

# Case Study

## Duplex System Townsville Railway Station



### Background

Townsville has experienced substantial growth over the last twenty years. By the beginning of the 21<sup>st</sup> century, the city had outgrown its original heritage listed station and needed to develop a new facility to cater for over 70,000 passengers annually on long distance passenger services, as well as the Brisbane to Cairns tilt train service.

The new station had to reflect the vibrant and growing nature of the area and called for innovation to meet the aesthetic requirements of its location at the southern gateway into the city as well as its functional demands as an operational transport hub.

The chosen solutions included a duplex system (paint over hot dip galvanizing) for the structural members, a painted steel roof and stainless gutters and downpipes.

The relocation of the Townsville Railway Station and North Yard Workshops from 2002 resulted in the opening of 36 hectares of prime creek front developable land for CBD expansion.

In 2012, we revisited the site to review the performance of the system.

### Location

The Townsville Railway Station is located approximately one kilometre from Cleveland Bay. Townsville itself is located in the tropical zone of Australia and experiences an average annual rainfall of around 1200 mm with hot humid summers and average UV index of 10. Any corrosion protection system involving the use of paint would therefore need to withstand some very harsh conditions; not only to protect the steel from corrosion, but also to withstand the harsh UV in this climate.

### Duplex Coating

Railways stations are a tough environment with steel being required to withstand damage from abrasion and knocks to the structural elements, in addition to the corrosive effects of the atmosphere.

The architects chose to protect the main structural members using a duplex system consisting of a whip blasted hot dip galvanized substrate, followed by a base coat of 100 µm of Amerlock 400 and the finishing aesthetic finish of 45 µm of Lusterthane 988 in 'Blue Weave'.



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In August 2012, after around 10 years of service, the duplex system had withstood the environment very well and there was no sign of corrosion of the steel structural elements. Adhesion of the paint to the HDG substrate had remained strong, although the invariable tough treatment from passengers had damaged the paint in a small number of areas. However, the hot dip galvanized coating under the aesthetic paint meant that the steel substrate had not corroded and the commonly occurring (and unsightly) rust staining had been avoided.

This result is a demonstration of the benefit of the duplex system where aesthetics are important. No stand-alone paint system could have been designed to eliminate this damage. In this case, the hot dip galvanized coating has protected the steel and the paint can easily be touched up if it is required to maintain the aesthetic effect.

The concrete footing supporting the steel column also shows damage to both the



paint and the concrete from abrasion and heavy knocks at the corners. Again, these can be easily repaired and the damage to the concrete is not considered critical to the use of the structure.

Importantly for an environment close to the sea and with high humidity, there is no evidence of corrosion in the unwashed areas under the eaves.

The stainless steel gutters and decorative items do show corrosion damage and these will need to be repaired to ensure that premature failure does not spread to the main structure. The reason for this





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stainless steel corrosion may well be related to incorrect specification of the material.

### The Advantages of Using a Duplex System

Hot-dip galvanized steel in structural applications is usually seen as the optimum material for corrosion protection because it can be pre-fabricated and protected, is durable and low maintenance, and allows a greater speed of erection.

Paint over bare steel is also commonly used for protecting steel from corrosion,

as it provides aesthetic options for colour where this is a requirement. However, paint is susceptible to damage in high traffic areas, is restricted in the climatic conditions in which it can be applied, and is often significantly more expensive than a simple hot dip galvanized structure. In addition, organic paints can quickly break down in high UV zones leading to increased maintenance costs.

However, in some cases the combination of a well-designed and properly applied paint over a suitably prepared hot dip galvanized article can provide both improved aesthetics and an increased protection from corrosion.



### Four Reasons to Choose a Duplex System

1. Aesthetics – the natural good looks of a hot dip galvanized structure can be further enhanced with the judicious use of colour
2. Superior corrosion protection – where hot dip galvanizing is used as the primary corrosion protection system, there is a significant increase in life of the structure compared to the life offered by a paint system alone
3. Abrasion resistance – even if the paint is damaged by knocks and bumps during construction or in use, the hot dip galvanized coating will protect the structure from early corrosion and unsightly rust staining
4. Identifying colour – many structures are also used in applications requiring a bright colour to warn users of a risk. In these cases the hot dip galvanizing will provide corrosion protection for the steel, while the paint serves only as the identifier

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Note: The GAA would like to thank the fabricator of the structural steel (Wulguru Steel, Townsville, Queensland) for assisting in the review of this project and for providing details of the paint specification.

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