



# THE STEEL PIPE BUYER'S GUIDE

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## INTRODUCTION

Buyers have a lot to contend with during pipe procurement, including choosing between available products, understanding which are best suited for specific applications and sourcing pipe that meets industry standards and complies with restrictions imposed by governments and customers.

We built this guide as a resource for buyers considering a pipe purchase, and we hope it helps make procurement easier and projects more efficient.

That starts by knowing what you're looking for.

# TYPES OF STEEL USED FOR PIPE

As industrial processes have evolved, steel pipe buyers' options have expanded to suit many unique needs across a variety of industries. But not all types of steel are equal. Piping industry professionals can become better buyers by examining the types of steel available today and understanding why some types of steel make great pipe and others do not.

## CARBON STEEL

Steel is created when carbon is added to iron, which is relatively weak on its own. In modern industry, carbon is the most prominent additive to a ferrous material, but alloying elements of all sorts are common.

In fact, alloying elements are common even in piping products still considered to be carbon steel.

According to the American Iron and Steel Institute (AISI), ferrous material is designated as carbon steel when its core makeup is specified to include no more than 1.65% manganese, 0.60% silicon and 0.60% copper and when no minimum content is specified for other alloying elements.

Carbon steel pipe enjoys wide use across many industries due to its strength and ease of workability. Because it contains relatively few alloying elements and in low concentrations, carbon steel pipe is relatively inexpensive.

## ALLOY STEEL

Alloy steel is what it sounds like: Steel that includes specified amounts of alloying elements. Generally, alloying elements make steel stronger and more resistant to impact or stress. While the most common alloying elements include nickel, chromium, molybdenum, manganese, silicon and copper, many others are used in steel production.

There are countless combinations of alloys and concentrations in use in industry, with each combination designed to achieve specific qualities.

High-alloy is favored in the piping industry for service in extreme conditions, whether it be in hot or cold conditions or subject to rough use. That's because the combination of chemistry and proper heat treating can yield strong yet ductile pipe that can take a beating. The oil & gas and power generation industries often favor alloy pipe due to its toughness.

Alloying elements also impart increased corrosion resistance to steel pipe. That makes it a leading choice for chemical companies as well.

# TYPES OF STEEL USED FOR PIPE

## STAINLESS STEEL

The term is a bit of a misnomer. There's no one combination of iron and alloying elements that makes stainless steel what it is. Instead, stainless steel refers to the fact that products made from it do not rust.

Alloys in stainless steel can include chromium, manganese, silicon, nickel and molybdenum. These alloys work together to interact with oxygen in water and air to quickly form a thin but strong film over the steel that prevents further corrosion.

Naturally, stainless steel pipe is used in any industry where corrosion protection is necessary. While stainless steel pipe is essentially alloy pipe by another name, it is not well suited for extreme service unless it's been appropriately heat treated to increase strength and impact resistance.

Due to its aesthetic appeal, stainless steel is often chosen if pipe must be visible in public or professional settings.



# ORGANIZATIONS AND STANDARDS IMPACTING STEEL PIPING

An integral part of the industry are the organizations that publish standards governing how pipe is manufactured and tested prior to sale and use.

The organizations listed below each have their roots in assuring the safety and consistency of industrial materials.

## ASTM INTERNATIONAL AND ASME STANDARDS

[ASTM International](#) provides industrial material and service standards across a wide range of industrial sectors. The organization has published more than 12,000 standards currently in use in industries worldwide.

More than 100 of those standards pertain to steel pipe, tubing, fittings and flanges. Unlike some standards organizations that impact steel pipe in specific industrial sectors, ASTM standards cover a wide variety of pipe used in just about every industry you can think of.

The [American Society of Mechanical Engineers](#) (ASME) began publishing standards for industrial tools and machine parts in 1880 and has been a driving force behind safety improvements to boilers and pressure vessels used across industrial sectors.

As pipe commonly accompanies pressure vessels, ASME standards cover a wide variety of pipe applications across many industries, same as ASTM. In fact, the ASME and ASTM pipe standards are largely identical.

For example, [A106 B](#) is a spec published by ASTM (the ASME spec would be SA106 B). The “A” designates a ferrous material. ‘106’ is an arbitrary number that designates it as a seamless carbon steel pipe suited for high-temperature service. Then, grades (such as A, B or C) are assigned that indicate certain characteristics of the steel based on differences in its chemical makeup and mechanical properties.

Any time you see a pipe standard expressed with both an ‘A’ and an ‘SA’—an example is [A/SA 333](#)—it’s a sign that the material meets both the ASTM and ASME standards.

Pipe sizes are described by using a pipe chart (ANSI/ASME B36.10 and API 5L) that includes the outside diameter and wall thickness. The outside diameter can be referred by the nominal pipe size (NPS) or the actual dimension in inches and the wall by stating the schedule or the actual thickness in inches.

Note that while ASTM and ASME specs are largely identical, an important difference is that pipe meant for use in pressure systems sometimes requires different or additional quality tests before it complies with the ASME standard.

# ORGANIZATIONS AND STANDARDS IMPACTING STEEL PIPING

## API STANDARDS

As its name indicates, the American Petroleum Institute (API) is an industry-specific organization that, among other things, develops and publishes standards for pipe and other materials used in the oil & gas industry.

Piping rated under an API standard can be very similar in material and design to pipe used in other industries under other standards. API standards are stricter and include additional testing requirements, but there is some overlap.

[API 5L pipe](#), for example, is the most common standard to which line pipe in the oil and natural gas industry is rated. The standard is similar to [A/SA 106](#) and [A/SA 53](#). Some grades of API 5L pipe comply with the A/SA 106 and A/SA 53 standards and therefore can be used interchangeably. But A/SA 106 and A/SA 53 pipe do not comply with all API 5L criteria.

API 5L pipe is broken down into [PSL1 and PSL2 delivery conditions](#); those conditions are further broken down into pipe grades, i.e. Grade B, X42, X52, X65, etc. Buyers should include the combination of the overarching standard, the delivery condition and the grade for the API 5L pipe they need.

## AISI AND SAE DESIGNATIONS

The American Iron and Steel Institute (AISI) and the Society of Automotive Engineers (SAE) share a numbering system to classify steels. [AISI/SAE designations](#) only describe the chemical makeup of a steel. They do not include manufacturing, heat treating or testing information.

Using 1020 steel as an example, the first digit expresses the steel as a plain carbon steel. The second digit indicates there are no added alloys. The last two digits indicate the steel has around 0.20 percent carbon content.

For another example, a popular steel in the piping industry is 4130. The '41' indicates the steel contains chromium and molybdenum alloys. The '30' indicates the steel has around 0.30 percent carbon content.

# ORGANIZATIONS AND STANDARDS IMPACTING STEEL PIPING

## BUILDING CONSENSUS WITH ANSI

The [American National Standards Institute](#) was founded following a gathering of several industry standards organizations in 1916 with the goal of developing voluntary consensus standards in the U.S.

ANSI joined with similar organizations in other countries to form the [International Organization for Standardization \(ISO\)](#). The Organization publishes standards accepted by industrial stakeholders from across the world. ANSI also acts as an accrediting body that endorses standards developed by individual organizations for worldwide adoption.

Many ASTM, ASME and other standards have been endorsed by ANSI as acceptable common standards. One example is the ASME B16 standard for flanges, valves, fittings and gaskets. The standard was initially developed by ASME, but it's been endorsed for use worldwide by ANSI.

ANSI's efforts have helped open international markets for producers and suppliers of pipe due to its role in the development and adoption of common standards accepted globally.

# OTHER CONSIDERATIONS FOR BUYERS

Buyers who place incomplete or inaccurate orders put their operations at risk of delays or cost overruns. When in doubt, consult with an engineer and refer to the industry standards that govern your application. Also be aware of other factors that play into your purchase:

- What manufacturer restrictions are in place that may impact your order?
- Are there any origin restrictions that you need to follow when buying?
- What pipe lengths and end finishes do you need?
- Are there specific chemistry requirements needed for the application?
- Are there age restrictions that may impact your order for export?

Armed with accurate, detailed pipe orders, your pipe supplier can quickly connect you with the pipe you need without follow-up calls or delays.

If you want to learn more about the pipe buying process, experts at American Piping Products are available to help you with anything you want to know. Just [contact us](#) to talk through your questions or concerns, or [request a quote](#) if you're ready to talk numbers. We also have a variety of [conversion charts and calculators](#) you can use to refine your order.



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