Eskom coastal sub-stations

Eskom have since the roll out of the electrical power distribution transmission lines erected throughout South Africa since the early seventies, specified hot dip galvanizing as the preferred method of corrosion protection. Many of the transmission lines are today still providing maintenance free service lives.

Sub-stations follow the same trend and the following sub-stations in the Western Cape are included as Case Histories to evaluate the durability of the hot dip galvanized coating.

Accompanied by Jannie du Toit of Eskom Brakenfell, Cape Town, Duine, Paardekloof and Rietvlei sub-stations were visited at the tail end of February 2014 and the hot dip galvanizing inspected and evaluated. *(Due to a space constraint only Duine Sub-Station is reported in this case history. The other two will follow in subsequent editions).*

Duine Sub-Station

Application

The original steelwork for Duine Sub-Station was erected in September 1977, to date equalling about 37 years of exposure to aggressive marine conditions adjacent to Koeberg Power Station.

The sub-station is situated about one to one and a half kilometres from the sea.

The site

Marine chlorides are present *(see photos)*. Duine Sub-Station is considered to be about a C4 bordering on a C5 environment (an environment with a zinc corrosion rate of 2 to 8µm/year) in accordance with ISO 9223 or the Association's Information Sheet No 11, Corrosivity of Zinc.

Our findings

The hot dip galvanizing is performing above expectation. Judging by the residual coating thickness on the structure as well as the holding down bolts and nuts, we predict the galvanizing will provide an excess of a further 30 years of service-free life.

Conclusion

In spite of visible surface chlorides from the sea air, the hot dip galvanizing has performed admirably over the last 37 years reasonably close to the West Coast.

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Duine Sub-Station.

Radiators.

Edge of the radiator (above left) and close up of the edge of the radiator showing visible marine chloride salts and an area cleaned for taking coating thickness readings (above right).

Above left and right: Residual coating thickness readings of 264 & 215µm respectively on the bracing struts.

Edge of the radiator showing the two cleaned areas where residual coating thicknesses were taken.

Above left and right: Residual coating thicknesses of 71.4 and 69.0µm respectively.

Above left and right: Residual coating thicknesses of 65.4 & 75.2µm respectively.

Chloride salts cleaned off the underside of the radiator.

Above left and right: Residual coating thicknesses of 80.9 and 98.8µm respectively taken on the underside of the radiator.

Areas of coating damage (no corrosion creep).

Above left, centre and right: Residual coating thicknesses adjacent to mechanical damage of 204µm, residual iron zinc alloy coating thickness at damage of 21.0 and 35.0µm respectively.

Above left, centre and right: Appearance of the coating on support angle, with residual coating thickness taken at a cleaned area of 169 and 191µm respectively.

Above left, centre and right: Another component showing visible chloride salts, removed and residual coating thickness readings of 124 and 123µm respectively.

Above left, centre and right: Residual coating thickness readings on cleaned holding down nuts and bolts of 79.1, 85.6 and 260µm respectively.

One single base plate showed corrosion on the edge. Residual coating thickness readings of 140 and 165µm were taken adjacent to the corroded area. A possible cause is an original over cleaned edge or use of an acidic grout.

Insert showing galvanized steel duct cover plates. Above left and right: Coating thickness readings of 90.9 and 108µm respectively on the underside of the duct cover plates.

Coating thickness reading of 112µm on the steel entrance gate.

Above left and right: Coating thickness readings of 62.9 and 118µm respectively on the topside of the duct cover plates.

Coating thickness reading of of 61.2µm on the steel entrance gate.