Appendix V Corrosion and fire protection

For composite structures that are exposed to the weather and particularly for those that are adjacent to a body of salt water, corrosion protection will become a major design issue. The steelwork in a typical steel framed multistorey office building is likely to be well protected from the weather particularly if the building is air conditioned. In such applications a decision can normally be made that no corrosion protection will be required for exposed steelwork within the building.

As discussed in section A3, for the purposes of the main design example, it was assumed that no fire protection would be required to the exposed steel beams forming part of the composite floor beams.

This appendix provides some additional background information related to corrosion and fire protection.

1 Corrosion protection

This section relates to building structures although methods of corrosion protection for other structures such as bridges and wharfs are mentioned. For buildings, atmospheric corrosion is applicable, whereas for bridges and particularly wharfs, exposure to seawater may be the dominant cause of corrosion. Atmospheric corrosion varies depending on the geographic location of the steel and its location in a structure. Where there is no moisture, there is no corrosion. AS/NZS 2312 "Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings" is a very comprehensive source of information and recommendations regarding corrosion and corrosion protection.

When exposed to oxygen and water, iron corrodes to form ferric oxide. When chloride ions are present, as they are in coastal locations, corrosion is very rapid. However, within the interior of totally enclosed buildings, particularly when they are air-conditioned, there is little moisture and virtually no corrosion, making protective coating of structural steel unnecessary. (Steel may, however, be painted for other reasons.)

Methods of corrosion protection include:

- Painting
- Galvanising
- Concrete encasing
- Protective wrapping
- Cathodic protection

These can be characterised as distributed sacrificial anode systems (paints containing zinc and galvanising), barrier systems (other paints, concrete encasement and wrapping), discrete sacrificial anode systems, and active cathodic protection systems. These are discussed below.

1.1 Painting

Preparation for painting.

The performance of all paints is highly dependent on the prior preparation of the surface of the steel surface. For painting of steel intended for a protected environment, a class 1 finish (brush blasting or power wire brushing) is appropriate. For steel exposed to the weather in a non-marine environment, a class 2½ abrasive blast finish should be specified. Class 3 should be specified for a marine environment or other extremely aggressive environments. (The deeper surface profile of a type 3 surface provides the optimum paint adhesion.) For class 2½ and 3 surfaces, all sharp corners should be ground off to avoid a thin paint film that would otherwise occur at these locations.

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Table of contents