Data sheet: B5.1

ASTM A606M Type 4 CR

Cold Rolled Atmospheric Corrosion Resistant, High Strength Structural Steel Sheet

General description

Cold rolled ASTM A606M Type 4 CR specification is a high strength, low alloy structural steel in which the alloy content has been formulated so that the steel possesses excellent weathering resistance when exposed to most atmospheric conditions. Typical applications of cold rolled weathering steel include roofing, cladding, tubes, containers and a wide range of architectural and structural applications in the building and construction industry.

ASTM A606M Type 4 CR is produced by ArcelorMittal South Africa as a fully killed continuously cast steel. This results in a homogeneous analysis and good mechanical properties in both the longitudinal and transverse directions. Cold forming of the sheet with the bending axis transverse to the rolling direction can be carried out to the suggested minimum inside diameter of four times the sheet thickness. Slightly more liberal diameters are suggested for bending axes parallel to the rolling direction.

ASTM A606M TYPE 4 CR steel can be welded by means of standard arc welding procedures such as resistance welding, shielded metal arc welding and gas metal arc welding. Low hydrogen consumables should be used.

Chemical composition

Table 1: Chemical composition specification (ladle analysis, percent)

C max	Mn Max	P	S max	Si	Cu Min	Cr	Ni max	Al
0,22	1,25	0,07-0,15	0,04	0,25-0,75	0,20	0,75-1,25	0,65	0.02-0.06

The elements phosphorus, silicon, copper and chromium contribute both to strength and atmospheric corrosion resistance. For unpainted applications, the minimum chromium content is normally 0,75% and the minimum content of copper and nickel combined is 0,50%.

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https://www.arcelormittalsa.com/Products.aspx

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Mechanical properties

Table 2: Mechanical properties

Minimum yield strength (MPa)	Minimum tensile strength (MPa)	Minimum elongation (%)
310	445	22

Note:
The tensile test conforms to EN 10 002: Part 1 using type 1 specimens (initial gauge length Lo = 50mm). The samples are tested at right angles to the rolling direction. Yield strength is determined by the 0,5% offset method.

Dimensions

Table 3: Available dimensions

Thickness *t* (mm)	Width (mm)
$1{,}00 \leq t \leq 2{,}00$	1165 - 1260

Note:
1. Thicknesses and widths are available in increments in accordance with Price List 130.

Surface texture

ASTM A606M TYPE 4 CR is available only in standard surface texture as set out in Data Sheet: Cold Rolled Products (file reference B1).

Oiling

Unless otherwise specified, cold rolled material will be oiled. When required, cold rolled material may be ordered un-oiled, but it is not recommended due to an increased possibility of atmospheric corrosion.

Dimensional tolerances

Tolerances on shape and dimensions are given in Data Sheet: Cold Rolled Product Tolerances (file reference B1.1).

Coil inside diameter

The standard inside diameter is 610mm (508mm on enquiry).

Weathering characteristics

To achieve the benefit of the enhanced atmospheric corrosion resistance offered by ASTM A606M TYPE 4 CR steel, it is essential that proper design, detailing, fabrication and erection procedures be observed. Care should be taken to avoid moisture entrapment, and ventilation should be sufficient to allow proper wet/dry cycles.

When ASTM A606M TYPE 4 CR is exposed under these conditions, a homogeneous patina of corrosion products forms. After an initial exposure period of two to three years, the patina stabilises, drastically reducing the rate of further corrosion. The presence of sulphur in the atmosphere contributes to the rapid formation of a stable film.

The patina is a dense, tightly adhering, thin oxide layer, which contains alloying elements in the same ratio as that found in the base metal. Insoluble sulphates of the alloying elements, copper, chromium and nickel tend to block the pores, resulting in a dense protective layer.

Different rates of corrosion are experienced in different atmospheres and, as part of an international weathering steel corrosion data collection programme, ArcelorMittal South Africa established test sites in

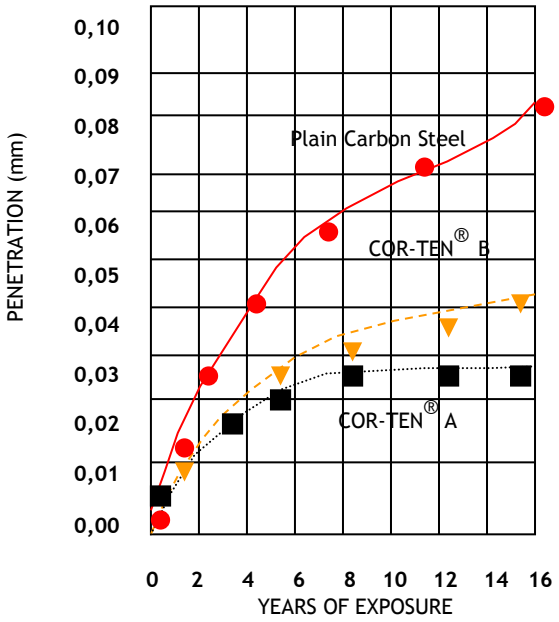
typical rural, marine and industrial environments. Data collected during a sixteen-year period are reflected in the accompanying graphs.

'Penetration' refers to the reduction in the thickness of the samples, on one side only, resulting from corrosion. Under continuously wet conditions or in cases where the product is permanently buried, the corrosion rate of ASTM A606M Type 4 CR (previously sold under license as CORTEN A) may be the same as that of carbon steel, as the patina does not stabilise.

In marine environments stable oxide films may form on the steel, provided chlorides are washed off regularly. Normally, however, the use of unpainted ASTM A606M TYPE 4 CR is not recommended for applications subject to salt spray.

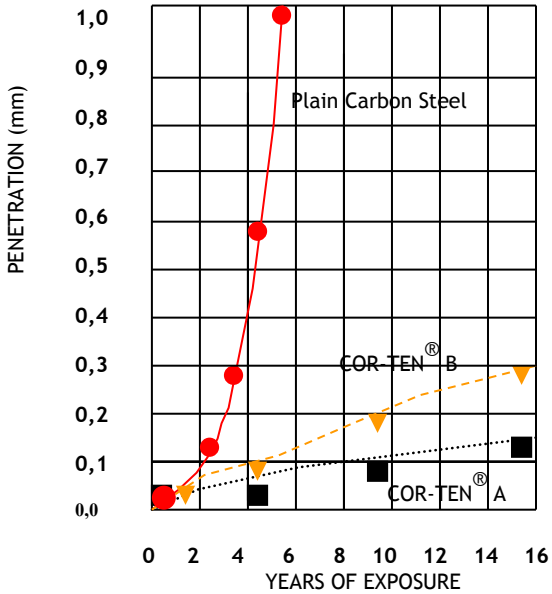
Average corrosion penetration - rural environment

Test site situated 8 km east of the centre of Pretoria at the CSIR.



Average corrosion penetration - rural marine environment

Test site situated about 30 km south of Richards Bay on a wooded dune 100 m above sea level and 500m from the beach.



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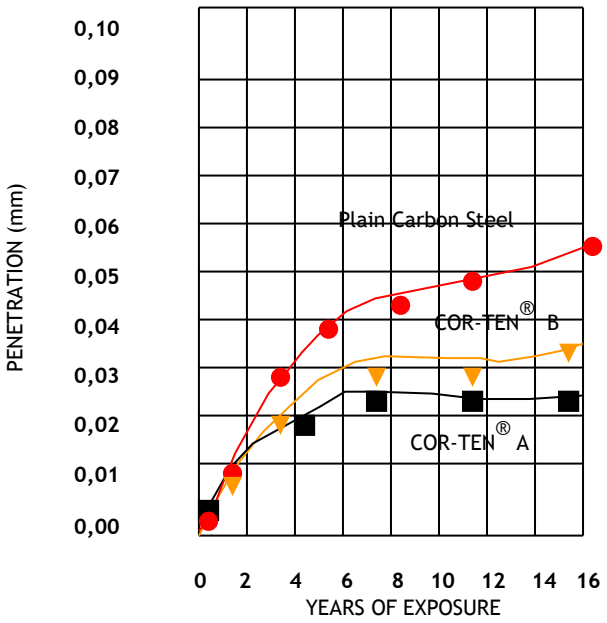
Average corrosion penetration – semi- industrial environment

Test site situated about 8 km west of the centre of Pretoria near the ArcelorMittal South Africa Works.



Painting of ASTM A606M Type 4 CR

For applications where the formation of a stabilised patina might be prevented, it is advisable to paint ASTM A606M TYPE 4 CR steel. It should be noted that ASTM A606M TYPE 4 CR can be painted with enhanced results compared with normal carbon steel.

The same paint systems used for normal carbon steel can be applied to ASTM A606M TYPE 4 CR to achieve up to twice the functional paint life obtained on carbon steel. This can be ascribed to the fact that underfilm corrosion of ASTM A606M TYPE 4 CR is prevented by the stabilised patina sealing off damaged areas on the paint film. The enhanced performance of paint systems on ASTM A606M TYPE 4 CR should not, under any circumstances, be used as a reason for specifying an inferior paint system.

The user should refer to the paint manufacturers' prescribed method for pre-treatment and application.

Certification

Test and analysis certificates will be supplied with all material.

Supply conditions

ASTM A606M TYPE 4 CR is supplied in terms of Price List 130 and ArcelorMittal South Africa's General Conditions of Sale.

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