

Protective Coating Systems for New Exterior Steelwork on Commercial New Builds

A guide to achieving suitable corrosion protection on atmospherically-exposed carbon steel in low to moderate corrosivity zones



For the protection of concrete and steel structures through condition assessment, testing and inspection of concrete repair, corrosion control, and protective coating systems.

Introduction

Corrosion of architectural steelwork is most pronounced on buildings that are situated in proximity to salt water. Reactively responding to corrosion can be costly, often requiring complex remedial work. Robust systems, controls and procedures relating to corrosion protection are needed to ensure steelwork can be used satisfactorily over a long period of time even in adverse conditions. These systems of procedures are needed as corrosion is not always properly addressed in mandatory codes and standards.

In order to achieve suitable corrosion protection, it is important to understand the requirements of the project environment and have clear and appropriate coating specifications. This document is supplementary to the National Construction Code (NCC) and will assist Owners in gaining suitable corrosion protection for new atmospherically exposed steel in a low to moderate corrosivity zone on commercial new builds, typically at a distance greater than one kilometer from salt water. It outlines standard procedures, best practice and requirements to ensure that a high quality level of workmanship and long term performance is achieved.

The information below provides generic guidance specific to one coating system. An assessment should be made by the Coatings Focal Point (CFP, as defined below) as to whether the works are to be exposed to either:

- greater corrosivity by factors either environmental or introduced by abrasion, hidden in buried or submersed zones, or exposed by chemicals or pollution; or
- different surfaces, such as galvanised steel or previously-painted steel.

Reactively responding to corrosion can be costly, often requiring complex remedial work.



Project Roles and Pre-commencement Meeting

ROLES

In new commercial new builds, the following roles are critical when specifying and applying an exterior coating system for the purposes of protecting new atmospherically exposed steel from corrosion:

- The Owner, who is either the Asset Owner or their nominated representative. The Owner may appoint a Coatings Focal Point (CFP) to oversee and validate the technical requirements of corrosion protection by protective coatings.
- The CFP, who should be NACE Coating Inspector Program (CIP) Certified – Level 3, has a range of responsibilities including, review of project documentation, responding to technical queries, recommend Owner-initiated Hold points on the Inspection and Test Plan (ITP), review and approve Applicator ITPs and other quality documentation, and/or recommend if an independent third-party coating inspector is needed to represent the Owner during inspection Hold points.

- The Contractor is considered to have overall responsibility for the site and sub-contractors.
- The Applicator refers to the sub-contractor company that performs surface preparation and coating application tasks. All surface preparation and painting are to be undertaken under the supervision of an experienced and accredited supervisor. The Applicator is also responsible for providing all equipment necessary for accurate measurement (e.g. of surface temperatures, relative humidity and other factors) and inspection.
- An independent third-party coating inspector may be nominated to represent the Owner during quality inspection Hold points to verify application conformance. The inspector should be qualified NACE CIP – Level 2.

PRE-COMMENCEMENT MEETING

Before work commences, a meeting between the Owner, CFP, Contractor, Applicator, Coating manufacturer, and any subcontractors should be conducted to clarify and concur with the Applicator's proposed program, methodology, and inspection procedures (including the ITP).

Project Roles and Pre-commencement Meeting

COATING REQUIREMENTS

For commercial new builds in low to moderate corrosivity zone, all exterior steel work should be coated with the system designated in AS/NZS 2312 as PUR 4. Surface preparation should be by abrasive blast cleaning to Sa 2½ as specified in AS1627.4. Cleaned surfaces should be primed with an epoxy zinc-rich primer conforming to AS/NZS 3750.9 Type 2 to give a nominal dry film thickness (DFT) of 75 to 90 microns.

When cured, primed surfaces receive a build coat of high-build epoxy conforming to AS/NZS 3750.14, to give a nominal DFT of 125 to 175 microns. The final coat will be a nominal 50 to 85 microns DFT of a recoatable 2-pack polyurethane conforming to AS/NZS 3750.6 and in a colour and gloss level per Owner concurrence.

Total nominal DFT of the full coating system must be 250 to 350 microns. Provision is made in AS/NZS 3894.3 for individual readings that may be up to either +/- 20% of the nominated range, however, the average reading must comply.

PRE-FABRICATION WORKS

The preferred approach is for all pre-fabricated steel to be prepared with at least the approved primer coat applied prior to delivery to site. Surfaces should meet surface preparation requirements prior to application of the approved coating system, including removing any holding

primer. If the approved primer is used as a pre-fabrication primer prior to installation, all surfaces should be washed prior to over-coating in the field to remove all zinc salts by a method designated in AS 1627.1.

It is good practice to halve the manufacturer stated maximum re-coat window for all pre-fabrication coatings once delivered to the field. If no maximum value is stated, a maximum three-month duration can be applied.

All pre-fabrication coatings are subject to the agreed specification including quality auditing, documentation, and inspection at the blast yard. The Contractor is responsible for ensuring that items are stored, handled and shipped in a manner as to minimise damage.

TRIAL APPLICATION

The trial application stage provides an expectation of coating surface texture and colour. A trial application utilises all proposed methods of surface cleaning, surface restoration, coating application, and acceptance testing and is conducted on a piece of steel or on a sample plate of minimum dimensions (300 x 300 x 6 mm steel).

Any amendments required to the coating system or work systems should be submitted prior to commencing full work. Once submitted by the Contractor and approved by the Owner, the trial application becomes the agreed upon reference sample when evaluating the full work.

Surface Preparation

REMOVE SURFACE CONTAMINATION

The degree of surface preparation required is such that all loose matter, contamination, and deteriorated paint is removed from the surface.

Before surface preparation can commence, all steel surfaces must be washed down by solvent cleaning to remove surface contamination (e.g. chlorides salts, fungal growth, oil, grease and dirt). Potable water and biodegradable non-ionic detergent may be used. Alternatively, oil and grease may be removed by solvent cleaning in accordance with AS 1627.1. Heavy deposits can be first removed by chipping, scraping, or impact tools.

FABRICATION DEFECTS

Before any weld areas are blast cleaned, all weld spatter, sharp corners, and hardened cut edges must be removed. The areas should be thoroughly scrubbed with clean water to remove all traces of weld fluxes. Sharp edges and corners should be rounded to a minimum radius of 2 mm.

POWER-TOOL CLEANING

Power-tool cleaning may be suitable for either spot repair less than 0.5 m² in area, site weld zones between two prefinished steel members, or where abrasive blasting is not allowed. The preferred method for the finished surface is using a bristle blaster meeting a cleanliness level at least the equivalent of AS1627.4, Sa 2 or SSPC SP-15.

For larger areas, substituting abrasive blast cleaning for power-tool cleaning has potential for negative consequences and therefore requires input from the CFP.

ABRASIVE BLASTING

Abrasive blast cleaning is the preferred method of surface preparation. Abrasive blasting must comply with the requirements of AS 1627.4.

The profile should be of an angular and dense nature over the entire surface to be coated, as follows:

- Abrasive blasting – between 40µm and 75µm.
- Bristle blasting – greater than 25µm.

Profile should be measured with profile replicating tape in accordance with Method A of AS 3894.5 or other approved method. If non-compliant readings are observed, additional testing is required to identify incompatible areas and rectified. Adjacent sections of steel that either are not being refurbished or have already been completed must be protected from contamination or damage.

The Owner should be notified for inspection each day when surface preparation is ready and prior to primer application.

BLAST CLEANING EQUIPMENT

The compressed air supply used for blasting must be free of water and oil as determined by AS/NZS 3894.6.

SALT CONTAMINATION

If the Owner requests, if there is a risk of salt contamination, or if salt contamination is identified, the CPF must be informed and will provide recommendations. Any salt contamination must be removed by the Applicator.



Application

PUR 4 COATING SYSTEM – AS/NZS 2312.1

Paint must comply with the requirements of the relevant material and performance specification as provided by AS/NZS 2312.1 for PUR 4 coating system. If deviation from the required values is sought, a request must be submitted to the CFP who will provide appropriate parameters.

MIXING PAINT

All paints should be thoroughly mixed so that all pigment is in suspension before use. The manufacturer's written recommendations should be followed when adding curing agents or hardeners. Zinc-rich paint may require agitation during application to keep the paint homogeneous. Unused portions of mixed convertible coating should be discarded at the end of the manufacturer's recommended pot life.

All paints, thinners, solvents, and any other liquids should be stored and mixed within bunded areas and brought into the shop or onto the site in their original containers.

TINTING

Where successive coats of the same colour have been specified, alternate coats should be tinted off-shade sufficiently to produce enough contrast to indicate complete coverage of the surface.

CONDITIONS FOR PAINTING

Unless otherwise permitted by the manufacturer, ambient conditions should be maintained during application and curing of paint as follows:

- the substrate temperature is greater than 3°C above dew point and less than 45°C;
- the ambient air temperature is above 5°C; and
- the relative humidity is less than 85%.

The Contractor is responsible for maintaining suitable controls to meet ambient weather requirements and must inform the CFP if there is difficulty meeting these requirements.

APPLICATION OF PAINT

The preferred method of paint application is by spray application, however, the Owner may permit brush or roller application. Requirements for thinning should be in accordance with the manufacturer's written instructions.

Painters should be provided with wet film gauges to ensure that the specified film thicknesses are achieved.

PRIMING

Abrasive blast or mechanically-cleaned areas should be primed with a coat of paint within four hours. Re-blasting to freshen the surface is required if the surface is left overnight.

STRIPE COATING OF EDGES

Stripe coating should be performed by applying a separate layer of paint by brush, which is required for all welds, surface irregularities, edges, or corners. Stripe coating mitigates early onset of corrosion from these locations. This coat should be a full coat in contrasting colour.

Achieving opacity in these areas is indication of suitable paint thickness. The most suitable stage for stripe coating is usually between application of the primer and intermediate coat.

APPLICATION

Each coat should be applied uniformly and completely over the entire surface. All runs and sags should be brushed out immediately or the paint should be removed and the surface re-applied.

REPAIR OF COATING DEFECTS

Each layer of paint should be inspected by the Applicator and all defects or damage to previous coats to be repaired prior to applying additional coats. Insufficient or excessive coating thickness are common defects. For spot repairs, the coating around the damaged area should be feathered and the full system reinstated after cleaning.

Each coating may take multiple applications to meet requirements. The Owner should be notified for inspection when the Applicator believes that the requirement has been met for each full layer of primer, intermediate, and finish coat.



Quality

MATERIALS

To ensure sufficient performance and protection against corrosion, projects should have robust procedures in place for quality control. This may involve:

- independent testing of paint samples to confirm compliance with specification;
- use of materials only within specified shelf life;
- materials must only be transported, stored and used per manufacturer's instructions; and
- product labels, data sheets and instructions for use must be readily available.

DOCUMENTATION

The Applicator must provide to the satisfaction of the Owner, an ITP and other reports in the approved form. This plan will detail the procedures that will be undertaken by the Applicator to verify compliance with the specification and must include space for inspection by the Owner, Contractor, and Applicator.

Completed documentation should be submitted to the CFP who will review and submit a recommendation to the Owner.

INSPECTION

The Contractor should always allow the Owner access to the work in progress and provide every facility for inspection at all stages of the work. Any work rejected by the Owner as not conforming to the specification is to be made good at the Contractor's expense. The Applicator is responsible for monitoring their own work to ensure all aspects are in compliance with the specification.

The Owner may engage an independent third-party inspector to witness inspection stages. Any area that has been repaired must be re-inspected.

REPORTING

The Applicator must complete a daily inspection report of an approved format for each work area and supply copies to the Owner at the end of each week. The report should also record paint batch numbers and quantities used with detail regarding the type of surface preparation and paint system used.

Warranty

The Contractor should provide warranty for all coatings applied and must take responsibility for any existing coatings that have been over-coated. The warranty term should meet the requirements described in the project contract documentation.



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REMEDYAP

Remedy Asset Protection (RemedyAP) are accredited experts in assessment, specification and inspection of corrosion and corrosion protection systems within the infrastructure and civil construction markets throughout Australia. This market-leading Australian company has identified a gap in the general construction market where corrosion is not properly addressed in mandatory codes and standards. This can leave specifiers, certifiers, building contractors and owners unprotected when things go wrong.

RemedyAP have taken the durability lessons learned in heavy industry and packaged them into a set of systems and procedures for the general and civil construction industry to help protect everyone in the supply chain from the early onset of corrosion.

RemedyAP can be your Coatings Focal Point (CFP) where you encounter technical queries in meeting this Specification. The company can also provide independent inspection of your quality Hold points described in the Inspection Test Plan.

REMEDYAP CORRASSURE™ PROGRAM

To be effective in controlling corrosion, RemedyAP provides a system of procedures to assess, control and maintain building assets.

CorrAssure™ for the Construction Industry provides a series of:

- Design and specification review – to include items requiring more robust control measures.
- Inspection – during building phases to capture any improvements required to minimise corrosion.
- Certification – where recommendations have been reviewed and implemented, RemedyAP will provide a Certificate of Assurance that the observed corrosion protection systems will provide minimum five-year corrosion resistance to local atmospheric conditions.

RemedyAP can deliver digitalisation to your organisation by providing cloud-based asset management software. Whether existing software systems or RemedyAP's proprietary software is used, RemedyAP can upload condition assessments with scheduled maintenance and inspection duties for your team to action. Web-based quality control forms are also available to align Contractors to requirements for Inspection Test Plans and Daily Report Forms.

For the protection of concrete and steel structures through condition assessment, testing and inspection of concrete repair, corrosion control, and protective coatings.

Services include:

- Condition assessment of concrete and steel assets
- Aligning specifications for repair and protective coatings
- Inspection of surface preparation and coating application
- Defect mapping, failure analysis and dispute resolution

REFERENCES

¹ See, e.g. Docopro Pty Ltd. "Forms for Industrial Specifications." Docopro. <https://docopro.com> (accessed 22 August 2020).

² Ibid.

All information provided correct as of September 2020