Corus Construction & Industrial

A corrosion protection guide

For steelwork in indoor swimming pool buildings

Interior environments			
Environment category	Corrosion risk		Typical steelwork location
C4	High	High humidity and a corrosive environment	Swimming pools, chemical processing plants, paper manufacturing plants, coastal ship and boat yards, etc.

Notes

The environment category is based on BS EN ISO 12944: Part 2.

Swimming pool buildings – interiors									
Environment category		C4 High risk		C4 High risk		C4 High risk	
System number		S1		S2		S3	
Possible life in years (note 1)		Structure life 50	Coating life 10+ (note 2)	Structure life 50	Coating life 30	Structure life 50	Coating life 25
Nearest BS EN ISO 12944 equivalent		–		S5.06		S5.11	
Shop applied	Surface preparation (BS 7079: Part A1)*	–		Blast clean to Sa 2½		Blast clean to Sa 2½	
	Coatings	Hot dip galvanize BS EN ISO 1461 (note 3)	85µm	Zinc rich epoxy primer Epoxy MIO (2 coats) (note 4)	60µm 200µm	Epoxy zinc phosphate primer Epoxy MIO (2 coats) (note 4)	80µm 200µm
	Surface preparation	Mordant wash or etch primer or sweep blast (note 5)		–		–	
	Coatings	Surface tolerant epoxy	75µm	–	–	–	–
Site applied	Coatings	Acrylic urethane	50µm	Aliphatic polyurethane finish	60µm	Epoxy acrylic or acrylic urethane	50µm
Approx cost £/m² (note 6)		13.50		15.00		15.60	

*or equivalent ISO 8501-1

Building interiors surface protection in highly corrosive environments

This document is intended to provide guidance to engineers and architects concerned with the design of new buildings. It suggests a range of corrosion protection systems for the structural framework of buildings which will be clad and protected from the weather. Where possible, the document is in accordance with existing and proposed standards and represents a consensus of UK experience.

The document does not seek to cover every possible case. The systems suggested are considered to be cost-effective methods of providing corrosion protection in internal highly corrosive environments and systems designed to meet environmental legislation are included. There is no intention to restrict the specifiers' field of choice. In some circumstances, alternative methods of protection not given here may well be economic as well as beneficial. New coatings are being continuously developed and the authors wish to encourage such development.

The environment considers one category (C4) for both hidden and visible steelwork but there will be variations around and within this category. For this and other reasons, specifiers must use their judgement, and when necessary take advice in selecting the optimum system. Any of the contributing bodies, or the manufacturers of protective systems, will be pleased to give advice on systems for individual projects.

Notes to table

1. In deriving the protection systems in this document, the design life of building structures has been taken as around 50 years. The table gives two figures for durability:

   a) Structure life
   The period of reasonable freedom from severe corrosion of the steel work that might lead to weakening of the structure. This figure assumes no mechanical damage in service, that no maintenance is carried out and that up to 1mm steel may be lost from the surface at the corrosion rate for the C4 environment given in BS EN ISO 12944. Visible steelwork will normally be accessible for maintenance and if repainting is carried out, the quoted structure life will be extended.

   b) Coating life
   The expected period to maintenance of the protective coating. More frequent re-coating may often be preferred for decorative reasons because of fading, contamination, wear and tear, etc. Hidden steelwork is assumed not to be accessible for maintenance, thus a figure for coating life of hidden steelwork systems is not applicable.

2. The Coating Life is estimated for the paint system only and does not include the hot dip galvanized coating. The life of the total protection system without maintenance should exceed 25 years, however, it is anticipated that for aesthetic reasons maintenance will be carried out at periods of 10 years or less.

3. For steel profiles 6mm thick and over, the minimum average galvanized coating thickness is 85µm. For hidden steelwork, e.g. behind a suspended ceiling, no further treatment is required. For steelwork that is visible, the galvanized coating should be surface treated and coated as shown.

4. The epoxy MIO coats are dark in colour. In situations where light finishes are required, suitably tinted recoatable' epoxies may be used as an alternative.

5. Methods of preparing hot dip galvanized coatings need to ensure that a satisfactory condition is achieved to accept a paint coating system. It is important that the steelwork is thoroughly degreased and free from any contamination. Several methods can be considered including;
   a) Mordant wash or 'T' wash
   b) Etch primer
   c) Sweep blast
   Mordant washing or 'T' washing is the brush application of a chemical solution that reacts with the galvanized surface. The effectiveness of the solution is readily visible and untreated areas are self evident. After treatment, the solution should be rinsed off with clean water and then the treated surface dried ready for painting. It is important that the manufacturers' instructions are carefully followed to ensure successful results.

   Etch primers can be either single or two pack materials and they are applied as thin film coatings to around 10µm to 25µm in thickness. The two pack versions tend to provide an improved surface compared with the single pack.

Sweep blasting is the use of low pressure fine grade non-metallic abrasive which can be very effective but requires care and expertise. The treatment should slightly roughen the galvanized surface without removing the coating.

6. Costs given here are in £ and are for guidance only. There will be considerable variations that may, for a variety of reasons, be ±50%. Quotations should be obtained before making the final selection of the protective treatment. The indicative costs are for 2004. They include estimates for material and labour.

General notes

This document gives details of corrosion protection systems for steelwork inside swimming pool buildings.

Coating thickness
Film thicknesses given in the table are nominal dry film values (µm = micron = 0.001mm).

Workmanship
It is assumed that the quality of work will be to an acceptable professional standard and in accordance with the coating manufacturers recommendations.

Surface preparation
Correct surface preparation is essential for satisfactory performance of coatings. In all of the systems in this document, the treatment is in accordance with BS 7079: Part A1: (ISO 8501-1) Sa 2½.

Coating systems
Steelwork fabricators' process routes vary. The sequence may be (a) Blast-Fabricate-Prime or (b) Blast-Prime-Fabricate or (c) Fabricate-Blast-Prime. The choice of sequence depends upon the facilities available to the fabricator or applicator; and the size of the structural members.

Under certain circumstances, some of the coats given in treatments as 'site applied' or given as 'shop-applied' may be applied on site.

Galvanized components
The weathering of the zinc/iron alloy layers within the galvanized coating can give the appearance of superficial rusting many years before the durability limit has been reached. Where galvanized steelwork is affected by ‘white rust’ (wet storage staining) this should be removed with a stiff brush and washed with water before subsequent pre-treatment and coating.

Many components e.g. purlins are manufactured from pre-galvanized steel sheet typically with a zinc coating of 20µm thickness. The durability and times to first maintenance of these components are unlikely to be identical to those for structural steelwork indicated in the above table.

Hot dip galvanized or sherardised fasteners should be used for galvanized steelwork.

Fire protection
Corrosion protection and fire protection are sometimes required together. Should such a situation arise, advice should be sought from the manufacturer of the fire protection system.

Concrete encasement
Structural steelwork fully encased in concrete is not normally coated. It is suggested that the provisions of Eurocode 2 and/or Eurocode 4 should be followed. The concrete should have the correct composition and compaction with a depth of cover appropriate for the environment (see BS8110, Part 1).

Where steel is partially embedded in concrete, extra protection should be applied at the steel/concrete interface by means of an alkali resistant paint at the junction, or an alkali resistant mastic.

Environmental issues
The handling and application of all protective coatings must be carried out in accordance with the manufacturers' recommendations and comply with the requirements of relevant environmental legislation.

Handling and transport
Care in the handling and transportation to minimise mechanical damage is essential to the performance of the protective system. The responsibility for the repair of damaged coatings should be clearly defined.

Site storage
Incorrect storage on site prior to erection can accelerate the deterioration of coatings. Steelwork should be supported oft the ground with items separated by wooden battens allowing free circulation of air. Avoid 'ponding' (retention of standing water) by laying down sections to ensure adequate drainage.

Hollow sections
It is unnecessary to coat the interior of sealed hollow sections.

Other sources of advice

The British Constructional Steelwork Association Ltd
4 Whitehall Court
Westminster
London SW1A 2ES
T 0207 839 8566
F 0207 976 1634

Paint Research Association
Waldegrave Road
Teddington
Middlesex TW11 8LD
T 0208 614 4800
F 0208 943 4705

Galvanizers Association
Wren's Court
56 Victoria Road
Sutton Coldfield
West Midlands B72 1SY
T 0121 355 8838
F 0121 355 8727

www.corusgroup.com

Designed and produced by
Orchard Corporate Ltd.

Corus Construction & Industrial
Technical Sales and Marketing
PO Box 1
Brigg Road
Scunthorpe
North Lincolnshire
DN16 1BP
T +44 (0) 1724 405060
F +44 (0) 1724 404224
E tsm@corusgroup.com
www.corusconstruction.com

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