

# Weathering Steel Corrosion with BlueScope



**Weathering steels are used in many countries in an unpainted condition to take architectural advantage of their structural and aesthetic qualities.**

BlueScope produces a range of weathering steels which—in non-marine and non-industrial environments—offer enhanced weather resistance when compared to traditional structural steel grades such as 250. These steels are widely recognised for their distinctive ‘patina’ which results from protective surface oxidation and develops during exposure to the atmosphere.

The patina is actually a complex protective oxide layer that forms on the steel’s surface. It is this oxide layer that gives the steel its distinctive appearance, as well as contributing to this material’s enhanced weather resistance capabilities compared to standard steels. If the protective oxide layer is damaged, the process of oxidation may recommence in that area until the protective layer is reformed.

The improved corrosion performance can lead to improved service life and can provide a cost advantage over other materials. Weathering steels are typically used in bridges, rolling stock and shipping container applications. The aesthetic qualities of weathering steels have also led to their use in architectural applications such as building façades as well as for decorative sound barriers on freeways.

## Corrosion Resistance

According to John Dryden (Hot Rolled Product Owner, BlueScope Steel), “In non-marine and non-industrial environments, weathering steels may exhibit a greater resistance to corrosion than normal structural steels. The improved corrosion resistance is the result of the development of a protective oxide layer on the steel surface. If this layer is damaged or disturbed, the process of oxidation may recommence in that area until the oxide layer has reformed.”

The formation of the protective oxide layer relies on the following conditions:

- Bold exposure to the atmosphere of all the steel surfaces
- Alternative wetting and drying of the steel surface
- Limited access to atmospheric chloride contamination

Where these conditions are not met (such as on the underside of horizontal surfaces), the weathering steel will corrode at approximately the same rate as normal structural steel.

“Weathering steels do not provide any advantage in terms of the corrosion resistance over plain carbon structural steels for buried or submerged applications or for applications exposed to severely concentrated industrial fumes,” said Dryden.

“There is no advantage to using weathering steels (compared to plain carbon structural steels) for marine applications where salt may be deposited by either spray or fog. However, when painted for use in marine applications, weathering steels can provide better paint life than plain carbon structural steels.”

## Deakin University Burwood Link

A new pedestrian bridge that connects Deakin University's two Burwood campuses, divided by Gardiners Creek in Melbourne's eastern suburbs, uses BlueScope REDCOR® weathering steel to deliver a practical, paint-free structure requiring minimal maintenance compared with conventional structural steel.

By avoiding the need to paint (and re-paint) structures, weathering steel can contribute to improving a structure's sustainability. Melbourne-based architect Rob Watson designed a symmetrical three-dimensional modular bridge structure that addressed several key challenges.

The first of these challenges was access. While there was a small existing bridge across the creek, it sat at-grade and was only accessible by stairs on the Elgar Road bank. Any new bridge had to comply with the requirements of the Disability Discrimination Act and provide safe and easy passage for people of all abilities.

Secondly, because the creek corridor is titled Crown Land (the parcels on either side are owned by the University) the flyover section had to be low-maintenance, and to allow for quick and easy access for cleaning and repairs, to avoid protracted and costly access permits.

Thirdly, the bridge had to blend in with its native bush surroundings, an especially important consideration because a previous proposal had proved controversial within the local community and was later scrapped. As part of his solution to address these challenges, Mr Watson chose to build the new 250m long bridge using weathering steel, including 200 tonnes of BlueScope REDCOR® in grades WR350L0 and HW350.

Watson devised an innovative structural system, which includes an 85m long central section that sits above the parcel of Crown Land, touching the ground at just one point via two V-shaped steel pylons, that minimised the bridge's impact on the creek corridor, both during initial construction and throughout its projected lifespan.

"While there are some excellent paint systems available for steel structures, on this project any painting would have been problematic," Watson said.

"The bridge has a lifespan of 100-plus years, so it would have needed to be painted three or four times during its life. Not only did the weathering steel provide an acceptable appearance to the community, the fact that you don't need to maintain it, apart from basic cleaning, was very appealing from a whole design life perspective."

The bridge comprises a series of repetitive modular bays, each approximately 4m long by 4m wide, that were connected to form a series of six trusses which range in length from 16.5m to 47m.

The walkway deck consists of concrete panels cast in permanent formwork trays made from the Grade HW350 weathering steel. They give the underside of the bridge the same appearance as the rest of the structure, so that the weathering steel finish is visible from every conceivable angle.

### PROJECT TEAM

**Client:** Deakin University

**Architect:** Watson Architecture + Design

**Structural Engineering:** WSP Structures

**Builder:** Kane Constructions with Associated Rigging and Metcalf Cranes

**Steel Detailing:** PlanIT Design

**Steel Fabricator:** Sutcliffe Engineering

**Temporary Works Engineer:** Andrew Baigent

**Steel Distributor:** Surdex Steel

**Steel Manufacturer:** BlueScope

