



Painting Galvanised Steel

The recommendations given here will produce paint coatings of optimum performance in both functional and decorative applications. The paint systems recommended are established and proven. They range from simple self-priming finishes to complex systems suitable for the most demanding service requirements. Powder coatings over galvanised steel also offer advantages in architectural applications and in severe environments.

Premature failure of paint on galvanised steel is usually due to the incorrect choice of paint systems. Adoption of correct systems will ensure satisfactory performance and in many cases will simplify application. Painting is a complex subject however. Where doubt exists, expert advice should be sought.

The following recommendations have been developed in conjunction with Dulux Australia, Taubmans Proprietary Limited, Jotun Protective Coatings Pty Ltd. and Watty Limited.

Why Paint Galvanised Steel?

In general, galvanised coatings used alone provide cost-effective long term corrosion protection for steel. When galvanised steel is painted it is usually for identity, aesthetics or added chemical or corrosion resistance in extreme service.

Economics

Correctly chosen and applied paint coatings on galvanised steel provide outstanding durability and near ultimate protection for steel. Where steel is exposed to highly corrosive environments or where access is difficult and freedom from maintenance is required, duplex systems of galvanising-plus-paint provide very long service life, resulting in outstanding economics.

The longer life of correctly chosen and applied paint coatings on galvanised steel results from the stable zinc substrate which prevents underfilm corrosion at breaks in the paint coating, and resists even severe impacts which might damage a paint film.

The Synergistic Effect Of Duplex Galvanising-Plus-Paint Systems

Test results show that suitable paint coatings combined with galvanising achieve a synergistic effect in which the duplex coating may last up to three times as long as the combined life of each coating used alone.

Corrosion tests were carried out in the extremely corrosive environment of the Stichting Doelmatig Verzinken Weathering Station, Amsterdam, Holland, on the North Sea.

Under the very aggressive conditions of the test environment a thin galvanised coating of 10g/m² provided four years protection, while a two coat paint system over uncoated steel provided protection for only three years. The combination of an equivalent two coat paint system over the same galvanised steel provided protection for ten years.

Painted galvanised steel test panels with heavier 750g/m² galvanised coatings were also compared to panels painted with an equivalent two coat paint system. The painted steel panels failed at three years, while the painted galvanised panels were still sound after sixteen years.

Painting Recommendations For Galvanised Steel

The painting of galvanised steel requires different paint systems and procedures from those used for painting uncoated steel. Painting is not difficult, but it is important that the procedures outlined here and



Giving Steel A Real Edge.

the recommendations of paint manufacturers are followed exactly, to ensure long term adhesion, retention of film properties, and optimum performance.

The tabulated painting recommendations given later provide cost-effective systems for the following service:

Table 1: Decorative Purposes - Rural, urban, industrial and mild weathering

Table 2: Decorative Purposes - Heavy industrial and moderate weathering

Table 3: Maximum Long-Term Protective Life - Heavy industrial, marine and severe weathering, possibly subject to abrasion.

Extract from Galvanisers Association of Australia Handbook - Painting Galvanised Steel

Each of the tabulated recommendations offers the user the choice of several paint systems. Final choice in each case will usually depend on prior experience of particular systems acknowledge of local exposure conditions, taking into account the cost of the paint system and its application.

The following notes provide background to recommendations given in the tables. It is essential that only compatible paint systems specified by reputable manufacturers as suitable for galvanised steel are used, and that the pretreatment, primer and coating sequence is followed exactly.

Cleaning Before Painting

As in all painting operations, the surface to be painted should be clean, dry and free from grease, oil and all contaminants. Galvanised steel surfaces are clean and oil free as manufactured, but should they become contaminated during transport, storage or fabrication, the following cleaning methods should be used:

1. Non-oily soils and dirt should be removed by brushing or scrubbing. Detergent washing, followed by thorough clean water rinsing is satisfactory, provided the detergent is of the non-ionic type. Other types should be avoided as their residues may interfere with paint adhesion.
2. Remove grease and oily deposits using an alkaline oil emulsifying detergent. Other than for small areas, solvents tend to spread oil and grease.
3. Dry thoroughly.

Mechanical Preparation

Mechanical preparation by a light 'whip' or 'brush' blasting procedure to roughen the surface can provide an improved mechanical key for certain compatible paint systems, but will not improve the adhesion of unsuitable paints.

Some Australian government departments recommend a profile height of between 20 and 30microns, with minimum coating loss. Brush blasting is covered by Australian Standard AS1627 Part 4.

This method requires a high degree of skill and control, and should be undertaken only by highly experienced operators, to ensure that excessive coating thickness is not removed.

Coating Pretreatment For Long-Term Adhesion

Water-Borne Self-Priming Finishes

For less severe exposure, water-borne self-priming finishes of the 100% acrylic type give excellent performance on galvanised steel. They may be directly applied without pre-treatment other than



cleaning.

Water-borne self-priming finishes are ideal for decorative and protective coatings on new galvanised steel used for exterior walls, guttering and roofing. Two-coat application direct to new clean galvanised steel surfaces is recommended for a minimum of ten years service.

Near The Sea Coast. Under more severe exposure conditions near the sea coast, top quality acrylic coatings are necessary.

An alternative in such exposure is to prime the surface using a water-borne primer of the type discussed below.

Collection Of Drinking Water. Care must be taken to ensure that the paint manufacturer's specification states that the selected product is suitable for use on surfaces collecting drinking water. Suitable products include Taubmans Sunproof Gloss and Satin, and Wattyl Solaguard, however the first run-off should be discarded because of foam from the surfactant.

Maintenance painting of water-borne finishes is normally carried out using the same type of water-borne finish.

Modified Acrylic Water-Borne Primers

These specialised primers provide a simple, easily applied water-borne primer for use under water-borne finishes near the sea coast and in condensation areas, or for use under other decorative paint systems, including alkyd enamels.

Cold Phosphating Pretreatments

Suitable cold phosphating pretreatments for galvanised steel increase adhesion and greatly enhance the performance of water-borne paints in adverse conditions. Their use is mandatory under many of the paint systems recommended for more severe exposure conditions.

Extract from Galvanisers Association of Australia Handbook - Painting Galvanised Steel

Cold phosphating pretreatments produce adherent non-metallic conversion coatings of finely crystalline structure which provide excellent, permanent adhesion and generally upgrade the performance of suitable paint systems on galvanised steel.

Application usually comprises a three-stage operation. The manufacturer's instructions must be followed exactly.

1. Thoroughly clean and degrease. Alkaline cleaners are not recommended.
2. The cold phosphating solution is applied by dip, brush or spray and left for 3 to 6 minutes to allow formation of the grey zinc phosphate coating.
3. The surface is rinsed thoroughly and allowed to dry. Painting should be carried out as soon as possible after the surface has dried.

Etch Primers

Two-pack etch primers or wash primers are ideal for priming galvanised steel in production line processes where dry film thickness can be strictly controlled and occupational health requirements met. Coatings **must** be thin, applied by spray and strictly in accordance with the manufacturer's instructions.

Cold phosphate pre-treatment is recommended prior to etch priming when maximum adhesion is required.



The base vehicle or first pack of a two-pack etch primer contains a polyvinyl butyral resin in alcoholic solvents. The second pack or activator is an alcoholic solution of phosphoric acid which reacts with the galvanised coating, the pigment and the resin. When applied, the activated etch primer produces a translucent greenish-yellow film molecularly bonded to the surface of the galvanised coating.

Finish Coats For Severe Exposure Conditions

For more demanding exposure conditions, the paint system listed will give outstanding performance provided the complete system recommendations are followed.

Paints which give good results as top coats with suitable primers in severe environments include chlorinated rubbers, two-pack epoxies, polyurethanes and catalysed acrylics.

Industrially applied heat-cured coatings not covered here which also give outstanding results include thermosetting acrylics, silicone modified polyesters and acrylics, and thermosetting vinyls.

Powder Coating Galvanised Steel

Powder coating greatly enhances the durability of galvanised coatings under conditions of severe exposure and hard wear. A wide range of colours and finishes is available.

Powder coatings are applied by the electrostatic spraying of dry powders which are then heat fused at moderate temperatures to form a continuous, homogeneous coating. There is no solvent release during application or curing, increasing safety and minimising the environmental hazards often associated with painting.

In the powder coating of galvanised steel, polyester powders are the most commonly used, except in underground applications, where epoxies are preferred.

Powder coating should be performed soon after galvanising and work should not be allowed to become wet before coating. Galvanised steel intended for powder coating should not be chromate quenched by the galvaniser.

For normal exposure conditions, the freshly galvanised steel surface is iron phosphate pre-treated, followed by a chromate seal treatment, and then powder coating.

For heavy duty applications where maximum adhesion, salt spray resistance and durability is required, zinc phosphate pre-treatment is recommended.

Not Recommended

Alkyd Enamels And Alkyd Primers should never be applied direct to galvanised steel. The practice of weathering before direct application of alkyds, for example in the painting of domestic roof guttering, will not prevent premature failure of the paint coating, nor will chemical etching before painting.

Chemical Etching of galvanised surfaces by so called 'mordant' solutions based on weak hydrochloric acid, acidified copper sulphate and others must not be used. Etching cannot be controlled and will often remove excessive galvanised coating thickness, without aiding painting adhesion.

Extract from Galvanisers Association of Australia Handbook - Painting Galvanised Steel

Mechanical Preparation is not recommended unless strictly controlled as discussed on page 66. Mechanical preparation will not improve long term adhesion or performance of unsuitable paints and may result in unnecessary loss of galvanised thickness.



Giving Steel A Real Edge.

Weathering of exposed galvanised surfaces as a pre-treatment for painting is not recommended. The proven pre-treatment systems, specialised primers and self-priming paints for galvanised steel recommended here are easy to apply and permit more positive quality control.

Painting Recommendations

A range of recommendations for painting galvanised steel in the factory and on site is given in the Tables 1,2 and 3. Three groupings have been defined and recommendations are made to cover each condition.

Table 1: Decorative Purposes Rural, urban, industrial and mild weathering

Table 1

Painting galvanized steel
for decorative purposes
Exposure condition 1
Rural, urban, industrial and mild weathering

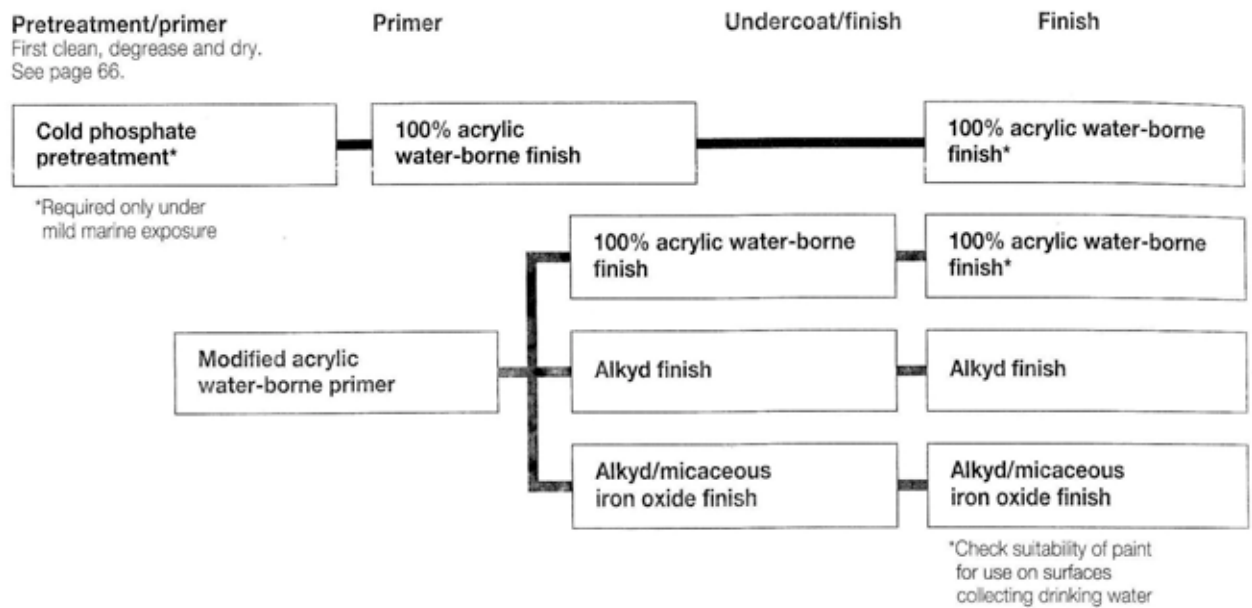


Table 2: Decorative Purposes Heavy industrial and moderate weathering

Table 2

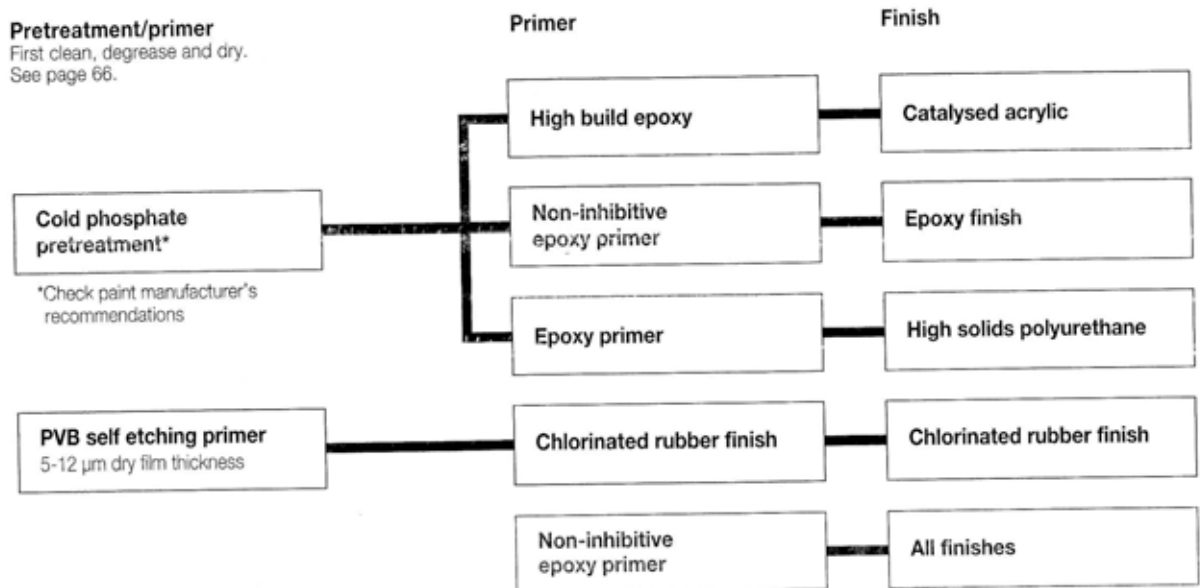
Painting galvanized steel
for decorative purposes
Exposure condition 2
Heavy industrial exposure and moderate weathering

Pretreatment	Primer	Undercoat/finish	Finish
First clean, degrease and dry. See page 66.			
Cold phosphate pretreatment	Modified acrylic water-borne primer	100% acrylic water-borne finish	100% acrylic water-borne finish
PVB self etching primer 5-12 µm dry film thickness		High build chlorinated rubber finish	Unmodified chlorinated rubber finish
Cold phosphate pretreatment	Non-inhibitive epoxy primer		Polyurethane finish
Cold phosphate pretreatment		High build epoxy	Catalysed acrylic finish
	Non-inhibitive epoxy primer		All finishes

Table 3: Maximum Long-Term Protective Life Heavy industrial, marine and severe weathering, possibly subject to abrasion

Table 3

Painting galvanized steel
for maximum long term protective life
Exposure condition 3
Heavy industrial, marine, and severe weathering possibly subject to abrasion



It is essential that the recommendations given are followed exactly. Use of paint types in combinations other than those listed, or omission of any part of a recommended system may result in reduced performance or complete failure of the paint film.

In situations of doubt or where specific recommendations are required, Galvanisers Association of Australia offers advice.

Extract from Galvanisers Association of Australia Handbook - Painting Galvanised Steel