Draft Indian Standard

CODE OF PRACTICE FOR PAINTING OF NON-FERROUS METALS IN BUILDINGS

PART II PAINTING

0. F O R E W O R D

0.1 This Indian Standard was adopted by the Indian Standards Institution on 16 October 1968, after the draft finalized by the Painting, Varnishing and Allied Finishes Sectional Committee had been approved by the 'Civil Engineering Division Council.

0.2 This standard is the second part of the Indian Standard code of practice for painting of non-ferrous metals in buildings, and deals with the painting schedule. The first part of this standard covers the pretreatment. Both the parts together are intended to provide guidance with regard to the painting of non-ferrous metals in buildings.

0.3 In the formulation of this standard due weightage has been given to international co ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by referring to BSCP 231 : 1966 'Painting of buildings' published by the British Standards Institution.

0.4 This standard is one of a series of Indian Standards on painting in buildings. Other standards published so far in the series are given in Appendix A.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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PART II PAINTING

1. SCOPE

1.1 This standard (Part II) lays down schedules for painting of non-ferrous metals used in buildings.

2. TERMINOLOGY

2.1 For the purpose of this standard the definition of terms relating to painting shall be as given in IS : 1303-I963.

3. NECESSARY INFORMATION

3.1 Required information for the efficient painting of non-ferrous metals as given in 3 of IS : 2524 (Part I)-1968 shall be taken into account.

4. MATERIALS

4.1 General – It is the feature of certain non-ferrous metals, for example, aluminium, zinc, cadmium, copper, lead and tin, that under rural atmospheric conditions, they are capable of resisting corrosion without painting. When painting on non-ferrous metals, proper surface preparation is essential. This involves cleaning, sanding and applying a suitable primer designed for non ferrous surfaces to ensure optimal paint adhesion.The choice of paint depends on the type of metal and its intended use. Anodized aluminium may be especiaily resisting. Metal-to-metal joints need careful treatment, especially if they are likely to be exposed to damp conditions and the metals are dissimilar. A jointing compound (*see* **4.1.1**) or a preformed bandage or strip, should be used to insulate magnesium and aluminium from one another, but bitumen paints or rubber-based compounds may be used for joints involving other metals. In all cases the joint should be made while the jointing compound is still wet, the metal having been previously prepared and primed.

4.1.1 *Jointing Compound* – These are usually paste-like materials used for coating surfaces which are to be brought together and which will be inaccessible. Sometimes several coats of the paint used elsewhere on the structure are used for jointing, when it is usual to bring the surfaces together before the last applied coat is dry. Where dissimilar metals are used in conjunction in a structure, an isolating jointing compound is essential, and those containing chromates are preferred where aluminium or

magnesium is one of the metals. A typical compound for this purpose consists of equal parts by weight of barium chromate and kaolin in an oil varnish medium, the content being between 50 and 60 percent by weight and free from water soluble sulphates and chlorides. Bitumen or bituminous pastes and rubber-based jointing, compounds are used for other metals.

4.1.2 The surface should be prepared as specified in **6** of IS: 2524 (Part I)-1968. Even where this includes using an etch primer it is still necessary to apply a priming paint appropriate to the individual metal except in the case of lead and terne coating. Some etch primers are softened by water. For situations where exposure of the etch-primed surface to moisture may be expected special types of water-resistant etch primer should be used, or they should be quickly overcoated with primer. Where the metals concerned come into contact with alkaline materials, for example, concrete, lime mortar and brickwork, they should be given one or two coats of bituminous paint and, where the conditions are persistently damp, even thicker 6hns are desirable. Aluminium, lead, terne plate and tin must be treated fully in this way, zinc, cadmium, tin and magnesium need only be treated in this way if conditions are adverse, while copper is unlikely to need protection. Where non-ferrous metals are brought into permanent contact with hard-woods, such as oak and chest-nut, for example, when used for flashings for oak frames and sills, two coats of bituminous paint should be applied to both contact surfaces.

4.2 Aluminium – Whether the preparation has included pretreatment with an etch primer or not a zinc chrome or a modified zinc chrome paint should be used. For subsequent coats, normal types of oil, oleoresinous or synthetic resinous paints may be used provided that they are compatible with the priming paint. Bituminous paints are also permissible. Following materials are required for painting aluminium surface:

- Drop cloth
- Degreasing detergent
- Wire brush
- Sandpaper or sanding block
- Self etching spray primer
- Acrylic spray paint
- Enamel sealant

Following steps are involved for painting the aluminium surface:

i). Clean the aluminium : Fill a large bucket with warm water and mix it with a degreasing cleaner. Dip a rag into the solution to remove dust and dirt from the surface of the metal. If the surface is covered in rust or has some old flaking paint, scrub these bu using the wire brush because they can prevent the new coat of paint from adhering.

ii). Sand the metal surface : After cleaning the surface, dry it completely. Now sandpaper the surface.Sand all the sides, crevices and corners of the object. Start with a coarse sand grit paper like an 80 to 100 grit paper to sand the

surface then repeat the process with a finer 400 grit or higher sandpaper. Rewash the piece with warm water and degreasing cleaner to remove any particle and dust and allow the metal to dry completely.

iii). Apply self-etching primer then sand again : A self etching primer is crucial in painting aluminium. Its formulation contains chemicals that etch into the surface of aluminium for the best bond. To apply the primer, spray it in thin coats according to manufacturer's recommendations.Allow the primer to dry completely, followed by light sanding with a fine-grit (400 grit or higher) sandpaper and wipe away the dust using a rag.

iv). Apply the paint : Latex or acrylic paints are the best for painting aluminium. Choose the ones designes for use on the aluminium surface. In case of outdoor project, the paint should be of exterior grade. High gloss paint should not be used since it will highlight imperfections on the surface. Paint may be applied either by brush or spray and follow the manufacturer's recommendations for the best result.

v). Apply the sealer : After the paint has dried completely, apply at least two coats of enamel sealer. This protects the paint from chipping, fading or scratching over the years.

4.3 Zinc and Zinc-Coated Metals – As many items constructed fromzinc and zinc-coated metal, such as ducting, cladding and 'casing units arrive on site untreated, particular care should be taken for pretreatment and preparation of zinc surfaces. For subsequent coatings, normal types of paint, as described in **4.2**, may be used provided that they are compatible with the priming paint and will adhere well to it. Following Process should be adopted for painting on zinc and zinc-coated metals :

i). Preparation of galvanized steel before painting : There are four recognized methods of surface pretreatment that produce a sound substrate for a paint coating.

- T- Wash : Despite the fact that this preparation process has been available for some considerable time, T-wash is still generally considered to be the best pretreatment method for painting galvanized steel. T-Wah is a modified zinc phosphate solution which contains a small amount of copper salts. When applied, a dark grey or black discolouration of the zinc surface will result. T-Wash must not be allowed to pool on horizontal surfaces or this will prevent maximum paint adhesion. Any excess should be removed by water. It is most suitable for application to new galvanizing and should not be used on weathered galvanizing. Sufficient time must be allowed for the T-Wash to react and dry thoroughly before the first coat is applied. T-Washed surface can be left up to 30 days before painting and good paint adhesion can still result. So, there should be minimum time between pretreatment and paint application. The constituents of T-Wash are phosphoric acid (9.0 %), Ethyl cellusolve (16.5 %), water (57.0 %)

- Etch primer : Etch primers have also been used successfully. Their major disadvantage is the absence of any visible colour change as is case with T-Wash. Etch primers are most suited to application on older, weathered galvanizing.

- Sweep blasting : A mechanical method of pre treatment is sweep blasting using fine copper slag, J blast or carborundum powder with a blast pressure of no greater than 40 psi (2.7 bar). This will ensure that only the minimum amount of oxide is removed and the zinc surface is left in a slightly roughened condition. Care should be taken while carrying out sweep blasting on very thick galvanized coatings to avoid damage to the coating.Angular iron blasting grit must not be used under any circumstances. Sweep blasting is often used in addition to the chemical preparation stage.

- Weathering : This process only becomes fully effective after a galvanized surface has been exposed to the atmosphere for a period of at least six months. The surface is prepared using either abrasive pads or a stiff brush to remove all loose adherent materials and making sure that the bright zinc surface is not restored. This is followed by a hot detergent wash and rinsing with fresh clean water. The surface must be fully dry before any paint is applied. Weathering should not be used as a method of surface preparation in marine enmvironments with high chloride levels. The choices of paint sustems on galvanized metal will depend upon both the application and service environment.

  Two pack polyurethane and acrylic urethanes are commonly used as top coats and offer good durability and colour retention. Alternatives include acrylic epoxies and polysiloxanes, the latter offering increased abrasion resistance along with good gloss and colour retention.

ii). Selecting the correct paint : All paint systems should be specifically formulated for use on galvanized steel and applied in accordance with the paint manufacturer's recommendations.

iii). Application of paint coating : Paint coating should be carried out in accordance with manufacturer's instructions i.e. time of application, dry film thickness and curing rates.

4.4 Copper Lead – Copper can be painted in a number of ways. Apart from the traditional application of paint by brush, roller or spray, powder painting is also used, which is ideal for copper components such as flat bars, bus bars, bus ducts, connectors or other electrical components. It provides a hard and damage-resistant insulating coating with excellent physical, functional and aesthetic properties. Before painting copper, regardless of the method chosen, the surface must be properly prepared. Firstly, it should be degreased and any dirt or old paint removed. This will ensure proper adhesion and the expected parameters of the new coating. The oxidation of copper, although aesthetically undesirable very beneficial, as the copper oxides form a protective layer on the surface of the metal, preventing the developmemt of corrosion.

The process of removing old paint from copper can be tedious and depemds on the type of preparation used. The following techniques should be used to clean copper :

- Sandblasting : This involves cleaning the surface with a jet of sand or other abrasive under high pressure. It is effective in removing rust, paint or organic contaminants, but it does not work well on delicate components.
- Chemical cleaning : Using special chemicals that react with contaminants and old paint to dissolve them.
- Electrochemical cleaning : This technique uses an electrolyte and an electric current to remove contaminants from the copper surface.
- Mechanical rubbing or grinding : For smaller components or delicate surfaces, mechanical cleaning methods such as scrubbing with a steel brush or sanding with sandpaper can be used. However, this method must be used very carefully to avoid damaging the surface of the copper component.
- Ultrasonic cleaning : This method involves immersing the copper component in a special chemical solution and subjecting it to ultrasonic treatment. It is effective in removing very fine contaminants but requires specialized equipment.

To paint copper and maintain the functionality of the component, it is necessary to choose paints designed for type of surface. It is necessary to use products with very good adhesion, long term durability, resistance to damage or corrosion , as well as fast drying times.
The most commonly used paints for painting copper include Epoxy paint, polyster paints, polyurethane paints, acrylic paints, alkyd paints.

- Epoxy paint : Epoxy paint contain epoxy resins as the main component. They have high mechanical strength, which means that they are resistant to abrasion, scratching and mechanical damage. Epoxy paints adhere very well to a variety of substrate including copper and provide a durable and effective coating. They are resistant to fading and discolouration, which means they retain their attractive appearance for a long time. Epoxy paints are resistant to UV radiation and changing weather conditions, making them ideal for outdoor applications.

- Polyester paints : Polyester paints are durable, weather and corrosion resistant. It is widely used in the automotive, construction, furniture and other industries. Polyester paints allow beautiful effects to be achieved on copper surfaces while providing protection from the elements.

- Polyurethane paints : This paint is recommended for creating anti corrosion coatings.

- Acrylic paints : This paint is easy to apply and dry quickly, making them a popular choice for painting copper when work needs to be completed quickly. They are ideal for protecting and refurbishing copper pipes.

- Alkyd paints: Alkyd paints are good for painting radiators and copper central heating systems. Polyvinyl acetate paints are used for painting copper copper components outdoors.

The first coating or primer may be an unpigmented resin varnish or an etching primer. If a light-coloured finish is required, a coat of aluminium paint over the resin varnish will need to be applied; its leafing properties help to prevent the discoloration of superimposed coats of paint by green compounds should they be formed by inter-action between the copper and the medium. The finishing coats may be those indicated for zinc.

4.5 Magnesium – Magnesium is really not too difficult to paint. Degreasing, pretreated by deoxidizing and priming prior to painting, cleans it. Since magnesium is more is more alkali resistant than aluminium, it is degreased using strong alkaline cleaners. Deoxidizing can be done by acid pickling with chromic acid. Blast cleaning also remove oxidation. Surfaces should always be degreased before blast cleaning.
The pretreatment for magnesium are:

- Type I Chrome- Pickle treatment : A chemical treatment for magnesium in a nitric acid, sodium dichromate solution. The treatment gives some protection against corrosion by producing a film that is also a base for paint.

- Type II Sealed Chrome- Pickle treatment : This treatment consists to rinse first with cool water at a temperature from 40 ºF to 70 ºF and therafter rinse with hot water at a temperature from about to F. An improved chromate coating is thus formed on the surface of the magnesium shape by the action of the improved chrome pickle.

- Type III Dichromate treatment : This treatment consists of boiling magnesium parts in a solution of sodium dichromate. It provides good paint base and protective qualities on all standard wrought magnesium alloys except the magnesiumthorium alloys. Acid pickling of the magnesium surface prior to application of the dichromate treatment is required if maximum corrosion resistance of the finish is expected.

- Type IV Galvanic anodizing treatment : It is one of the most widely used surface treatment for magnesium and its alloy. In this electrolytic oxidation process, the surface of a metal is converted to an anodic oxide/ hydroxide film with desirable protective , decorative or functional properties.

The medium throughout the paint system to be applied to magnesium and its alloys should be highly resistant to water and alkali, for example, a stoving or air-drying medium, such as that based on tung oil/phenolic resin varnish. The primer should not contain graphite, lead pigments or metallic lead, bronze or aluminium; it should, however, contain zinc chromate in a proportion appropriate to the severity of the conditions of exposure. For normal exposure, the zinc chromate should constitute about 20 percent by weight of the dry paint film.

5. SCHEDULE FOR PAINTING

5.1 General – The surface shall be prepared and pretreated as specified in **6** of IS : 2524 (Part I)-1968. After treatment the surface of the metals shall be handled as little as possible before painting and shall be primed without delay.

5.1.1 The painting system may comprise primer, primer surfacer or filler, putty and finish coats in full or in suitable combination, such as primer/finish or surfacer/finish as may be found necessary depending on the condition of substrate and its end use. Finish coats alone may be applied where adequate. Dry, mineral oil or *water* -ding using suitable grades of abrasive paper may, be carried out at appropriate stages to obtain a smooth finish. Each successive coat may be applied only when the preceding coat is thoroughly dry. After applying the top coat further processing, such as to produce any decorative design for pleasing appearance, varnishing or polishing with suitable polishing compounds may be followed.

5.1.2 The types of primer, primer surfacer, etc, may be of any type compatible to each other and suitable for application over the substrate.

5.1.3 Application may be by any satisfactory method and air drying, force drying or stoving may be carried out.

5.2 Factory Painting – A variety of paint systems applied by ordinary or sophisticated methods of application like roller coat, electrostatic spraying, etc, and air drying, force drying or stoving all or part of the components in the painting system are possible.

5.3 On-Site Painting – Surfaces untreated or protected with a temporary protective shall be pretreated as specified in 6 of IS : 2524 (Part I)-1968 and then painted in a suitable system as mentioned in **5.1**.

5.3.1 Surfaces already factory pretreated and primed or finished shall be cleaned of foreign matter like oil, grease, dust, etc; damaged areas, if any, shall be appropriately feather-edged and touched up with suitable primer and brought forward as necessary with primer, primer surfacer, putty, finish coats, etc. The entire surface may then be flatted, if necessary, before apply in finish coats. Generally only an air-drying system may be possible for on-site painting and applications may be linked to brushing and spraying

6. MAINTEANCE

6.1 General – Since the prime object of painting is to protect the metal from corrosion, the paint film should not be allowed to deteriorate to a serious extent before recoating. If the paint film is allowed to crack or peel Corn the surface, corrosion may start and spread under the paint completely in order to prepare the surface properly for repainting.

6.2 Removal of the Old Paint – In removing the old paint, care should be taken to avoid, as far as possible, damaging any anodized or other chemical conversion coating which may have been applied to protect the metal. For this reason, an organic solvent-type paint remover should be employed, so that only a minimum of scraping and mechanical abrasion will be needed.

6.3 Where flaking of the paint has occurred on a limited area and the adhesion of the rest appears to be sound, it may be sufficient to remove loose paint and the corrosion products.

6.4 Priming – After the removal of the loose paints and corrosion products priming on patches or on the overall surface, as the case may be, shall be carried out at once.

6.5 Finishing – Subsequent process for finishing should be followed as described in **5**.

APPENDIX A
(*Clause 0.4*)

LIST OF STANDARDS ON PAINTING

IS : 1477 (Part I)-1959	Code of practice for finishing of ferrous metals in buildings : Painting and allied finishes : Part I Operations and workmanship
IS : 1477 (Part II)-1963	Code of practice for finishing of ferrous metals in buildings : Painting and allied finishes : Part II Schedules and equipment
IS : 1650-1960	Colours for building and decorative finishes withdrawn
IS : 2338 (Part I)-1967	Code of practice for finishing of wood and wood based materials : Part I Operations and workmanship
IS : 2338 -(Part II)-1967	Code of practice for finishing of wood and wood based materials : Part II Schedules
IS : 2395 (Part I)-I966	Code of practice for painting concrete, masonry and plaster surfaces : Part I Operations and workmanship
IS : 2395 (Part II)-1967	Code of practice for painting concrete, masonry and plaster surfaces : Part II Schedules.
IS : 3140-1965	Code of practice for painting asbestos cement building Products
IS.: 4597-1968	Concrete pipes – Methods of test (Second Revision)

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