Rusty Bottoms: A Case Study

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Telecom Cellular Tower Base Bottom

Bascule Bridge railing after four years
Thorndon Overbridge Lighting Poles Replacement

Cast-in balcony support

The Case Study Project
Waikato Expressway Project ($2.1B)
Third Section ($250M) Tamahere to Cambridge (16 km)
with 8 bridges and >1.5km of galvanized steel barriers
Opened 15 December 2015
T5 Barrier baseplate corrosion observed 8 September 2016 (9 months later)
Opus Inspection 27 April 2017 of 6m removed length
Contractor repaired 730 baseplates between Sept 2017 and Feb 2018.

Expressway opening 15 Dec 2015
Defects Liability Inspection (Sept 2016)

Opus Inspection April 2017

Removed Baseplate (Example 1)
Removed Baseplate (Example 2)

Condition of Holding Down Bolts

Thornton Rd Bridge

Karapiro Bridge Parapet Baseplate
Karapiro Bridge Mortar Pad

Immersed Zinc Corrosion vs Temperature and pH

Repair Procedure (1 of 2)

- Remove barriers to an elevated working platform
- Remove mortar and ZCP by scraping and abrade sound galvanizing with sandpaper
Repair Procedure (1 of 2)

• Remove barriers to an elevated working platform
• Remove mortar and ZCP by scraping and abrade sound galvanizing with sandpaper
• Power tool clean red rusted areas to SSPC-SP3

Repair Procedure (2 of 2)

• Fit temporary plug into threaded inserts in top of concrete parapet
• Trowel mortar onto existing dry pack to fill voids and level surface

Repair Procedure (1 of 2)

• Brush apply two 150µm WFT coats of rapid cure surface tolerant moisture cured urethane

Repair Procedure (2 of 2)

• After 2 hrs mortar cure and <15 min before reinstalling barrier apply a layer of moisture cured urethane sealant to the top of the mortar pad
Repair Procedure (2 of 2)

• After 2 hrs mortar cure and <15 min before reinstalling barrier apply a layer of moisture cured urethane sealant to the top of the mortar pad
• After replacing of refurbished base plates remove excess sealant
• Remove plugs and partially install HD bolts – caulk annulus then tighten down or replace washer and nuts

Impact damaged galvanizing on silicon-killed steel (0.14 – 0.29% Si) repaired with brush applied zinc rich epoxy to 100µm DFT.

EXTRACT FROM NSW Roads & Maritime Services Standard Bridge Barrier Drawing B500 (2013)

GROUTING SHALL BE CARRIED OUT TO ENSURE THAT THE FORMED RECESES ARE COMPLETELY FILLED AND THAT THERE ARE NO VOIDS UNDER THE BASE PLATES.
SIDE FACES OF GROUT PADS SHALL BE VERTICAL AND FLUSH WITH EDGES OF BASEPLATES.
THE FORMWORK FOR THE GROUT PADS SHALL REMAIN IN PLACE FOR A MINIMUM OF 3 DAYS AND CURING COMPOUNDS SHALL BE APPLIED TO THE SIDES OF THE GROUT PADS AFTER REMOVAL OF THE FORMWORK.
THE UNDERSIDE OF THE BASEPLATES AND SIDE FACES OF THE SLOTTED HOLES SHALL BE PAINTED WITH TWO PACK SURFACE TOLERANT EPOXY PAINT WITH A MINIMUM DRY FILM THICKNESS OF 100 MICRONS.
Ring bark corrosion

Coat (or sleeve) your bottom

Paint underside and edges of steel plate with a coat of non-conductive paint in accordance with Note (1), to a minimum of 100mm in form of the edges to the top face of the plate. Chamfer and place mastic bead when interface between steel and concrete is clearly visible.

Slope concrete surface away from steelwork, wherever possible.

Provide mastic sealant coving to seal any existing shrinkage cracks.

General corrosion protection system to the steelwork (e.g. single coat IZS)

Band of single coat of non-conductive paint, in accordance with Note (1), extending above and below the level of the concrete surface as noted.

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Acknowlegements

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- To the NZ Transport Agency for approval to present this information
- To the principal investigator, Raed El Sarraf, Opus Corrosion and Asset Integrity Consultant
- To the ITP Inspector for the repairs, Hanieh Ghominejad, Opus Materials Engineer and NACE Coatings Inspector Level 2-Certified
Questions?

New Zealand Steelwork Corrosion Coatings Guide

Australian steelwork corrosion and coatings guide