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Weathering Steel

INTRODUCTION

BlueScope produce a range of steels in Plate, Hot Rolled Coil and Cold Rolled Coil that have enhanced weather resistance typically in non-marine and non-industrial environments in comparison to the normal structural steel grades such as 250. These steel types have nominal yield strength of 300 MPa and 350 MPa.
Typical end uses for these steels include bridges, truck bodies, rolling stock and shipping containers. Weathering steels have also been used for architectural applications as a result of the "patina" developed after bold exposure to the atmosphere.

CORROSION RESISTANCE

In non-marine and non-industrial environments weathering steels may exhibit a greater resistance to corrosion than normal structural steels (e.g. AS/NZS 3678-250). 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 oxidation 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 weathering steel 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.

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. Furthermore 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. 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 STEEL

Care should be exercised in the handling of weathering 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 weathering steels can be readily welded both to other plates of weathering 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 weathering steels are Group 5 materials as are AS/NZS 3678-350 grade structural steels.

Also consult BlueScope Technical Note: Guidance of welding in weathering steel.

The need to colour match weld areas is dependent on the end result required. Over a shorter period (e.g. 1-2 years) there may be 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 weathering 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 typically result in a close colour match.

AVAILABILITY

The weathering steels are available in thicknesses ranging from 1mm to 50mm. The grade names covering weathering steels are:

Product	Grade	Australian Standards	Thickness Range (mm)	Impacted Testing Option Availability
XLERPLATE® steel (Plate)	WR350	AS/NZS 3678: 2011	8-20	N/A
XLERPLATE® steel (Plate)	WR350L0	AS/NZS 3678: 2011	8-20	L0
XLERPLATE® steel (Plate)	WR350L0	AS/NZS 3678: 2011	>20-50	L0
XLERPLATE LITE® steel Coil Plate	HW350	AS/NZS 1594: 2002	3-6	N/A
Hot Rolled Coil	HW350	AS/NZS 1594: 2002	3-6	N/A
Cold Rolled Coil	CW300-G	AS/NZS 1594: 2002	1-2	N/A

Tolerances : AS/NZS 1365
Ultrasonic Inspection : AS/NZS 1710 (XLERPLATE® grades only)

The nearest equivalent overseas grades are COR-TEN A, EN 1025-5-S355J0WP, EN 10025-5-S355J0W+N, JISG 3125-SPA-H and ASTM A242 Type 1.

ARCHITECTURAL APPLICATIONS

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

Weathering steels were first offered in Australia in the 1960s, and the steel types available today from BlueScope have resulted from development since that time of those earlier product offerings.

Whilst the excellent weathering characteristics of weathering steels allow them to be used unpainted, these products are not ideally suited for all applications, environments or service conditions. For example, weathering steel is not recommended for use in 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. It is recommended that specialist advice be sought from BlueScope Steel Direct on 1800 800 789.

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.*

If you have any questions regarding this Bulletin contact BlueScope Steel Direct on 1800 800 789.

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BLUESCOPE

The information and advice contained in this Technical Bulletin ('Bulletin') is of a general nature only and has not been prepared with your specific needs in mind. You should always obtain specialist advice to ensure that the materials, approach and techniques referred to in this Bulletin meet your specific requirements.

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