Thomas Graham
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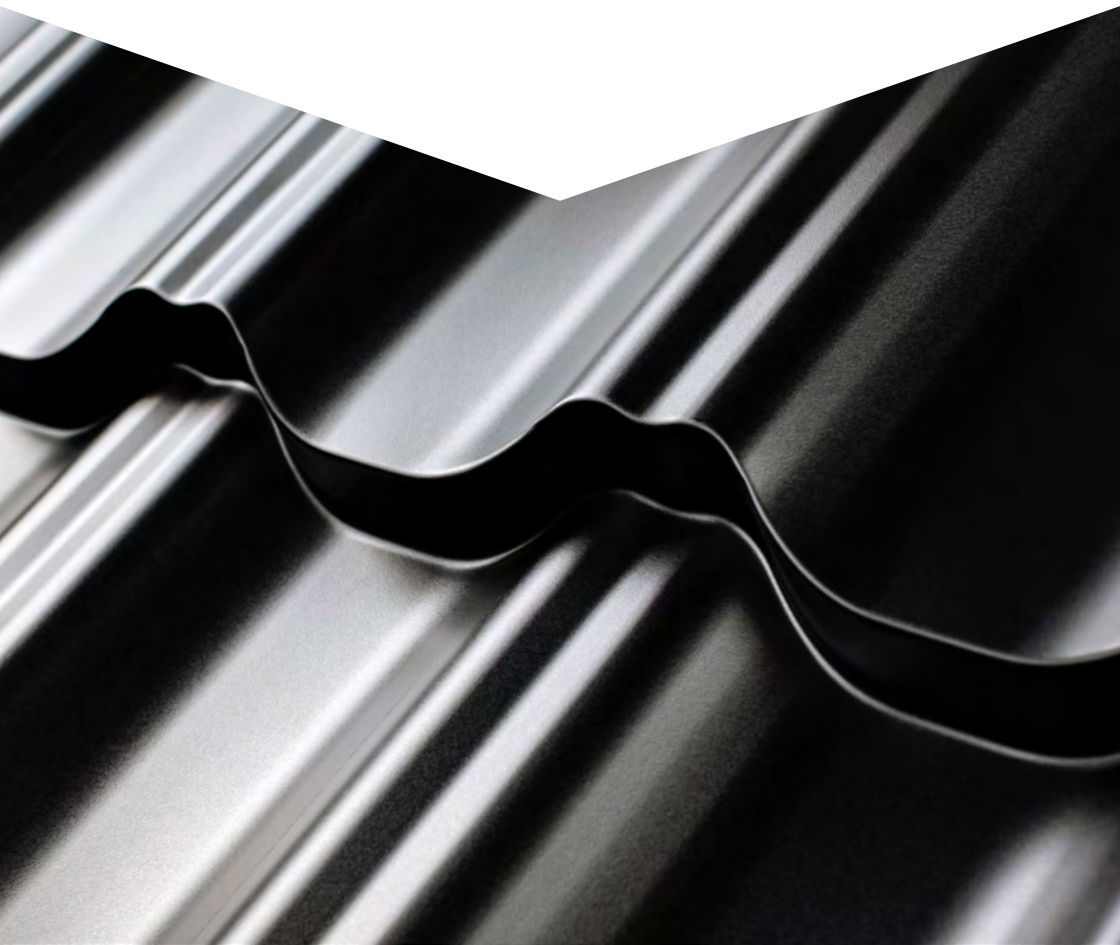
Your In-Depth Guide to Steel Types and Grades



Introduction

In our blog "The Ultimate Guide to Steel Grades" we explored the essentials of how steel is graded, the key standards you should be aware of, and how to choose the best grade for your project. This downloadable guide takes things one step further.

Here, we provide a detailed breakdown of the different types of steel and their applications, covering everything from the most common types of steel to hollow sections and hot rolled structural grades. You'll also find insights into specific classifications, common UK and international standards, and practical examples of where each type is commonly used.

With over 130 years of experience working with businesses across construction, engineering, and manufacturing, here at Thomas Graham we combine quality materials with practical expertise to help you find the right solution for your project.

Whether you're working on large-scale construction or precision engineering, this guide is designed to help you make informed decisions. With clear explanations of grades, properties, and applications, it's a practical reference you can return to whenever you're choosing steel for your projects.

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Carbon Steel Grades

Carbon steel makes up for approximately 90% of total steel production, and is frequently produced in large quantities due to it being relatively inexpensive, as well as being robust enough for large scale construction

Carbon steel is classified based on its carbon content:

LOW CARBON STEEL/MILD STEEL — AISI 1081

With up to 0.3% of carbon in this steel, it is ductile and easy to work with. Because of its weldability and strength, it is found in a lot of consumer products

MEDIUM CARBON STEEL — AISI 1045

This metal has 0.3% - 0.6% of carbon apparent, and is stronger and harder. It is often used in the automotive and construction industries

HIGH CARBON STEEL — AISI 1095

Containing more than 0.6% of carbon, this metal is very strong, but less ductile than the others. It is often used in tools, high strength wires and springs

Mild Steel Grades

(BS EN 10025)

Common Grades:

S235JR

This is a general structural steel with relatively low strength, making it suitable for simple structures. A lower grade and widely used hollow section is also readily available in this material

S275JR

This grade is medium strength with good weldability. The most commonly sold rerolled products, such as plates and others, are available in this grade

S355JR/JO/J2

This grade is high strength with a good toughness, and is widely used in heavy structures, buildings and offshore applications. Heavy sections are typically supplied in grade JO. This grade is also available for higher-strength mild steel products such as hollow sections, plates, and rerolled items

Breaking Down the Grades

S	The “S” stands for “structural”, and the next three numbers indicate the minimum yield strength
J	The “J” relates to the minimum impact of joules in the charpy impact test for example 27 joules. There are different levels of joules in grades but this is the most common

The next letter relates to the temperature of the material when the impact test was conducted

R	Tested at room temperature
0	Tested at 0°C
2	Tested at -20°C (for improved cold weather performance)

+N	Can be requested = Normalised (heat treated for better toughness)

EXAMPLE: S355J2+N

S	Structural steel
355	Minimum yield strength in MPa
J	Impact tested 27 joules
2	Impact test at -20°C
+N	Normalised (heat treated for better toughness)

Hollow Sections

(BS EN 10210 & 10219)

There are two different manufacturing processes for hollow sections. Hot-finished sections are formed at high temperatures, whereas cold-formed are formed at room temperature

EN 10210

Hot-finished structural hollow sections. The grain is more refined, giving enhanced structural benefits and is more suitable for bending than cold formed steel

EN 10219

Cold-formed structural hollow sections. These are cost-effective and lighter-duty

These grades will also be accompanied with a structural steel grade, mainly S235JR or S355J2, and are available in Circular Hollow Section (CHS), Square Hollow Section (SHS), Rectangular Hollow Section (RHS)

Carbon Alloy Steel Grades

Including bright bar (BS 970 & EN 10083)

Though BS 970 has been largely replaced, many UK engineers still refer to these classic alloy steel grades

Common BS 970 Grades:

EN3B

This is a general engineering grade with a bright finish. It is often found in machinery parts, bolts and fixings

EN8 (080M40)

A medium carbon steel, with good tensile strength. It is used for shafts and axles

EN9 (070M55)

This has a higher carbon content, and is suitable for wear-resistant parts. It is used widely in general engineering applications

EN19T

A high tensile and quality grade. Because of its characteristics, it is used in oil and gas drilling equipment

EN24T (817M40)

This is a nickel-chromium-molybdenum steel, used in aerospace and high-stress components

EN36 (655M13)

A case-hardening steel that develops a hard, wear-resistant surface and a tough, ductile core, making it ideal for gears and heavy-duty parts

EN16T

This high tensile steel matches the mechanical properties of EN8, but offers better resistance to frictional wear. It is used often in automotive and industrial machinery

Stainless Steel Grades

Stainless steel contains at least 10.5% chromium, making it better for corrosion resistance, hygiene, and aesthetic appeal

Microstructures of stainless steel include austenite, martensite, ferrite, and duplex, each contributing to different properties in the metal

AUSTENITIC (300 SERIES)

High corrosion resistance, non-magnetic

Examples: 304 (common grade), 316 (marine-grade, more corrosion-resistant)

FERRITIC (400 SERIES)

Magnetic, less corrosion-resistant

Example: 430 (appliances, automotive trim)

MARTENSITIC

Hard and strong, used in knives and tools

Examples: 410 420

DUPLEX

Fall outside the three digit series. Higher strength than austenitic and ferritic but consists of both

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UK Grades: BSEN 10088

1.4301 GRADE 304

General-purpose stainless steel, used in catering, pipes, and sinks

1.4401 GRADE 316

Marine-grade stainless steel, excellent corrosion resistance

1.4016 GRADE 430

Ferritic stainless, used in automotive and decorative applications

GRADE 410

Cutlery, pump shafts and turbine blades

GRADE 420

Harder than 410 - used when material needs sharpened. Surgical instruments and knife blades

Aluminium Steel Grades

Iron and carbon are combined with additional alloying elements to provide specific properties, such as strength, ductility, corrosion resistance and toughness

Because of the different properties within alloy steel, it is a lightweight metal, and is adaptable to a wide range of projects across many industries

1000 SERIES

PURE ALUMINIUM

It has a desirable appearance, high corrosion resistance and good weldability. However, it has a low strength

2000 SERIES

ALUMINIUM/COPPER ALLOY

This metal is high strength, with good machineability. However, it has a lower corrosion resistance and is harder to weld

3000 SERIES

ALUMINIUM/MANGANESE

This grade is highly corrosion resistant, weldable with moderate strength. It is commonly found in roofing sheets

4000 SERIES

ALUMINIUM/SILICON ALLOY

The metal is wear-resistant, reasonably corrosion-resistant, and both formable and weldable

5000 SERIES

ALUMINIUM/MAGNESIUM ALLOY
(5005 ANODISING QUALITY)

This offers excellent corrosion resistance and is strong, weldable, and easily formable

6000 SERIES

ALUMINIUM/MAGNESIUM/SILICON ALLOY

Alloy grades 6060 or 6063 (not 6082) are strong, formable, weldable, and provide good corrosion resistance

7000 SERIES

The grade is very high strength and machinable, however, it has poor weldability and only moderate corrosion resistance

Tool Steel Grades

Tool steel is used for cutting and drilling equipment. It includes added elements which enhances the properties of the steel, making it a preferred material for tools:

TUNGSTEN

Which is known for having the highest melting point of all metals

CHROMIUM

Which is corrosion resistant

MOLYBDENUM

Which is strong and hard

VANADIUM

Which is incredibly high wear resistant

These elements combined make tool steel suitable for tasks such as cutting, pressing, and moulding other metals

As it holds shape under heavy use, tool steel is the preferred material for most hand tools as it is deemed safer and more durable

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TYPES:

- WATER-HARDENING (W-SERIES)
- AIR-HARDENING (A-SERIES)
- OIL-HARDENING (O-SERIES)
- SHOCK-RESISTANT (S-SERIES)
- HOT-WORKING (H-SERIES)

COMMON GRADES:

- D2 (HIGH WEAR RESISTANCE)
- A2 (VERSATILE TOOL STEEL)
- H13 (USED IN DIES AND HOT FORGING TOOLS)

Get in Touch

Understanding the different grades of steel and their properties is key to choosing the right material for your project.
We recommend working with a structural engineer to make sure you have the most suitable grade for your needs. As explored in this guide, each grade of steel brings its own strengths, features, and applications.

When it comes to sourcing steel, partnering with a trusted supplier can make a real difference. At Thomas Graham, we stock a wide range of steel products and have built a reputation for supporting businesses across construction, engineering, manufacturing, and trade. We provide not only high quality products but also reliable expertise and advice.

If you would like support with your next project or want to learn more about the steel products we offer, feel free to get in touch.

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