Hot Dip Galvanized Case Study No. 10
Marian Island Weather and Research base

The Application

The project involved the design, off site fabrication of steel and equipment, the logistics of loading and sea transportation of the entire base facilities, offloading and construction of the base buildings on a remote island where the weather conditions control progress and completion of construction.

An aerial view of the base under construction

Environmental Conditions

The corrosive conditions encountered at this remote location can be classified as a C4 or a C5 environment in terms of ISO 9223:2012. In terms of this corrosivity category and considering the cold environment, all be it in a marine location, a C4 or *Exterior urban coastal significant chloride effect/deposits, e.g. jetties and offshore structures, within a few hundred metres of the ocean and certain exposed areas along the coastline.*

Zinc corrosion rates in such an atmospheric environmental classification are estimated in the range of 2 to 4 micron (µm) per year. Considering the actual site conditions the expected corrosion rate of zinc would be approximately 3µm per year.

The Site

Marion Island lies at 46°52'34" South 37°51'32" East in the Southern Indian Ocean.

Marion Island is 19 km long by 12 km wide, and the two islands have a combined area of 316 square km and politically form part of South Africa's **Western Cape Province**. The islands are volcanic in origin, with Marion having many hillocks (secondary craters) and small lakes. **Prince Edward Island** has spectacular cliffs up to 490m high on its south western side.

This remote site, located in the South Indian Ocean, has zero facilities or material resources, which dictated that the entire base be manufactures off site and transported, by sea, involving detailed logistical planning and related activities. This could only be achieved using the versatile nature of fabricated steel in combination with the corrosion control attributes of hot dip galvanizing capable of providing an estimate minimum service life of 30 years.

Findings

Hot dip galvanized fabricated steel was selected on the basis of logistics requirements, the need for rough handling of materials to and on site as well as during installation.

Hot dip galvanizing and its cathodic protection characteristics to withstand handling damage and still provide corrosion control was considered to be of major benefit. Site repairs, where necessary, were of a minor nature and fundamentally simple to apply.

Conclusion

The primary features and benefits illustrated by this project are:

1. Cost effectiveness given the site location and availability of local materials and equipment.
2. The effective use of hot dip galvanizing in a C4 environment, i.e. marine conditions and designing the corrosion protection system to suit the given environment.
3. Versatility of steel and the effective methods use to combat corrosive elements within the given environment.

Large projects situated in remote locations involving special logistical arrangements, extreme and changeable weather conditions and resulting difficulties involved in other forms of construction.

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HOT DIP GALVANIZERS ASSOCIATION SOUTHERN AFRICA