

## Weather resistant steels

### INTRODUCTION

BlueScope Steel produce a range of steels in Plate and Hot Rolled Coil that have enhanced weather resistance in comparison to AS/NZS 3678-250/350 steels. These steel types have nominal yield strength of 350 MPa and were previously known as "Austen50" and "Lyten". Typical end uses for these steels include truck bodies, rolling stock and shipping containers. Weather resistant steels have also been used for architectural applications as a result of the "patina" developed after bold exposure to the atmosphere.

### CORROSION RESISTANCE

The weather resistant steels may exhibit a greater resistance to corrosion than normal structural steels (e.g. AS/NZS 3678-250) of up to approximately 4-6 times under certain environments and applications. The improved corrosion resistance is the result of the development of a complex protective oxide layer on the steel surface. If this layer is damaged or disturbed, the process of corrosion may recommence in that area until the oxide layer has reformed. The formation of the protective oxide layer relies on the following conditions:

- i) bold exposure to the atmosphere of all the steel surfaces
- ii) alternate wetting and drying of all of the steel surface
- iii) limited access to atmospheric chloride contamination.

Where these conditions are **NOT** met, (for example on the underside of horizontal surfaces), the weather resistant steels will corrode at approximately the same rate as normal structural steel. It is important for the designer and/or fabricator to allow for the formation of the protective oxide layer on the steel surface when using this steel type.

Weather resistant 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. Furthermore there is no advantage to using weather resistant 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 have been found to give up to four times the paint life of plain carbon structural steels. Where further corrosion protection is required refer to Australian/New Zealand Standard AS/NZS 2312:2002 *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings*.

### USE AND HANDLING OF WEATHERING STEELS

As for normal structural steels (such as AS/NZS 3678-250) care should be exercised in the handling of weather resistant steels. These steels must be kept free from oil, chalk marks,

paint, concrete splatter and similar staining by other construction materials. Any foreign matter adhering to the steel needs to be removed as soon as practicable. Care should also be exercised in design as run off staining may occur to the surrounding area depending on the nature of the surface, e.g. bare concrete. Contact with clothing may also result in staining to clothing in the same manner as for plain carbon structural steels.

### WELDING

The weather resistant steels can be readily welded both to other plates of weather resistant steel and to plain carbon structural steels. When welding these steels low hydrogen electrodes should be used.

Care should also be taken in the selection of the welding procedure. Consult Australian/New Zealand Standard AS/NZS 1554.1:2004 *Structural Steel Welding – Welding of Steel Structures*. Note that weather resistant steels are Group 5 materials as are AS/NZS 3678-350 grade structural steels.

The need to colour match weld areas is dependent on the end result required. Over a period of 1-2 years there is little difference between standard electrodes and specialised electrodes designed for this type of steel (E70xx). However, over extended time periods the standard weld metal discolours and corrodes at a different rate to the weather resistant steel. Where close colour matching is required, such as for architectural applications special electrodes must be used (contact a welding consumable manufacturer). However, when welding thin plate (<12mm) there is sufficient dilution of the parent plate into the weld metal to result in a close colour match.

### AVAILABILITY

The weathering steels are available in thicknesses ranging from 3mm to 20mm. The grade names covering weather resistant steels are:

**XLERPLATE®** – AS/NZS 3678-WR350

**XLERCOIL®** – AS/NZS 1594-HW350

The nearest equivalent overseas grades are COR-TEN A, ENEN 1025-5-S355J0WP, JISG 3125-SPA-H and ASTM A242 Type 1.

### ARCHITECTURAL APPLICATIONS

Weather resistant steels are used in many countries in the unpainted condition to take architectural advantage of their structural and aesthetic qualities.

Weather resistant steels were first offered in Australia in the late 1960s, and the steel types available today from BlueScope Steel have resulted from continual development of the Austen50 from the 1960s and 1970s.

Whilst the excellent weathering characteristics of WR350 and HW350 allow them to be used unpainted, these products are not ideally suited for all applications, environments or service conditions. For example, very sheltered positions, marine environments, components exposed to areas of high or constant wetness (ledges, crevices or gutters), and consideration must be taken to avoid staining of surrounding materials.

#### REFERENCED AUSTRALIAN STANDARDS

- **AS/NZS 3678:2011** – *Structural steel – Hot-rolled plates, floorplates and slabs.*
- **AS/NZS 1594:2002** – *Hot-rolled steel flat products.*
- **AS/NZS 1554.1:2011** – *Structural steel welding – Welding of steel structures.*
- **AS/NSZ 2312:2002** – *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings.*

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