galvanizers
ASSOCIATION OF AUSTRALIA

Guide to paint systems for hot dip galvanized steel in atmospheric service (duplex coatings)

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Cover page: Duplex coating on structural members of the Queanbeyan Pool, ACT

The painting of hot dip galvanized steel is an orthodox and well-proven practice in outdoor environments, both in Australia and internationally. The practice is commonly called 'duplex coating'.

Introduction

The painting of hot dip galvanized steel is an orthodox and well-proven practice in outdoor environments, both in Australia (AS/NZS 2312.2[1]) and internationally (ISO 12944.5[2]). The practice is commonly called "duplex coating". However, there are examples of early failures of duplex coatings due to incorrect specifications and poor practice. This Guide aims to avoid such failures by directing specifiers and applicators to the paint systems, surface preparation and application practices that will provide a durable duplex coating in a broad range of service conditions.

While good painting practices and generic products for the various exposure conditions have been nominated, this does not preclude the possibility of other paints and methodologies also performing satisfactorily. However, in selecting alternative products, specifiers are urged to select products only from those with verified records of satisfactory long-term performance in equivalent or more severe service conditions.

This document is a general guide only and requires strict compliance with the individual paint manufacturer's detailed application instructions for each proprietary product.

Painting objectives

Reasons for painting hot dip galvanized steel are primarily:

- **Decorative** – to create an aesthetic colour and gloss or provide an identifying colour.
- **Enhanced durability** – to increase service life.
- **Wider chemical resistance** – in a situation where hot dip galvanizing alone may be vulnerable, such as outside the pH range of 6 to 12.

Figure 1: Close-up of some of the duplex coated structural members inside the Queanbeyan, ACT Pool after around eight years' service

Decorative painting

In outdoor service, remote from the coastal fringe and isolated from areas of severe industrial pollution, hot dip galvanizing is inherently durable[3]. This contrasts with paints and other organic materials, which are degraded by solar radiation. Therefore, in most conditions of atmospheric exposure, little is to be gained from painting hot dip galvanized steel that has a coating thickness more than 42 µm (300 g/m^2) unless aesthetic or colour considerations are important (see Figure 2).

In benign internal situations, and particularly conditions of extreme impact or hard wear, unless a change in colour or gloss is considered necessary, hot dip galvanizing is usually best left unpainted.

A great deal of hot dip galvanizing is painted on a casual basis, with conventional latex or suitably primed solvent-based alkyd paint[3]. The choice of primer for alkyd paint is crucial and requires a clear recommendation from the paint manufacturer. In particular, the use of an alkyd primer in direct contact with the hot dip galvanizing risks delamination of the paint due to its saponification.

It is important to note that because these paint systems are quite thin, typically 70 to 120 µm for a three coat system, the zinc profile and localised areas of increased zinc thickness, such as at edges, may be visible in the finish, much in the same way as the grain is visible in painted timber. While this would rarely be a problem, higher build paints can be used as part of the painting specification.

While acknowledging the lesser user requirements of conventional (DIY) decorative paints, strict adherence to the appropriate surface preparation and prime coat specification are a key to reliability in all situations when painting over hot dip galvanizing.

The paint systems detailed under Service Conditions 1 and 2, are essentially decorative paint systems.

Figure 2: "The Moment" by Damian Vick

Townsville Railway Station

Painting for enhanced durability

Hot dip galvanizing is inherently very durable, so there will rarely be a need to paint over it to achieve the intended service life. Indeed, in higher corrosivity zones (C3 to C5) painting hot dip galvanized steel can actually accelerate corrosion of the zinc substrate and reduce the overall service life of the article from the expected hot dip galvanized-only life unless a **judiciously selected, uniformly applied, high build paint system is applied and the integrity of that paint system is maintained through its service life.**

Nevertheless, in circumstances where the hot dip galvanized coating is slowly being attacked by a corrosive environment, the application of a suitable coating which insulates the zinc from that environment can prolong the life of the hot dip galvanized coating. Therefore, in severe coastal and industrial service environments (such as shown in Figure 3); the painting of hot dip galvanizing can significantly extend service life. Even in quite benign outdoor service conditions where hot dip galvanizing might last for many decades, it can be prudent to paint areas which are sheltered from the cleansing influence of rain to extend the service life of the structure even further.

The paint systems detailed under Service Requirements 3 to 5 are essentially paint systems intended to provide enhanced durability performance, resistance to wear and trafficking and more aggressive atmospheric service conditions. The paints range from two-pack epoxies and polyurethanes to powder coatings. Most paints have specific restrictions for how they are to be applied and cured and these restrictions need to be strictly enforced. For example, below about 8°C, latex paints will not usually dry and many two-pack coatings have a limited recoating time. Powder coatings, because they are hard cured as soon as they are stoved, can offer logistical benefits. In addition, because they can be applied electrostatically, more uniform coverage can be achieved with intricate shapes than is possible with conventional paints. However, judicious selection of pretreatment and application by competent operators is critical to performance.

For effective duplex coatings the thickness of the paint system must be increased as the environment becomes more corrosive. For painting in a high corrosivity locale where the coating thickness and integrity is difficult to guarantee, hot dip galvanizing may need to be avoided and an alternative corrosion protection system sought.

The selection of a suitable corrosion inhibitive primer is another prerequisite. Indeed, many failures of duplex coatings can be traced to either an inappropriate primer or an inadequate total paint thickness[4].

The paint systems detailed under Service Requirements 3 to 5 also provide options for situations where an aesthetic finish is also needed.

The effect of microclimates

Where the surface is shielded from the cleansing influence of rainwater, which would otherwise wash pollutants (particularly coastal and other salts) from the surface, uncoated steel and hot dip galvanizing are more susceptible to corrosion than other corrodible metals. The corrosion in these shielded locations, for example under verandahs and open roofed areas, can be typically 3 to 5 times greater than that for surfaces exposed to rain. In such cases, the appropriate paint systems detailed under Service Requirements 3 to 5 should be considered and the paint system would need to extend beyond the microclimate by at least 150 mm.

Even in quite benign locations, where maximized service life is required, the application of one coat of a two pack epoxy primer at 75 µm DFT to non-rain-washed surfaces, after cleaning and degreasing the surface, can significantly extend the service life of the structure. This added coat insulates the hot dip galvanizing from the accumulated pollutants. As this coat will not be exposed directly to sunlight, a two-pack epoxy primer (refer to AS 3750.13[5] or APAS 2971[6]) will be quite durable.

In a similar vein, while a hot dip galvanized structure might be essentially exposed to the atmosphere, at some points it may be in contact with the ground, buried in soil or may be exposed to intermittent or continuous ponding of rainwater. In such situations localised painting or the application of a protective tape or wrap may be needed to avoid premature corrosion in these areas. Again, the protective coating would need to extend well beyond the microclimate. AS/NZS 4680 provides some commentary on this issue and the GAA can provide further advice.

Painting for enhanced chemical resistance

Hot dip galvanizing is recommended to be used within the pH range of 6 to 12 (see Figure 4). Outside this range, its service life is likely to be unacceptable. This includes exposure to strong acids and alkalis as well as salts of strong acids and weak bases and vice versa. Hot dip galvanizing may also catalyse the deterioration of certain organic chemicals that are exposed to it. This phenomenon is rare and causes no damage to the hot dip galvanizing.

Just as coatings provide enhanced protection in corrosive atmospheric service environments, judiciously selected paint systems can also protect hot dip galvanizing from aggressive chemicals. Such approaches are usually only taken where the chemical exposure is low or moderate. Otherwise, the safe principle to adopt in extreme exposure situations is the use of a substrate material which is inherently inert. In such situations, stainless steels and plastic composites often find advantage.

In specific chemicals exposure, the recommendations of an expert or an established successful case history should always be sought[7].

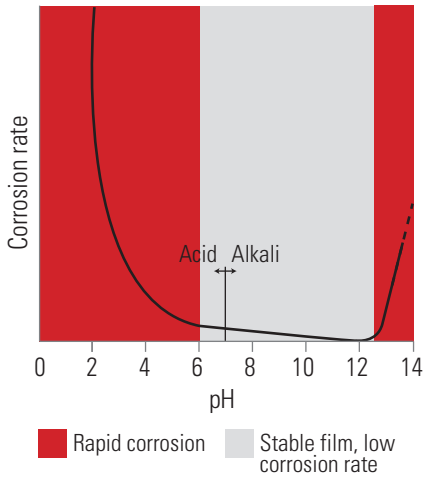

Figure 4: Corrosion rate of zinc with varying pH. Between pH 6 and pH 12, the corrosion rate of zinc is very low.

Surface preparation

When painting hot dip galvanizing, as when painting any other surface, the cleanliness and condition of the surface are of critical importance and a high proportion of paint failures on hot dip galvanized steel can be attributed to inappropriate or inadequate surface preparation.

In preparing hot dip galvanizing for painting, the basic requirements are largely the same as for other surfaces. Namely, anything that prevents the paint wetting out or adhering to the surface needs to be removed. Therefore oils, dirt, dust, salts, corrosion products and other friable material and soluble salts must be removed as a precursor to any subsequent treatment. Refer to AS/NZS 2312.2 Section 7.5.3[1] and AS 1627.0[8]. The difficulty of removing some contaminants should not be underestimated and for severely corroded hot dip galvanizing, in particular, reinstatement may be impractical, because of the extensive preparation required.

For the removal of oil and grease, water based emulsifiers, alkaline cleaners of pH less than 12 or organic solvents are variously appropriate. Where oils and grease are removed by solvent soaked cloths, these need to be changed frequently as oil contaminated cloths only serve to spread the contamination. Usually this method is only practical over small areas.

Apart from the removal of dirt, dust and grease, which are common to all substrates, it is important to recognise all sophisticated coatings intended for extended durability service require high standards of surface preparation for maximised performance.

One important issue for hot dip galvanized surfaces is the time lapse between hot dip galvanizing and painting. The best advice is to paint hot dip galvanizing as soon as possible, for the sooner it is painted the less likely it is to be contaminated by dust, salts and corrosion products. Conversely, the longer the time lapse and the more severe the conditions of exposure prior to painting, the more difficult and costly the preparation will be. In extreme cases, such as where surfaces have been close packed in humid or damp conditions and suffered wet storage staining, brushing with 1% to 2% ammonia, or in extreme cases one part citric or acetic acid to 25 parts water, may be required[9].

A second consideration is the smooth, glossy surface that emerges from the hot dip galvanizing bath. This can inhibit paint adhesion. In the past, two methods of dealing with this problem were to etch the surface with an aggressive salt solution or mineral acid or allow the zinc to weather for some time before painting. These techniques have long been discredited.

Figure 3: Desalination plant, Sydney during construction - the lower section of the uprights are painted to protect the surface from salt splash

Figure 5: Duplex coated pedestrian bridge located at Captains Creek, Townsville, Queensland

For painting unweathered hot dip galvanizing with conventional low build paints (see Service Requirements 1 & 2) cleaning and degreasing is normally adequate, although light scuffing with sandpaper will invariably enhance paint adhesion. For higher build paints and under conditions of more arduous wear, brush (whip) abrasive blasting is favoured (see Service Requirements 3 to 6).

This process lightly roughens the surface without removing a significant amount of hot dip galvanizing and provides a key to promote adhesion of the paint film. This procedure should be carried out using a soft abrasive, by impacting the surface at a glancing angle and operating at low air pressure. The following criteria included in AS/NZS 2312.2 Section 7.5.3.2[1], AS/NZS 4680 Appendix I[11], and AS1627.4[12] are recommended:

- Blast pressure 275 kPa (40 psi)
- Abrasive Grade 0.2 – 0.5 mm (clean ilmenite)
- Angle of blasting to surface no greater than 45°
- Distance from surface 350 – 400 mm
- Nozzle orifice diameter 10 – 13 mm of venturi type

It is important that this procedure be performed carefully to ensure that no more than 10 µm of zinc is removed. Organic paint coatings should be applied as soon as possible after abrasive blasting.

Newly hot dip galvanized coatings are normally quenched in an aqueous solution by the hot dip galvanizer to impede early onset of white rust. If a hot dip galvanized article is to be painted, it is usually best to exclude this step from the hot dip galvanizing process to minimise contamination. To ensure the best possible surface for painting, advise the hot dip galvanizer of your needs prior to hot dip galvanizing.

Captains Creek, Townsville, Queensland

Selecting the right paint

There are three main steps required to select the right paint to apply over any fabricated, hot dip galvanized structural steel article, once it has been determined the design lends itself to painting in a manner which can achieve uniform paint application. They are:

1. Identify the environment *(see page 11 – Corrosivity Environment – A Quick Guide)*
2. Determine the service life required for the painted structure *(see page 5 – Painting Systems)*
3. Select the appropriate painting system from the Service Requirement Guide *(see pages 6 to 8)*

If there is any doubt, you should always choose the more aggressive corrosivity environment.

Choosing the service life is often a matter of cost. If the paint system does not last long enough, rectification could be expensive. In the same manner; as the effectiveness of paint systems increase, the materials and application costs rise. AS 2312.1 Appendix E[10] provides guidelines on the economics of corrosion protection and the specifier is urged to consider not only the initial cost but also the lifetime cost of any chosen corrosion protection system.

Painting systems

The following pages provide guidance on paint systems suitable for use in industrial and commercial situations under six different "service requirements" as follows:

Service Requirement	
1	Low corrosivity conditions & medium term service
2	Low corrosivity conditions and high resistance to wear and trafficking/long term service.
3	Medium corrosivity conditions and high resistance to wear and trafficking/long term service.
4	High corrosivity conditions and high resistance to wear and trafficking/long term service.
5	Very high corrosivity conditions and high resistance to wear and trafficking/long term service.
6	Specific industrial chemical or solvent exposure.

Notes

1. **Service life:** The paint systems listed in this guide provide for either medium or long term service lives, which are typically 5 to 10 years or 10 to 15 years respectively, for a maintenance repainting cycle to retain **aesthetic performance**.

   NOTE: In this Guide we have assumed aesthetic performance is critical to the design. AS/NZS 2312.2 Section 7.5.2 and Table 7.2 provide information on expected durability of the duplex coated article if aesthetic performance is not critical and professional advice should be sought for preparation of an appropriate paint system specification.

2. **The atmospheric corrosivity condition** assessment is based upon AS 4312[13], which provides excellent guidance for the determination of the general Australian macro environment with respect to corrosivity zones and the guidelines of AS/NZS 2312.2, which essentially defines corrosivity in terms of distance from the seacoast. "Corrosivity Environment – A Quick Guide" (page 14) provides assistance on choosing the corrosivity environment.

   NOTE: AS/NZS 2312.2 - 2014 includes the new extreme (CX) corrosivity zone. The GAA has no paint system recommendation for category CX at the time of preparation of this guide.

3. **Application** should be strictly in accordance with the paint manufacturer's written instructions and the relevant recommendations of AS/NZS 2311 in the case of Service Requirement 1 and to AS/NZS 2312.2 in the case of Service Requirements 2 to 6.

4. For all but Very Low and Low Corrosivity Service Requirements it is recommended that a **brush applied stripe coat** be applied to corners, welds and other sharp edges to ensure full thickness coverage. Indeed, for High and Very High Corrosivity Conditions it is critical. This is because, unlike hot dip galvanizing, paint tends to shrink away from sharp edges.

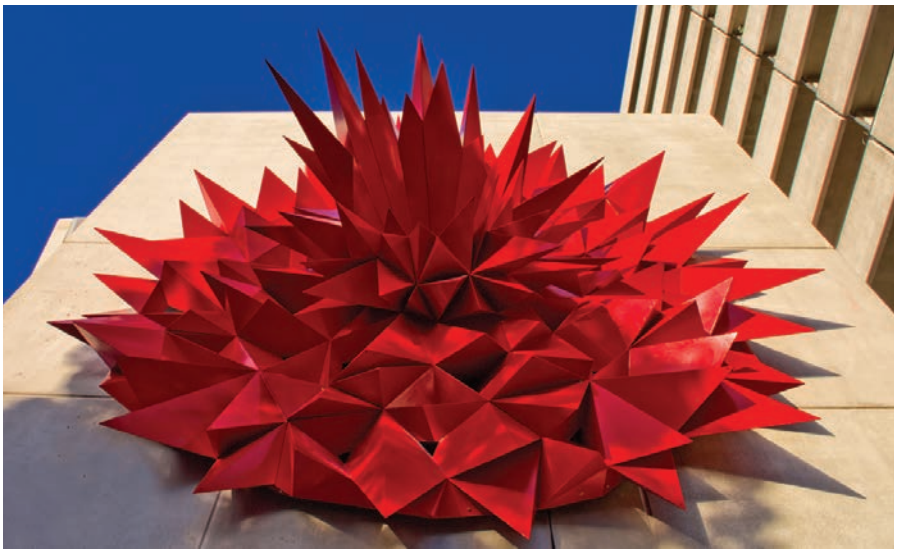

Figure 6: The complex sculptural shapes in "The Moment" meant that only a hot dip galvanized base with an aesthetic top coat would meet to the requirements of the sculptor, Damian Vick.

Service Requirement 1						
C1 (very low) & C2 (low) corrosivity conditions[1] Medium term service[2]						
Decorative finish						
Clean Degrease	>	1 coat of Latex Primer to AS 3730.15[14] or APAS 0134[15]	>	1 coat of 100% Acrylic Gloss Latex to AS 3730.10[16] or APAS 0280/1[17]	>	1 coat of 100% Acrylic Gloss Latex to AS 3730.10 or APAS 0280/1

Notes:

1 AS/NZS 2312.2 Corrosion Categories C1 and C2. It also includes Category C3, provided the structure is totally exposed to the cleansing influence of rainwater or is subject to an appropriate regular hosing with fresh water, as unwashed areas in Category C3 can be quite corrosive.

2 Typically 5 to 10 years maintenance repainting cycle to retain aesthetic performance.

3 For enhanced resistance to wear and trafficking and staining adopt *Service Requirement 3*.

4 Flat, Low Gloss and Semi-Gloss 100% acrylic latex finishes may be also options, as aesthetics demand.

5 Application should be strictly in accordance with the paint manufacturer's written instructions and consistent with the relevant recommendations of AS/NZS 2311 *Guide to the painting of buildings*.

Service Requirement 2				
C1 very low & C2 low corrosivity conditions[1] Long term service[2]				
Decorative finish				
Minimum system DFT 175 µm				
Clean Degrease	>	1 coat of 2 pack inhibitive epoxy primer (minimum DFT 75 µm)	>	2 coats of 2 pack polyurethane or 2 pack acrylic (minimum DFT 50 µm/coat)

Notes:

1 AS/NZS 2312.2 Corrosion Categories C1 and C2. It also includes Category C3, provided the structure is totally exposed to the cleansing influence of rainwater or is subject to an appropriate, regular hosing with fresh water, as unwashed areas in Category C3 can be quite corrosive.

2 Typically 10 to 15 years maintenance repainting cycle to retain aesthetic performance.

3 For enhanced resistance to wear and trafficking or staining adopt *Service Requirement 3*.

4 Powder Coatings covered under Service Requirement 3 are also appropriate.

Portland ring road pedestrian overpass

Thomas Jewellers – Outriggers

Townsville Railway Station

Service Requirement 3						
C3 medium corrosivity conditions[1] High resistance to wear & trafficking/long term service[2,3]						
Decorative finish						
Paint						
Minimum system DFT 175 µm						
Clean Degrease	>	Brush Blast	>	1 coat of 2 pack inhibitive epoxy primer (minimum DFT 75 µm)	>	2 coats of 2 pack polyurethane or 2 coats of 2 pack acrylic (minimum DFT 50 mm/coat)
Powder coating						
Clean, coat and cure in accordance with the powder coating manufacturer's written instructions using the appropriate polyester powder coating to a cured thickness of not less than 70 µm.						
Industrial finish						
Minimum system DFT 225 µm						
Clean Degrease	>	Brush Blast	>	1 coat of 2 pack inhibitive epoxy primer (minimum DFT 75 µm)	>	1 coat of high build 2 pack epoxy (minimum DFT 150 mm)

Notes:

1 AS/NZS 2312.2 Corrosion Category C3, except in tropical locations where Service Requirement 4 is more appropriate. It also includes Category C4 locations, provided the structure is totally exposed to the cleansing influence of rainwater or is subject to an appropriate, regular hosing with fresh water, as unwashed areas in Category C4 can be very highly corrosive.

2 Wear & trafficking is defined as surfaces subject to mild abrasion and scuffing, such as occurring in public thoroughfares, kitchens and other work areas.

3 Typically 10 to 15 years maintenance repainting cycle to retain aesthetic performance.

4 For enhanced performance or in the more corrosive areas within the Category C3 a higher minimum total cured film thickness may be required.

Service Requirement 4						
C4 high corrosivity conditions[1] High resistance to wear & trafficking/long term service[2,3]						
Decorative finish						
Minimum System DFT 350 µm						
Clean Degrease	>	Brush Blast	>	2 coats of high build of 2 pack epoxy (minimum DFT 250 µm)	>	2 coats of 2 pack polyurethane or 2 pack acrylic (minimum DFT 50 µm/coat)
Industrial finish						
Minimum System DFT 350 µm						
Clean Degrease	>	Brush Blast	>	3 coats 2 pack high build MIO epoxy		

Notes:

1 AS/NZS 2312.2 Corrosion Category C4. These include tropical coastal service and indoor swimming pools.

2 Wear & Trafficking is defined as surfaces subject to mild abrasion and scuffing, such as occurring in public thoroughfares, kitchens and other work areas.

3 Typically 10 to 15 years maintenance repainting cycle to retain aesthetic performance.

4 Where decorative finish is not required polyurethane or acrylic may be replaced by a further coat of high build 2 pack epoxy of equivalent thickness.

Service Requirement 5								
C5 very high corrosivity conditions[1] High resistance to wear & trafficking/long term service[2,3]								
Decorative finish								
Minimum system DFT 400 µm								
Clean Degrease	>	Brush Blast	>	1 coat of inhibitive 2 pack epoxy primer (minimum DFT 75 µm	>	1 or more coats of high build 2 pack epoxy (minimum DFT 225 µm)	>	2 coats of 2 pack polyurethane or acrylic (minimum DFT 50 µm/coat)
Industrial finish								
Minimum system DFT 400 µm								
Clean Degrease	>	Brush Blast	>	1 coat of inhibitive 2 pack epoxy primer (minimum DFT 75 µm)	>	3 or more coats 2 pack high build MIO epoxy		

Notes:

1 AS/NZS 2312.2 Corrosion Categories C5. It also applies in a few aggressive industrial areas.
2 Wear & Trafficking is defined as surfaces subject to mild abrasion and scuffing, such as occurring in public thoroughfares, kitchens and other work areas.
3 Typically 10 to 15 years maintenance repainting cycle to retain aesthetic performance.
4 Polyurethane finish preferred unless OH&S considerations prohibit isocyanates.
5 Alternatives to galvanizing should be considered, particularly in wear and tear conditions.

Service Requirement 6						
Specific industrial chemical or solvent exposure[1]						
Typical minimum system DFT 400 µm						
Clean Degrease	>	Brush Blast	>	1 coat of inhibitive 2 pack epoxy primer (minimum DFT 75 µm)	>	Finish coat subject to manufacturer's technical advice

Notes:

1 While the requirements for surface cleaning and brush blasting are mandatory, the specific paint system and its total system thickness are dependent upon the type and concentration of the chemical/solvents exposure and the manufacturer's advice.
2 Typically 10 to 15 years maintenance repainting cycle to retain aesthetic performance.
3 Typically polyurethanes are specified for resistance to acids and organic solvents and epoxies for resistance to alkalis. Where strong acid or alkali contact is envisaged, alternative construction materials should be considered.
4 Alternatives to galvanizing should be considered, particularly in acid or alkali conditions.

Typical paints

Major paint suppliers have provided the GAA with specific product recommendations to meet the Service Requirements in this guide. The supplement *Duplex Coatings – Paint Product Guide* lists the supplier's products with notes and provides their contact information if further support is required.

Figure 6: "The Moment", Damian Vick.

Sample specification

The following provides guidelines for preparing an appropriate specification for painting galvanizing. Specific projects may need to encompass additional requirements not included in this generalised specification and Section 10 of AS 2312.1 provides additional advice.

NOTE: For powder coating, while the general specification format would be appropriate, the technical requirements, notably surface preparation and application and cure conditions will be considerably different and need to be consistent with the guidelines of the specific powder coating manufacturer or the Australasian Institute of Surface Finishing (www.aisf.org.au).

1. Introduction

1.1 Purpose

This Specification defines the technical requirements for surface preparation and application of protective coatings that have been hot-dip galvanized in accordance with AS/NZS 4680. It does not cover powder coatings, which requires specific recommendations regarding surface preparation and coating system selection, application and cure.

(Accurately describe the article's final location and scope of items to be painted.)

1.2 Definitions/Glossary of Terms

For a glossary of paint and painting terms, refer to AS 2310[18].

2. Reference documents

The following documents have been referred to in this Specification:

2.1 Standards/Codes

AS 1627	Metal finishing - Preparation and pre-treatment of steel surfaces
AS 1627.1	Part 1: Removal of oil, grease and related contamination
AS 1627.4	Part 4: Abrasive blast cleaning (Note: Relevant for Service Requirements 2 to 6)
AS 3894	Site testing of protective coatings
AS/NZS 2310	Glossary of paint & painting terms
AS/NZS 2311	Guide to the painting of buildings (Note: Only relevant for Service Requirement 1)
AS 2312.1	Guide to the protection of iron and steel against exterior atmospheric corrosion – Part 1: Paint coatings
AS/NZS 2312.2	Guide to the protection of iron and steel against exterior atmospheric corrosion – Part 2: Hot dip galvanizing
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated articles

The Wave

3. Technical requirements - coatings

3.1 General

(i) Surface preparation treatments, inspection and testing and health and safety shall comply with statutory requirements and the guidelines of AS/NZS 2311 or AS 2312.1 and AS/NZS 2312.2, as appropriate.

(ii) All cutting, welding and other physical working of the metal shall be completed before surface preparation and these shall be completed off-site, except for repairs made necessary because of damage during transport, storage and construction.

(iii) All paint forming part of the one paint system shall be from the same paint manufacturer.

(iv) No paint shall be used after the expiration of its shelf life or its pot life and all paint shall be mixed, thinned as appropriate and applied in strict accordance with the manufacturer's written instructions.

(v) Apply the first (prime) coat to the clean, dry surface as soon as practicable after it has been prepared for coating.

(vi) Coating application shall only proceed when the surface temperature is greater than 15°C and at least 3°C above the dew point of the surrounding air.

(vii) Coating application procedures and the time elapsed between coats shall be consistent with this specification and strictly in accordance with the manufacturer's written recommendations.

(viii) Where repairs to the coated finish are necessary and permitted by the Project Manager, they shall be carried out using the system approved by the manufacturer(s) of the original system, and to a standard which will not compromise the protective performance of the overall coating system.

(ix) The Project Manager reserves the right to check each and every stage of the coating process to determine the cleanliness of surfaces, degree of cure, adhesion, time between application and coating thickness, colour gloss and finish. When tested in accordance with AS 3894.3 each coat and the total coating thickness shall be not less than the specified minimum.

(x) After the completion of all painting works, all equipment and materials used in painting activities and all paint debris shall be removed from the site, which shall be restored to its original condition.

3.2 Surface Preparation

(i) Remove any oil, grease or wax in accordance with the relevant method described in AS 1627.1[19].

(ii) Remove all dirt, dust, water-soluble salts and other contaminants by appropriate methods consistent with the requirements of AS 1627.

(iii) Remove or smooth out all sharp edges, dags, weld spatter and laminations in a manner that such physical imperfections in the galvanized surface shall not thwart the even build-up of the subsequent paint system.

(iv) **(Service Requirements 3 to 6 only)**. Lightly (brush or whip) blast all galvanized steel using a soft abrasive, such as limestone or aluminium magnesium silicate in a manner that profiles the surface without removing a significant amount of zinc from the surface.

3.3 Painting

(i) The first coat of paint shall be applied to the clean, dry prepared surface as soon as practicable after it has been prepared for coating and at least within 4 hours. Immediately prior to coating, the surface shall be air blasted or dusted off to remove any surface dust.

(ii) For Corrosivity Zones C5 and CX, or where otherwise nominated by the Project Manager, all edges and corners shall be first stripe coated with prime coat, prior to application of one full prime coat.

(iii) The prime coat shall be ……...

[Add details for the primer/first coat from the paint system selected]

(Detail at least product name and minimum dry film thickness)

(iv) As soon as practicable after the minimum recoat time for the primer, apply ……...

[Add details for the intermediate or top coat from the paint system selected. If there is an intermediate coat, add another step for the top coat]

(Detail at least the product name, the minimum dry film thickness for each coat to be applied and the minimum total dry film thickness of the paint system and colour/ gloss of final finish)

The final finish shall be smooth and uniform in colour and gloss consistent with best industry practice for the products specified.

(v) Damage or other defects in the coating system shall be feathered back to a smooth transition and patch repaired with the same products to not less than the specified dry film thickness.

Note: A editable version of this duplex coating specification is available from the GAA (gaa@gaa.com.au)

Corrosivity environment – A quick guide

Corrosivity in Australia as defined in AS/NZS 2312.2 and described in AS 4312			
	Category	**Generic examples**	**Specific examples**
CX	Severe surf shore-line	Surf beach shoreline regions with very high salt deposition.	Some Newcastle beaches
C5	Surf Sea-shore	Within 200 m of rough seas & surf beaches. May be extended inland by prevailing winds & local conditions.	More than 500 m from the coast in some areas of Newcastle
C4	Calm Sea-shore	From 200 m to 1 km inland in areas with rough seas & surf. May be extended inland by prevailing winds & local conditions.	All coasts
		From the shoreline to 50 m inland around sheltered bays. In the immediate vicinity of calm salt water such as harbour foreshores.	
C3	Coastal	From 1 km to 10 km inland along ocean front areas with breaking surf & significant salt spray. May be extended inland to 50 km by prevailing winds & local conditions.	Metro areas of Perth, Wollongong, Sydney, Brisbane, Newcastle, & the Gold Coast
		From 100 m to 3 – 6 km inland for a less sheltered bay or gulf.	Adelaide & environs
		From 50 m to 1 km inland around sheltered bays.	Port Philip Bay & in urban & industrial areas with low pollution levels
C2	Arid/Urban Inland	Most areas of Australia at least 50 kilometres from the coast.	Canberra, Ballarat, Toowoomba & Alice Springs
		Inland 3 – 6 km for a less sheltered bay or gulf.	Adelaide & environs
		Can extend to within 1 km from quiet, sheltered seas.	Suburbs of Brisbane, Melbourne, Hobart
C1	Dry indoors	Inside heated or air conditioned buildings with clean atmospheres.	Commercial buildings

Baanip Boulevard Noise Wall Grovedale

Document history

Edition 1 (May 2007). Prepared by Don Bartlett of CTI Consultants, in conjunction with GAA Staff. Launch document using research and standard practices.

Edition 2 (May 2012). Prepared by Don Bartlett of CTI Consultants, in conjunction with GAA Staff. Major revision to the document, with the inclusion of the latest local and international reference standards. Document reformatted and Paint Systems reworked based on available materials.

Edition 2.1 (January 2015). Minor revisions by GAA Staff to take into account the advice included in AS/NZS 2312.2 (released in December 2014). Contents page included for ease of use. References updated. Some typographical errors corrected.

Edition 2.2 (January 2018) Minor content revisions by GAA Staff, including reference to new supplement 'Duplex Coating - Paint Product Guide'.

NOTE: Edition 2 of this document was the basis of Clause 7.5 of AS/NZS 2312.2 and this edition has been aligned with that document where possible.

Don Bartlett retired from general consulting practice during 2013/14. The GAA thanks and acknowledges the significant input from Don into this Guide and for his research and technical papers on the techniques and solutions for successful paint over galvanizing over many years.

Bibliography

1. **Standards Australia/Standards New Zealand.** *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Part 2: Hot dip galvanizing. Sydney/Wellington* : SAI Global, 2014. AS/NZS 2312.2.
2. **International Organization for Standardization**. *Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 5: Protective paint systems. Geneva* : International Organization for Standardization, 2007. ISO 12944.5.
3. **Standards Australia/Standards New Zealand**. *Guide to the painting of buildings*. Sydney/Wellington : Standards Australia/Standards New Zealand, 2000. AS/NZS 2311.
4. **Bartlett, Don J**. *Paint finishes over galvanizing - Why do they fail?* Melbourne : Australasian Corrosion Association, 2003. Australasian Corrosion Association Conference.
5. **Standards Australia/Standards New Zealand**. *Paints for steel structures - Epoxy primer (two pack)*. Sydney/Wellington : SAI Global, 1997 (reconfirmed 2013). AS/NZS 3750.13.
6. **Australian Paint Approval Scheme**. *Durable two-pack epoxy primer for the long term protection of steel*. Melbourne : APAS, 2003. Specification 2971 Revision No. 9.
7. **Slunder, C J and Boyd, W K**. *Zinc: its corrosion resistance*. s.l. : International Lead Zinc Research Organization, 1983.
8. **Standards Australia**. *Metal Finishing - Preparation and pretreatment of surfaces - Method selection guide*. Sydney : Standards Australia, 1997. AS 1627.0.
9. **Smith, L M**. *Cleaning and painting galvanized steel. Journal of Protective Coatings and Linings*. April 2001, Vol. 18, pp. 51-55.
10. **Standards Australia/Standards New Zealand**. *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Part 1: Paint systems*. Sydney/Wellington : SAI Global, 2014. AS 2312.1.
11. **Standards Australia/Standards New Zealand**. *Hot-dip galvanized (zinc) coatings on fabricated ferrous articles*. Sydney (Aus) and Wellington (NZ) : Jointly published by Standards Australia and Standards New Zealand, 2006. AS/NZS 4680.
12. **Standards Australia**. *Metal finishing - Preparation and pretreatment of surfaces - Abrasive blast cleaning of steel*. Sydney : SAI Global, 2005. AS 1627.4.
13. **Standards Australia**. *Atmospheric corrosivity zones in Australia*. Sydney : Standards Australia, 2008. AS 4312.
14. **Standards Australia**. *Guide to the properties of paints for buildings - Primer - Latex - For metallic zinc surfaces*. Sydney : Standards Australia, 2006. AS 3730.15.
15. **Australian Paint Approval Scheme**. *Latex Primer For Galvanised Steel & Zincalume (Buildings)*. Melbourne : APAS, 2003. Specification 0134 (Revision No. 7).
16. **Standards Australia**. *Guide to the properties of paints for buildings - Latex - Exterior - Gloss*. Sydney : Standards Australia, 2006. AS 3730.10.
17. **Australian Paint Approval Scheme**. *Exterior water based paint for buildings*. Melbourne : CSIRO, 2011. AP-S0280 rev 3.
18. **Standards Australia/Standards New Zealand**. *Glossary of paint and painting terms*. Sydney/Wellington : Standards Australia/Standards New Zealand, 2002. AS/NZS 2310.
19. **Standards Australia**. *Metal finishing - Preparation and pretreatment of surfaces - Removal of oil, grease and related contamination.* Sydney : Standards Australia, 2003. AS 1627.1.

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We provide information, publications and assistance on all aspects of design, performance and applications of hot dip galvanizing.

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