Preventable Coating Defects

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Introduction

This article identifies some preventable coating problems noticed on 7 year old coated steel structural elements. The steelwork is located a couple of kilometres from the sea within an Atmospheric Corrosivity Category (ACC) at the high end of D. The ACC was determined from Table 4.1 of AS/NZS 2312 (SNZ, 2004) and Section 4 of NZCCG (Clifton and El Sarraf, 2005).

Defect No. 1: Rafter Crossing Two Exposure Situations

Figure 1 show two fully coated CHS members bolted on to a primed only main girder holding a canopy. Half of the main girder is inside the building with the other half outside the building exposed to the prevailing wind. The exposed part of the girder should have been coated in a manner similar to the attached CHS members; however, the coating used on the internally exposed portion was used, a simple alkyd primer on wire brushed surface. A suggested coating for the exposed portion of the girder would be a 3 coat system of a zinc rich primer, followed by a high build epoxy, finished with a poly-urethane gloss coating (designated as PUR5 in Table 6.3 of AS/NZS2312) to a surface preparation of Sa2 ½. Note the accelerated corrosion and the dull finish the main girder has in comparison to the appropriately coated bright and better performing CHS.

Better communication between the architect, engineer, builder, fabricator and coatings applicator could have avoided this.

Where two coatings systems are to be used on a member the extent of each coating and type needs to be clearly specified.

Figure 1: Exposed Girder and CHS

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Defect No. 2: Coating Delamination

Figure 2 shows a coated T-section lacking a zinc rich primer, which would have prevented coating undercutting that led to delamination. Another contributor to this defect are the rough gas cut edges of the T section as discussed in the following Defect No. 3.

Figure 2: Coating Delamination

Defect No. 3: Sharp Edges Initiating Corrosion

Figure 3 shows corrosion initiating at the girder's edges which are still "sharp". AS/NZS 2312 Figure 3.1 (q) states that all "sharp edges" are to be chamfered or rounded prior to coating to allow sufficient coating build up. An inappropriate coating application to the exposed rafter as discussed in Defect 1 also contributed to the defect.

Figure 3: Sharp Edges Accelerated Corrosion

Defect No. 4: Bi-metallic Corrosion

Figure 4 shows a stainless steel pin without a neoprene washer to isolate the stainless steel from the mild steel. The result is accelerated bimetallic corrosion around the pin.

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Figure 4: Bimetallic Corrosion

Conclusion

All of the stated defects are preventable with proper communication, surface preparation, application and inspection would have picked up. These matters are covered in AS/NZS2312 and NZCCG, which provide extensive guidance on these issues. Effective coating inspection before, during and after application would typically prevented the development of the defects discussed. Section 8 and 11 of AS/NZS2312 and Section 22 of NZCCG provide guidance on the inspection of coatings systems before, during and after application of that system.

References

AS/NZS 2312:2002/2004, Guide to the Protection of Structural Steel against Atmospheric Corrosion by the Use of Protective Coatings, incorporating Amendment No 1:2004. Standards New Zealand, Wellington.

Clifton, C and El Sarraf, R; New Zealand Steelwork Corrosion Coatings Guide. HERA Report R4-133, HERA, Manukau City, New Zealand. 2005

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