



Industry Bulletin 139

Coating and corrosion failure to carports and patios

This bulletin is intended to highlight the responsibilities of fabricators and installers when carrying out the preparation, manufacture and installation of carport and patio structures.

The Department of Mines, Industry Regulation and Safety, Building and Energy Division (Building and Energy) continues to receive complaints regarding powder coating failure and corrosion of steel structures such as carports, patios and the like. Generally, the complaints relate to delamination of the powder coating system and subsequent corrosion of the steel beneath.

What were the complaints about?

Building and Energy found that in the majority of cases, failures regarding coatings of steel structures are linked to:

- inadequately treated steel;
- inadequately applied powder coating; or
- a combination of both.

The combination of poorly or inadequately treated steel and inadequately or non-compliant powder coating, often leads to premature break down of the coating and corrosion of the steel.

Steel components have been found to be inadequately galvanised where the coating is too thin and a primer was not applied prior to the application of the powder coat finish. This may lead to a breakdown of the coating which can result in corrosion of the steel beneath.

Inadequately treated, primed and powder coated steel can cause the powder coating to trigger a 'microenvironment' which promotes corrosion of the steel substrate.

Note – corroded structures are generally found to be located in corrosive environments such as close to the coast or near a river.

Building Code requirements

Building legislation in Western Australia adopts the Building Code of Australia (BCA), being Volumes One and Two of the National Construction Code (NCC), as the applicable building standard for all building work.

The NCC is a performance based document. The NCC Performance Requirements can be met using either a:

- Performance Solution;
- Deemed-to-Satisfy Solution (DTS); or
- combination of both.

The DTS provisions in NCC Volume Two are generally divided into two compliance pathways:

1. "Acceptable Construction Practices" which are some of the most common forms of national construction practices; and
2. "Acceptable Construction Manuals" which are the DTS referenced documents – generally Australian Standards.

May 2021

Note – DTS provisions are prescriptive requirements that tell you how, what and in which location things must be done. They include materials, components, design factors and construction methods that, if used, are deemed to meet the Performance Requirements, hence the term “Deemed-to-Satisfy”. Refer to [Industry Bulletin 102 – Performance Solutions for housing projects](#).

Design and specification

Carports, patios, sheds and similar structures are classified under the NCC as a Class 10a building (non-habitable building). Such structures must be designed to resist actions which they may reasonably be subjected to.

The documentation must clearly demonstrate how compliance with the NCC will be achieved by including in the specification:

- the amount of protective coating;
- type of surface preparation;
- final coating type;
- dry film thickness; and
- how any welds or damage is to be treated.

The NCC sets out specific performance requirements that the designer, fabricator and installer must comply with in order to achieve this.

Where a Performance Solution has not been used in the design for the structural steel work, the performance requirements of the NCC are satisfied if the structures are designed and constructed in accordance with the appropriate DTS provisions of NCC Volume Two Part 3.4.4 Structural Steel Members.

Part 3.4.4 allows compliance with either the Acceptable Construction Practice found under this Part or one of the following Acceptable Construction Manuals:

- a) Steel structures: AS 4100.
- b) Cold-formed steel structures: AS/NZS 4600.

The designer also needs to consider the specification for the protective coating to the steel work and ensure that it complies with either (a) or (b) above when following the Acceptable Construction Manual pathway. The degree of protection is to be determined after consideration has been given to:

- the location of the structure,
- any local conditions; and
- design considerations.

The structure’s location and local conditions are important because they can affect the durability and longevity of the coating and the steel substrate. This is why the designer needs to consider the corrosion protection required prior to fabrication and construction of the structure.

Consideration should also be given to the design to avoid entrapped dust and water, open crevices and increased protection for components that may be inaccessible for maintenance.

Note – where the client indicates a particular preference in regards to protection coating, it is the designer’s responsibility to ensure that the structure meets compliance with the NCC.

Fabrication

The fabrication of structures must be in accordance with the applicable building standards.

In the fabrication process particular attention should be given to any construction joints made after galvanising has been carried out.

For a DTS solution under NCC Part 3.4.4 Acceptable Construction Practice, clause 3.4.4.4 requires that structural steel members that are not built into a masonry wall must be protected against corrosion in accordance with Table 3.4.4.7. Protective coatings for steelwork.

Note – it is generally found that steel used in the construction of patios, carports and sheds have received a galvanised coating and then a powder coated finish.

Table 3.4.4.7 provides minimum protective coating requirements relative to the structure's location (internal/external) and the severity of the environment. The fabricator must ensure compliance with these requirements as a minimum for the protection of the steel.

Powder coating process

While Table 3.4.4.7 referenced in the NCC applies to duplex coatings (galvanised steel followed by a paint coating), it does not refer to powder coating. The majority of the failures referred to in this industry bulletin relate to powder coating finishes.

Where reliance is to be placed on powder coating to provide the necessary protection, this must be addressed through a suitably documented Performance Solution.

Powder coating of suitably galvanised steel may provide equivalency in the coating protection system, provided the steel is appropriately treated and primed prior to being powder coated using the most appropriate grade of powder.

It was found that a number of failures regarding powder coating systems may be linked to the fabricator not ensuring that the steel is primed prior to powder coating.

Note – whilst the thickness of the galvanising provides the required corrosion protection, it is the surface preparation of the galvanising, or lack of, that appears to be the cause of most failures.

Most galvanised steel is either quenched in sodium dichromate or has a clear polymer layer. Both of these coatings/contaminants, sodium dichromate, or the polymer layer, are not removed in the powder coaters' pre-treatment baths.

Powder coating suppliers require these coatings to be removed to ensure the stated performance requirements of the coating can be met.

Note – fabricators should consult galvanised steel, powder and pre-treatment suppliers for advice on system selection and performance.

Installer's responsibility

In all instances where DTS has been used in the design, the installer needs to consider the location of the structure and ensure that its design and fabrication complies with the requirements of the NCC. The installer must also ensure the steel components are adequately galvanised, treated and coated prior to installation.

Note – failure to do so may render the installer liable for rectification or replacement of the structure.

Where a powder coating system is applied over steel framing instead of a paint finish as detailed in table 3.4.4.7 of the NCC, reference should be made to AS 4506-2005 *Metal finishing – Thermoset powder coating* which sets out recommended pre-treatment and coating thickness.

Painting of steel framing is referred to in AS 2312:2002 *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings*.

Where the installer supplies the materials, it is incumbent upon them to ensure the product they provide is fabricated and installed in a proper and proficient manner and is without any defect that occurs due to an insufficient or poorly provided protective coating. Whatever system the installer chooses, they must be confident that it will not corrode or present delamination prematurely.

Whether the materials are supplied by the installer or others, the installer still has a responsibility to ensure that the installation complies and that the materials have relevant evidence of suitability. Refer to [Australian Building Codes Board Handbook – Evidence of suitability](#).

Under the Building Services (Complaint Resolution and Administration) Act 2011 a building service complaint for workmanship defects can be made up to 6 years following the time of practical completion of the structure. Premature coating failure and corrosion may be considered a workmanship defect where adequate durability of the steel has not been provided.

Further information

The NCC's publications are available online at <https://ncc.abcb.gov.au/ncc-online/NCC>

Department of Mines, Industry Regulation and Safety, Building and Energy Division website: [Industry Bulletin 102 – Performance Solutions for housing project](#)

Disclaimer – The information contained in this fact sheet is provided as general information and a guide only. It should not be relied upon as legal advice or as an accurate statement of the relevant legislation provisions.

If you are uncertain as to your legal obligations, you should obtain independent legal advice.

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