An evaluation of hot dip galvanized cable ladders after being exposed for some 25 years at a Cape Town Petro-Chemical Plant

The application

This petro-chemical plant in Cape Town was established in 1966 and these particular cable ladders which convey vital electrical and communication cables to various parts of the plant, were installed some 18 years afterwards in about 1984 (making them about 25 years old).

Having been originally contacted by Ian McArthur an electrical engineer at the plant who was interested in a duplex protected cable ladder at the time, as he felt this was necessary for long term sustainability in this plant. The discussion went about why a duplexed cable ladder was seen to be necessary and had 'galvanizing' on its own been thoroughly evaluated for past performance over a known life.

Ian then invited me to conduct this assessment and evaluation of some known aged hot dip galvanized cable ladders.

The cable ladders that were selected as the case history were identified as supplied by a company Adriano and Stefano (A&S) who were in existence when I was employed at my previous company, O-Line Support Systems, starting in 1987. The company A&S are no longer locally in existence.

Due to a higher side rail height of 140mm which is higher than the normal proprietary types of cable ladder and top-hat type cross rung configuration, these cable ladders were generally specified for use in most of the petro-chemical industrial plants at that time throughout South Africa.

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The general view on the petro chemical plant in Milnerton.



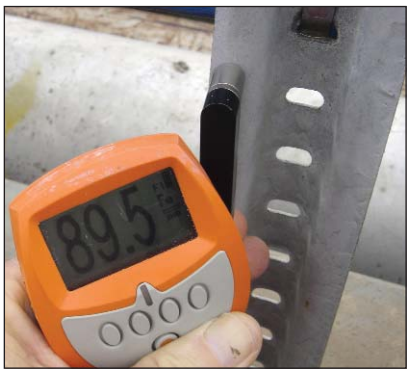
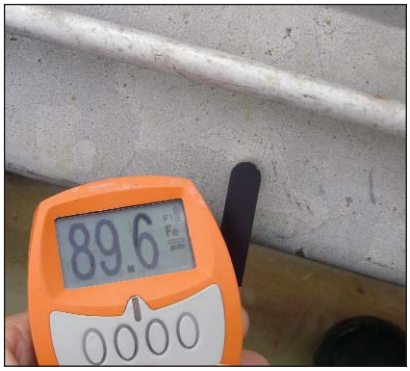
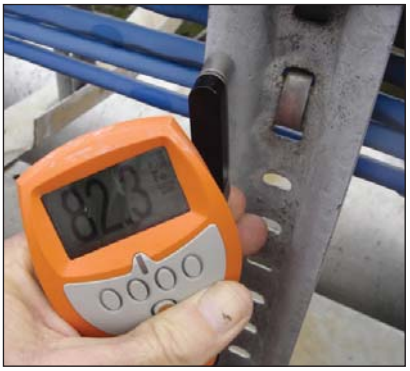
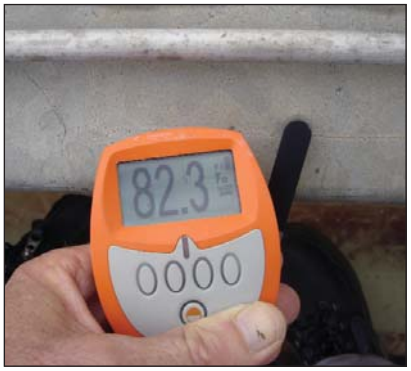


Photo left shows the A&S Cable ladder in the foreground and a more modern edge mounted cable ladder in the background. Centre shows a close up of the A&S Cable ladder and right, residual coating thickness on the cross rung (89.5µm).







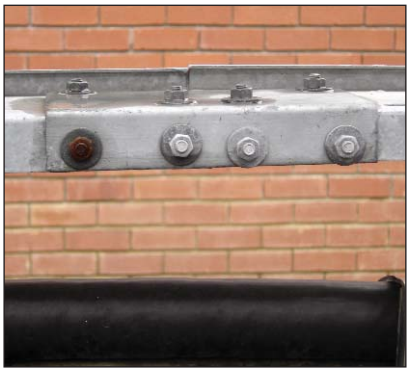
Photos above show coating thickness on the side rails (89.6 and 82.3µm) and again on the cross rung (82.3µm). Coating thicknesses are still well above that required by the standard.

The cable ladder had a 140mm high side rail and top-hat type cross rungs both made from 2.0mm mild steel. The splice was made as a flat plate bolted using 5 x M6 fasteners uniquely spaced on either side of the splice joint. The cable ladders and splices were hot dip galvanized by the general process which was then specified by the previous national standard, SABS 763. All fasteners on this cable ladder were either zinc electroplated or mechanically plated and were in an advanced state of corrosion. (In order to preserve the life of these fasteners and hence extend the life of the cable ladders, it is recommended that the fasteners be replaced or thoroughly cleaned and generously over coated with an appropriate zinc rich epoxy, such as 'Zincfix' or equal. One of the reasons why the cable ladder in the background (not an A&S type of cable ladder) was developed was so that M8 machine fasteners (used in this instance), which could be supplied as hot dip galvanized, would be used when the initial cable ladder was specified as hot dip galvanized.

Environmental conditions

The plant is situated in Milnerton within about three and a half kilometres off the Atlantic Coast line.

On closer examination of the cable ladder and while most corrosion products (mostly zinc chloride) were removed prior to recording coating thickness readings, the layer of



Only zinc electroplated fasteners have been supplied in some instances.

contaminants was not nearly as thick and as tenacious as experienced on other components used as example case histories in other similar regions along the coastline.

This suggests that the environment at hand even though it is categorized as marine is not nearly as corrosive as originally estimated. Using the indicators in ISO 9223 – Corrosion of Metals and Alloys – Corrosivity of Atmospheres – Classification and the slow rate of corrosion achieved suggests that this part of Milnerton is a C3 to at worst a moderate C4 environment taken from ISO 9223.

Hot dip galvanizing is specified primarily for corrosion protection. For this reason the two requirements to satisfy this requirement are coating thickness and continuity.

SANS 121 (ISO 1461) which superseded SABS 763 in 2000, requires that for steel thickness greater than and equal to 1.5mm and less than 3mm the local coating thickness be 45µm and the mean be 55µm. The coating thickness readings taken on both the side rail and cross rung of the cable ladder in question, still generously exceed this initial requirement.

Conclusion and recommendation

In requesting Association assistance in the evaluation of known aged hot dip galvanized components before over specifying the corrosion protection required by cable ladders for this plant, the electrical engineer, Ian McArthur has been rewarded with the knowledge that hot dip galvanizing on its own in most areas of the plant is the correct choice of corrosion protection.

Similarly in other sections of the plant where frequent maintenance painting is required on structural steel, hot dip galvanizing of this may have been the more appropriate and cost effective solution in the long run!

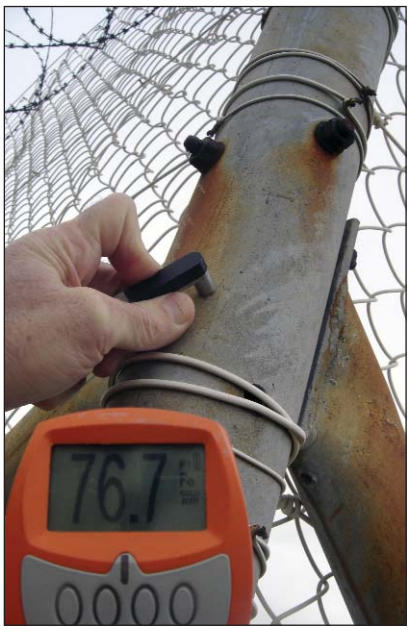


Photo left, shows the residual hot dip galvanized coating thickness on the boundary fence corner post.