

The range of sprayed metal coatings for the protection of iron and steel against corrosion

Application Data Sheet AC-AC-002

Introduction

The selection of a coating system is dependent on the environment in which it is to operate. These environments are detailed below. This is followed by the range of systems available and a chart to indicate the typical time to first maintenance. The treatments recommended for longer lives will always protect for shorter periods and are frequently also economical for these shorter lives. The information in this bulletin is abstracted from BS EN ISO 14713 and BS EN ISO 2063.

Environments

Chart Reference	Category	Corrosion risk	Description
1	C1 - Interior	Very low	Internal areas with dry atmosphere
2	C2 - Interior	Low	Internal area with occasional condensation or moisture
	C2 - Exterior	Low	Exposed, rural inland, low pollution
3	C3 – Interior	Medium	High humidity, some air pollution
4	C3 – Exterior	Medium	Urban inland or mild coastal
5	C4 - Interior	High	Swimming pools, chemical plants
	C4 – Exterior	High	Industrial inland, urban coastal
6	C5 - Exterior Inland	Very high	Industrial with high humidity
7	C5 – Exterior Marine	Very high	High salinity coastal
8	Im2 – Temperate seawater	Very high	Sea water in temperate regions

Other environmental considerations

Mines

Warm Humid Conditions (water present - sometimes saline).

Specialist advice should be sought as conditions in different mines vary considerably. Zinc coatings (not aluminium or paint in coal mines) should be considered provided that the water pH is greater than 5. A sealed coating is preferred. Guidance can be sought from Environment 8 but time to first maintenance may vary widely, depending on particular conditions.

Soil

Earth, sand, rock etc.

Specialist advice is advised as the performance of the coatings will vary accordingly to the nature of the soil. Coating lives may be shortened by soluble sulphates and un-burnt coke contained in clinker and ashes. Coatings are preferably sealed. Aluminium coatings are not recommended for direct contact with alkaline clays.

Encasement in Concrete

Alkaline concrete away from atmosphere.

Aluminium is unsuitable for direct contact with concrete due to its alkalinity and an inert barrier should be provided. This barrier is not required with zinc. Zinc coatings are beneficial in areas where carbonation of the concrete may occur.

Refrigerated Surfaces

Subject to ice formation and condensation.

Sealed or unsealed coatings are generally suitable. For temperatures below - 30°C advice should be sought.

Chemicals

Sealed metallic zinc is generally suitable for chemicals in the pH range 5 -12, sealed aluminium in the pH range 4 - 9, provided the chemical does not specifically attack the coating. The effect of the coating and sealer on the chemicals should be considered, as well as the protection of the steel.

Abrasion and Impact

Additional consideration in some applications.

The resistance to abrasion, rough handling or impact by sprayed metals (sealed or unsealed) is acceptable. The coating polishes by friction. Where abrasion is critical, specialist advice should be sought.

Table of typical coatings and life to first maintenance

Coating thickness	Environment (refer to table above)							
	1 ^a	2	3	4	5	6	7	8
Unsealed Aluminium								
100μ	a	≥20 yrs	≥20 yrs			5-10 yrs		
150μ	a					≥20 yrs	10-20yrs	
250μ	a						≥20 yrs	
Unsealed zinc								
50μ	a	≥20 yrs						
100μ	a		≥20 yrs	≥20 yrs	≥20 yrs	5-10 yrs		
150μ	a					≥20 yrs	10-20yrs	
250μ	a						≥20 yrs	
Sealed^p Aluminium								
50μ	a	≥20 yrs						
100μ	a		≥20 yrs	≥20 yrs	≥20 yrs	10-20yrs	10-20yrs	
150μ	a					≥20 yrs	≥20 yrs	≥20 yrs
Sealed^p zinc								
50μ	a	≥20 yrs						
100μ	a		≥20 yrs	≥20 yrs	≥20 yrs	10-20yrs	10-20yrs	
150μ	a					≥20 yrs	≥20 yrs	10-20yrs
250μ	a							≥20 yrs

Note a: Low corrosion category C1 has no specified coatings but will typically be 5-10 times longer than C2.

Note b: Sealed coatings will typically perform better than unsealed coatings and life to first maintenance will exceed that of an unsealed coating. Sealers should generally be applied until absorption is complete. Sealants and paints should be chosen for the specific environmental conditions.

Painting of sprayed metal coatings

Painting of sprayed metal coatings is normally only required when:

01. The environment pH value is outside the range 5-12 for zinc or 4.9 for aluminium
02. The metal is subject to direct chemical attack
03. The desired finish can only be obtained by paint
04. Additional abrasion resistance is required. Generally one or two coats of paint are sufficient, except in abnormally aggressive environments. (Sealed metal spray is normally preferable).

Metal spraying provides a very good bond surface for painted coatings and can increase the life of painted coatings