



## **Hot Dip Galvanized Case Study No. 8 Power Transmission Lines**

### **The Application**

For more than 50 years, Eskom power transmission towers have been hot dip galvanized for corrosion control purposes. These tower pylons are situated throughout the country and are therefore subjected to the full spectrum of environmental and climatic conditions. The application and use of hot dip galvanizing to provide corrosion control of this National asset, is testimony to the corrosion control characteristics and properties of this unique coating system.

### **Environmental Conditions**

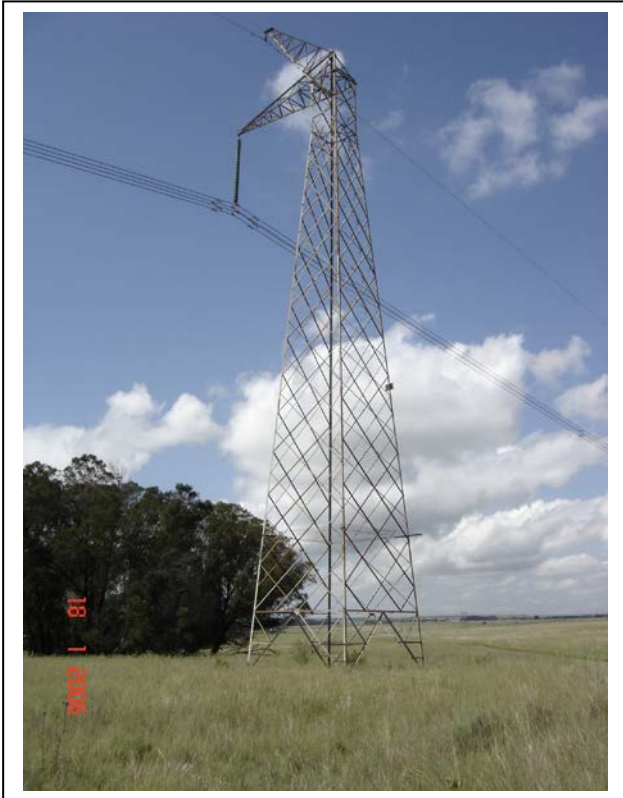
South Africa is known for its many severe corrosive atmospheric conditions. These environmental conditions are not only restricted to the coastal regions, but include many inland industrial areas as well. Environmental conditions range from benign rural areas to severe marine and industrial sites. Atmospheric corrosive environments are broadly classified in terms of ISO 9223:2012, which are similar to ISO 12944 and ISO 14713.

Information sheet No 8 “**Corrosion of Zinc – Corrosivity of Atmospheres**” refers.

### **The Site**

As indicated the sites range across the full spectrum of climatic conditions. We shall therefore restrict this case study to three sites, ranging from a benign condition, an inland industrial and a severe marine coastal environment.

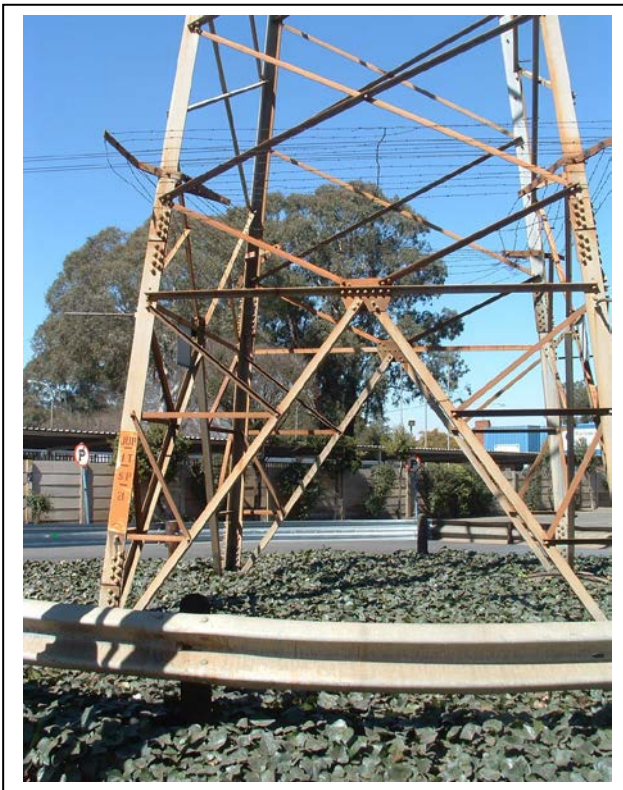
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**Site No. 1**

**Relatively Benign Conditions  
ISO C2 or C3**

**53kV DC line from Cabora Basa to  
Eskom's Apollo Sub-Station South  
of Pretoria installed 1973**



**Site No. 2**

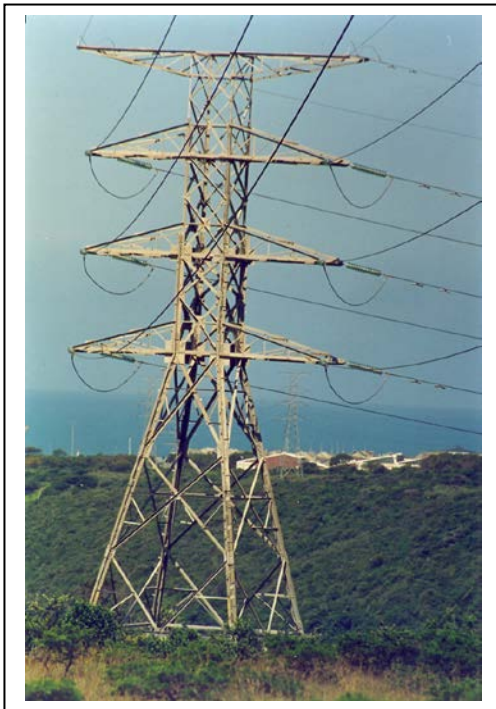
**Inland Industrial site selected for its  
relatively severe corrosive conditions**

**This site is located within Germiston  
Industrial area and the tower is believed  
to have been in service for the past 40  
plus years**

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The third site selected for its severe marine conditions consists of transmission towers on the Buffalo-Port Rex Transmission Lines situated outside of East London.

We acknowledge and thank Eskom for allowing us the use of their inspection report relating to this particular installation.

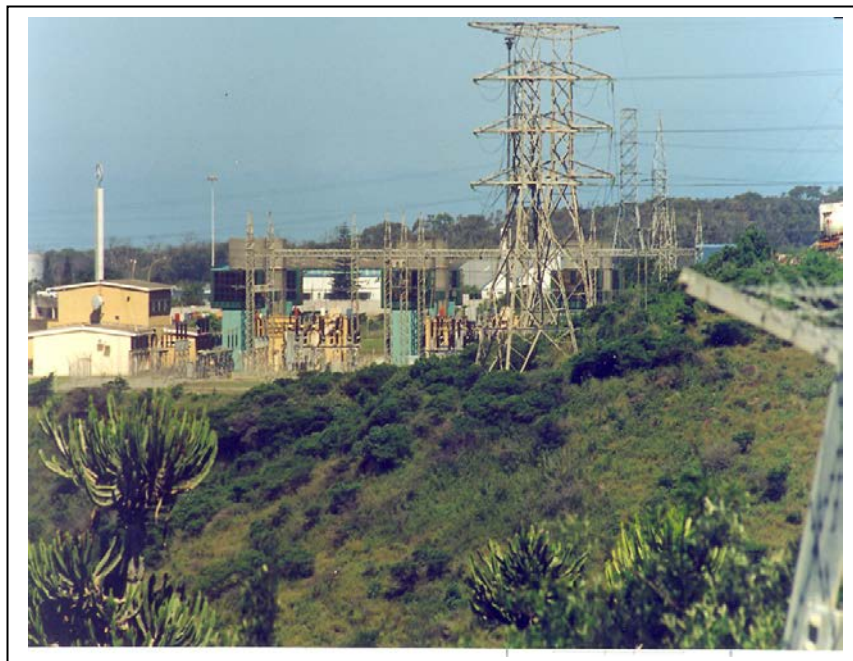


### Site No. 3

#### Severe Marine Coastal Conditions

**Buffalo-Port Rex Transmission Line  
situated outside of East London high up  
and exposed to winds from off the  
Indian Ocean**

**At the time of the inspection, the towers  
had been in service for 25 years.**





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### Findings



#### Site No. 1

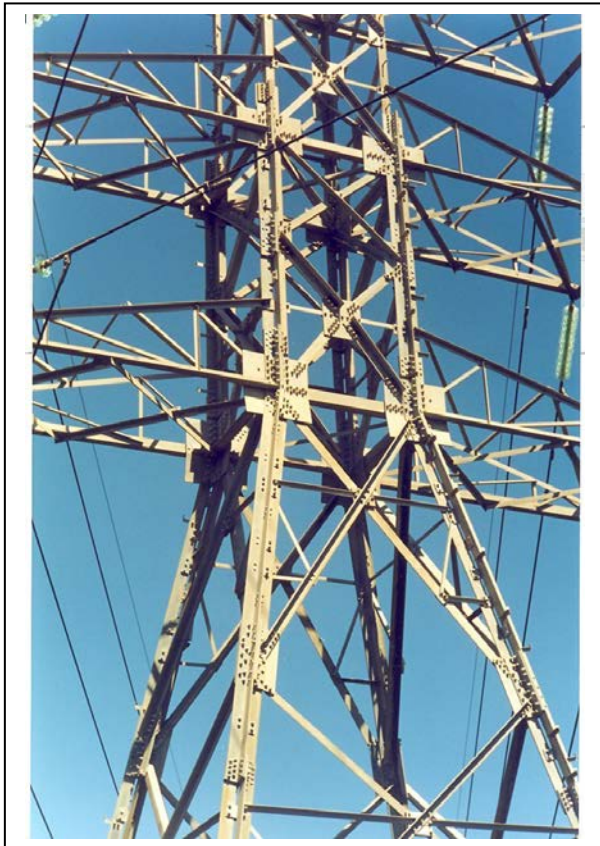
After removing the “apparent” rust discolouration, the underlying zinc hot dip galvanized coating measured 65µm. Accuracy of the instrument is approximately 5%.



#### Site No.2

After the removal of the discolouration, i.e. corrosion products, a measurement of the remaining hot dip galvanized coating revealed 119µm.

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### Site No.3

**General condition of the tower after 25 years of service, was found to be such that an over coating of a paint system was recommended in order to extend the service life of the structure.**



The tower that was inspected is situated approximately 3 kilometres from the ocean next to the Buffalo River salt-water estuary, as well as alongside a city dump.

At the time of the inspection the tower had been in service for 25 years. The initial corrosion control comprised hot dip galvanizing and had never been over coated with an organic coating system.

Severe corrosion with subsequent metal loss was observed on some of the structural members. In one isolated instance the degree of metal loss was so severe that it had resulted in the perforation of the member.

The nuts and bolts associated with these sections were also severely rusted. The most severe corrosion was mainly located on the inner surfaces of the members. The members that showed severe signs of corrosion were either perforated or the degree of metal loss was in the 1 to 2 mm range. The outer surfaces of these members were only superficially corroded and the hot dip galvanized thickness readings ranged from 87 and 104  $\mu\text{m}$ .

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### Conclusion

The information gained from these three sites is very useful in that it allows us to study the effects of corrosion and the protective qualities of hot dip galvanized steel, across the full spectrum of environmental conditions knowing the years of service.

Service life of a steel structure depends on two fundamentals, viz, type and quality of the corrosion control system and environmental conditions in which the structure is located.

Hot dip galvanized structures have been shown to exhibit outstanding performance over the full spectrum of environmental conditions. Where severe environmental conditions are encountered, Duplex coatings (hot dip galvanizing plus a top paint coating) should be considered.