been replaced by 'Solvent Based Paint' in accordance with the present practice.

c) Certain modifications have been made in respect of the preparation of background for lime plaster surfaces.

Painting of concrete, masonry and plaster surfaces is carried out not only for hygienic or aesthetic reasons, but also for waterproofing the surfaces and protecting them against natural weathering and chemical attack from industrial atmospheres contaminated with corrosive fumes.

Calcareous surfaces like lime and cement plastered surfaces are highly alkaline in the initial stages, they retain large quantities of water during construction and it takes long time for the greater part of the water to evaporate even when the atmospheric conditions are favourable. Therefore, in applying a paint system on these surfaces, it is essential to take cognizance of the stored up moisture and also the alkalinity of the surfaces. These surfaces are porous and present problems, such as variable suction, surface imperfections, growth of moulds, mosses, lichens and algae. As each of these have adverse effect on most of the surface coating materials, finishing of these surfaces need special care. The purpose of this standard is to explain the preparatory treatment and the painting system and provide guidance for successfully overcoming the problems connected with painting concrete, masonry and plaster surfaces.

In the formulation of this standard due weightage has been given to international coordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

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.

The committee responsible for the preparation of this standard is given at Annex G.

Draft Indian Standard

PAINTING OF CONCRETE, MASONRY AND PLASTER SURFACES - CODE OF PRACTICE

PART 1 OPERATIONS AND WORKMANSHIP

(First Revision)

1 SCOPE

1.1 This standard (Part 1) deals with the preparatory treatment and painting operations of calcareous surfaces, such as concrete, masonry and plaster surfaces in building work.

1.2 Schedules for painting is covered in IS 2395 (Part 2~~) :~~): ~~1994~~.

2 REFERENCES

The Indian Standards listed in **Annex F** are necessary adjuncts to this standard.

3 TERMINOLOGY

3.0 For the purpose of this standard the definitions given in IS 2212 ~~: 1991~~, IS 2572 ~~: 1963~~, IS 1597 (Part 1) ~~: 1967~~, IS 1661 ~~: 1972~~, IS 2402 ~~: 1963~~, IS 2394 ~~: 1984~~, IS 456 : 1978 and IS 1303 : 1983 and the following shall apply.

3.1 Clearcole – A priming/sealer coat composed of ~~size~~oil or glue with whiting and sometimes a little alum, used before applying lime wash or distemper.

3.2 Suction – Absorption of liquid from ~~a~~ paint by a porous surface. High suction may make the paint difficult to apply and leave the coating in an underbound condition. Uneven suction may cause lack of uniformity in the finished appearance.

3.3 Water Filler – An easily rubbed down and washable distemper paste or composition of ~~size~~oil, whiting, and fine plaster, which accepts solvent based paints in a satisfactory manner.

3.4 Algae: A green film or powdery deposit is typical on paving, stonework and garden furniture. The dark green or blackish jelly-like growths that often appear in damper, cooler weather on paths and areas of tarmac are incorrectly known as blue-green or gelatinous algae, but are in fact a cynabacteria called Nostoc.

3.5 Lichen: Lichens are found in damp places as they need moisture for both growth and reproduction. Lichens are particularly common in areas with clean air. However, they grow only very slowly so, unlike moss and algae, are slow to spread. There growth on path and garden furniture often appears in sheltered areas overhung by

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plants. These are common on paving and timber structures such as garden benches. The colour of lichen varies with species, but most are silver-grey, grey-green, yellow or orange. They can be crust- like, leafy or scurfy in texture.

3.6 Liverwort: Liverworts that grow on hard surfaces usually have a green, flattened, plate-like body. They are small plants and have no true roots, stems or leaves. They are not economically important to humans but do provide food for animals and facilitate the decay of logs and aid in the disintegration of rocks by their ability to retain moisture. Liverworts also traditionally called the Hepaticae.

3.7 Moss: Mosses are simple living organisms that grow on rocks and trees. They are commonly found on hard surfaces are usually cushion-like. Mosses are non-flowering plants known as bryophytes. These are distributed throughout the world except in salt water and are commonly found in shady locations. They are best known for those species that carpet woodland and forest floors.

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3.8 Mould: Mould/Mold is a type of fungi which being an organism cannot form in areas that do not support life. Mould is a member of the fungi family with thousands of varieties and exists in every indoor and outdoor environment. Moulds have mycelia and reproduce by releasing tiny spores into the air.

3.9 Lime fast pigment: These pigments are often made from natural earth pigments such as metal oxide. These are called alkali resistant 'lime fast' pigment.

3.10 Osmotic pressure: Osmotic pressure can be defined as the minimum pressure that must be applied to a solution to halt the flow of solvent molecules through a semipermeable membrane. It is a collidative property and is dependent on the concentration of solute particles in the solution.

3.11 Fungi are eukaryotic organisms that include micro-organisms such as yeasts, moulds and mushrooms. These organisms are classified under kingdom fungi.

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4 NECESSARY INFORMATION

4.1 For efficient planning and execution of painting work on plaster surfaces, detailed data and information with regard to the following shall be furnished:

a) Type of concrete, masonry or plaster surface to be painted, the type and nature of previous treatment, if any,

b) Situations of use, namely, whether an external finish or an internal finish, and the extent to which the surface will be exposed to weather and rain; and

c) In the case of new plastered surfaces the nature of the backing, the type of plaster undercoat and finish, the approximate date of completion of the plaster work in individual rooms; and any addition of lime to the plaster finishing coat shall be noted.

4.2 Arrangement shall also be made for the proper exchange of information between those engaged in painting work and all those whose work will affect or will be affected.

5 CHDARACTERISTICS OF THE SUBSTRATA AND TREATMENT

5.1 General

In painting calcareous surfaces, careful consideration shall be given to the physical and chemical properties of the substrata and the backing materials which are strongly alkaline. Concrete, lime and cement plasters are likely to cause alkali attack on paint. This will have to be clearly distinguished from materials which are neutral or nearly so, as in case of calcium sulphate plasters. The characteristics of different calcareous surfaces are described in **Annex A.**

5.2 Planning of All Painting Operations in Relation to Dampness in the Background

When painting new walls, any type of paint system which will seal in the moisture shall be avoided.

5.2.1 The material for initial decoration shall, therefore, be chosen in due relation to the ultimate scheme for redecoration. If, for example, it is intended eventually to paint the surface with solvent based paint, the initial decoration shall be done IS 2395 (Part1) 1994 either with a material which can be removed easily and completely, or with one which is suitable to receive solvent based paint.

5.2.2 When the surface has properly set and cured and when all excess moisture has dried out from it and from the backing and further movements of moisture will be negligible, painting may be done as specified, it being merely necessary to select an alkali resistant priming paint when solvent based paints are used to suit the porosity of the surface.

5.2.3 However, where it will not be possible to allow the required time for the surface to dry out fully, the decoration in such cases shall be with a porous finish, such as lime wash, colour wash, cement paint (*see* **Annex B**), oil-free distemper or suitable emulsion paint which will allow drying to continue at a reasonable rate through their films. Gloss paint shall not be used until drying is complete.

If a surface remains persistently damp, the cause shall be examined and the surface suitably treated before attempting to decorate. If remedy is impractical, isolation of the affected surfaces by battening out and plastering or boarding may be necessary. Local areas affected by efflorescence (*see* **Annex C**) shall be cut out and replastered, or treated with metal foil to prevent the absorption of water from the exterior or the penetration of water into the interior (*see* **Annex D**).

5.3 Painting and Other Finishes on Both Sides of the Wall

Painting new walls or partitions on both sides may result in an increased risk of paint failure, because the means of escape of water introduced during construction

operations are restricted. A difference in the porosity of the paint films applied to either side of a wall may result in one side being more affected than the other. The risk is similar and greater when only one side is painted and other side is sealed by some impermeable form of treatment, for example, wall tiling. Particularly, severe conditions may be met when walls, partitions and ceilings are built of materials that need large quantities of water for curing and setting. For all solid walls, partitions and ceilings, therefore, the precautions outlined in **5.2** shall be carefully observed.

5.4 Variation in Suction

The variation in suction characteristics of the surfaces to be painted require corresponding variation of the priming coat or, in some cases, the use of glue size, petrifying liquid or sealers according to the type of paint to be used. Surfaces which show local variations in suction, as for example, between individual bricks or on patches produced on plastered surfaces by local over-trowelling or by efflorescence, shall be treated by the application of a suitable primer. Lime plaster finishes have a moderate suction which can easily be counteracted by use of sealers.

5.4.1 If the suction is so high or variable that a normal painting procedure is unlikely to give a good finish one of the following ~~pretreatments~~ re-treatment shall be applied over the whole surface as a primer, according to the type of paint to be used:

	Type of Paint	***Re treatment***
a)	~~Size~~Oil-bound distemper 1) One-coat Application 2) Two-coat Application	 A coat of clearcole A coat of ~~size~~oil alone will be sufficient
b)	Dry distemper	A coat of the same distemper thinned with water or petrifying liquid supplied by the manufacturer or A coat of sharp colour or primer-sealer with the addition of finely ground pumice
c)	Solvent based paint	A coat of thin primer or primer-sealer, preferably in consultation with the manufacturer of the paint
d)	Emulsion paint	A coat of the same paint thinned with water or sealers recommended by the manufacturer ~~by the manufacturer~~
e)	Cement paint and limewash	Wet the surface before applying paints

5.5 Imperfections on surface either plastered or otherwise mar the appearance of the paint finish, and are especially conspicuous if the finish is glossy. Where smooth finishes are required, particular attention shall be paid to the preparation of the surface, including any necessary rubbing down, sealing, stopping or filling.

Plaster, if improperly gauged and worked, is liable to develop surface crazing (map crazing). This defect, if present, shall be treated according to the method given in **7.1.2** before painting to prevent the cracks or their positions from showing in the finished work.

5.6 Growth of Moulds, Fungi, Algae and Lichens

Mould Growth: Mold growth occurs when mould is allowed to expand beyond its origins. Mould growth can be exponential because as more mold forms, more spores are released by the new mould. Preventing mould growth can be performed through a variety of means. Typically, the first way to prevent mould growth is to control the moisture level. This can mean ensuring that surfaces are dry where mould growth is a concern. It can also mean controlling the humidity. Mould must also have the appropriate temperature to grow. Chemicals such as fungicides can be used to prevent mould growth if they are powerful enough to prevent the formation of organic matter.

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5.6.1 *Characteristics of Mould Growth* **–** The growth of mould is generally associated with continued dampness, either of the material painted or of the surrounding atmosphere. It shows itself in the form of black or ~~vari~~vary-coloured spots or colonies which may be on, in, or beneath the paint film, and are easily recognizable under a microscope. Mould growth may occur on almost any type of building material, including plastered surfaces. Some growths may penetrate the underlying plaster or brickwork and become difficult to eradicate. On new work mould growth is unlikely to be encountered. The surface of old work (covered as it may be with wall-paper, distemper, or solvent based paint) may already be infected with mould, particularly in premises which have been left unoccupied for some time or where there has been persistent damp penetration, and especially where walls have been saturated with water in the course of ~~t~~fire fighting. Poorly drained and/or shady conditions contribute to the growth of algae, moss, liverworts and lichen on paths and hard surfaces.

5.6.2 *Precautions Against Moulds, Fungi, Algae and Lichens***–**Exterior surfaces of porous building material like brick, stone and cement rendering, especially if unpainted, may develop growths of vegetation ranging from thick beds of moss to slimy streaks or patches of algae. Any such growth shall be removed and ammoniacal copper solution (*see* Note), shall be applied to the surface and allowed to dry thoroughly before painting.

NOTE – A recommended composition and concentration of the ammoniacal wash shall consist of 7 g of copper carbonate dissolved in 80 ml liquorammoniaand diluted to one litre with water. Alternatively, 2.5 percent magnesium silicofluoride solution may be used.

5.6.3 *Prevention of Recurrence of Mould Growth* **–** To prevent recurrence of mould growth on repainted surfaces the following procedure shall be adopted:

a) Remove the source of dampness and dry out the walls;

b) Improve ventilation, if necessary;

c) Remove the infected paint or paper; and

d) Sterilize the surface by applying any antiseptic wash, such as 2 percent sodium pentachlorophenateor any other suitable comparable material and allow to dry.

e) There should not be any standing water as this is essentially a breeding ground for mould.

f) Surface should be as dry as possible.

g) The surface should be clear of debris and dirt. Mould needs food to survive and dirt and debris can easily supply it with what it needs to thrive.

h) Use a solution of a ½ cop of detergent per gallon of water and mop the surface with it to clean the dirt from the surface.

i) Increase the temperature.

j) Improve the ventilation.

k) Dehumidify the surface.

~~d)~~

Many special problems regarding mould growth may require individual consideration and expert advice may be sought when necessary.

Care shall be taken to ensure that mould growth is not transferred to a surface from dirty brushes or other equipment as the organism then becomes more firmly embedded in the decorative finish and is, therefore, relatively more difficult to eradicate. In addition to the usual cleaning, the equipment shall be given a final rinse in a suitable fungicidal solution,

5.6.4 Fungi Growth: Fungi usually grow in places which are moist and warm enough to support them. Fungi are common widely distributed and grow vigorously on paper, wood, plaster, paint, leather and fabric that contain 12 % to 15 % water, adjust to temperature changes more rapidly than higher life forms. Fungus is caused due to extreme humidity, inadequate ventilation and water leakages and may lead to respiratory problems and allergies. Fungus can be identified by its different appearance which includes black, green or white spots on the surface. It may also have a musty odour.

5.6.5 Prevention of recurrence of Fungus growth: To prevent fungus growth, it is essential to maintain proper ventilation and control moisture levels. Consistent inspection and repair of any leaks or water damage is vital. Using mould-resistant paint and cleaning surfaces with antifungal solutions can also help prevent the growth of fungus.

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6 SELECTION OF PAINTS

6.1 The selection of .paints shall generally be as given in the schedules covered in I~~s~~S 2395(Part 2)~~: 1994~~.

6.2 Quality solvent borne paint should be applied when repainting over an existing oil-based system and latex paint should be applied over an existing water-based system.

6.3 Compared with oil paint, solvent-borne paints generally provide better adhesion than latex paint and shrink less.

7 PREPARATION OF ~~R~~BACKGROUND

7.1 For Lime Plaster Surfaces

7.1.1 In the case of new lime plaster, precautions with regard to the drying of background shall be observed carefully as these will considerably affect the performance of the finish In the case of new lime plaster, the essential principles with respect to drying of background will be the following:

a) Be ensure, the lime plaster surface has completely cured and is fully set.

b) If there are dark patches on the surface, this is a sign that plaster is still damp.

c) Substrates must be dry, solid and clean.

d) Check for any lumps and bumps on the plasterwork and use fine sandpaper to remove them. Brush off loose particles and remove dust from the surface.

e) Make sure to use a breathable, vapour-permeable paint. Check that natural ingradients as chalk and clay paints are more likely to be breathable.

f) While working on exterior walls, it will most likely be made up of lime render which has similar properties to lime plaster.

g) Holes and cracks must be filled and smoothened out with wall filler to obtain a level surface.

~~a)~~h) If possible, lime plaster shall be left unpainted for the first few months so as to allow the plaster to carbonate, harden and dry thoroughly. If the plaster has any tendency to craze or crack owing to shrinkage on drying, the movements shall be allowed to occur before the surface is painted, so as to enable provision of suitable preparatory treatment. Heating the rooms, if accompanied by good ventilation, will assist drying, but shall be cautiously adopted.~~–~~ Too rapid drying may damage the plaster by causing undue shrinkage and separation of the plaster coats.

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~~b)~~i) If there is any objection to leaving the plaster bare, a temporary decoration of soft distemper (non-washable distemper) may be applied. This may be removed easily at a later date and replaced by a more permanent decoration. Other types of paint suitable for early application are cement paints, silicate paints, and washable distemper depending upon the final decoration in view.

~~c)~~**j)** If the, background of the plaster is one likely to contain large amounts of water, for example, new brickwork, concrete or building blocks, no attempt shall be made to apply solvent based paint (especially gloss finishes) until there is every reason to believe that the walls are thoroughly dry. Some indication of the progress in drying can be obtained by means of the tests described in **Annex E.**

~~d)~~k) If the background is of a drytype, for example, wood or metal lath, solvent based paints may be applied with safety after a few weeks drying, and oil-bound distempers even earlier.

7.1.2 In case of old unpainted plaster surfaces any source of dampness in walls and ceilings shall be removed and painting shall be deferred until the plaster has dried.

Any major cracks or defects in the plaster shall be cut out in *V* shape and made good. Cracks may be wetted thoroughly prior to filling, to avoid undue absorption of water and subsequent shrinkage of the filling. For filling, a retarded hemi-hydrate calcium sulphate plaster gauged with about one-third of its volume of hydrated lime may be used.

Prior to painting, fine cracks may be primed and subsequently filled with a putty of suitable consistency made out of enamel, water and whiting powder.

7.1.3 In the case of previously painted lime plaster surfaces the following precautions given in **7.1.3.1** to **7.1.3.6** shall be observed.

7.1.3.1 Any existing fungus or mould growth shall be completely removed. The surface shall be thoroughly scraped and rubbed down with bristle brush and sand paper and then washed down with clean water and allowed to dry. A coat of fungicidal wash shall then be applied and allowed to dry after which a further coat shall be applied and left for some time to dry thoroughly. The surface shall be kept under observation during the drying out period and if the mould recurs, the treatment and drying shall be repeated before painting. The surface shall be brushed with a soft bristle brush to remove any dust particles 24 hours after the wash. Painting shall be carried out over the top of the fungicidal wash without removing it with water.

7.1.3.2 Any existing paint showing extensive flaking, bleaching, or saponification (as shown by stickiness or the presence of yellow soapy runs) shall be removed by scraping and washing and the surface allowed to dry completely. It may then be repainted as prescribed for new surfaces.

7.1.3.3 Local defective patches shall be treated individually by removing all loose or softened paint and bringing forward the treated patches with primer and undercoating before applying a fresh coating over the whole area.

7.1.3.4 Dry distempers and lime wash shall be totally removed prior to repainting. It may sometimes be necessary to wet the surface before scraping. This shall not be overdone and all surfaces shall be perfectly dry prior to the application of any priming coats.

7.1.3.5 Certain wall and ceiling surfaces may reveal hairline cracks. After complete removal of the existing paint systems and if the lime plaster has cured and dried completely, use at least two coats of any of the primers for the paint system to be adopted. When solvent based paint is to be used, the primer at least shall be of the alkali resistant type. Lime fast pigments shall be used.

7.1.3.6 Water based paint or washable distemper, if in a clean, sound condition, need not be removed if similar coatings are to be applied in the new paint system. By using a mild detergent, the surface may be washed and then after a light sanding, will be ready to receive a fresh coat (with spot priming if required).

7.2 For Cement and Cement Concrete Surfaces

~~Before painting, the surface shall be thoroughly brushed to remove all dirt and remains of loose or powdered materials.~~

i).Clean the area: The first step in preparing concrete for paint is to thoroughly clean the area. It is important to remove any surface debris that can easily be swept up or vacuumed. Before painting, the surface shall be thoroughly brushed to remove all dirt and remains of loose or powdered materials.

ii). Repair any defects: After surfaces are clean, use a masonry filler or a ready mix concrete patch to make good any defects on the surface.

7.2 2 For Old Work:

i). Clean the surface: But on old unpainted surface, if there is an extensive growth of vegetable material which cannot be removed by brushing, the growth shall be destroyed by applying a wash of ammoniacal copper solution in accordance with **5.6.2**. The dead and dry remains of the growth shall be brushed off prior to painting. If possible, power-wash the surface to remove old flaking paint etc. Also, if mould or algae are in evidence then add some bleach or mildewcide to the water. In case of indoor or where power washer is impractical, then use a scraper and wire brush to remove old paint. Scrub well into the concrete surface to ensure that paint will adhere.

ii). Repair any defects: After surfaces are clean, use a masonry filler or a ready mix concrete patch to make good any defects on the surface . Any loose or uneven areas or any major cracks in the cement concrete or plaster background shall be cut out in V shape and made good and the repairs allowed to dry thoroughly before painting is commenced. Minor repairs may be made with cement mortar. Cement plaster or concrete which is previously painted shall be prepared in the same manner as in **7.1.3**.

7.3 For Gypsum Plaster Surfaces

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Before application of the paint it shall be ensured whether the surface is alkaline or neutral and the alkalinity may be tested in accordance with **E-1**.

If the surface of the plaster has a patchy appearance and shows wide variations in suction due to efflorescence or other causes, a paint primer shall be applied before the application of a regular paint system.

For old surfaces, unpainted or previously painted, the preparation of background will be the same as in the case of lime plasters. If it is a neutral surface, the application of a priming paint may not be necessary.

7.4 For Masonry Surfaces

7.4.1 For New Work:

i). Clean the surface: The first step in preparing the masonry surface for paint is to thoroughly clean the area. Take a heavy brush and clear the surface. If possible, power-wash the surface and make sure to do this work a few hours before the start of paint or at least enough time to let it dry. Dirt may be removed by washing with water.

7.4.2 For Old Work:

In the case of old masonry, wherever there is extensive growth of vegetable matter, it shall be treated suitably according to **5.6**. Previously painted brickwork shall be prepared in the manner given at **7.1.3**.

8 APPLICATION OF PAINT FINISH

8.1 After preparing the surfaces in accordance with 7 the selected paint finish shall be applied. The painting operations including tools for painting shall be in accordance with the provisions suitable for the respective paints covered in IS 1477 (Part 1)~~: 1971~~ and IS 1477 (Part 2)~~: 1971~~.

9 MAINTENANCE: Maintenance refers to the routine activity of applying a fresh coat of paint to different surfaces in order to sustain their quality and protect them from damaging environmental factors.

9.1 General: Regular maintenance such as dusting and spot cleaning, is the key to prolonging the life span of the paint and therefore saving of time and money as well as create a healthier indoor environment by preventing the build-up of dust and allergens.
Following steps shoud be performed for carrying out the maintenance:

i). Perform a visual inspection
ii).Scrap away loose paint
iii). Kill mildew
iv). Prime and touch-up
v). Wash away the grime

9.1.1 Existing paint work shall be cleaned or rubbed down with wire brush and then dusted to remove all loose material according to its type, and damage to the plaster shall be made good.

9.1.2 Defective paint on surfaces (as shown by stickiness or the presence of soapy runs) shall be removed and the surface allowed to dry completely. Repainting on such exposed plaster shall be carried out as described for new plaster surfaces.

9.1.3 Where small patches of defective paint are removed, the area may be filled with a water filler IS 2395 (Part 1) ~~: 1994~~ using a broad-knife to bring it level with the surrounding surface. Water fillers shall be applied to the plaster and primed when dry. Where solvent based paint is to be used, ~~d~~all patches and repairs shall be primed and brought forward with undercoating. Where oil-bound water paint or emulsion paint is to be used a thin coat shall be applied prior to the general application.

9.1.4 The choice of paint system to be applied to the surface will vary according to the nature of the existing paint and that of the new finish to be applied [*see* IS 2395 (Part 2) ~~: 19941~~.

9.1.5 Since flat and matte paint has porous textures that tend to trap dirt and dust . This paint is not so durable and require a more delicate approach to cleaning. Cleaning of this paint starts by dusting them with a soft brush or microfiber cloth to remove loose debris. Now dampen a sponge or cloth with a mild detergent mixed with warm water and gently wipe the surface in circular motions, covering each inch. Do not use a scrubbing motion, as this can damage the paint. If stains/marks are noticed then gently dab the solution on this area.

9.1.6 For Latex or water based paint, it's essential to be cautious not to wash the surface with water alone, as this can potentially thin the paint. The best method is to add a few drops of dish detergent or a few tablespoon of vinegar to approximately half a bucket of water. Use a soft sponge to wipe dirt and drime it out well before cleaning the surface and avoid applying too much pressure that could inadvertently strip away the paint. After that rinse the surface with damp and clean cloth. Finally ventilate the space and dry the surface with a soft towel to prevent water spots. If there are splash of coffee or a pen mark, address spills and stains on the walls immediately to prevent them from setting. Blot the surface with a soft cloth and a gentle cleaning solution.

9.1.7 For solvent based paint, clean the surface by preparing a cleaning solution of warm water combined with a mild degreaser or mild detergent and vinegar. These will effectively break down grease and grime without damaging the paint. Now, use a sponge or cloth to apply small amounts of the solution to the surface. Again use some elbow grease to remove any stubborn grime or stains but not to scrub too vigorously to avoid damaging the paint. Now rinse the surface with a clean cloth and water, working in sections to prevent streak marks. Finally blot the wall dry then use dehumidifiers or open windows to speed up the rest of its drying. Since solvent based paints are more susceptible to damage by moisture hence pay proper attention to moisture prone areas.

9.2 Precautions Against Mould Growth

When redecorating old work, if the surface is found to be infected with mould growth it shall be treated in accordance with **5.6**.

9.3 Repainting Over Bituminous Coatings

9.3.1 Preparation of surface:

i). Apply Moss and Mould Killer.

ii).Scrub using paint prep and housewash. Alternatively, waterblast to remove flaking paint.

iii).Spot prime exposed bitumen using membrane roofing primer.

iv).Fill cracks and voids. If the cracks are under 1 mm, use brushable crack filler. For cracks over 1 mm, use Selleys no more gaps exterior formulation or similar. For holes and voids, use either jointflex or an approved masonry filler.

9.3.2 Key accessories essential to complete the job:

- 50-75 mm blue or professional brush
- Broad knife
- Brushable crack killer
- Moss and Mould killer
- Masonry filler or Epox-O-Bond

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ANNEX A
(*Clause* 5.1)

CHARACTERISTICS OF CALCAREOUS SURFACES WITH REGARD TO PAINT FINISH

A-1 CHARACTERISTICS OF LIME PLASTER

a) Lime plasters are highly alkaline and hence, until they are thoroughly dried and matured, they are liable to cause alkali attack on solvent based paints and distempers and fading of certain pigments. While it is true that limes vary in their tendency to attack paint according to the proportion of soluble alkalis (soda and potash) which they contain, it is wise always to take full precautions against alkali attack irrespective of the type of lime used. This is justified because, in practice a lime plaster finish frequently becomes contaminated with soluble alkalis from extraneous source, for example, from portland cement gauging or from bricks or other backing material behind the plaster.

b) Lime plaster finishes have a moderately high suction. This may be counteracted by
c) suitable adjustment of the first priming coat.

d) They develop efflorescence less frequently than other plaster finishes.

e) Lime plaster, if improperly gauged and worked, is liable to develop surface crazing. This defect, if present, may be reduced by special treatment as described in **7.1.2** to prevent the cracks or their positions from showing in the finished painted surface.

f) Lime plasters are softer than other types of plaster and, to this extent, they and any applied decorations are more liable to mechanical damage in certain situations. The plaster shall, however, be made to harden more quickly by suitable gauging.

A-2 CHARACTERISTICS OF GYPSUM PLASTER

a) Although finishing coats of gypsum plaster may be applied over different kinds of undercoating, for example, plaster-sand or cement-sand undercoating, this fact does not seriously affect the painting procedure, it is the composition of the plaster finishing coat which chiefly needs to be considered.

b) When the plaster is properly set and hardened and the plaster backing and background are dry, gypsum plasters may be painted successfully with almost any type of paint except cement paint.

c) Plaster finishes gauged with lime involve a greater painting risk than other plasters, owing to the possibility of alkali attack. The risk is least with retarded semi-hydrate gypsum plasters but for practical purposes, it is advisable to take precautions against alkali attack from any plaster to which lime has been added.

d) Neat calcium sulphate plasters have no appreciable chemical action on paint, and paint defects which occur on them are, generally, associated with the action of moisture and of efflorescent salts.

On anhydrite plaster, patches of efflorescence sometimes develop on areas differing in suction from the remainder of the surface and there is a tendency for paint to fail in adhesion at these places. Extra care in priming is needed to secure adequate adhesion and an even finish. The technique of 'priming following the trowel' helps to overcome the difficulty.

e) Retarded hemi-hydrate plasters, when exposed continuously to damp conditions, are liable to 'sweat out', a defect characterized by a failure to harden or by disintegration. This may occur in various circumstances, for example, when the background of the plaster is permanently damp or when moisture is sealed into the plaster by the premature application of an impervious paint film. Care shall be taken, therefore, to avoid these conditions.

f) Gypsum plasters are liable to a defect known as 'dry out', characterized by **a** friable condition of the plaster surfacing and sometimes affecting the whole thickness of the finishing coat. It occurs when the plaster is allowed to dry too quickly before it had time to combine with all the water needed for the setting and hardening process. A 'dry out' can be caused by application of the plaster finish to a highly absorbent undercoat, by conditions favoured by rapid evaporation or by the premature application of artificial heat. An impervious backing to a thin plaster finishing coat may be as dangerous as one which is too absorbent; since it holds little or no reserve of water and the finish dries rapidly.

The condition of 'dry out' is not, usually,apparent at the time the surface is decorated but, if an impervious coat of paint is applied, water from the backing may cause expansion of the partially hydrated plaster producing ridges, blistering and disintegration in the plaster and often causing the paint to loose adhesion.

g) While, it is possible to obtain a satisfactory paint finish on any type of gypsum plaster, provided the appropriate precautions are observed, it is preferable, from the painter's point of view, that the plaster surface shall not be too highly trowelled and made non-absorbent. A plaster surface which shows a moderate and uniform degree of suction provides a margin of safety in the matter of paint adhesion. It is particularly desirable to have a surface of this type when emulsion paints, water paints and distempers are to be used, since these adhere less strongly to impervious surfaces than do solvent based paints.

A gloss paint finish shows up any irregularities in the plaster surface, and hence, in places where such a finish is required, the plaster used shall be one which can readily be brought to a smooth level finish. To some extent, this conflicts with the requirements that the plaster shall not be highly

trowelled. It is desirable, therefore, that the plaster shall be trowelled only to the minimum extent needed to produce a smooth finish and no attempt shall be made to produce a high polish.

A-3 C~~IM~~HARACTERISTICS ~~6~~OF CEMENT AND RENDERINGS

A-3.1 New portland cement concrete and renderings are strongly alkaline, and for this reason solvent based paints when applied to them, are subject to saponification and bleaching. In addition, there is a risk of damage by efflorescence.

A-3.1.1 The risk of failure from the above causes continues until drying of the material has reached an advanced stage, and with mass concrete thisstage may require many months. The combined effect of drying and surface carbonation progressively reduces the danger of alkali attack. The process cannot be materially hastened by treatment of the surface with solutions of acids or salts, such as zinc sulphate, the application of salts in solution may even appreciably enhance the risk of efflorescence. Solvent based paints, therefore, shall not be used on such surfaces, until several months have passed, but earlier decoration may be carried out with portland cement paints or silicate paints.

ANNEX B
(*Clause 5.2.3)*

APPLICATION OF COLOUR WASH AND CEMENT PAINTS

B-1 COLOUR WASHING

B-1.1 Preparation of Colour Wash

The colour wash shall be prepared from fat lime conforming to IS 712~~: 1984~~. The lime shall be slaked at site and shall be mixed and stirred with about 5 litres of water for 1 kg of unslaked lime to make a thin cream. This shall be allowed to stand for a period of 24 h and then shall be screened through a clean coarse cloth. Four kilograms of gum dissolved in hot water shall be added to each m^3 of cream. About 1.3 kg of sodium chloride dissolved in hot water may be added for every 10 kg of lime. Mineral colours not affected by lime shall then be added. Generally used pigments are yellow earth red ocher and blue vitriol. These are crushed to powder, before mixing.

NOTE 1 – As an alternative for gum, 0.14 kg of glue may be added to 10 kg of lime so that the colourwash may not be easily rubbed off.

NOTE 2 – For exterior work the colour wash may also be prepared by scattering one part by weight of tallow in small lumps over 12 to 16 parts of quick lime, slaking it with only just sufficient water to form a thick paste, stirring occasionally to assist in dispersing the tallow, and allowing it to stand until cool. The resultant paste shall then be let down to thin wash which is strained through a coarse cloth. Mineral colours not affected by lime shall then be added. If tallow is not obtainable then linseed oil orcastor oil may be used.

B-1.2 Preparation of Surface

The new surface should be thoroughly cleaned off all dirt, dust, mortar drops and other foreign matter and shall be wetted. If the receiving surface is rough, it should be made smooth by rubbing with sand paper.

1.2.2 Old surface-

In case of old work, the surface should be broomed to remove all dust and dust. All loose scales and other foreign matter should be removed. Where heavy scaling has taken place, the entire surface should be scraped clean. Any growth of moulds moss should be removed by scrapping with steel scraper and ammonical copper solution consisting of 15 gm of copper carbonate dissolved in 60 ml of liquor ammonia in 500 ml of water should be applied to the surface and allowed to dry thoroughly before applying colour wash.

~~In case of old work,~~ ~~a~~All loose pieces and scales shall be scrapped off and as patches of less than 50 cm^2 area shall be filled up with mortar of the same mix. The surface shall then be wetted before the application of the colour wash.

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B-1.3 Application

The colour wash shall be applied with MOONJ or other brushes to the specified number of coats. The operation for each coat shall consist of a stroke of the brush first given horizontally from the right and the other from the left and similarly the subsequent stroke from bottom upwards and the other from top downwards before the first coat dries.

Each coat shall be allowed to dry before the next coat is applied. No portion of the surface shall be left out initially to be patched up later on. For new work, minimum two coats shall be applied so that the surface presents a smooth and uniform finish through which the plaster does not show. For colour washing on new work, the first primary coat should be of white wash and the subsequent coats should be of colour wash. The finished dry surface shall not show any signs of cracking and peeling and the colour wash shall not come off readily on the hand when rubbed.

For old work, after the surface has been prepared as in **B-1.2** a coat of colour wash shall be applied over the patches and repairs. Then one, or two or more coats of colour wash shall be applied over the entire surface. The colour washed surface shall present a uniform finish through which the plaster patches do not show.

B-1.4 Protective Measures

Doors, windows, floors, articles of furniture, etc, and such other parts of the building not to be colour washed shall be protected from being splashed upon.

B-2 CEMENT PAINTING: Cement paint is water based finish used for painting exterior or interior walls to avoid seepage and dirt collection. It is used for painting exterior wall surface mainly for preventing water penetration and reduction of dirt collection. It is suitable for coating concrete as well as decorating indoor and outdoor walls.

B-2.1 Properties of cement paint:

- **Durability**
- **Adhesion**
- **Breathability**
- **Resistance to alkali**
- **Ultra violet resistance**
- **Cost effectiveness**
- **Coverage**
- **Ease of application**
- **Versatility**
- **Repellent properties**

B-2.2 Types of Cement Paint:

- **Regular cement paint**
- **Water proof cement paint**

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- **Acrylic cement paint**
- **Elastomeric cement paint**
- **Texture cement paint**
- **Anti-algal cement paint**
- **Decorative cement paint**
- **High build cement paint**

B-2.1 Appropriate Usage

Portland cement paints are suitable for use on exterior and interior cement concrete and stucco surfaces not subjected to mechanical abrasion. They are recommended where it is desired to decorate or reduce the water permeability of exterior wails built of porous, open textured concrete, such as concrete block masonry. They may also b~~y~~e used where the concrete or stucco is damp at the time of painting or may become damp subsequently. They are not well suited for interior surfaces requiring frequent and thorough cleaning, as coatings of these paints are not easily washed and tend to erode with vigorous scrubbing.

B-2.2 Age of Concrete

Cement painting shall be deferred until the cement concrete of stucco has aged at least three weeks. The application of tinted paints to cast in place concrete walls shall be postponed for several months after the curing period so that the concrete will be drier and a less likely source of efflorescence.

B-2.3 Preparation of Background

The background surface shall be prepared as described in **7**.

B-2.3.1 *Wetting of Surface*

Before applying a cement paint the concrete shall be thoroughly wetted to control surface suction and to provide a reserve of moisture to aid in the proper curing of the paint. A garden hose adjusted to give a fine spray may be used for this purpose. For concrete masonry walls that readily absorb moisture, the surface shall be wetted in one operation not more than one hour before painting. The surface shall be moist but not dripping wet when the paint is applied. Dense concrete absorbs moisture so slowly that it shall be wetted in at least two operations not less than 30 min apart. It will be more effective to dampen larger areas in advance of painting so that ample time is allowed for the moisture to soak into the concrete.

B-2.4 Preparation of Paint

Portland cement paints are made ready by adding paint powder to water and stirring to obtain a thick paste which shall then be diluted to a brushable consistency. Generally equal volumes of paint powder and water make a satisfactory paint. For

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preparation of paint take two parts of cement paint and one part of water and stir thoroughly. Now add remaining one part of water to the mixture. Stir the solution thoroughly to obtain uniform finish. Take care to add cement paint gradually to the water and not vice versa.

B-2.5 Application of Paint

B-2.5.1 No painting shall be done when the paint is likely to be exposed to a temperature of below 7°C within 48 h after application.

B-2.5.2 When weather conditions are such as to cause the paint to dry rapidly, work shall be carried out 'in the shadow' as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.

B-2.5.3 To maintain a uniform mixture and to prevent segregation the paint shall be stirred frequently in the bucket.

B-2.5.4 The paint shall be applied in two coats of the same colour, not less than 24 h shall be allowed between coats and the second coat shall not be started until the first coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the first coat shall be slightly moistened before applying the second coat.

B-2.5.5 Cement paints shall be applied with a brush with relatively short stiff hog or fibre bristles. The paint shall be brushed in uniform thickness and shall be free from excessively heavy brush marks. The laps shall be well brushed out.

B-2.5.6 When painting concrete masonry for the dual purpose of moisture proofing and decoration, both the coats shall be vigorously scrubbed on in such a manner as to work the paint into the voids and provide a continuous paint film free from pinholes or other openings through which water may penetrate.

B-2.5.7 Spray application may only be adopted for dense concrete for interior surface where the paint is not required for waterproofing purposes.

B-2.5.8 The covering capacity of cement paint for two coat brush work on plastered surfaces shall be 3.0 to 4.0 m^2/kg.

B-2.5.8 Do not apply cement paint on surfaces which are already treated with whitewash, colour wash and dry distemper unless the surface is thoroughly scrapped and cleaned properly.

B-2.5.9 Fresh cemented wall should never be painted. Allow the cement to set well for at least 28 days.

B-2.6 Curing

Hardening of paint film depend upon the availability of moisture for chemical reaction with the portland cement. Painted surfaces shall be sprinkled with water using a fog spray two or three times a day. It is recommended that this shall be done between

coats and for at least two days following the final coat. The curing shall be started as soon as the paint has hardened so as not to be damaged by the spray, about 12 h after the application.

ANNEX C
(*Clause* 5.2.3)

EFFLORESCENCE

C-1 CHARACTERISTICS OF EFFLORESCENCE

C-1.1 Efflorescence means the growth of salt crystals on a surface caused by evaporation of salt-laden water. It is a deposit of crystalline salts, usually loose, white and fluffy, that forms on or near the surface of material. Efflorescence on painted surfaces is not very common and is often confused with chaulking of paint films. True efflorescence characterized by a deposit of crystalline salts may be easily identified under a magnifying glass through their prominent crystal structure. The efflorescent deposit is readily soluble in water or dilute acid solutions.

C-1.2 Types of efflorescence:

- Primary efflorescence
- Secondary efflorescence
- Insoluble efflorescence

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C-2 CAUSES

C-2.1 For efflorescence, moisture is the carrier of salts to the surface. Water in the masonry walls eventually moves to the exterior surfaces either by vapour pressure or by liquid diffusion. In the liquid form it takes appreciable quantities of soluble salts with it, which are deposited on the surface, specially near the cracks when the water evaporates. The reduced osmotic pressure of these concentrated solutions near the surface of the masonry also plays an important part in further water movements. As these solutions get more concentrated through evaporation, water movement occurs.

C-2.2 Efflorescence occurs when water soluble salts travel to the concrete surface. The mineral salts might be a result of the cement hydration reaction or can come from many other sources like sulphate rich sand. Porous concrete, masonry and mortars will be more susceptible to the migration of salts to the surface.

C-2.3 If there is a high concentration of mineral salts in the concrete there will be a higher chance of efflorcence. When the salt rich water migrates to the surface, the water evaporates leaving behind a salt deposit causing the white staining of the surface.

C-2.~~2~~4 In addition to their origin from the brick and plaster, soluble salts present in the soil may also contribute significantly to the efflorescence. Salt solutions through capillary action may rise to appreciable heights in walls due to high porosity and give rise to efflorescence.

C-2.5 How to avoid efflorescence:

- Reduce alkali sulphate content of concrete or grouts
- Reduce lime content by using a class- F fly ash
- Keep low water cement ratio

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- Ensure proper compaction to reduce voids and potential pathways for water migration
- By using of Hydrophobic sealant
- Installing capillary break
- Quality masonry construction
- Increased emphasis on landscapoing and sprinklers
- Installing grout with mechanical vibration
- Using dense tooled mortar joints
- Utilizing grout admixtures

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C-3 REMEDY

C-3.1 Sealing coats may not effectively hold back strong efflorescence. Dry brushing of the growth as it appears is the only remedy. Efflorescent salts shall not be removed by washing with water as it may carry some of the salts back into the pores. On redrying, efflorescence may be even worse than before if the salts were still present in the structure. Efflorescence will continue as long as there is sufficient water in the structure or plaster backings to carry the soluble salts forward and it is useless to attempt to seal the moisture by the paint film on the surface. The treatment of an old wall with hydrofuge silicone will frequently stop the efflorescence as the liquid blocks the passage for movement of moisture. In the case of efflorescence due to the rising of salt solutions through capillary action from sub-soil the only remedy is to provide bitumen or metallic seals in the walls above the ground level so that an effective barrier to the capillary action is created.

C-3.2 Efflorescence can be stopped by providing diluted solution of vinegar, muriatic or citric acid over the affected area. Be sure to always wear the the required personal protection equipment (PPE). After this apply baking soda or any other similar alkaline product to the area to neutralise the acidity on the concrete surface.

C-4 TEST TO KNOW W~~H~~HEN EFFLORESCENCE IS FAIRLY COMPLETE

C-4.1 Small areas of the plaster where the efflorescence is most conspicuous shall be rubbed down with a suitable abrasive followed by the application of a damp (not wet) cloth and left for at least one week This process shall be repeated, if necessary, until no more salts appear. Conditions shall be then reasonably safe for permanent painting. The test shall be carried out under conditions of warmth and ventilation approximating those of occupational conditions.

C-4.2 The cessation of efflorescence may be ascertained by brushing or wiping an affected surface free of existing efflorescence, then waiting for a reasonable period to ensure its continuing absence.

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(*Clause 5.2.3)*

APPLICATION OF ALUMINIUM FOIL TO CALCAREOUS SURFACES

D-1 PROCEDURE

D-1.1 The area to be treated shall be cleaned of dust and allowed to dry prior to the application by means of a brush of a thin coat of bitumen primer conforming to IS 3384~~ : 1986~~. Blown type bitumen ~~type bitumen~~ (Penetration 10 to 20) conforming to IS 702~~ : 1988~~ shall be hot applied by brush at a temperature of 175°C to the surface at the rate of approximately 1.5 kg/m^2.

The aluminium foil (0.025 mm thick) shall immediately be unrolled o~~h~~n the surface applied with hot bitumen. All joints shall have at least 50 mm overlap and shall be hot sealed. If required the blown type bitumen at 175°C at the rate of 1.5 kg/m^2 may be applied over the aluminium foil as a sealer coat. Thereafter, the aluminium foil or the bitumen sealer coat shall be painted with a plastic emulsion paint or water based paint as required.

ANNEX E
(Clauses 7.1.1 and 7.3)

TESTS RELATING TO T~~I~~HE FITNESS OF PLASTER FOR PAINTING

E-0 GENERAL

E-1 TEST FOR ALKALINITY

E-1.1 This test helps in determining the degree to which a paint resists reaction with alkaline materials such as lime, cement, plaster. Representative areas of the plastered, surface shall be treated with ~~an~~a solvent based paint or other alkali-sensitive paint (tinted with Prussian blue) and left for at least a week. If, at the end of that time, there is no sign of bleaching or saponification, conditions shall be reasonably safe for permanent decoration. If, on the other hand, bleaching or saponification has occurred, further small areas shall be treated. This shall be repeated until sample areas remain undamaged.

Alkalinity may also be detected by the use of moistened red litmus paper on the surface. If it turns blue the presence of alkaline background may be inferred.
Alkalinity throughout the plaster due to the presence of lime and/ or cement will decline slowly from an initial pH in excess of 12 to around 9.5. This may not happen on the same time scale as loss of residual moisture. The recommended minimum drying times for cementitous substrate may be used as a guidelines may be used as a guideline, with an allowance for lime carbonating more slowly than cement.If the plaster has not been fully and uniformly incorporated to eliminate lumps, there may be spots of very high alkalinity, which will decline only very slowly. The difference in properties from the surrounding plaster may cause blowing or popping of the plaster over these lumps. Where detected, they should be dug out and the holes stopped up.

E-2 TEST FOR EFFLORESCENCE (*see* C-4)

E-3 TEST FOR DRYNESS/ MOISTURE CONTENT: Before starting any painting work especially where solvent-borne paints or other relatively impermeable coatings are to be applied, it is important to consider the moisture content of any substrate to be coated. Moisture content of various substrate can be measured using a moisture meter, a plastic sheet test for concrete, or a calcium chloride test for horizontal concrete.

It is adviseable to test the plaster with a moisture meter to ensure that the moisture content at the surface does not exceed the acceptable limits for painting i.e. 12 %. However, high concentration of moisture may cause efflorescence and blistering.

Types of Moisture meters:

- Pin-type moisture meters/ Destructive / Invasive moisture meters
- Pin-less moisture meters/ Non-destructive/ non-invasive moisture meters
- All-in-one moisture meters

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Moisture readings must be taken to assure that not more than 12 % moisture content is in the plaster prior to the application of any coating.

E-3.1 It shall be noted, however, that these tests covered in**E-1** and **E-2** are not sufficient since a plastered wall may be neutral and show no signs of efflorescence and yet be damp, which is liable to cause paint to fail in adhesion. Moisture meter for testing the dryness of walls may be used in deciding when a surface has reached a fixed condition to receive paint. However, no form of test may indicate the condition of more than a small area and since a plastered wall seldom dries uniformly, the test shall be repeated at a number of places. Again it shall be noted that deep-seated moisture, which is not always detected by superficial tests may make its presence felt after the surface is painted.

ANNEXF
(Clause 2)

IS No.	*Title*
IS 456 ~~: 1978~~	Code of practice for plain and reinforced concrete (*third revision*)
IS 702~~: 1988~~	Specification for industrial bitumen (second revision)
IS 712 ~~: 1984~~	Specification for building limes ***(third revision)***
IS 1303 ~~: 1983~~	Glossary of terms relating to paints (second revision)
IS 1477 (Part 1) ~~: 1971~~	Code of practice for painting of ferrous metals in buildings : Part 1 Pretreatment (First revision)
IS 1477 (Part 1) ~~: 1971~~	Code of practice for painting of ferrous metals in buildings : Part 2 Painting *(first revision)*
IS 1597 (Part 1) ~~: 1967~~	***Code*** of practice for construction of stone masonry : Part 1 Rubble stone masonry
IS 1661 ~~: 1972~~	Code of practice for application of cement and cement-lime plaster finishes (first ***revision)***
IS 2212 ~~:1991~~	Code of practice for brickwork (first***revision)***
IS 2394 ~~: 1984~~	***Code*** of practice for application of lime plaster finish (first ***revision)***
IS 2395 (Part 2) ~~: 1994~~	

Tide

codeor practice for painting con&&, masonry and plaster surfaces: Part 2 Schedule ***(pstrev&@n)***
Code of practice for external rendered finishes
Code of practice for construction of hollow concrete block masonry
Specification for bitumen 'primer for use in waterproofing and damp-proofing cfirst ***reviiion)***
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IS 2395(I'art1):1994

ANNEX G
(*Foreword)*

COMMI'ITEE COMPOSITION
Painting, Varnishing and Allied Finishes Sectional Committee, CEf3 34
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Deputy Director (Civil Engg), BIS
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Review **of Indian Standards**
Amendments are issued to standards as the need arises on the basis of comments. Standards are
also reviewed periodically; a standard along with amendments is reaffirmed when such a review
indicates that no changes are needed; if the review indicates that changes are needed, it is taken
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