Hot Dip Galvanized Case Study No. 2
Storms river bridge

The Application

Hot dip galvanizing was applied to achieve corrosion control of balustrades, hollow sections, guardrails, stanchions, box girder ribs, drainage channels, some of the fasteners and the 'Vastrap Plate' walkways. According to the engineers hot dip galvanizing was selected of its, ***maintenance free service life, competitive initial cost versus paint, reliability of the hot dip galvanizing process, speed of installation, complete coverage of hollow sections and resistance to handling damage."***

The Storms River Bridge is to many bridge designers and contractors alike, a symbol of bridge construction in South Africa

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Environmental Conditions

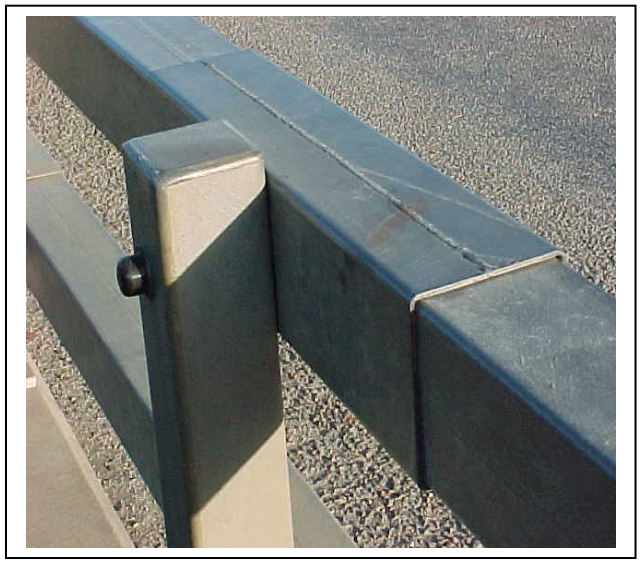
The location of the bridge is approximately within 10 kilometres from the coast and approximately 130m above sea level. Corrosion conditions are described as moderate coastal in a corrosivity category of a C3 atmospheric environment in terms of ISO 9223:2012 specification. A general description of a C3 environment is given in terms of the following;

Temperate zone with medium (SO_2 5 to ≤ 30µg/m³) or some effect of chlorides, e.g. urban areas, between a one to thirty kilometres (depending on prevailing winds, buildings, vegetation and topography) from the ocean, or within one hundred metres of sheltered coastal areas with low chloride deposits.

The Site

The Storms River Bridge was the first major bridge to be constructed on the section of the N2 from Plettenburg Bay to Port Elizabeth. Dr Ricordo Morandi was responsible for the design with construction from January 1986 with hand over taking place in February 1987.

The conceptual design method used to widen and strengthen the existing 100m concrete arch was entirely original. The overall width of the deck was increased from 8,180m to 11,450m, using lightweight hot dip galvanized plate girder cantilever rib supporting the precast concrete slabs to minimize the extra dead weight on the arch rib. The arch rib itself was strengthened by the addition of externally bonded steel plates at the crown and springing, which at the time was thought to be original.



Hot dip galvanized slip joint designs to eliminate a requirement for unnecessary site alterations, compromised service life and illumination of coating repairs

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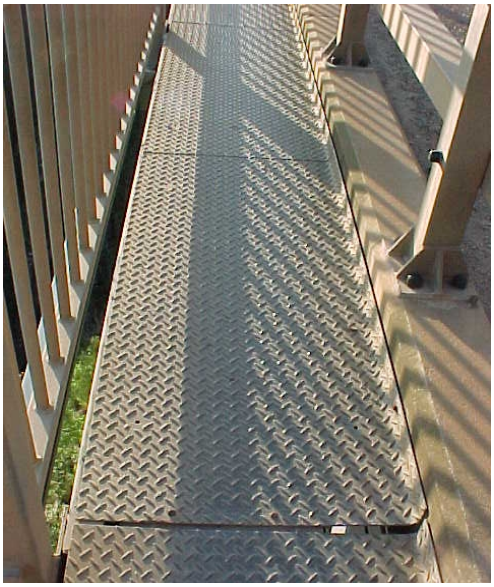
Findings

The hot dip galvanized coating is in excellent condition and coating thickness readings were all far in excess of the heavy duty coating (105µm) originally requested.



General view of the "Vastrap Plate" walkway that shows coating thickness adjacent to the anti-skid ridges of 149µm

Plastic covers filled with silicon were introduced to seal fasteners and to increase maintenance free service life

Balanced design of structures is achieved by the use of hot dip galvanized fasteners throughout an installation

It would appear that the electro-plated wash is corroded due to an inadequate zinc coating thickness

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Electro-plated fasteners that have corroded due to insufficient zinc coating thickness

Corroded bolt end cut off after installation; note the absence of under corrosion creep

Seal crevices at junctions to avoid the ingress of moisture and the potential crevice corrosion

The example illustrates the use of an insulating pad between the mating parts

Conclusion

After approximately 18 years of service, the hot dip galvanized coating continues to provide a maintenance free life and to achieve design criteria. Some fasteners, which were originally inadequately coated (possibly zinc electro-plated), require coating repair. Adequate repairs to these specific areas, the bridge will continue to provide effective corrosion control and a maintenance free service life.

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