



DHW Technical Guideline

KG016 Corrosion Protection

1. Purpose

This guide sets out Department of Housing and Works (DHW) requirements for corrosion protection for non-residential government buildings.

1.1. Site corrosivity

The corrosion level (corrosivity) of a site will depend on a number of factors, including proximity to coast, tidal rivers, wetland or industrial areas; exposure to winds and rain; temperature, humidity and micro-climatic conditions. Corrosion levels are generally highest in coastal locations. AS 4312 Atmospheric corrosivity zones in Australia section 2.2.1(b) states that “Airborne salt ... causes the most damage to infrastructure in Australia as most of the population live within 50 kilometres of the coast.”

Perth, with its exposed ocean and strong winds, is likely to experience comparatively highly corrosive atmospheres, up to several kilometres inland.

2. Requirements for DHW projects

Design teams are required to:

1. Assess the specific corrosivity for each site in accordance with AS 4312, and design accordingly.
2. If the site:
 - a. is within 5 km of a coast, river, industrial area or other corrosive environment,
 - and**
 - b. the site corrosivity level appears to be C4 or C5 as defined by AS 4312,then the design team must engage an AMPP (Association for Materials Protection and Performance) Accredited Corrosion Technologist to assess site corrosion levels and advise on project-specific corrosion protection requirements unless otherwise agreed with DHW.
3. If the site corrosivity level appears to be C3 as defined by AS 4312 and the building is 2 storeys or more in height, then materials shall be specified which fulfil the requirements of C4 and C5 sites. C3 sites with large areas of exposed steel may consider engaging an AMPP Accredited Corrosion Technologist as above.
4. Avoid specifying any material that requires maintenance more than once every 5 years. Specific project briefs may require longer warranties for certain materials.

5. If possible, specify inherently corrosion resistant materials, especially for cladding, for all sites in medium, highly and very highly corrosive environments. (Categories C3, C4 and C5 as defined in AS 4312)
6. Where less durable materials must be used in corrosive environments, e.g. structural steel, ensure warranty conditions are appropriate to the site and client.
7. Specify protective coatings appropriate to the environment of the site, and in accordance with relevant standards and manufacturers' recommendations and warranties.

Note: Warranties offered by material manufacturers may be voided by application of post-applied treatments.

8. Specify that galvanising and other protective coating systems are to be applied post-fabrication and in a controlled environment. Avoid making good on site wherever possible.
9. Any on-site fabrication using galvanised steel and other protective systems is to be done in accordance with AS 2312 Parts 1 & 2 and the manufacturer's requirements, to ensure a uniform protection for the completed building.
10. Where metal building elements are exposed to the atmosphere and sheltered from rain, up-specify the level of corrosion protection provided in accordance with AS 2312 series or in accordance with manufacturer recommendations. For example, over-painting to protect galvanised steel or specifying more durable cladding products.
11. When applying protective coating systems to provide additional corrosion protection, ensure:
 - a. Contract specification is clear and comprehensive, including all hold points and witness points;
 - b. Galvanised surfaces or other protective coating systems are prepared in accordance with the coating manufacturer's requirements;
 - c. Painted coatings are applied in accordance with AS 2312 series and the manufacturers' requirements and specifications;
 - d. Contractor must conduct checks at hold points as required by the contract specification, with the Superintendent's Representative and the structural engineer, to ensure the surface is cleaned and the coating(s) applied correctly;
 - e. Contractor's Site Inspection Sheet records are comprehensive and up to date;
 - f. Superintendent's Representative signs Site Inspection Sheet record to certify that each required hold point and witness point inspection has been completed;
 - g. For projects located within C4 or C5 corrosivity zones, a AMPP Accredited Corrosion Technologist is engaged to conduct a secondary check of

preparation and application work at the appropriate stages. (This service is typically a relatively minor cost and represents good value.)

Some paint manufacturers will not guarantee the product without this check process.

- h. At the initial check, the AMPP Accredited Corrosion Technologist must also verify that the specified steel is being used.
12. Discuss any required maintenance regimes with the client to ensure that they understand and commit to undertake any maintenance required in accordance with specific product warranties.
 13. Document any warranty conditions and required maintenance and provide this information to the DHW project manager and the building owner.

2.1. Additional Design Considerations

Corrosion rates are accelerated in exposed, sheltered situations, where atmospheric salts and other pollutants can accumulate on surfaces that are not washed clean by rain. AS 2312.2:2014 *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Hot dip galvanizing* recommends:

7.5.4 Painting for unwashed surfaces

In coastal service and industrial atmospheres where the steel article is not subject to the cleansing influence of rain, such as on the underside of horizontal surfaces, the proper over-painting of hot dip galvanised coatings will significantly extend service life. In this case, the paint insulates the hot dip galvanised surface somewhat from the corrosive contaminants (e.g. hygroscopic salts in a marine environment).

Similarly, other protective coating systems (for example: zinc silicate) may also require over-painting to significantly extend service life in an external situation.

2.1.1. Structural steel – Uncoated

Preparing uncoated structural steel for a protective coating and then applying that coating is a multi-stage process, including sandblasting then applying multiple protective coats. Correctly specifying and undertaking these stages is critical to the future performance of the materials. Failure to adequately specify or undertake the appropriate procedures for preparation of steel and application of the protective coating can result in corrosion. This can be both an aesthetic and structural concern. The defects may not appear until after the contractual defect's liability period has ended. Remedial work can then be protracted and prohibitively expensive.

2.1.2. Structural steel – Metal Coated

Light gauge structural steel sections, such as purlins or girts are supplied in the metallic coated condition. Typically, utilising zinc-coatings (galvanised), these products are metal coated prior to fabrication. The coated steel products used in the manufacture of light gauge metallic coated steel products should conform to the requirements of AS

1397:2021 *Continuous hot-dip metallic coated steel sheet and strip – Coatings of zinc and zinc alloyed with aluminium and magnesium.*

Products conforming to this standard are branded on one surface to demonstrate compliance.

Heavier gauge sections such as universal beams and columns, square hollow sections and rectangular hollow sections may also be metal coated, but are typically batch galvanised subsequent to fabrication. Metal coatings in this instance should conform to requirements of AS/NZS 4680:2006 *Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.*

In many cases, no additional corrosion protection is required for metal coated steel products providing adequate coating types and coating mass requirements are specified in consideration of the service environment and access for maintenance or repair. However, like uncoated structural steel, metallic-coated steel articles may also benefit from application of organic coatings (paint) if installed in unusually corrosive environments or exposed, sheltered scenarios that are likely to receive little to no maintenance.

In such scenarios, specification for suitable paint systems and application/preparation methods should be sought from reputable suppliers of post-paint systems. AS2312.1:2014 also provides advice regarding suitable paint specification for galvanised steel products.

2.1.3. Sheet steel – Metal Coated or Prepainted

Metal coated and/or prepainted steel products for roofing, walling and rainwater goods applications should also be specified in consideration of site corrosivity and structure design. A range of finishes and durability classes exist for cladding products and advice should be sought from manufacturers to determine the most suitable product for a given location and application.

In many instances, warranty support may be available from manufacturers for appropriately specified cladding products. Ensure /manufacturers maintenance guidelines are understood with regard to the product and application and are practical and able to be implemented by the building users.

Only cladding products that are manufactured from materials that meet the requirements of AS1397:2021 for metal coated steel or AS/NZS 2728:2013 for prepainted steel products should be specified.

Additional information regarding appropriate material selection relevant and factors related to design and installation of sheet steel for roofing and walling applications are addressed in AS 1562:2018 *Design and installation of sheet roof and wall cladding – Part 1 Metal.*

Further consideration should also be given to fasteners used during installation of sheet steel products in relation to both their durability and also compatibility with cladding materials.

3. References

1. AS 4312-2019 *Atmospheric corrosivity zones in Australia* Figure A.6. Standards Australia. Sydney Australia. 2019
2. AS/NZS 2312.1-2014 *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Paint coatings* Standards Australia. Sydney Australia 2014
3. AS/NZS 2312.2-2014 *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Hot dip galvanising* Standards Australia. Sydney Australia 2014
4. AS 1397-2021 *Continuous hot-dip metallic coated steel sheet and strip – Coatings of zinc and zinc alloyed with aluminium and magnesium* Standards Australia. Sydney Australia 2021
5. AS/NZS 2728-2013 *Prefinished/prepainted sheet metal products for interior/exterior building applications - Performance requirements* Standards Australia. Sydney Australia 2013
6. AS/NZS 4680-2006 *Hot-dip galvanized (zinc) coatings on fabricated ferrous articles* Standards Australia. Sydney Australia 2006
7. AS 1562:2018 *Design and installation of sheet roof and wall cladding – Metal* Standards Australia. Sydney Australia 2006
8. Galvanisers Association of Australia, 2021 *Performance in Various Environments* viewed 8 January 2021 <https://gaa.com.au/performance-in-various-environments/>

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