IDEAL Choice of Most Common Sheet Metal Materials

IDEAL MANUFACTURING SOLUTIONS PROTOTYPE & PRODUCTION

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HOT ROLLED STEEL (HRS)

Hot rolled steel is produced when steel is processed by a series of roll presses at temperatures over 1700°F.

The process creates a steel that is easily formed or shaped into large pieces and is best used where tolerances aren't as important.

Q235 and Q345 are 16 Mn steel grade with good formability and weldability properties. It's commonly used for structural applications and parts for a variety of industries.

Q345 offers better performance at low temperatures and offers better steel strength.

Advantages	Good flexibility making it ideal for structural components Well suited to high production runs Suitable for a variety of shapes and forms Cooling process hardens and normalizes the material which prevents any internal stresses Lower cost than cold rolled steel Good mechanical performance in terms of toughness
Disadvantages	Surface isrougher than cold rolled steel and can have imperfections Looser tolerances than cold rolled steel Require surface finishing to avoid corrosion Available only in thicknesses over 3mm (0.12 inches) Less formability than cold rolled steel Material mechanical performance fluctuate across a single sheet / batch Unstable spring back during CNC bending
Commonly used for	Rail tracks, hopper cars, components Construction including i-beams, metal buildings, doors, shelving Vehicle frames, agricultural equipment Water heaters, pipes, tubes Cross-sections Sheet metal

COLD ROLLED STEEL (CRS)

Cold rolled steel (CRS) is essentially hot rolled steel that has gone through an additional rolling process at room temperature. This additional processing produces a steel with closer tolerances and a broader range of finishes.

The result is an increase in strength by as much as 20% compared to hot rolled steel.
SPCC is commonly used for automotive parts and some construction applications. SPCC can be used for galvanized products, appliances, containers, and other products.

SAPH440 is commonly used for automotive frames, wheels, and other parts. It has very good tensile strength making it a good choice for load bearing or structural uses.

Advantages	Harder and stronger than hot rolled steel Good for tight tolerances, creating shapes that are square with true edges and corners Allows for precise dimensions High quality smooth surface and finish Easier to process than hot rolled steel with less spring back during bending Stable mechanical performance across multiple batches High formability
Disadvantages	Additional steps required after production to prevent corrosion Higher cost than hot rolled steel Cold rolled steel can be more expensive than hot rolled steel Only available up to 3 mm (0.12 inches) thick
Commonly used for	Machine and automotive parts Metal furniture, desks, cabinets Home appliances Lighting fixtures Construction products Steel drums, cabinetry, water heaters Strips, bars, and rods

SPRING STEEL

The category of spring steel includes several high yield strength steels including low-alloy manganese, medium-carbon steel, or high-carbon steel.

They are primarily used to manufacture springs as the steel will return to its original shape after twisting or load bearing.

A carbon steel can be used for small springs, but large springs are best when an alloy is used.
High carbon spring steel is a common choice, inexpensive, and easily processed.

It is not suited to extreme temperatures or for shock/ impact loads.
Alloy spring steel are well suited to shock or impact loads or conditions with high stress.
Stainless spring steel can be used in some forms at extremely high temperatures (288°C) and are corrosion resistant.
65Mn is a high carbonwith manganese to improve hardenability. It has good wear resistance and good workability.

Advantages	High yield strength, resistingdistortion when twisted or compressed Products can withstand continuous twisting, compression etc and return to original shape Good hardness, elasticity, and hardenability
Disadvantages	Some metals can have issues when overheated including brittleness Requires tempering after heating and quenching to relieve material stresses Not all are well suited to welding Difficult to form in hardened and tempered state
Commonly used for	Valve springs Clutch springs, brake springs Grinder spindles Coil springs, leaf springs, and s-tines Piano wire, guitar strings, precision tool wires Washers Lock picks Antennas, scrapers Blades

ALUMINUM

Aluminum is a pure metal that is easily alloyed with small amounts of other materials like copper, manganese, silicone, or magnesium.

It is not magnetic or combustible and is a good conductor of electricity. Aluminum offers good corrosion resistance and is generally easy to form and process. It comes in several different grades and is often used because of its weight. It weighs about 1/3 of other materials like iron, steel, copper, and brass. It conducts heat well and is non-toxic making it a good choice in a variety of applications.

AL1060 is a wrought alloy with high electrical conductivity, corrosion resistance, and workability but somewhat low mechanical strength. It's commonly used in electrical and chemical industries.

AL6063 is most often used for architectural applications or trimming. It has high tensile properties and offers good finish options. It also offers high corrosion resistance and is a good option for anodized applications.

AL 6061 is the most flexible heat-treated alloy with excellent workability. It's well suited to most processes and has good corrosion resistance.

AL 5052 is the highest strength non-heat-treated aluminum alloy and offers very good fatigue resistance.

Highly workable, AL 5052 can be formed into complex shapes and offers good saltwater corrosion resistance.

Advantages	Corrosion resistant and generally offers a maintenance-free finish Much lighter weight than alternatives like iron, steel, copper, and brass Great heat conductivity Nontoxic so it's suitable for food exposure and other specialized applications Non-combustible and reflective so often used for lighting Good formability, workability, weldability and machineability
Disadvantages	More expensive than steel Steel is a better option where strength is a primary concern and weight isn't an issue Some alloys are less corrosion resistant than a stainless steel option Can affect taste of food so it's less common for food or cooking applications
Commonly used for	Window frames Aircraft and automotive parts Kitchenware Food packaging Lighting Electrical products Machinery and equipment

STAINLESS STEEL

Stainless steel includes a variety of sheet metals which contain at least 10.5% chromium.There are many different grade available, offering corrosion resistant and a commercially familiar appearance.

Standard or austenitic stainless steel (300 series steels) is very common and does not require heat during the manufacturing process. They offer good corrosion resistance, formability, and weldability.

SS301 has high work hardening and is commonly used for trailer bodies and fasteners.

SS304 has low carbon, is an economical grade but is not seawater resistant.

SS316 has higher molybdenum content that improves its resistance to seawater corrosion.

A lower carbon version(SS316L) is available for better corrosion resistance after welding.

Advantages	Chromium content creates a corrosion resistant finish Good combination of strength andhardness Available in a variety of widths, thickness, and hardness levels Can be used for hot or cold treatments/ processes Suitable for a variety of processing techniques including spinning, brazing, polishing, buffing Weldable and suitable forsoldering or riveting processes Very machinable Recyclable
Disadvantages	Can have corrosion at thick welding points Possible chipping during processing Tends to be more expensive Shows dirt and smudges easily and sometimes difficult to clean May require polishing and finishing
Commonly used for	Construction products like roofing, cladding, building structures, doors and windows Food processing equipment, cookware, and appliances Cooking utensils, kitchen sinks Vehicles including subways, cars airplanes Fuel and chemical containers

COLD GALVANIZED STEEL

Cold galvanized steel has a zinc coating painted to the steel surface to protect if from corrosion.

The coating will provide both a barrier protection and a galvanic protection to help extend the life of the product.

It can be applied with brushes, rollers, sprayers, or through electrogalvanizing. The paint includes special binders so it will mechanically bond to the steel.

SGCCis a galvanized steel with good weldability and formability. It can have a pure zinc coating or have a Zn/Fe alloy coating.

Advantages	Protection in corrosive environments with a barrier and potentially cathodic protection for the steel Surfaces are generally easy to clean Low maintenance and good life expectancy for finished product Cost effective, fast application process Better than hot-dipped galvanization for small parts and components Can topcoat without any additional preparation
Disadvantages	Surface of the steel must be clean and dry before application. This requires an extra step but is less demanding than hot-dipped applications Doesn't offer as good durability, abrasion resistance, or cathodic protection as hot-dipped galvanizing Physical damage can compromise the coating and result in corrosion Surface can include spangles
Commonly used for	Roofing, shutters, and other covers Equipment bodies Frames