

BUILDING DIGEST

CENTRAL BUILDING RESEARCH INSTITUTE, INDIA



PAINTING NON-FERROUS METALS IN BUILDINGS

Introduction

Non-ferrous metals are relatively less used in buildings and are usually more resistant to corrosion than iron and steel. They may corrode in alkaline and acidic environments and in marine and industrial atmospheres. Rain water and water running off building materials may also constitute a corrosion risk. The prevention of corrosion of non-ferrous metals by painting is dealt with in this Digest. The subject is also covered by IS : 2524-1968, Parts I and II, Code of Practice for Painting Non-ferrous Metals in Buildings.

Design Considerations

Galvanic corrosion of metals should be prevented by taking precautions in the design of the building itself. The contact of copper, nickel and their alloys (e.g. brass and bronze) with aluminium, and of zinc and aluminium with steel should be avoided. Magnesium should be protected from contact with aluminium. Where dissimilar metals are used in conjunction with each other, an isolating jointing compound is essential. Bitumen and bituminous pastes, inhibiting primers and some plastics sheets are some of the effective isolating materials. Compositions containing chromates are preferred to isolate aluminium and magnesium from other metals. Contact of metals with certain hardwoods should also be avoided.

Surface Preparation

Most of the methods for the preparation of iron and steel surfaces for painting (Building Digest No. 71) applies in principle to non-ferrous metals also. Degreasing is particularly necessary for non-ferrous metals because they readily retain the grease used in their manufacture. New surfaces, particularly if polished, should be roughened or etched on site without weathering.

Methods of surface preparation and priming treatment for each metal are given below:

Zinc and Galvanized Iron

Zinc is prone to surface corrosion in moist atmosphere yielding voluminous white corrosion products. Failure of paint on these surfaces is

mostly attributed to the smooth and slightly greasy nature of the surface which offers little key to the paint film. As zinc is sensitive to strongly acidic and alkaline conditions, preliminary cleaning of the metal is done by neutral emulsion type cleaners. If time permits, the surface may be left exposed to weather for about six months or less depending on the atmospheric conditions. The surface should lose its lustre and become dull in appearance as a result of the conversion of zinc into zinc oxide. The surface must then be cleaned free of dust and loose oxide film, if any.

Etch primer or wash primer is usually used to roughen the surface and it is then followed by a normal coat of primer paint.

Sheradised and electro-galvanized iron have a rougher surface than hot dip galvanised iron. Such surfaces should be smoothened before the application of any pretreatment.

A primer based on calcium plumbate is excellent for galvanized iron and zinc and requires no pretreatment before its application. Zinc rich primer and zinc chromate primer are good for severe climates. Zinc dust/zinc oxide primer also offers good protection and is economical.

Aluminium and its Alloys

In the rolling process, a thin film of oil or oil emulsion is invariably left on aluminium surface, and its presence may have a detrimental effect on the adhesion of paint. Weathering the metal for a month or two will probably be enough to remove most of this oil film but normally degreasing is necessary. Aluminium is not an easy metal to clean because it is sensitive to both acids and alkalis and it is readily corroded by them. It is best to remove oil, grease or wax by solvents such as petrol or a mixture of white spirit and solvent naphtha or, better still, cellulose thinner. The solvent should be frequently changed as it gets contaminated by grease and oil. On site the solvent should be scrubbed into the surface with a stiff brush and then wiped before priming.

The second problem with aluminium is in achieving good adhesion of the coating. Slight

roughening of the surface is desirable to provide mechanical anchorage to the paint film. On small areas, this can be done successfully by means of wire brushing or rubbing with emery paper but on large areas it becomes impracticable and some chemical treatment becomes necessary. Sand blasting should never be done. Chemical treatment consists in applying a coat of each primer which normally consists of phosphoric acid with a small proportion of corrosion inhibiting pigment such as zinc chromate in resinous medium. It provides the best possible adhesion but the film produced is usually thin and should be followed by a coat of normal primer with a minimum of delay. Exposure to damp conditions, immediately after application of etch primer should be avoided and the operation may be postponed if it is likely to rain.

Although aluminium and its alloys vary in their resistance to corrosion the same priming treatments are used for most of them. The choice of primer will depend to some extent on the condition to which the surface will be subjected in service. In marine and industrial areas, it is important that the primer should have good corrosion inhibiting properties. For such situations a primer with a high content of zinc chromate will probably give the best performance. For normal conditions of exposure the primer paint may contain varying proportions of red oxide and zinc chromate pigments. Lead and graphite pigments should not be used in the primer because they accelerate corrosion of the metal. Aluminium in contact with alkaline materials such as concrete should be given a coat of alkali-resistant primer or other protective material.

Copper and its Alloys

After degreasing with white spirit or petrol, the surface is roughened with fine abrasive paper preferably wet or with white spirit.

Etch primer and aluminium pigmented primer are both satisfactory. For interior locations primer paint can be omitted.

There is a demand for short notes summarising available information on selected building topics for the use of Engineers and Architects in India. To meet the need, this Institute is bringing out a series of Building Digests from time to time and the present one is the 76th in the series. Readers are requested to send to the Institute their experience of adopting the suggestions given in this Digest.

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Lead

Lead is rubbed with abrasives to roughen the surface to provide mechanical key to the paint. It is then treated with a dilute solution of phosphoric acid, phosphating solution or etch primer. Zinc chromate primer can be applied on lead as a thin coat. Primers containing graphite pigment should be avoided. Lead in contact with concrete or any other alkaline material should be protected with a bituminous coating.

Chromium, Nickel, Tin and Cadmium

After degreasing with white spirit corrosion products if any are cleaned down with fine abrasive. Etch primers are suitable and provide good key for subsequent finishing.

Finishing

In general paints which are suitable for iron and steel can be used for undercoating and finishing. A paint system such as an ordinary alkyd undercoat and a gloss finish is usually adequate. Where conditions are not severe a coat of primer and a coat of alkyd enamel can be applied. In chemically contaminated environment, chlorinated rubber paint or epoxy paint should be applied. Acrylic and acetate-butyrate clear lacquer are widely applied on aluminium and copper to preserve the bright appearance of the new metal.

Maintenance Painting

It is best to repaint before the existing finish begins to fail in order to avoid excessive expenditure involved in cleaning the entire paint work. One coat of finishing paint is then applied after dusting down the surface and removing loose paint. Rust spots if any are cleaned down to the bare metal which are touched up with an appropriate primer before the application of finishing paint. In the case of galvanised iron, if it has started to rust, the surface should be prepared as thoroughly as possible and primed as iron. Any flaking usually means that the adhesion of all the old paint is suspect. The paint should therefore be stripped, preferably by solvent-type paint remover and the metal treated as new.