-

BMW Technical Guideline

TG016 Corrosion Protection

1 CORROSION PROTECTION

1.1 Purpose

This guide sets out BMW's requirements for corrosion protection for government buildings.

1.2 Site corrosivity

The corrosion level of a site will depend on a number of factors, including proximity to coast, river, wetland or industrial area; exposure to winds and rain; temperature 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.

Corrosion rates are accelerated in both exposed and sheltered situations, where atmospheric salts and other pollutants can accumulate on surfaces that are not washed clean by rain. AS 2312.2 *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.

1.3 Painting steel

Preparing 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 defects liability period has ended. Remedial work can then be protracted and prohibitively expensive.

1.4 Case study

Colorbond Ultra wall cladding was installed on a government office building located within 100m of the ocean, and the wall cladding is deteriorating after only 3.5 years. (See figure 1) The warranty conditions required that the exterior of the building be cleaned every two months with a high-pressure water cleaner. This maintenance regime was not adhered to by the building occupants, so the manufacturer's agreed 15-year warranty on the cladding is void.

Fig 1: Colorbond wall cladding damaged by a corrosive atmosphere.

1.5 Requirements

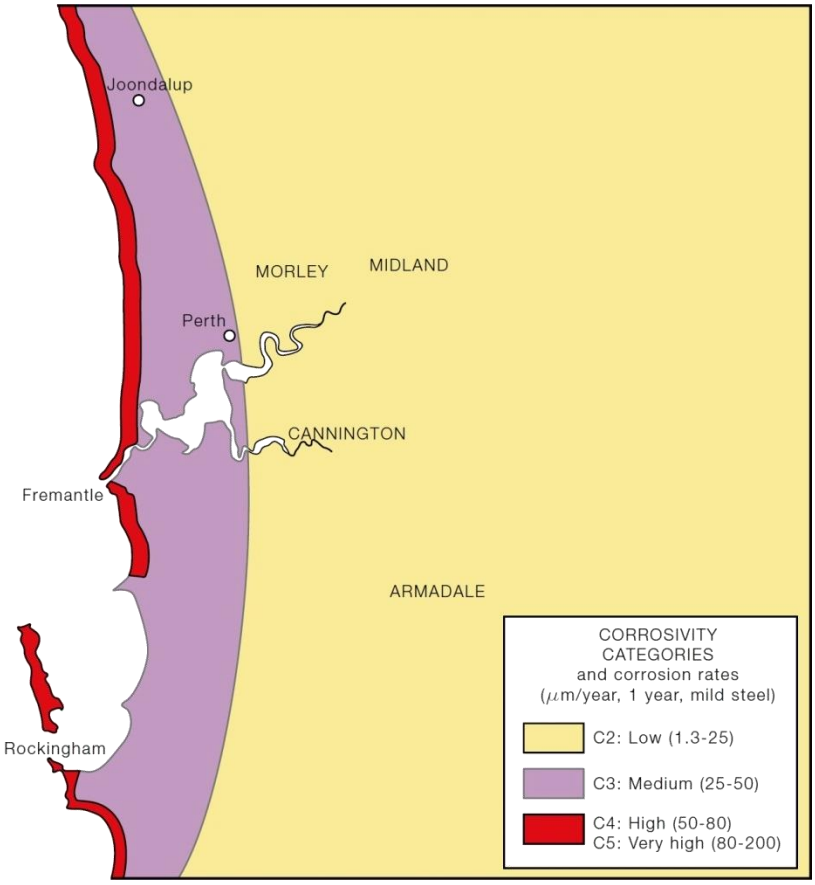
Design teams are required to:

1. Assess the specific corrosion level(s) 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. corrosivity level appears to be C4 or C5 as defined by AS 4312 (see figure 2),

   the design team must engage a NACE (National Association of Corrosion Engineers) accredited consultant to assess site corrosion levels and advise on project-specific corrosion protection requirements unless otherwise agreed with BMW.
3. If the site corrosivity level appears to be C3 as defined by AS 4312 (see figure 2), 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 the design team may consider engaging a NACE accredited consultant as above.
4. If at all possible, 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 non-corroding materials, especially cladding, for all sites in medium, highly and very highly corrosive atmospheres. (Categories C3, C4 and C5 as defined in AS 4312).
6. Where corrodible 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.

8. Specify galvanising and/or other protective coatings are applied in controlled (factory) environments wherever possible.

Figure 2: Corrosivity categories for Perth.



9. Any on-site fabrication including making good, using galvanised steel and other protective systems is to be done in accordance with AS 2312.1 and 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, for example over-painting to protect galvanised steel and other protective coating systems.

11. When painting galvanised steel and other protective coating systems to provide corrosion protection, ensure:
    a. Contract specification is clear and comprehensive, including all hold points and witness points;
    b. Galvanised surface or other protective coating systems are prepared in accordance with the paint 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 (where appropriate), to ensure the surface is cleaned and the coating(s) are 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 on C4 or C5 corrosion zones a NACE accredited consultant 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.) Note that some paint manufacturers will not guarantee the product without this check process.
h. At the initial check, the NACE accredited consultant 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 BMW project manager and the building owner.

2 REFERENCES

AS 4312-2008 *Atmospheric corrosivity zones in Australia* Figure A6. Standards Australia. Sydney Australia. © 2008 (NB: Status at Jan 2019: Pending Revision)

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

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

AS/NZS 4680-2006 REC:2017 *Hot-dip galvanised (zinc) coatings on fabricated ferrous articles.*

Galvanizers Association of Australia (GAA) *Long live Hot Dip Galvanizing An introduction to the new Standard AS/NZS 2312.2* located at: Technical Publications/General Information/Changes to AS/NZS 2312.2 https://www.gaa.com.au/technical-publications/

Atmospheric Corrosion Resistance of Hot Dip Galvanized Coatings 2012
Originally viewed via GAA website 16 February 2016. http://natgalv.com.au/assets/GEN-12-Atmospheric-Corrosion-Resistance-of-Hot-Dip-Galvanized-Coatings.pdf

3 DOCUMENT CONTROL

TRIM Reference	2015/02812 DOC 02202964
Revision Date	21/01/2019
Next Revision	January 2021

Content Owner	Assistant Director, Building Quality, Asset Advisory
Enquiries	Consult with Content Owner or principal.architect@finance.wa.gov.au

Date	Author	Reason	Sections
09/08/2016	F Hogg	Initial Release	All
22/03/2017	C MacLean	Format Updates	All
07/02/2018	F Hogg	Clarification of requirements for steel work protection	1.5 Requirements
21/01/2019	K Maher	Clarification of requirements for steel work protection Update	1.5 Requirements References, Document Control and Approval.

4 DOCUMENT APPROVAL

This guideline was endorsed and approved for use on 21 January 2019 by:

Dean Wood, Principal Architect
Building Management and Works