

Reliable Pipes and Tubes Limited are a stockist for Carbon Plates.

A36	A516
A572	Free Machining
A588	C1020/C1045

ASTM A36

This specification covers carbon Steel Shapes, Plates and bars of structural quality for use in riveted, bolted or welded construction of bridges and buildings and for general use.

ASTM A516

Standard specification for Pressure Vessel Plates, Carbon Steel, for Moderate and Lower Temperature Service

This specification covers carbon steel plates intended primarily for use in welded pressure vessels where improved notch toughness is important. It allows for four different strength levels. The most common is Grade 70.

This grade must be killed and made to a fine grain practice. Plates over 1-1/2" thick must be normalized. Additionally, when impact (notch toughness) tests are required on plates up to 1-1/2" thick, the plates must be normalized.

ASTM A572

Standard specification for High-Strength Low-Allow Columbium-Vanadium Steel

This specification covers structural shapes, bars, sheet piling, and plate to be used for construction of bridges, buildings, and other structures.

For certain applications, notch toughness may be an important requirement and should be addressed at the time the order is placed.

This grade has higher tensile and yield strengths resulting from the addition of small amounts of one or more alloying elements. The choice of alloying element, whether columbium, vanadium, nitrogen, or a combination of these is at the option of the producer unless otherwise specified.

ASTM A588

Standard specification for High-Strength Low-Allow Structural Steel with 50 ksi Minimum Yield Point

This specification covers high-strength low-alloy structural steel shapes, plates, and bars to be used for construction of bridges, buildings, and other structures.

Atmospheric corrosion resistance of this grade in most environments is substantially better than that of ordinary carbon structural steels. When properly exposed to the atmosphere, this steel can be used unpainted for many applications.

This grade must be made to a fine grain practice.

Free Machining Steels

Proprietary specifications for Steel Plate with Controlled Sulfur Additions

These grades comprise a group of steels that have been made with increase sulfur levels to provide enhanced machinability and increased tool life for applications with extensive machining requirements. The additional sulfur results in higher level of manganese sulfide inclusions, which provide a lubricating effect and contribute to chip breakage. Surface finish and dimensional stability may also be improved.

General requirements for delivery

Not covered by any standard specification, but it can be expected that the material will conform to the requirements of ASTM A 6.

C1020 / C1045 - ASTM A 830

Standard specification for Carbon steel Plate Furnished to Chemical Composition Requirements

ASTM A 830 was first issued in 1984; prior to that the C1020 and C1045 chemistries were defined by AISI specifications.

This specification covers structural quality carbon steel plates furnished to chemical composition requirements only. There are no tensile requirements or other mechanical property requirements for this specification.

The ASTM A 830 specification covers 48 standard chemistries. Oliver Steel offers two of these chemistry-only plate grades. C1020 offers better machinability than the normal low carbon commercial alternative of A36. C1045 provides higher strength and hardness levels and is readily flame hardened. Both have a much lower cost than free-machining grades of similar carbon levels.

General requirements for delivery

Material shall conform to the requirements of ASTM A 6.

Reliable Pipes and Tubes Limited are a stockist for Alloy Plates.

4140 / 4340 / 8620

A514

Alloy Plate - 4140 / 4340 / 8620 - ASTM A 829

Standard specification for Alloy Steel Plate Furnished to Chemical Composition

Requirements

ASTM A 829 was first issued in 1984; prior to that these grades were defined by AISI specifications.

This specification covers structural quality alloy steel plates furnished to chemical composition requirements only. There are no tensile requirements or other mechanical property requirements for this specification.

The ASTM A 829 specification covers 30 standard chemistries. Oliver Steel offers these chemistry-only alloy plate grades in the three most commonly used chemistries. 4140 is the standard for medium carbon chromium-molybdenum alloy with excellent response to quench-and-temper and moderate through hardening capabilities; at Oliver, our 4140 is modified to include a small amount of vanadium for even better hardening. 4340 includes nickel for higher overall hardness and superb through hardening. 8620 is alloyed for as-rolled core strength but can be readily carburized.

General requirements for delivery

Material shall conform to the requirements of ASTM A 6.

ASTM A514

Standard specification for High-Yield-Strength, Quenched and Tempered Alloy Steel

This specification covers quenched and tempered alloy steel plates of structural quality in thickness of 6 in. and under.

The low carbon content of this grade allows it to be used in welded structures; suitable welding procedures for the grade and intended use are required.

This grade must be made to a fine grain practice and shall be killed

General requirements for delivery

Material shall conform to the requirements of ASTM A 6.

Chrome Moly Plate

There are many chromium molybdenum steel products available, each of which has very different chemical and mechanical properties, but they are often grouped as a single category. Chrome moly is the most common name for this group but other names that are used include chromalloy, croalloy, and Cr-Mo (pronounced "cro-mo").

Chrome Moly Pressure Vessel Plates

Reliable specialises in chrome moly steel pressure vessel plates intended primarily for use in the fabrication of process equipment designed for elevated temperature service.

Typical applications will include:

- Boilers
- Pressure Vessels
- Heat Exchangers
- Flanges
- Valves
- Ducting
- Pipe Supports

Chrome Moly pressure vessel plates from Brown McFarlane are manufactured to the following steel standards:

ASME SA387	ASTM A387	EN10028-2
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What do chromium and molybdenum do to steel?

The addition to steel of the alloys chromium and molybdenum bring characteristics which are particularly desirable for units operating in high temperatures. Both alloys improve high temperature strength, molybdenum improves high temperature creep strength, both improve hardenability and there are additional benefits from wear resistance, corrosion resistance, and impact resistance. At the same time a chrome moly alloy is relatively easy to fabricate.

ASME SA387 and ASTM A387 Chrome Moly Plate

ASME SA / ASTM A387 Gr 11 Cl. 2

ASME SA / ASTM A387 Gr 22 Cl. 2

ASME SA / ASTM A387 Gr 5 Cl. 2

ASME SA / ASTM A387 Gr 9 Cl. 2

Arguably the most commonly used steel specifications for Chrome Moly plate are ASME SA387 and ASTM A387. As is normal, the chemical and mechanical properties of the ASME and ASTM specifications are the same.

Reliable supplies Chrome Moly plates to ASME SA387 and ASTM A387 both from stock and, where required by the customer, cut to size and shape. There are broadly equivalent specifications produced to the European standard EN 10028-2 and these are also supplied.

Both SA387 and A387 are described as a "Standard Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum". The specification covers alloy steel plates intended primarily for welded boilers and pressure vessels designed for elevated temperature use.

Plates are available under these specifications in several grades each having different nominal Chromium (Cr) and Molybdenum (Mo) contents as follows:

Grade	Nominal Cr Content (%)	Nominal Mo Content (%)
2	0.50	0.50
12	1.00	0.50
11	1.25	0.50
22, 22L	2.25	1.00
21, 21L	3.00	1.00
5	5.00	0.50
9, 91	9.00	1.00

Each grade except Grades 21L, 22L, and 91 is available in two classes of tensile strength described as Class 1 and Class 2.

The most regularly specified grades and hence those that are most readily available from stock are Grades 12, 11, 22, 5, and 9 and in most case stock plates will be produced to the tensile requirements of Class 2.

As with all ASME and ASTM pressure vessel steels, Chrome Moly to SA387 and A387 is produced in conformity to SA20 / A20 which outlines the testing and retesting methods and procedures, permissible variations in dimensions and weight, quality and repair of defects, marking, loading, and ordering information.

In addition to the basic requirements of SA20 / A20 certain supplementary requirements are available when additional control, testing, or examination is required to meet end use requirements. These might include product analysis (S2), charpy V-notch impact test (S5), or ultrasonic testing (S12): a variety of supplementary requirements are available.

SA387 / A387 Grade 11 Class 2

Reliable holds stocks of chrome moly pressure vessel plate for high temperature purposes certified to **ASTM A387 Grade 11 Class 2** and **ASME SA387 Grade 11 Class 2**. Plates can also be supplied cut to size or flame cut to specific shapes.

SA387 / A387 Grade 12 Class 2

Chrome moly pressure vessel plate for high temperature purposes certified to **ASTM A387 Grade 12 Class 2** and **ASME SA387 Grade 12 Class 2** is available from Reliable Pipes and Tubes Ltd. Plates can be supplied as cut shapes or simply cut to a smaller size.

SA387 / A387 Grade 22 Class 2

Plate certified to **ASTM A387 Grade 22 Class 2** and **ASME SA387 Grade 22 Class 2** is available from Reliable. These grades of steel are chrome moly pressure vessel plates for high temperature applications. As well as supplying in plate form, it can cut plates to size and also cut to specific shapes

EN 10028-2 Chrome Moly Plate

16Mo3

13CrMo4-5

13CrMoSi5-5

10CrMo9-10

12CrMo9-10

X12CrMo5

X10CrMoVNb9-1

The European steel standard which includes Chrome Moly plate for pressure vessel purposes is EN 10028-2. The full designation of the standard is "Flat products made of steels for pressure purposes - Part 2: Non-alloy and alloy steels with specified elevated temperature properties". This standard includes Chrome Moly material grades with varying quantities of chromium and molybdenum and some of these grades are broadly equivalent to those in the American standards ASME SA387 and ASTM A387.

Reliable supplies chrome moly plates to EN 10028-2 and, when required by our customers, can offer cut to size plates and profiles to meet exact design requirements.

Offshore & Structural Steel Plate

Supplied in as rolled, normalised, and quenched and tempered condition as applicable, Reliable Pipes and Tubes Ltd carries a wide range of structural and offshore steel plate to satisfy offshore contractors and steel fabricators in a full range of plate sizes up to 20 m long and 4 m wide in the thickness range 3 mm to 340 mm.

From the most basic structural grade through to highly specialised project related specifications, steel is available shot blasted and primed from stock and can be cut to size.

We can provide a complete project service, with fast track mill service available – for distribution worldwide.

Specifications

- BS EN 10025
- S235, S275, S355, S420, S460, S690, S890, S960
- BS EN 10225
- S355, S420, S460
- API 2H Gr50
- ASME/ASTM SA/A 36, 283 Gr C, 285 Gr C, 572 Gr 50

Applications

- Bridges
- Machinery Parts
- Mechanical Engineering
- Mining Equipment
- Oilfield Fabrications
- Plate Girders
- Transport Equipment
- Storage Tanks
- Wind Towers

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- Bridges
- Machinery Parts
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- Plate Girders
- Transport Equipment
- Storage Tanks
- Wind Towers

A516 Steel Plate

A516 steel plate, also known as PVQ516 steel plate, is carbon steel with specifications for pressure vessel plates and moderate or lower temperature service. A516 steel plate is intended primarily for

service in welded pressure vessels where improved notch toughness is important. Plates 1.50" and under in thickness are normally supplied in the as-rolled condition. The plates may be ordered normalized or stress relieved, or both. Plates over 1.50" in thickness shall be normalized.

PVQ Pressure Vessel Steel Plate				
all measurement in Inches		Thickness	Width	Length
A516	Grade 55	3/16" – 6"	48" – 120"	96" – 480"
	Grade 60	3/16" – 6"	48" – 120"	96" – 480"
	Grade 65	3/16" – 6"	48" – 120"	96" – 480"
	Grade 70	3/16" – 6"	48" – 120"	96" – 480"

A516 Grades 55, 60, 65, 70	A537
TC128	A285
A612	

TC128 Steel Plate

TC128-Grade B steel plate is used in pressurized railroad tank cars, and has been normalized.

A612 Steel Plate

A612 steel plate is the standard specification for pressure vessel plates that are high strength, carbon steel for moderate and lower temperature use. The maximum thickness for plates supplied under this specification is 1 in. [25mm].

A516 Grades 55, 60, 65, 70	A537
TC128	A285
A612	

A537 Steel Plate

A537 plate steel is heat-treated. As a result, it displays greater yield and tensile strength than the more standard A516 grades. **A537 steel plate** is ideal for both in boilers and pressure vessels, and is used in the oil, gas and petrochemical industry.

PVQ Pressure Vessel Steel Plate			
all measurement in Inches	Thickness	Width	Length
A537	1/2" – 4"	48" – 120"	96" – 480"

A516 Grades 55, 60, 65, 70	A537
TC128	A285

A612	
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A516 Grades 55, 60, 65, 70	A537
TC128	A285
A612	

A285 Steel Plate

A285 steel plates are intended for fusion-welded pressure vessels. Plates are normally supplied in the as-rolled condition.

A516 Grades 55, 60, 65, 70	A537
TC128	A285
A612	

EN Standard Steel Plate

Reliable Pipes & Tubes Ltd. offers structural steel plate that meets the European standard for structural steel. We carry EN 10025: 2004, in grades of S235, S275, S355, S420, S690 and S890.

The EN 10025: 2004 encompasses a broader range of structural metallic products and divides them into six basic categories:

- General Purpose Steels
- Non-alloy Structural Steels
- Normalized / Normalized-Rolled Weldable Fine Grain Structural Steels
- Thermo Mechanically-Rolled Weldable Fine Grain Structural Steel
- Atmospheric Corrosion Resistant Structural Steel ("Weathering Steel")
- High Strength, Quenched and Tempered Structural Steel

Within these six categories are individual grades. The foundation of each grade within the EN 10025 standard is the material's tested yield strength measured in megapascals (1 MPa = .145 ksi). Each structural steel grade begins with an "S" and is followed by suffixes that represent variations in the specific requirement for that structural application.

Example: S355K2C+N

- "S" - structural steel
- "355" - 355 MPa / 51,486 PSI
- "K2" - Longitudinal Charpy V-notch Impact 40 J @ -20 degrees C
- "C" - Grade suitable for cold forming
- "+N" - supply condition normalized or normalized rolled

EN Standard Steel Plates Grades	
S235	S275
S355	S420
S690	S890

S235 Steel Plate

S235 structural steel plate meets European structural steel standard **EN 10025: 2004**. S235 structural steel plate is a common carbon structural steel that can be used in a very broad range of fabrication processes. With minimum yield strength of 33 ksi at 16mm, this plate has excellent formability but is limited in applications requiring higher weight-bearing structural specifications.

S275 Steel Plate

S275 steel plate meets European structural steel standard EN 10025 : 2004. S275 structural steel plate is a common carbon structural steel with minimum yield strength of 36 ksi, it bears many similarities to ASTM A36 in both chemistry and physical properties. S275 structural steel plate can be bolted, riveted and welded in a full range of construction and fabrication including bridges and other general structural projects..

S355 Steel Plate

S355 steel plate is a high-strength low-alloy European standard structural steel covering four of the six categories within the **EN 10025: 2004** standard. With minimum yield of 50 ksi, it meets requirements in chemistry and physical properties similar to ASTM A572 / 709

Careful attention should always be placed on the specific variation of S355 required if considering substitute material.

S355 is used in almost every facet of structural fabrication.

S355 Steel Plate Applications:

- Structural steelworks: bridge components, components for offshore structures
- Power plants
- Mining and earth-moving equipment
- Load-handling equipment
- Wind tower components

S420 Steel Plate

S420 steel plate is a high-strength low-alloy European standard structural steel within the EN 10025: 2004 standard. S420 structural steel plate is only produced as normalized or thermomechanical rolled material.

Typical applications include:

- Power plants
- Mining and earth-moving equipment
- Load-handling equipment

S690 Steel Plate

S690 Fine Grain Structural Steel Plate

S690 steel plate is a high strength, quenched and tempered fine-grain structural steel. With minimum yield strength of 690 N/mm², this grade is intended for structural applications where weight savings is important. It's a EN specification designed to achieve a 100 ksi minimum yield point. The specification itself is comparable to some ASTM standards (i.e. A514), but it is not required to comply with exactly the same tolerances. The tolerances for S690 plates can be found in EN10029 and EN10064.

S355 Steel Plate Applications:

- Heavy road vehicles: chassis, dumper bodies
- Crane construction: booms for mobile cranes
- Structural steelworks: bridge components, components for offshore structures
- Pressure vessels: fixed and transportable storage tanks, vessels
- Power plants: penstocks, spiral cases
- Mining equipment: roof supports
- Load-handling equipment and masts

S890 Steel Plate

S890 Super Fine Grain Structural Steel Plate

S890 steel plate is a super high-strength, fine-grain, structural steel. Offering higher minimum yield strength (890 N/mm²) than the S690 and a 130 ksi minimum yield point, it combines strength with excellent weldability and formability.

S890 steel plate meets design and fabrication challenges for modern heavy equipment such as heavy haul trailers, cranes booms, truck frames and logging & construction equipment as well as

design fabrications that exceed the capabilities of S690. S890 offers design opportunities for weight reduction and increased payload and is more user friendly for today's modern fabrication methods.

The tolerances for this EN specification can be found in EN-10029 and EN-10064. Typical thickness ranges are from 3/16" (5mm) to 4" (100mm) thick.

Offshore and Marine Steel Plate

Reliable Pipes and Tubes Ltd. understands the legacy of ship building. Whether it's aircraft carriers, submarines, yachts or cruise ships, ingenuity has forever left its mark on how a ship is crafted. And it all starts with quality plate steel.

[ABS Grade A, B, AH36, DH 36, EH 36](#)

[API 2H Grade 50](#)

[A633](#)

ABS Steel Plate

Reliable Pipes and Tubes Ltd. offers grades that are certified by ABS (American Bureau of Shipbuilding) and represents the Higher Strength Group of ABS steel plate grades AH36, DH36 and EH36. Like ABS steel plate grade A & grade B, these grades of steel plate are almost exclusively utilized in the shipbuilding industry for the construction of structural parts of ships, barges and marine equipment.

Reliable Pipes and Tubes Ltd. stocks AH36 in the control-rolled condition, DH36 in both the control-rolled and normalized condition, and EH36 in the normalized condition.

Offshore & Marine Steel Plate

all measurement in Inches	Thickness	Width	Length
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ABS	Grade 55	3/16" – 6"	48" – 120"	96" – 480"
	Grade 60	3/16" – 6"	48" – 120"	96" – 480"
	Grade 65	3/16" – 6"	48" – 120"	96" – 480"
	Grade 70	3/16" – 6"	48" – 120"	96" – 480"

A633 Steel Plate

A633 steel plate is a normalized high-strength low-alloy structural steel plates for welded, riveted or bolted construction. A633 plate steel can be used for low ambient temperatures where the desired notch toughness is better than in as-rolled materials of comparable strength level.

Offshore & Marine Steel Plate				
all measurement in Inches		Thickness	Width	Length
A633	Grade 50	1/2" – 4"	48" – 120"	96" – 480"

A283 Steel Plates

A283 plate steel features low and intermediate tensile strength carbon steel plate of structural quality.

A 36	A572 Grade 42, 50, 60, 65
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<u>C SA G40.21 Gr 44W, 50W, 50A</u>	<u>A709 Gr 36, 50, 50W</u>
<u>A709 Gr HPS 50W, 70W</u>	<u>A ASHTO M270 Gr50, 50W</u>
<u>A588 & A606</u>	<u>A871-65</u>
<u>A656 Gr 50, 60, 70, 80</u>	<u>A573 Gr 58, 65, 70</u>
<u>A283</u>	

Stainless Steel Plate

Stainless steels are defined as ferrous alloys with the addition of at least 10.5% chromium by weight and are essentially low carbon steels containing significant amounts of chromium. It is the addition of chromium that gives this type of steel its corrosion resisting properties.

The chromium content of the steel allows the formation of an invisible corrosion resistant chromium oxide film on the steel surface. If damaged mechanically or chemically this film is self-healing providing that oxygen, even in very small amounts, is present. The corrosion resistance of stainless steel can be enhanced along with providing other useful properties by increasing the chromium content and by adding other elements such as molybdenum, nickel, and nitrogen.

The primary consideration in specifying stainless steel for a project is corrosion or oxidation (rust) resistance. Following on from that are its mechanical and physical properties (such as strength and hardenability), the available fabrication techniques, and the material costs (including total life cycle costs).

Stainless steel plate is used for a huge variety of applications in many diverse industries including nuclear, pharmaceutical, food processing, petrochemical, architecture, and chemical transportation.

Stainless Steel Plates Grades and Specification

Grades :

Austenitic Steel	304/304L	1.4301 / 1.4307		
Austenitic Steel	316 / 316L	1.4401 / 1.4404		
Duplex	S31803	1.4462	S32205	2205
Super Duplex	S32750	1.4410	2507	
Super Duplex	S32760	1.4501	Zeron 100	

Specification :

- ASME / ASTM SA / A 240
- BS EN10028-7
- Norsok MDS D45
- Norsok MDS D55
- NACE MR 0175 / ISO 15156

304 / 304L Stainless Steel

Steel Grade 304 / 304L | UNS S30400 / UNS S30403 | 1.4301 / 1.4307

These types of steel are some of the most regularly specified and have come to represent the embodiment of the basic stainless product. They are part of the 300 Series of steels (as defined in SAE specifications) which covers a range of austenitic chromium-nickel alloys. They are also known as 18/8 stainless due to their chemical composition which includes approximately 18% chromium and 8% nickel by weight. The steels are easy to form, weld, and fabricate and their resistance to corrosion from, amongst other things, acids naturally contained in food has resulted in them being used widely in the food and drink processing industries.

Type 304 and Type 304L have very similar chemical and mechanical properties and are often included on a single material test certificate when the actual properties of a stainless steel plate meet the criteria of both types. This is a very common occurrence. Type 304L is a variation of Type 304 and has a lower carbon content which improves weldability and lowers the risk of reduced corrosion resistance around the weld. Type 304L also has a slightly lower yield and tensile strength than Type 304.

As with most steel plate products a number of different designations are used for these steels. The most common are:

- Type 304 1.4301 (EN Steel Number) S30400 (UNS)
- Type 304L 1.4307 (EN Steel Number) S30403 (UNS)

Industrial Sectors

- Food Processing
- Chemical Industry
- Brewing
- Pharmaceuticals
- Petrochemicals

Product Applications

- Heat Exchangers
- Pipelines
- Pressure Vessels
- Flanges and fittings
- Valves
- Condensers.

316 / 316L Stainless Steel

Grade 316 / 316L | UNS S31600 / UNS S31603 | 1.4401 / 1.4404

These steels are the second most regularly specified stainless steels after Type 304 and are part of the SAE defined 300 Series which encompasses a range of austenitic chromium-nickel alloys.

Austenitic stainless steels like Type 316 are widely available, have good general corrosion resistance, good cryogenic toughness, and excellent formability and weldability.

Type 316 has 2-3% Molybdenum included in its chemical composition which prevents specific forms of corrosion and generally enhances its corrosion resistance. Type 316 is often referred to as "marine grade" stainless due to its increased resistance to chloride corrosion compared to Type 304 making it a very suitable material for use in salt water environments.

Type 316L is a variant of Type 316 and differs by having a lower Carbon content as well as slightly lower yield and tensile strengths. Type 316L offers improved weldability and also reduces the possibility of lower corrosion resistance around welded areas.

As with most steel plate products a number of different designations are used for these steels. The most common are:

- Type 316 1.4401 (EN Steel Number) S31600 (UNS)
- Type 316L 1.4404 (EN Steel Number) S31603 (UNS)

Industrial Sectors

- Brewing
- Chemical Industry
- Dairy
- Food processing
- Marine equipment
- Petrochemicals
- Pharmaceuticals

Product Applications

- Condensers
- Heat Exchangers
- Filters
- Pressure Vessels
- Valves
- Flanges and Fittings

Duplex Stainless Steel

Duplex stainless steel was developed as a product which could improve upon some of the technical weaknesses of the standard austenitic and ferritic stainless steels that are available in the market. Both have low strength, ferritic steels have poor low temperature toughness, and austenitic steels have a very low resistance to stress corrosion cracking. Duplex stainless has a microstructure which is split roughly 50:50 between austenite and ferrite and balancing of these phases provides the following benefits:

- Higher strength which is around twice that of Type 304 austenitic stainless steel. This leads to reduced plate thicknesses being used in fabrications reducing the weight which is of particular significance in items such as pressure vessels, storage tanks, and structural applications such as bridges.
- Good weldability in thick plates.
- Good low temperature toughness.
- Resistance to stress corrosion cracking of importance in many applications including hot water tanks, process plant, brewing tanks, and desalination plant.

It is worth noting that Duplex stainless steels are still being developed and improved by steel makers.

Another key feature of Duplex stainless is its enhanced corrosion resistance. There is no single measure of corrosion resistance but the Pitting Resistance Equivalent Number (PREN) is widely used as a means of comparing the relative corrosion resistance of different steel grades.

The PREN is obtained by applying a mathematical formula to the chemical composition of a steel so that $PREN = \%Cr + (3.3 \times \%Mo) + (16 \times \%N)$. Using this formula 31803 Duplex stainless has a PREN of 35 which when compared with the PREN of Type 304 and Type 316 (18 and 24 respectively) demonstrates its superior corrosion resistance.

In short, due to its higher strength, longer component life cycle, and lower alloy composition, Duplex stainless can be a very cost effective solution to an engineering problem.

S31803 (1.4462) Duplex Steel

Reliable stocks a wide range of large area duplex stainless steel plates which are certified to material grades UNS S31803, UNS S32205, and 1.4462. These steels are also compatible with the branded 2205 designation.

For more information on Duplex stainless steel and to visit our product page.

All stock is is fully certified in accordance with the relevant material specification. In addition the material is enhanced with further tests such as E562 microstructure analysis, and corrosion testing to G48 or A293 Method C. In order to further ensure good corrosion resistance, all stock is purchased with a guaranteed minimum PREN of 35.

All material is produced and certified in accordance with Norsok MDS D45 with plates up to and including 35 mm thick certified to Revision 4. Mill test certificates are produced with third party inspection to EN 10204 3.2.

S32205 Duplex Steel

Reliable stocks a wide range of large area duplex stainless steel plates which are certified to material grades UNS S31803, UNS S32205, and 1.4462. These steels are also compatible with the branded 2205 designation.

For more information on Duplex stainless steel and to visit our product page.

All stock is is fully certified in accordance with the relevant material specification. In addition the material is enhanced with further tests such as E562 microstructure analysis, and corrosion testing to G48 or A293 Method C. In order to further ensure good corrosion resistance, all stock is purchased with a guaranteed minimum PREN of 35.

All material is produced and certified in accordance with Norsok MDS D45 with plates up to and including 35 mm thick certified to Revision 4. Mill test certificates are produced with third party inspection to EN 10204 3.2.

Super Duplex Stainless Steel

Reliable holds stock of Super Duplex stainless steel plate specifications UNS S32750 (1.4410) and UNS S32760 (1.4501). In order to get more specific information on these steel grades click the following links:

- [Super Duplex S32750](#)
- [Super Duplex S32760](#)

A Super Duplex stainless steel is a type of Duplex stainless steel with enhanced corrosion resistance which is categorised by its PREN being greater than 40. A standard Duplex like the S31803 grade stocked has a PREN of around 35. The Pitting Resistance Equivalent Number (PREN) is widely used as a means of comparing the relative corrosion resistance of different steel grades. The PREN is obtained by applying a mathematical formula to the chemical composition of a steel so that $PREN = \%Cr + (3.3 \times \%Mo) + (16 \times \%N)$.

As a part of the Duplex family of stainless steels Super Duplex stainless has a microstructure which is split roughly 50:50 between austenite and ferrite. It differs from Duplex in its chemical composition (with increased amounts of Molybdenum, Nickel, and Chromium) and its mechanical properties (higher proof stress and tensile strength). This highly alloyed product is especially designed for marine, chemical, and oil engineering applications requiring both high mechanical strength and resistance to corrosion in extremely aggressive environments (chloride-containing acids etc.).

Super Duplex stainless steel, relative to other stainless steel products, gives

- High corrosion resistance
- High resistance to stress corrosion cracking
- High yield strength and tensile strength

It is used extensively for offshore oil and gas applications and can be found in flow lines, risers, process vessels, separators, coolers, manifolds, and process piping. Onshore it can be found in heat exchangers, boilers, and pressure vessels in petrochemical and chemical processing plant.

S32750 (1.4410) Super Duplex Steel

Super Duplex UNS S32750 | 1.4410

Reliable stocks super duplex stainless steel plates which are certified to material grades UNS S32750 and 1.4410. The steels are also compatible with the branded 2507 designation.

All stock is certified in accordance with the relevant material specification. In addition the material is enhanced with further tests such as E562 microstructure analysis, and corrosion testing to G48 or A293 Method C. In order to further ensure good corrosion resistance, all stock is purchased with a guaranteed minimum PREN of 40.

All material is produced and certified in accordance with NORSOK MDS D55 with plates up to and including 35 mm thick certified to Revision 4. Mill test certificates are produced with third party inspection to EN 10204 3.2

S32760 (1.4501) Super Duplex Steel

Super Duplex UNS S32760 | 1.4501

Reliable stocks super duplex stainless steel plates which are certified to material grades UNS S32760 and 1.4501. The steels are also compatible with the branded Zeron 100 designation.

All stock is certified in accordance with the relevant material specification. In addition the material is enhanced with further tests such as E562 microstructure analysis, and corrosion testing to G48 or A293 Method C. In order to further ensure good corrosion resistance, all stock is purchased with a guaranteed minimum PREN of 40.

All material is produced and certified in accordance with NORSOK MDS D55 with plates up to and including 35 mm thick certified to Revision 4. Mill test certificates are produced with third party inspection to EN 10204 3.2

Stainless Steel and Nickel Alloys

Reliable's standard range of Stainless steel plate includes the following specifications:

Austenitic Grades

- ASTM A240 304/304L, ASME SA240 304/304L, BS EN 10028-7, 1.4301/1.4307
- ASTM A240 316/316L, ASME SA240 316/316L, BS EN 10028-7, 1.4401/1.4404
- ASTM A240 321/321H, ASME SA240 321/321H, BS EN 10028-7, 1.4541
- ASTM A240 304H, ASME SA240 304H, BS EN 10028-7, 1.4948

Duplex Grades

- ASTM A240 UNS S31803, ASME SA240 UNS S31803, BS EN 10028-7, 1.4462

Super Duplex Grades

- ASTM A240 UNS S32750, ASME SA240 UNS S32750, BS EN 10028-7, 1.4410
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Supply Condition

- In standard & non standard sizes
- Available in other thicknesses, widths and lengths
- Thickness tolerance to BS EN 10029 Class B
- NACE Hardness to MR 0175
- Annealed and pickled
- All material fully certified to BS EN 10204 3.1.b or 3.1.c as required
- Inter Granular Corrosion test (IGC) to ASTM A 262 Practice E
- Hot rolled Mill Finish No. 1
- Polished to meet your requirements - dull or bright polishing

Processing

- Plasma cutting
 - Laser cutting
 - Cold sawing
 - Water jet cutting
 - Shearing / Guillotining
 - Full CNC / CAD CAM programming
 - Stitch cutting
 - Full development of cones, lobster backs, tees, reducers elbows and other parts.
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Nickel Alloy Plates

Inconel® 600, 601, 617, 625, 718, X-750 Inco Alloy HX:

Incoloy® 800/800H, Alloy 330, Alloy 188, L-605

Size range up to 50mm thick in standard and large area plates. Other thicknesses on request.

Boiler, Pressure Vessels and Chrome Moly Steels

Reliable's standard range of boiler and pressure vessel quality steel plate includes the following specifications:

BS 1501-161-430 A/B	ASME SA 516 Grade 60/65
BS 1501-224-490B LT50	ASME SA 516 Grade 70
BS 1501-223-490B LT50	DIN 17155 HII
BS 1501-225-490B LT50	ASTM A 285 Grade C
BS EN 10207 SPH 265	BS EN 100028 - 3 1993 P460 NL1
BS EN 10028 P265 GH	Impacts @ -50 deg. C, 3.1.c,
BS EN 10028 P355 NL1	Pressure Vessel material suitable for road tankers

Boiler & Pressure Vessel Steels are supplied as follows:

- In standard & non standard sizes
- Thickness tolerance to EN 10029 Class C
- Fully weldable
- All material fully certified to EN 10204 3.1b or 3.1c as required
- Multi grade certification
- NACE hardness to MR 0175
- Additional testing services (NAMAS approved test houses)
- HIC to NACE Specifications
- Simulated PWHT testing available
- Through thickness tensile testing
- Impact testing
- A full cutting and profiling service is available

Supply Condition

Normalised

Pressure Vessel Chrome Molybdenum Alloy Steel

standard range of Chrome Moly Alloy steels includes the following specifications:

- BSEN10028-2 16M03 0.25% - 0.35% moly - Working temp up to 500oC
- ASTM A387 Grade 12 Class 2, 1% chrome - 1/2% moly - Working temp up to 560oC
Dual certified to BSEN10028-2 13CRM045
- ASTM A387 Grade 11 Class 2, 11/4% chrome - 1/2% moly - Working temp up to 575oC

- ASTM A387 Grade 22 Class 2, 21/4% chrome - 1% moly - Working temp up to 600oC
Dual certified to BSEN10028-2 10CRM0910
 - ASTM A387 Grade 5, Class 2, 5% chrome - 1/2% moly
 - ASTM A387 Grade 91, Class 2, 9% chrome 1% moly
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Molybdenum Vanadium Steel Plate

A quality normalised and tempered material for steam turbine diaphragms and associated uses within the power generation industry.

Size Range - 20mm thick up to 400mm thick in plate sizes as required.

Section, Bars and Shapes

Standard range of high yield universal beams includes the following specifications:

BS 7191 355EM

BS 7191 355D

BS 7191 275D

BS 4360 50D

BS 4360 50B & 50C

BS 4360 43D MOD

ASTM A36

EN 10025 S355 J2G3 & J2G4

EN 10025 S355 JR & JO

EN 10025 S275 J2G3 & J2G4

ASTM A572 GR 50

Structural Hollow Section are supplied as follows :

- In standard & non standard sizes
- Available in other thicknesses, widths and lengths
- Fully weldable
- Yield range from 36Ksi - 50Ksi
- Low temperature impact tested @ -20oC -40oC -50oC
- Through thickness "Z" testing available
- All material fully certified to EN 10204 3.1b or 3.1c as required
- Additional NDT testing and third party inspection available on request
- Lengths between 6m - 18m as standard
- Longer lengths and a full cutting service available on request

Supply Condition

- As rolled
- Normalised rolled

Standard range of high yield universal columns and parallel flange channels include the following specifications:

BS 7191 355EM

BS 7191 355D

BS 7191 275D

BS4360 50D

BS 4360 50B & 50C

BS 4360 43D MOD

ASTM A36

EN 10025 S355 J2G3 & J2G4

EN 10025 S355 JR & JO

EN 10025 S275 J2G3 & J2G4

ASTM A572 GR 50

Hot Rolled Steel Angles

Standard range of hot rolled high yield steel bars includes the following specifications:

Angles

BS EN 10025 S355JO Mod (Impacts @ -30oC)

BS EN S355 J2G3 & J2G4

BS 4360 55C (Limited Range)

BS 4360 50C & 50D

ASTM A 572 GR 50

Hot Rolled Steel Angles are supplied as follows :

- In standard & non standard sizes
 - Fully weldable
 - Yield strength from 36Ksi-50Ksi
 - Low temperature impact tested @ -20oC, -30oC
 - Through thickness testing available
 - All material fully certified to EN 10204 3.1b or 3.1c as required
 - Additional Testing Services (NAMAS approved test houses)
 - Lengths between 6m - 12m as standard
 - Longer lengths and a full cutting service is available on request
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Round, Square & Flat Bars

Standard range of hot rolled high yield steel bars includes the following specifications:

BS 4360 50B

EN 10025 S355 J2G3 & J2G4

BS 4360 50D

Hot Rolled Bars are supplied as follows:

- In standard & non standard sizes
- Fully weldable
- Yield strength from 36Ksi-50Ksi
- Low temperature impact tested @ -20oC, -30oC
- Through thickness testing available
- All material fully certified to EN 10204 3.1b or 3.1c as required

- Additional Testing Services (NAMAS approved test houses)
 - Lengths between 6m - 12m as standard
 - Longer lengths and a full cutting service is available on request
-

European Standard Channels

European Beams & Channels are Supplied as follows

- Fully Weldable
- Yield Strength range from 36Ksi - 60Ksi
- Low Temperature impact tested @ -20oC, -40oC
- Through thickness "Z" testing available
- All material fully certified to EN 10204 3.1b or 3.1c as required
- Additional NDT testing and third party inspection available on request
- Lengths between 6m - 14m as standard. Longer lengths and cutting service available on request

Supply Condition

- As Rolled
 - Normalised rolled
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European Beams / Euronorm Sections

We offers a comprehensive range of high yield European sections that include the following specifications:

BS 4360 50D

ASTM A 572 GR 50

EN 10025 S235 J2G3 & J2G4

BS 7191 355D

BS 7191 355EM

EN10025 S355 J2G3 & J2G4

ASTM A 36

Fritenar 355

ST 52.3N