

COLD ROLLED STEEL





Cold rolled steel is a high quality steel product with a smooth, beautiful surface and excellent machinability. POSCO operates two cold rolling mills in Pohang and four cold rolling mills in Gwangyang. With the ever-growing demand in cold rolled products, we are expanding our development in the manufacturing activities of high quality products.

COLD ROLLED STEEL

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Upon completion of its first-phase manufacturing facility in 1973, Pohang Steelworks, Korea's first integrated steel mill, was finally completed after 4 stages of construction at Young-il Bay in February 1981.

POSCO is capable of producing and processing a variety of carbon steels and stainless steels. The company's global competitiveness was further enhanced when we opened the world's first FINEX commercialization facility in May 2007.

Main products hot-rolled steel, plate, cold-rolled steel, wire rod, electrical steel, stainless steel, API steel, etc.

Crude steel production 16.185 million tons (as of 2013)



Gwangyang Steelworks is the world's largest integrated steel mill. It features an optimal plant layout with carbon steel processing and high-mill processing capabilities, producing automotive steel, high-strength hot rolled steel, high-quality API steel, and thick plates among other products.

With the goal of specializing in the manufacturing of the world's best automotive steels, Gwangyang Steelworks focuses on enhancing its competitive edge.

Main products hot-rolled steel, plate, cold-rolled steel, car steel, API steel, etc.

Crude steel production 20.231 million tons (as of 2013)

The POSCO Quality

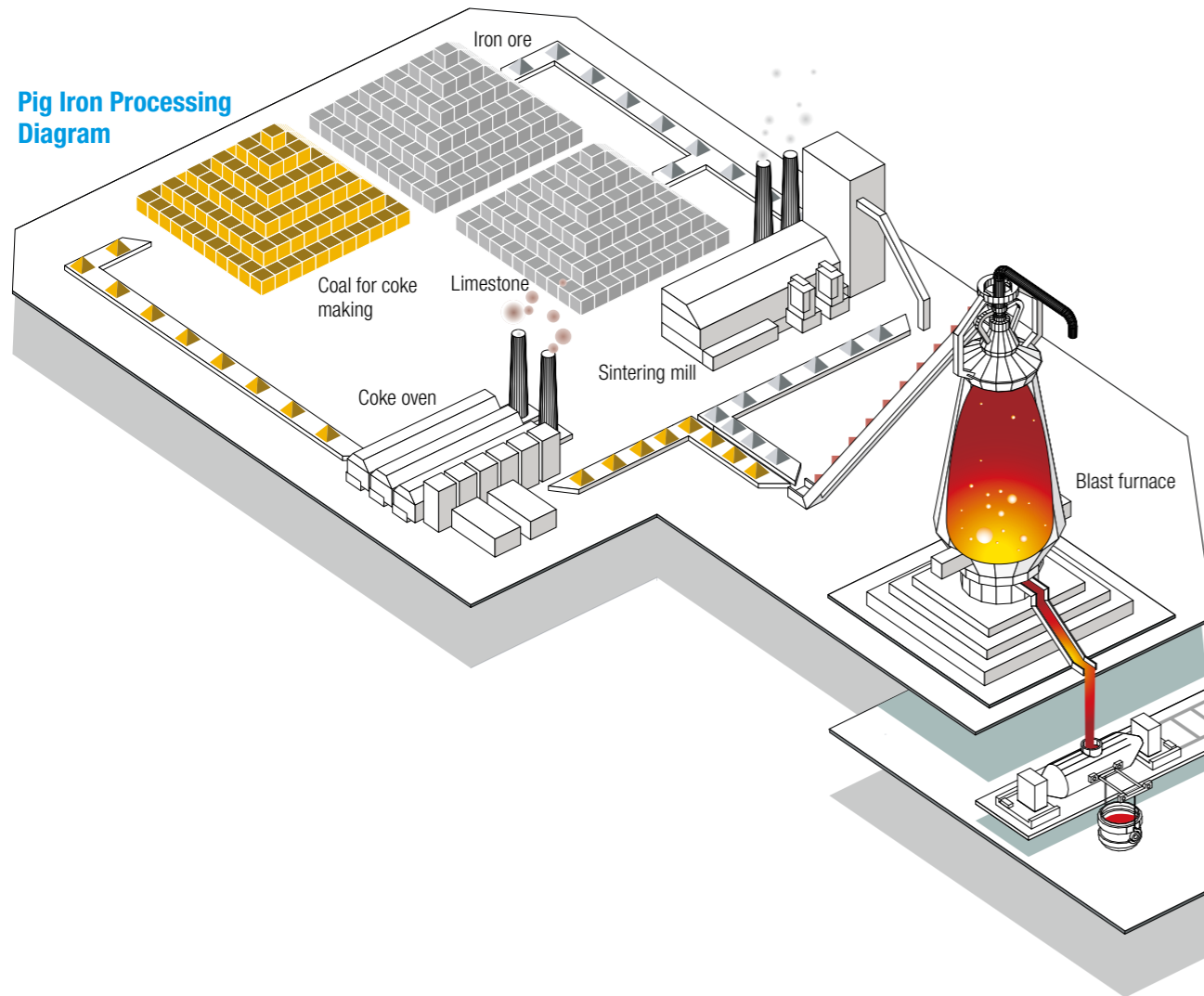
Ultra-High Quality Products Which Touch the Customer's Soul

- **Customer Inside:** We create the best value for customers by keeping their needs foremost.
- **Basic Inside:** We focus on fundamentals and principles, eliminating deviation and waste.
- **Synergy Inside:** We seek to grow alongside our supplier chain through trust and communications.

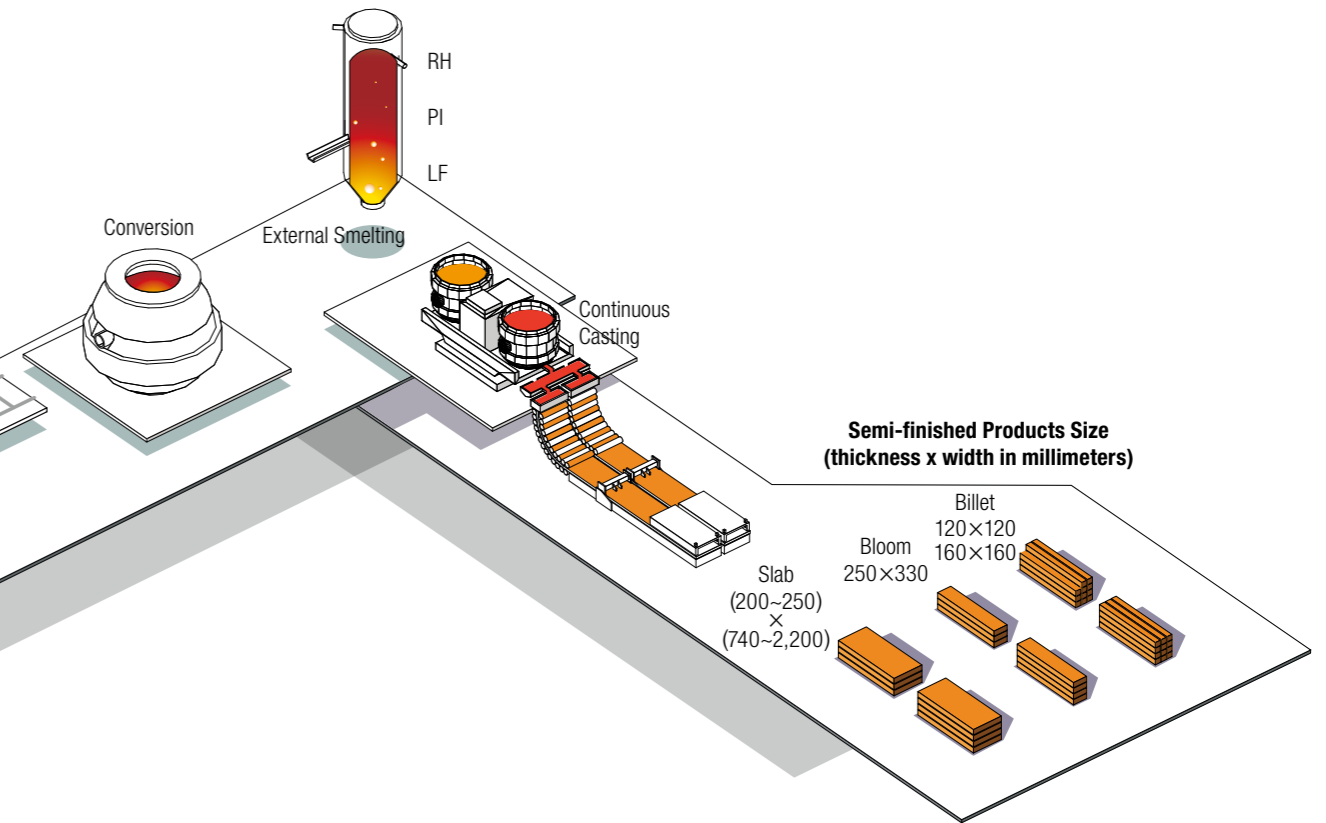


Manufacturing Processes

Pig Iron Processing Diagram



Steelmaking/Continuous Casting Processes



Stages of Pig Iron Processing in Detail

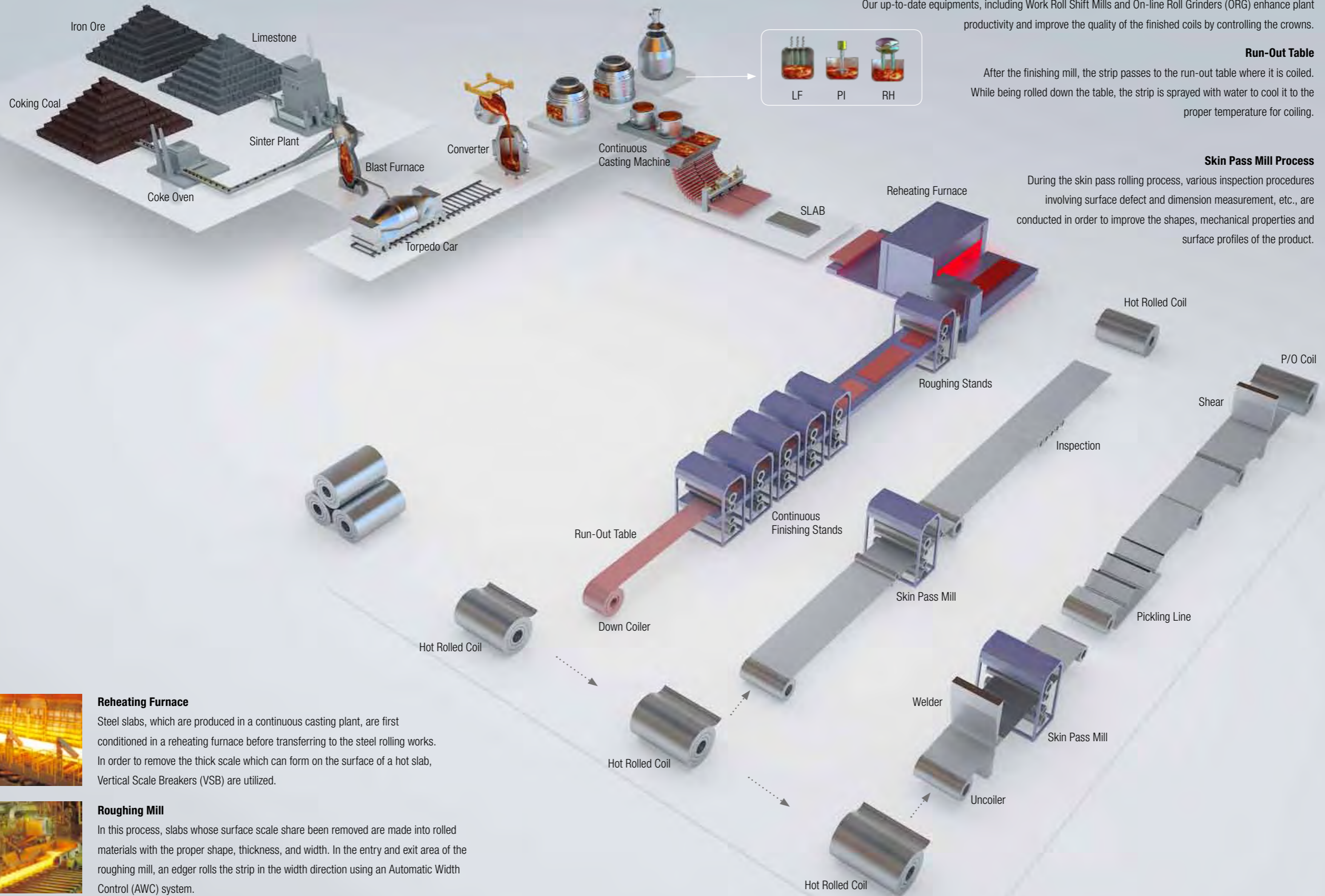
| Process | Description |
|-----------------------|---|
| Sintering | Iron ore, the main ingredient in steelmaking, is sorted by size into subgroups such as pelletized ore (10~25mm), lump ore (larger than 25mm), and fine ore (less than 10mm). After being crushed and sorted at the raw material factory, lump ore is sent to post-processing facilities in the form of pelletized or fine ore. |
| Fuel treatment | Limestone and powdered coke are mixed with fine ore, which is produced from crushing lump ore. The mixture is first heated at about 1,200°C, cooled, and then crushed into sintered ore of 10~50mm granule dimensions. - Operating facilities: five in Pohang and four in Gwangyang |
| Coke treatment | Coke is produced by heating various coals over 1,000°C to remove water and ash. The suitable grain size of coke to be used in blast furnaces is 25~75mm considering air permeability and chemical reactivity. - Operating facilities: five in Pohang and four in Gwangyang |
| Blast Furnace | Sintered ore, lump coke and other powdered raw materials are introduced at the top of the furnace in multiple stages. Then, the bottom of the furnace is brought up to a temperature of about 1,100°C to heat the coke/iron ore mixture, inducing a reduction reaction to produce molten iron. - Operating facilities: six in Pohang (including the first COREX furnace) and five in Gwangyang |

Steelmaking/Continuous Casting Processes

| Process | Description |
|---------------------------------------|--|
| Converter | - Molten iron in the furnace is converted to molten steel by adding oxygen, and Impurities are removed during this process. - Pohang: 3 converters of 100-ton capacity each at the 1st steelmaking plant, 3 converters of 300-ton capacity each at the 2nd steelmaking plant - Gwangyang: 3 converters of 250-ton capacity each at the 1st steelmaking plant, 3 converters of 250-ton capacity each at the 2nd steelmaking plant |
| Additional Refining Facilities | These processes remove impurities and make subtle adjustments to the chemical composition of the molten steel product of the converter. |
| | RH - Acronym for Reinstahl Hutenerwerke & Heraus - Ar or N ₂ is blown into the molten steel ladle to remove an impurity in this process, hydrogen gas, and to separate and raise non-metallic inclusions to the surface. - Decarbonizing can be accomplished by adding an oxygen injection process. |
| | PI - Powder injection - Through a lance, powders such as Ca-Si are injected to remove sulfuric elements. Non-metallic inclusions are separated and then raised to the surface by stirring the bottom of the molten steel volume. |
| LF | - Ladle Furnace - During this process, a high current electric arc is used to increase the temperature of the molten steel. |
| Continuous Caster | - Molten steel, which has undergone external refining processes (RH, PI and LF), is poured into molds to produce specific desired shapes. Intermediate products such as slabs, blooms, and billets are produced. |

Manufacturing Processes & Equipment for Hot Rolling

In order to deliver quality products, meeting customer's requirements, POSCO is equipped with the latest fully-automated computer controlled cutting edge facilities and technologies. These tools guarantee products of the highest precision and quality for our customers.



Finishing Mill

The purpose of finishing rolling is to adjust the thickness and width of a coil to the specified dimensions and to produce a smooth surface and shape at a desired finishing temperature appropriate to its intended use. Our up-to-date equipments, including Work Roll Shift Mills and On-line Roll Grinders (ORG) enhance plant productivity and improve the quality of the finished coils by controlling the crowns.



Run-Out Table

After the finishing mill, the strip passes to the run-out table where it is coiled. While being rolled down the table, the strip is sprayed with water to cool it to the proper temperature for coiling.



Skin Pass Mill Process

During the skin pass rolling process, various inspection procedures involving surface defect and dimension measurement, etc., are conducted in order to improve the shapes, mechanical properties and surface profiles of the product.



Reheating Furnace

Steel slabs, which are produced in a continuous casting plant, are first conditioned in a reheating furnace before transferring to the steel rolling works. In order to remove the thick scale which can form on the surface of a hot slab, Vertical Scale Breakers (VSB) are utilized.



Roughing Mill

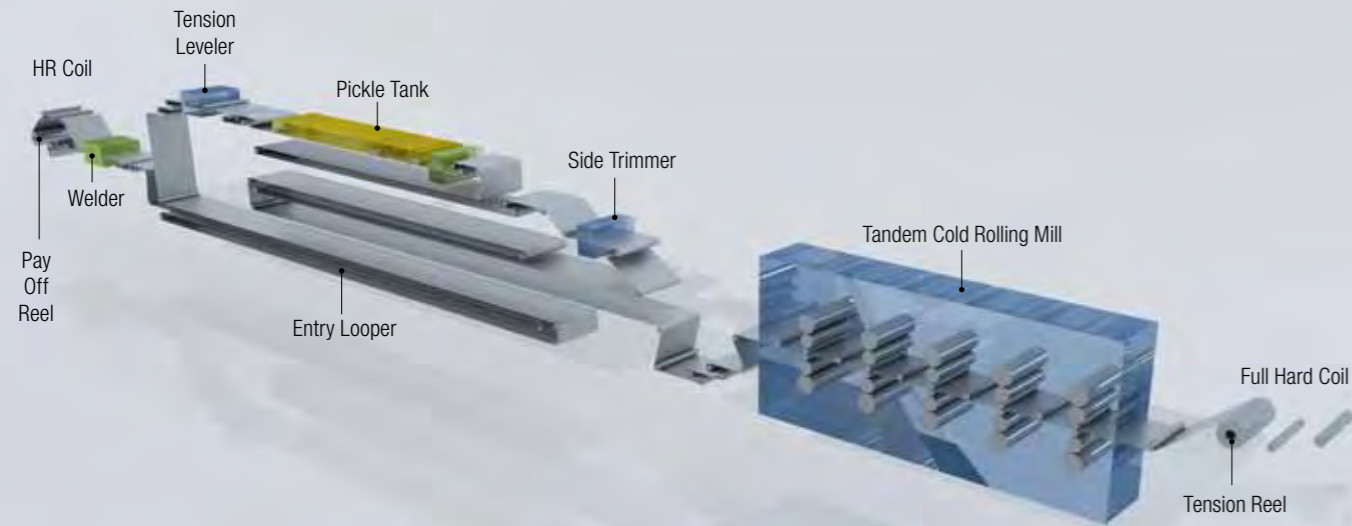
In this process, slabs whose surface scale have been removed are made into rolled materials with the proper shape, thickness, and width. In the entry and exit area of the roughing mill, an edger rolls the strip in the width direction using an Automatic Width Control (AWC) system.



Manufacturing Processes & Equipment for Cold Rolling

In order to deliver quality products meeting customer requirements, POSCO is equipped with the latest fully-automated, computer-controlled, cutting-edge facilities and technologies. These tools guarantee products of the highest precision and quality for our customers.

PL/TCM (Pickling Line and Tandem Cold Mill)



Pickling

The hot-rolled coil passes through a pickling line, where scale breaker machines and hydrochloric acid solutions are used to remove surface scale and oxide film, which cause surface flaws during the final stage of cold rolled steel processing.



Cold Rolling

Pickled coils are cold rolled in tandem mills to a specified thickness, typically 40–90%, of original material dimensions. Fully automated thickness and shape adjustment is ensured through state of the art process machinery.



Electrolytic Cleaning

The purpose of electrolytic cleaning is to remove lubricant oil and contaminants on the cold rolled steel prior to the annealing process. All traces of surface oil are removed through mechanical and chemical action as the cold rolled coil passes through an alkaline solution bath.



Annealing

After cold-rolling, the steel is hard and brittle, and its grains are elongated in the rolling direction. To obtain the desired grain structure and improve the mechanical properties, the material is reheated in a furnace and subjected to cycles of rapid heating and cooling. Steel products with extra deep drawing qualities and high tensile strength can be produced via this high productivity manufacturing method. Two annealing methods are commonly used: batch annealing and continuous annealing.



Skin Pass

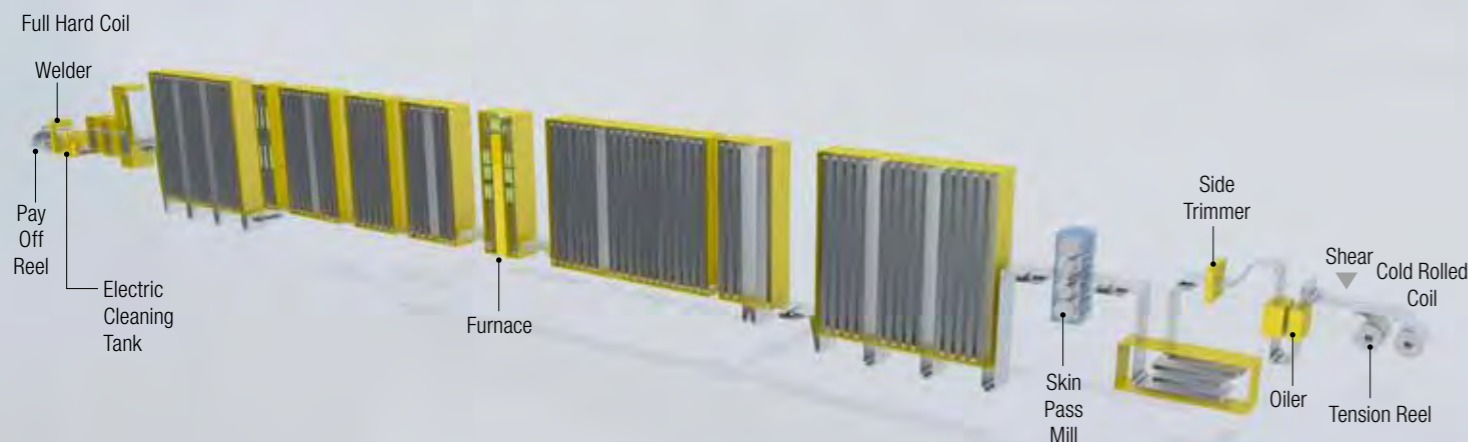
A final rolling process is performed in order to remove minor surface defects such as stretch marks and to produce a smooth, lustrous surface. Skin Pass results in a further thickness reduction of about 1%.



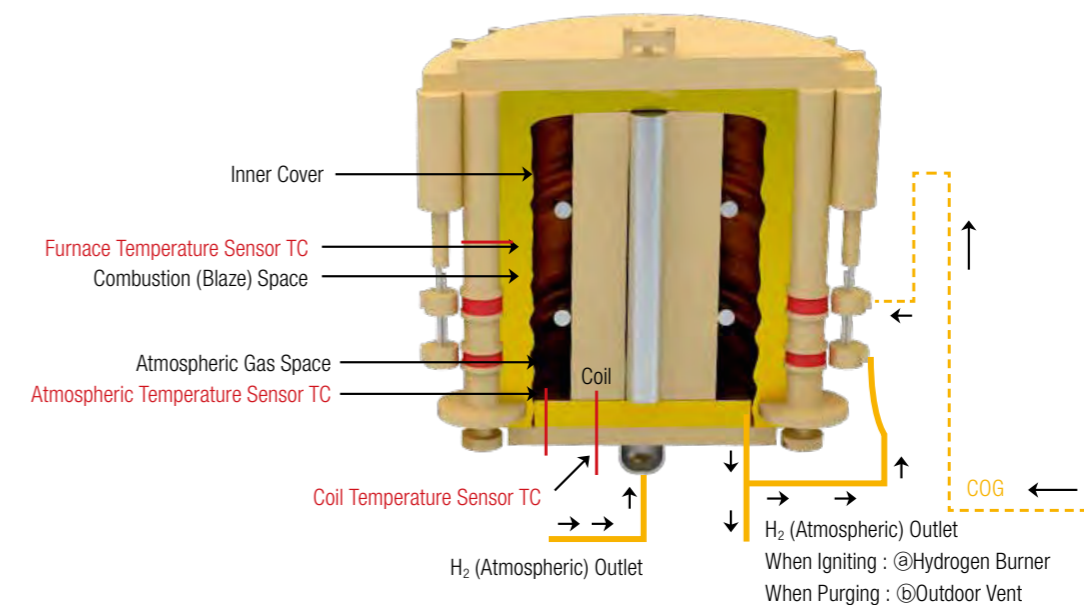
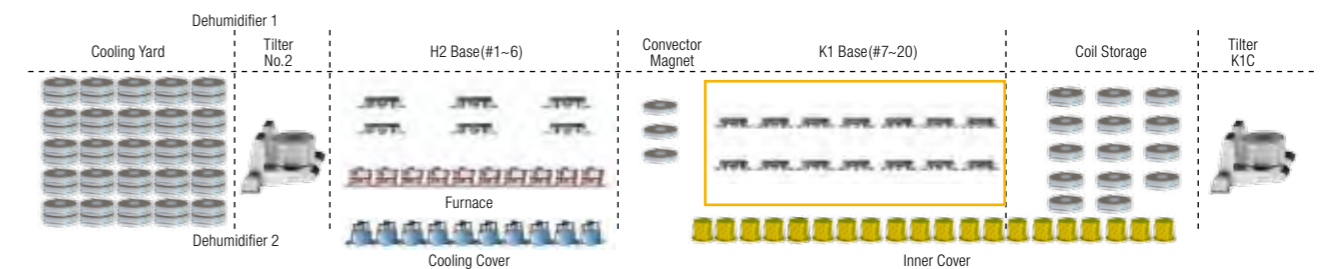
Finishing and Inspection

During this final stage of manufacturing, cold rolled strips are trimmed to customer specified size. The finished product is subject to final inspection, where thickness, width and surface quality are verified. Samples are sent for laboratory testing of mechanical properties as appropriate for specific end use.

CAL (Continuous Annealing Line)



BAF (Batch Annealing Furnace)



Main Uses

Cold rolled steel sheet (CR) features a fine surface and excellent workability. It is used for a variety of products ranging from home appliances such as refrigerators and washing machines to industrial machinery, architectural components and automobiles. Cold rolled steel is an indispensable material in our modern society.

Commercial Cold Rolled Steel

This type of steel is appropriate for manufacturing ordinary objects like refrigerator doors, drum containers and furniture as well as automobile parts such as oil filters.

HSS (High Strength Cold Rolled Steel) (up to 60kg class)

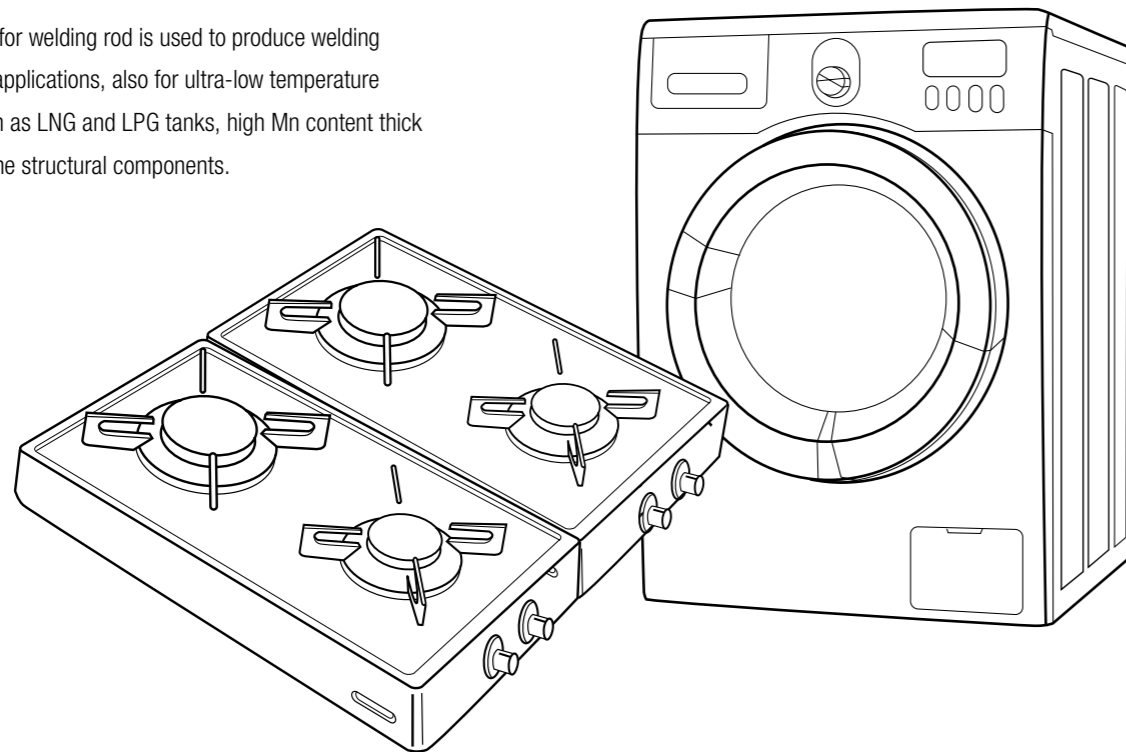
High strength steel is used in products requiring a material with higher strength than traditional cold rolled steel can provide. If machinability is also required along with strength, HSS is the right choice.

Structural Cold Rolled Steel

This material is particularly suitable for steel components that do not require further processing, such as drawing, but require high strength. Structural CR steel is widely used as a structural building material.

Cold Rolled Steel for Welding Rod

Cold rolled steel for welding rod is used to produce welding rod for ordinary applications, also for ultra-low temperature applications such as LNG and LPG tanks, high Mn content thick plates, and marine structural components.



Cold Rolled Steel for Porcelain Enameling

This product features desirable properties for enameled porcelain manufacturing such as heat resistance, corrosion resistance, and gloss surface, as well as traditional steel virtues (impact resistance, high ductility and formability). It is used for components of home appliances, construction materials, kitchen appliances and bathtubs, etc.

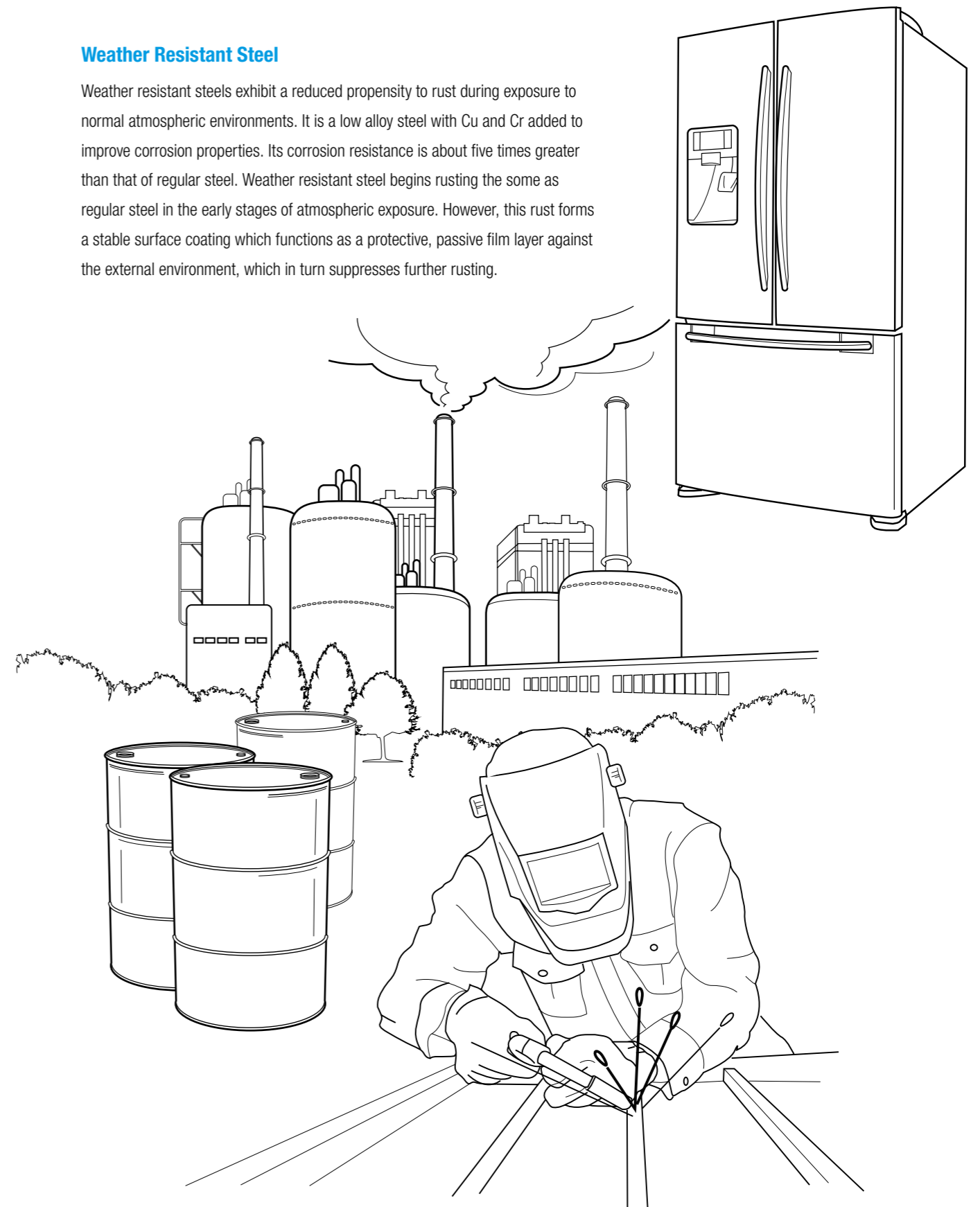
Sulfate Resistant Cold Rolled Steel

Gases emitted by thermal power plants and boilers, where fossil fuels such as heavy oil and bituminous coal are used, contain Sulfur Oxides (SOx). Sulfur oxides encounter condensed moisture during recovery of waste heat from exhaust gases, creating a highly corrosive environment. Sulfate resistant steel is an excellent choice for desulfurization and smoke elimination facilities where sulfate corrosion is a real concern. Through the use of this steel, maintenance and repair costs can be controlled making compliance with environmental regulations.

⚠ The applications described in this section reflect typical uses and are offered as examples. Please be sure to discuss your end use with our associates when selecting steel products.

Weather Resistant Steel

Weather resistant steels exhibit a reduced propensity to rust during exposure to normal atmospheric environments. It is a low alloy steel with Cu and Cr added to improve corrosion properties. Its corrosion resistance is about five times greater than that of regular steel. Weather resistant steel begins rusting the same as regular steel in the early stages of atmospheric exposure. However, this rust forms a stable surface coating which functions as a protective, passive film layer against the external environment, which in turn suppresses further rusting.



Regular Cold Rolled Steel

General Characteristics

A general purpose steel, it is used to make products such as home appliances, drum containers, furniture, etc.

Product Types and Features

| Division | Characteristics | Uses |
|--------------------|---|---|
| for General Use | For goods that require bending, forming, light processing, and welding. | Drums, furniture, etc. |
| for Machining | For goods that require machinability. | Outer plates for home appliances, etc. |
| for Deep Machining | For goods that require deep-machinability. | Frames for furniture, home appliances, etc. |

Remarks) Rigid steel for general purposes can be ordered in both KS and JIS Standards.

Chemical Composition

| Specifications | C(%) | Mn(%) | P(%) | S(%) |
|----------------|-------|-------|--------|--------|
| CSP1 | ~0.15 | ~0.60 | ~0.100 | ~0.035 |
| CSP2 | ~0.10 | ~0.50 | ~0.040 | ~0.035 |
| CSP3 | ~0.08 | ~0.45 | ~0.030 | ~0.030 |

Mechanical Properties

| Specifications | Yield Strength (N/mm ²) | Tensile Strength (N/mm ²) | Ductility(%) | | | | | | |
|----------------|-------------------------------------|---------------------------------------|---------------|---------|---------|---------|---------|---------|---------|
| | | | Thickness(mm) | | | | | | |
| | | | 0.25~0.3 | 0.3~0.4 | 0.4~0.6 | 0.6~1.0 | 1.0~1.6 | 1.6~2.5 | 2.5~3.3 |
| CSP1 | ~392 | 270~ | 28~ | 31~ | 34~ | 36~ | 37~ | 38~ | 39~ |
| CSP1D | ~343 | 270~ | 33~ | 33~ | 35~ | 37~ | 38~ | 38~ | 40~ |
| CSP2 | ~345 | 270~ | 30~ | 33~ | 36~ | 38~ | 39~ | 40~ | 41~ |
| CSP3 | ~294 | 270~ | 32~ | 35~ | 38~ | 40~ | 41~ | 42~ | 43~ |
| CSP3N | ~294 | 270~ | 32~ | 35~ | 38~ | 40~ | 41~ | 42~ | 43~ |
| CSP3E | ~294 | 265~ | 32~ | 35~ | 38~ | 40~ | 41~ | 42~ | 43~ |
| CSP3X | ~294 | 260~ | - | - | 47~ | 47~ | 49~ | 50~ | - |
| CSP3Z | ~250 | 255~ | - | - | 52~ | 52~ | 52~ | - | - |

Remarks) 1. Markings such as '-S', '-E', and '-Z' are added at the end of size symbols indicating tempering level and surface quality. (example: CSP1D-E)
S: standard tempering, E: strict surface treatment, Z: non-strict surface treatment
2. Products with markings CSP3N, E, X, and Z are guaranteed for six months without limitation after shipment.

Comparison Chart of Different National Standards

| Grade | POSCO | National Standards | | | |
|----------------------------|------------------------|------------------------|-------------------------|------------------------|---------------------------------------|
| | | KS | JIS | ASTM | EN |
| Commercial Quality | CSP1 | KS-SPCC | JS-SPCC | A1008 CS | EN-DC01, EN-DC03 |
| | CSP1D | | | | |
| Drawing Quality | CSP2 | KS-SPCD | JS-SPCD | A1008 DS | EN-DC04 |
| Deep Drawing Quality | CSP3(N) | KS-SPCE | JS-SPCE | A1008 DDS | EN-DC05 |
| Extra Deep Drawing Quality | CSP3E, CSP3X, CSP3Z | KS-SPCF, KS-SPCG | JS-SPCF, JS-SPCG | A1008 EDDS | EN-DC06, EN-DC07 |
| Test piece | Rolling direction KS 5 | Rolling direction KS 5 | Rolling direction JIS 5 | Rolling direction ASTM | Perpendicular to Rolling direction EN |

Remarks) 1. Components and materials of each national standard are listed in detail in the Appendix (page 31).
2. The specification comparison chart above is analogous to that of POSCO. Chemical composition and mechanical properties may vary depending on the test methods of each specification.
3. For details, please contact our technical representative.

Rigid Steel

| Difference in Tempering | Specifications | Hardness | |
|-------------------------|----------------|------------|------------|
| | | HRB | HV |
| Rigidity | SPCC-1 | No testing | No testing |
| 1/2 Rigidity | SPCC-2 | 74~89 | 135~185 |
| 1/4 Rigidity | SPCC-4 | 65~80 | 115~150 |
| 1/8 Rigidity | SPCC-8 | 50~71 | 95~130 |

High Strength Cold Rolled Steel

General Characteristics

High strength steel is used in products requiring higher strength than which traditional cold rolled steel can provide. If machinability is also required along with strength, HSS is the right choice.

Product Types and Features

| Classification | Name | Strengthening Method | Characteristics |
|----------------|--|--|---|
| E Class | Interstitial Free High Strength Steel High Strength Low Alloy Steel | Using ultra-low carbon steel as the base, the carbonitride-forming element Ti is added to acquire deep machinability. For high strength, permutable solid elements P and Mn are both added. | Proper strength is maintained and deep machinability acquired. |
| R Class | Rephosphorized Steel | Permutable alloying elements P and Mn are added to low carbon steel. Permutable elements cause lattice mutation and increase internal stress, disrupting electron migration which results in higher strength. | Compared to precipitation-strengthened steel (C class), the degree of the strengthening effect is smaller, but this type of steel still has high strength and good machinability. |
| C Class | Interstitial Free High Strength Steel | Using low carbon steel as the base, precipitation-enhancing elements Ti and Nb are added to spread carbonitride extracts very finely inside the steel. Precipitation inhibits electron migration, increasing yield strength and impact resistance. | In comparison to regular steel, high strength is maintained with a high yield point. |

Chemical Composition

| Classification | C(%) | Mn(%) | P(%) | S(%) | Si(%) |
|----------------|--------|-------|--------|--------|-------|
| E Class | ~0.005 | ~1.0 | ~0.11 | ~0.02 | ~0.40 |
| R Class | ~0.09 | ~1.4 | ~0.03 | ~0.015 | ~0.14 |
| C Class | ~0.09 | ~1.4 | ~0.025 | ~0.01 | ~0.34 |

Mechanical Properties

| Classification | Specifications | Yield Strength(N/mm ²) | Tensile Strength(N/mm ²) | Ductility(%) |
|----------------|----------------|------------------------------------|--------------------------------------|--------------|
| E Class | CHSP35E | 185~ | 340~ | 34~ |
| | CHSP40E | 215~ | 390~ | 30~ |
| | CHSP45E | 235~ | 440~ | 26~ |
| R Class | CHSP35R | 185~ | 340~ | 35~ |
| | CHSP40R | 215~ | 390~ | 29~ |
| | CHSP45R | 245~ | 440~ | 26~ |
| C Class | CHSP45C | 275~ | 440~ | 22~ |
| | CHSP60C | 350~ | 588~ | 17~ |
| | CHSP260C | 260~340 | 340~450 | 28~ |
| | CHSP340C | 340~440 | 410~530 | 20~ |
| | CHSP420Y | 420~530 | 490~600 | 16~ |

- Remarks)
- High Strength Cold Rolled Steel test sample is perpendicular to the rolling direction per KS 13A.
 - If thickness is less than 0.6mm, tensile test is not performed.
 - Chemical composition is subject to agreement between POSCO and ordering parties.

Structural Cold Rolled Steel

General Characteristics

This steel is not subject to post processing, and used for steel structures which require high strength.

Product Types and Features

It is widely used for architectural components, Minimum tensile strength is guaranteed.

Chemical Composition

| C(%) | Mn(%) | P(%) | S(%) |
|------|-------|-------|-------|
| ~0.2 | ~0.6 | ~0.04 | ~0.04 |

Mechanical Properties

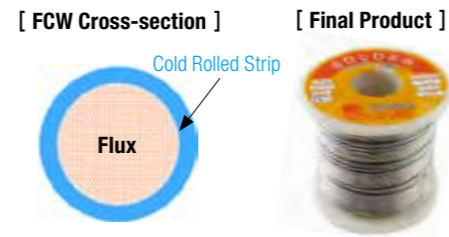
| Specification | Tensile Strength(N/mm ²) |
|---------------|--------------------------------------|
| CSP30 | 294~ |
| CSP32 | 314~ |
| CSP34 | 334~ |

Cold Rolled Steel for Welding Rod

General Characteristics

Flux Cored Wire Welding Rod :

The wire product, is made by slitting cold rolled steel in small widths, roll-forming to increase flux volume and passing the material through a die.



Product Types and Features

| Division | Specification | Uses | Product characteristics | Welded parts characteristics |
|---|---------------|---|---|----------------------------------|
| General use | CSP2-WB | • General purpose steel | • Excellent Productivity • Low Spatter | Impact resistance(-20℃) ≥ 27J |
| Ultra-low temperature | CSP2-WC | • Ultra-low temperature steel (LNG, LPG TANK types) | • Excellent ultra-low temperature impact resistance • Excellent Productivity | Impact resistance(-60℃) ≥ 47J |
| As an adhesive for special applications | CSP2-WE | • High Mn steel plate • Marine structural steel | • High temperature fracture resistance of Mn steel • Excellent ultra-low temperature impact resistance | Impact resistance(-60℃) ≥ 47J |
| for Low fume uses | CSP3-LW | • Eco-friendly steel | • Decreased fumes during welding • excellent tube forming properties | Impact resistance(-20℃) ≥ 27J |

Chemical Composition

| Specifications | C(%) | Mn(%) | P(%) | S(%) | Si(%) |
|----------------|--------|---------|--------|--------|-------|
| CSP2-WB | ~0.04 | 0.1~0.5 | ~0.02 | ~0.02 | ~0.03 |
| CSP2-WC | ~0.05 | 0.1~0.5 | ~0.015 | ~0.015 | ~0.03 |
| CSP2-WE | ~0.04 | 0.1~0.5 | ~0.01 | ~0.01 | ~0.03 |
| CSP3-LW | ~0.007 | 0.5~1.0 | ~0.015 | ~0.015 | ~0.03 |

Mechanical Properties

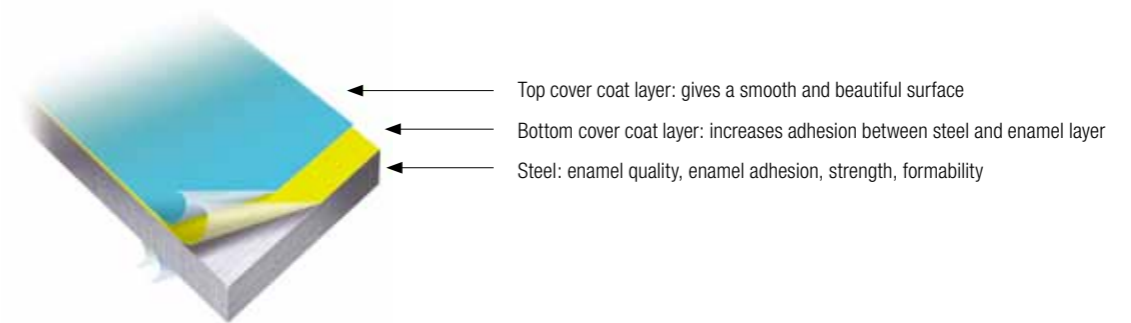
| Specifications | Yield Strength (N/mm ²) | Tensile Strength (N/mm ²) | Ductility(%) | | | | Hardness (HrB) |
|----------------|-------------------------------------|---------------------------------------|--------------|----------|----------|----------|----------------|
| | | | 0.4~0.6T | 0.6~1.0T | 1.0~1.6T | 1.6~2.0T | |
| CSP2-WB | ~260 | 270~ | 36~ | 38~ | 39~ | 40~ | ~55 |
| CSP2-WC | ~264 | 275~ | 36~ | 38~ | 39~ | 40~ | ~60 |
| CSP2-WE | ~260 | 270~ | 36~ | 38~ | 39~ | 40~ | ~55 |
| CSP3-LW | ~240 | 270~ | 38~ | 40~ | 41~ | 42~ | ~45 |

Remarks) 1. Test samples oriented in the rolling direction per KS 5.
2. If thickness is less than 0.6mm, tensile test is not performed.
3. Chemical composition is subject to agreement between POSCO and ordering parties.

Cold Rolled Steel for Enameling

General Characteristics

The material is baked at high temperature after being coated with inorganic hyaline enamel. Material compositions combines the characteristics of both metal and porcelain enamel such as strength, heat resistance, corrosion resistance, and surface luster.



Main Uses

| Division | Uses |
|---------------|--|
| Industrial | Chemical reaction furnace, heat exchanger, food processor, hot water tank, holding tank, etc. |
| Residential | Gas oven, washing machine, microwave oven, gas heater, boiler, dishwasher, kitchen appliances, etc. |
| Architectural | Shell plates for building, roofs, wall tiles, tunnel panels, blackboard, desks, road signs, exterior materials, etc. |

Product Types and Features

| Specification | Formability (Drawability) | Enamel characteristic | Enameling |
|---------------|---------------------------|-----------------------|----------------------------|
| CESP-C | for deep processing | Good | Plasticizing once or twice |
| POSCENA-C | for regular processing | Very good | |

Remarks) Enamel characteristic is mainly due to the enamel processing, which is related to the typical defects such as 'Fish scale' and 'Blister'.

Chemical Composition

| Specification | C(%) | Mn(%) | P(%) | S(%) | Notes |
|---------------|--------|-------|-------|-------|--------------|
| CESP-C | ~0.008 | ~0.5 | ~0.04 | ~0.06 | Ti added |
| POSCENA-C | ~0.008 | ~0.5 | ~0.04 | ~0.04 | Ti not added |

Mechanical Properties

| Specification | Yield Strength (N/mm ²) | Tensile Strength (N/mm ²) | Ductility(%) | | | | R-bar |
|---------------|-------------------------------------|---------------------------------------|--------------|----------|----------|----------|-------|
| | | | 0.4~0.6T | 0.6~1.0T | 1.0~1.6T | 1.6~2.0T | |
| CESP-C | ~240 | 270~ | 38~ | 40~ | 41~ | 42~ | 1.2~ |
| POSCENA-C | | | 34~ | 36~ | 37~ | 38~ | 1.4~ |

Sulfate Corrosion Resistant Steel

General Characteristics

Gases emitted by thermal power plants and boilers, where fossil fuels such as heavy oil and bituminous coal are used, contain oxides of sulfur (SOx). Sulfur oxide encounters condensed moisture during recovery of waste heat from exhaust gases, creating a highly corrosive environment. Sulfate resistant steel is an excellent choice for desulfurization and smoke elimination facilities where sulfate corrosion is a big concern. Through the use of this steel, maintenance and repair costs can be controlled making compliance with environmental regulations.

[Air Pre-Heater at thermal power plant]



Regular steel used (serious corrosion shown)

Sulfate resistant steel used (excellent corrosion resistance shown)

*Sulfate resistance degree by steel type: regular steel < stainless steel < weather resistant steel < sulfate resistant steel

Product Types and Features

| Specifications | Corrosion resistant environment | Sulfate corrosion reduction | Hydrochloric acid and sulfuric acid compound corrosion reduction |
|-----------------|--|------------------------------------|--|
| ANCOR-C | Sulfate condensation at low-temperatures | 45mg/cm ² /hr and under | - |
| ANCOR-CS | Hydrochloric acid and sulfuric acid compound corrosion | 30mg/cm ² /hr and under | 5mg/cm/hr and under |

* Advanced environmentally-friendly steel with sulphuric acid COrrOSion Resistance

■ Evaluation conditions for corrosion reduction

- Sulfuric acid: 50% sulfuric acid at 70°C
- Hydrochloric acid and sulfuric acid compound corrosion: 31% sulfuric acid and 0.4% hydrochloric acid at 80°C

Chemical Composition

| Specifications | C(%) | Mn(%) | Si(%) | Cu(%) | Other |
|-----------------|------|-------|-----------|---------|----------------------|
| ANCOR-C | ~0.1 | ~0.8 | 0.1~0.035 | 0.2~0.5 | Other Elements Added |
| ANCOR-CS | ~0.1 | ~1.7 | 0.1~0.035 | 0.2~0.5 | Other Elements Added |

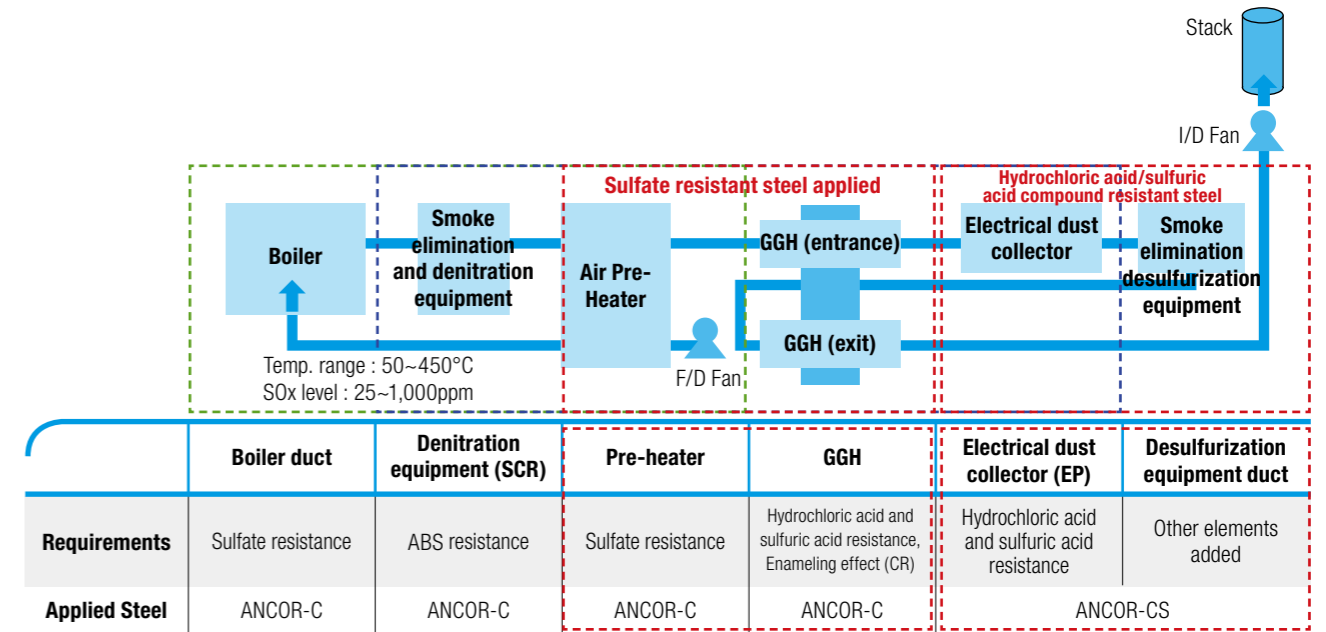
Mechanical Properties

| Specifications | Yield Strength(N/mm ²) | Tensile Strength(N/mm ²) | Ductility(%) | Hardness(HrB) |
|-----------------|------------------------------------|--------------------------------------|--------------|---------------|
| ANCOR-C | 245~ | 340~ | 22~ | 50~ |
| ANCOR-CS | | | | |

Main Uses

This steel is used in power plant's burning fossil fuel, boiler heat exchangers, and parts for desulfurization equipment.

→ Heat element and dust collecting panel usage

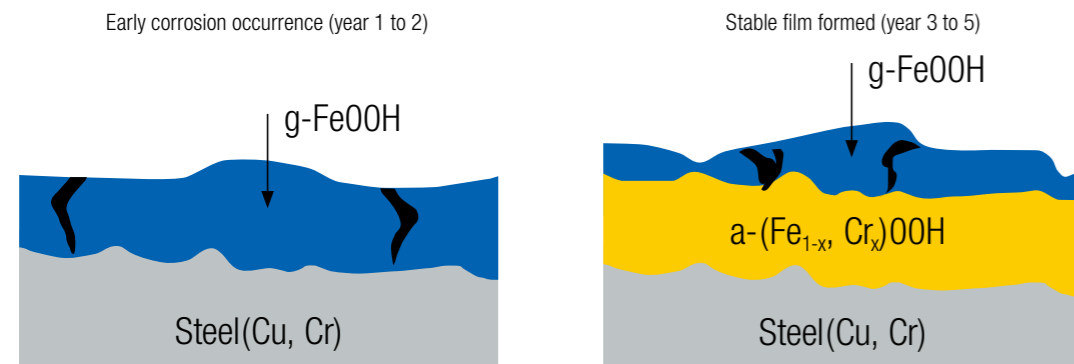


Weather-resistant Cold Rolled Steel

General Characteristics

Weather resistant steels exhibit a reduced propensity to rust during exposure to normal atmospheric environments. It is a low alloy steel that small quantities of Cu and Cr added to improve corrosion properties. Its corrosion resistance is about five times greater than regular steel. Weather resistant steel begins rusting like regular steel in the early stages of atmospheric exposure. However, this rust forms a stable surface coating which functions as a protective, passive film layer against the external environment, which in turn suppresses further rusting.

Surface Corrosion Development of Weather Resistant Steel



Surface g-FeOOH rust formed

Dissolution and precipitation easily occur, resulting low resistance corrosion. At this stage, both regular steel and weather resistant steel are similar.

Stable g-FeOOH rust formed

For weather resistant steel, a stable layer of rust with fine grain size is formed underneath the bottom of corrosion, through interaction with Cu, P, and Cr, making the oxidization harder. In regular steel, the corrosion occurs at the same rate as it does during the early stage.

Specification: KS D 3542(2013) KS-SPA-C, High Weather Resistant Rolled Steel

Chemical Composition

| Specifications | C(%) | Si(%) | Mn(%) | P(%) | S(%) | Cu(%) | Cr(%) | Ni(%) |
|----------------|-------|-----------|-------|-------------|--------|-----------|-----------|--------|
| SPA-C | ~0.12 | 0.25~0.75 | ~0.60 | 0.070~0.150 | ~0.035 | 0.25~0.55 | 0.30~1.25 | ~0.065 |

Mechanical Properties

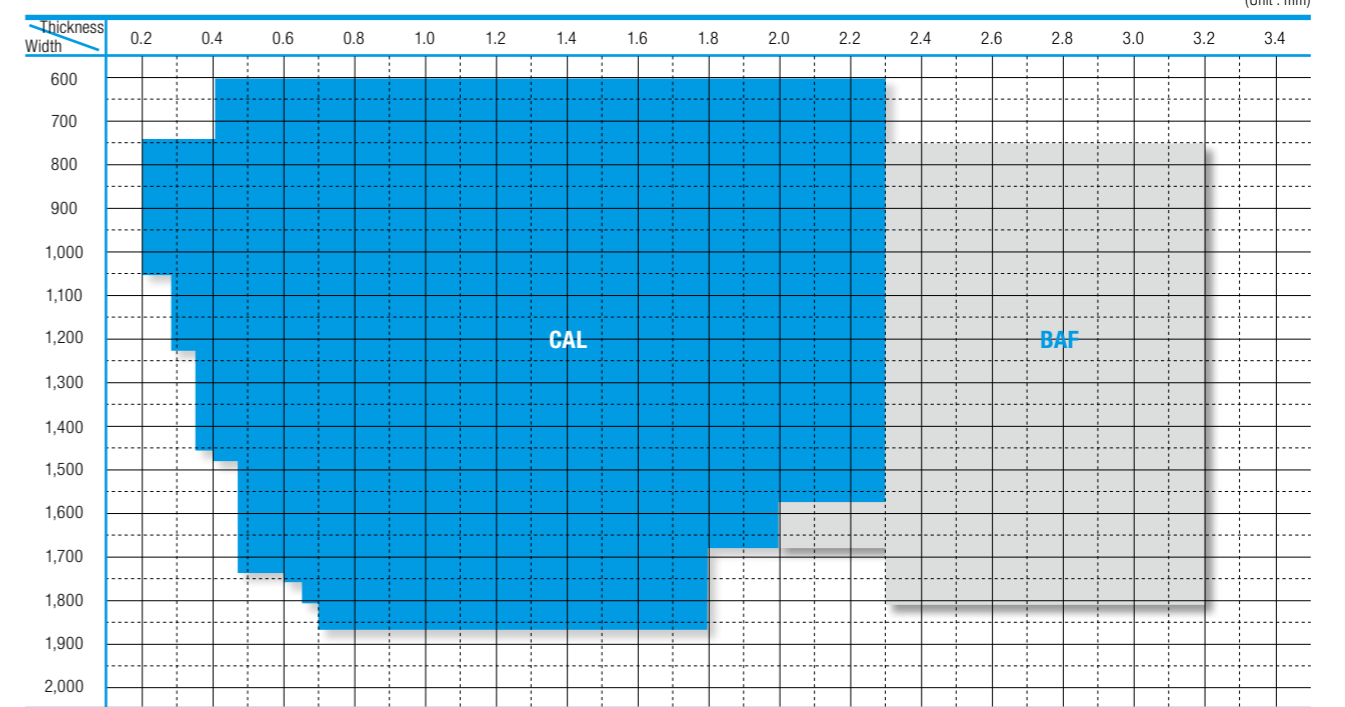
| Specifications | Yield Strength(N/mm ²) | Tensile Strength(N/mm ²) | Ductility(%) |
|----------------|------------------------------------|--------------------------------------|--------------|
| SPA-C | 315~ | 450~ | 26~ |

Main Uses

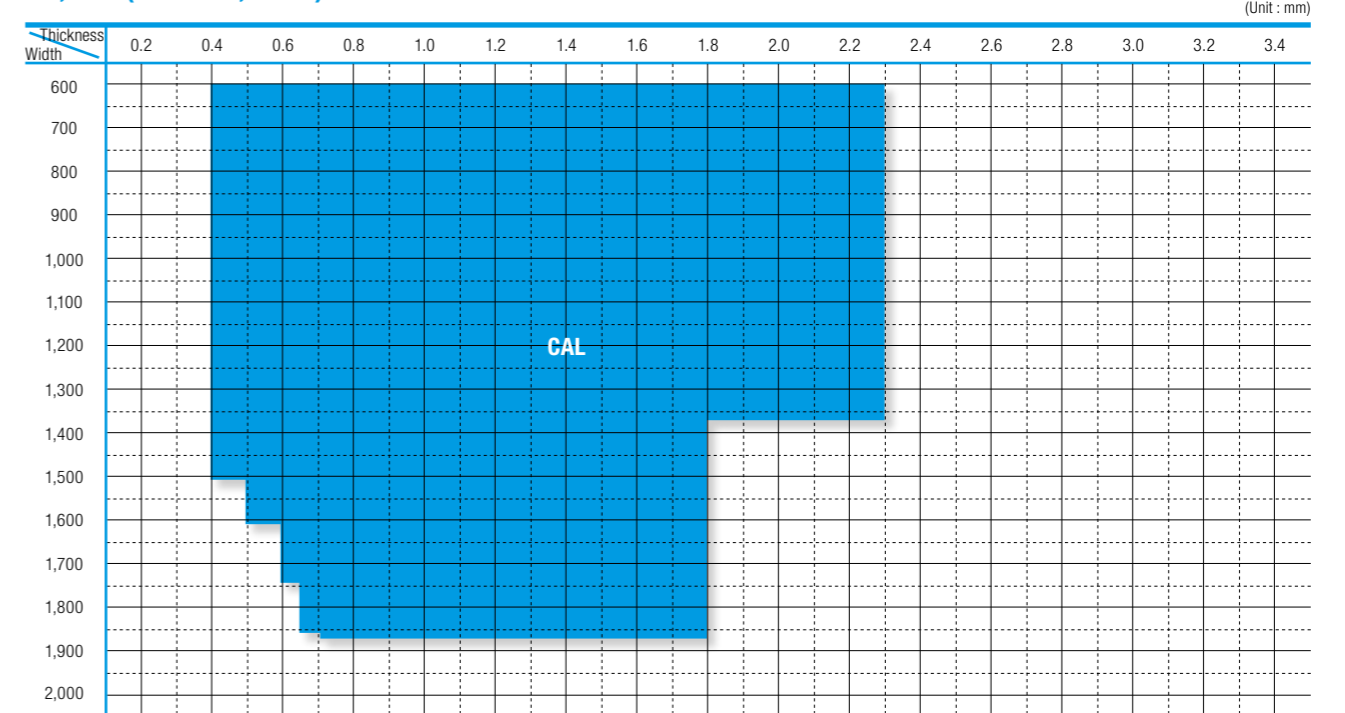
This type of steel is used for bridges, steel tubing utility poles, containers, transmission towers, steel structures, building materials, boiler pre-heaters, heat exchangers, dust collectors, and etc.

Available Dimensions

CQ(JS-SPCC)



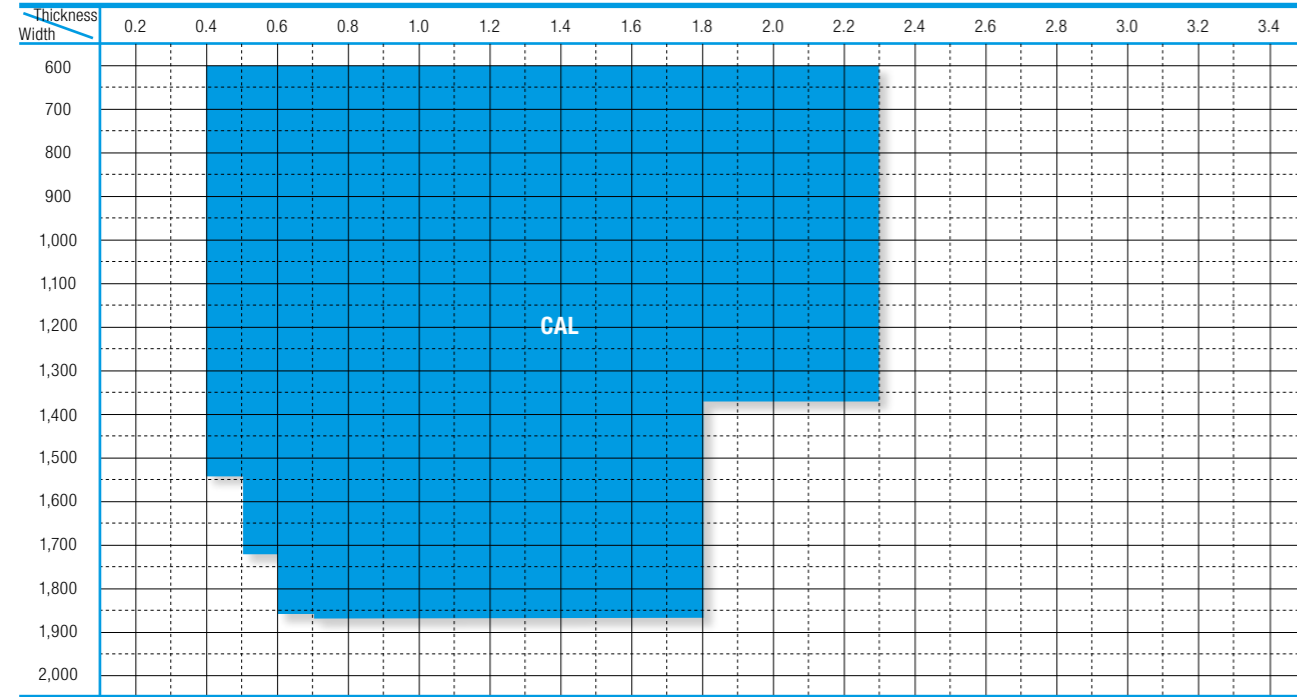
DQ, DDQ(JS-SPCD, SPCE)



Available Dimensions

EDDQ(JS-SPCG)

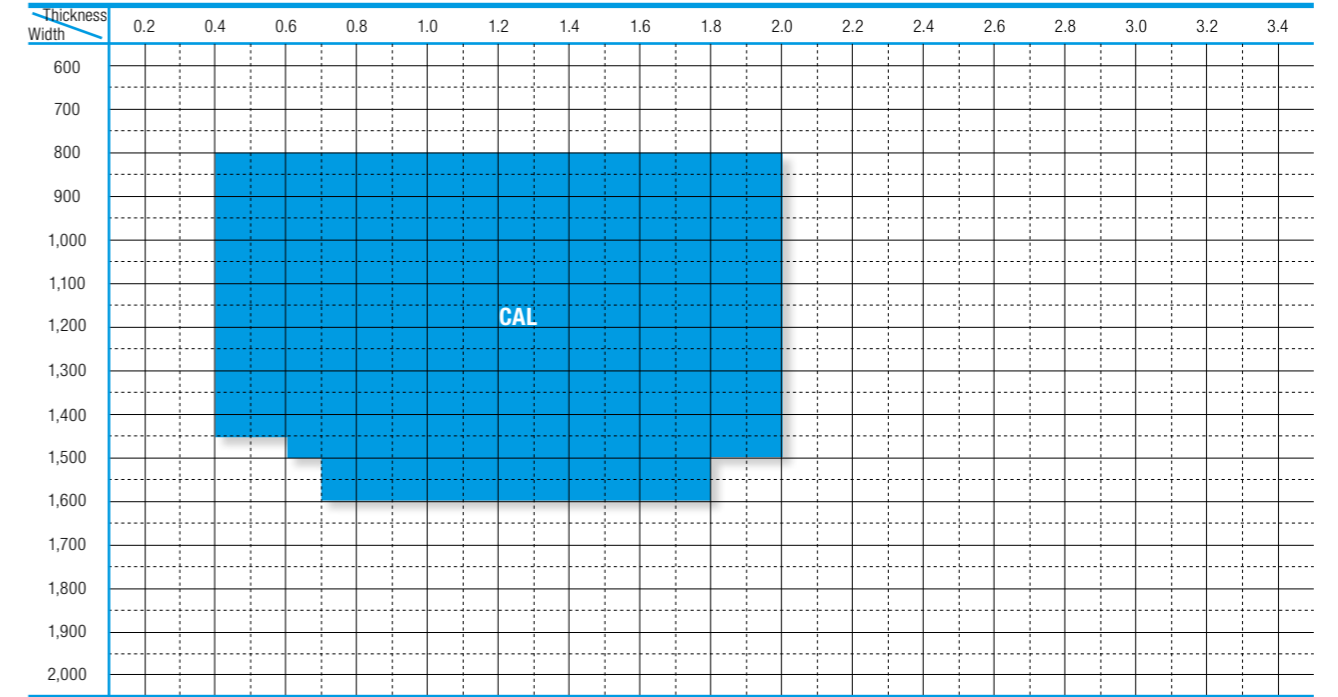
(Unit : mm)



⚠ Available sizes are subject to change. Please consult with your POSCO contact person before ordering.

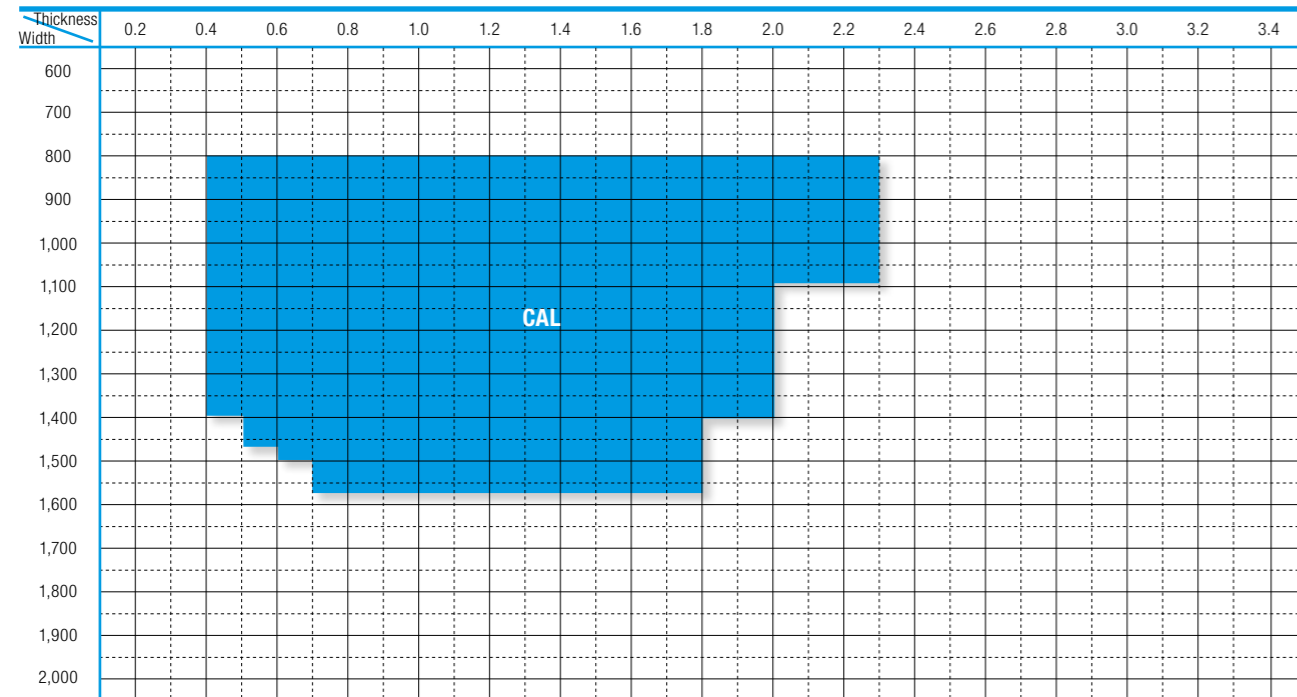
Welding Rod(CSP2-WB, CSP2-WC, CSP2-WE), Sulfate Resistant Steel(ANCOR-C, ANCOR-CS), Weather Resistant Steel(JS-SPA-C)

(Unit : mm)



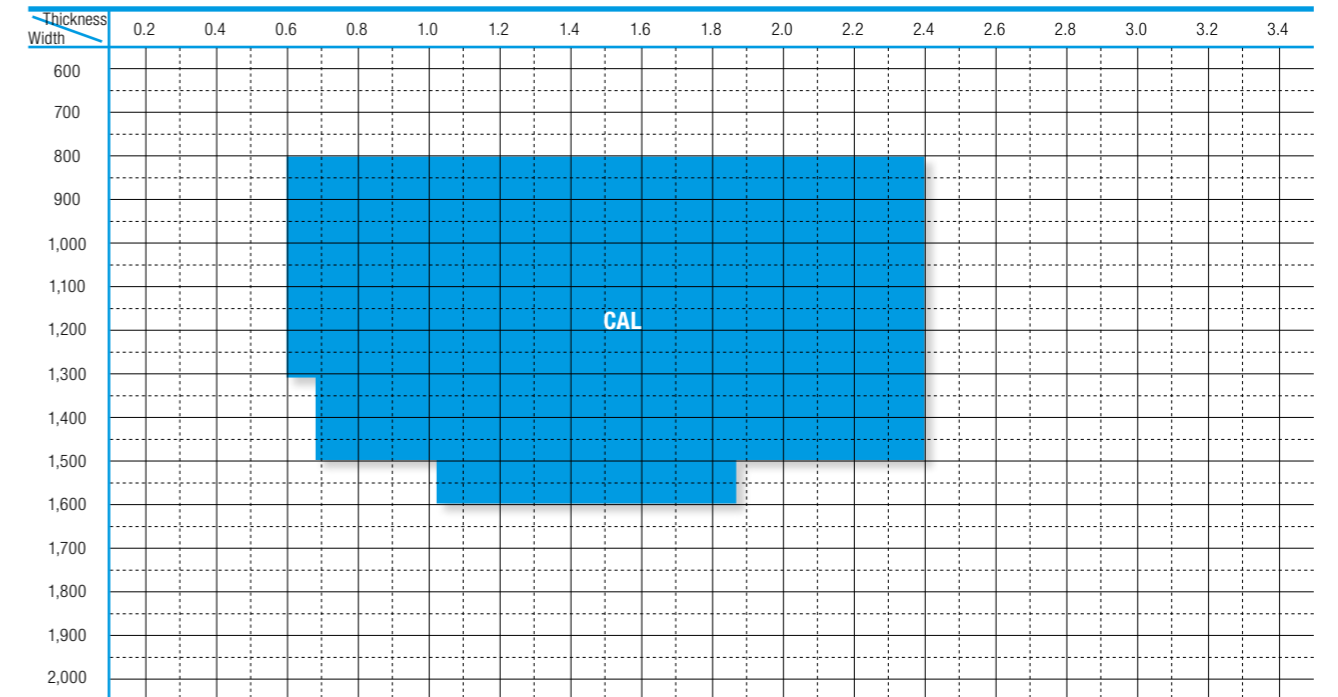
Enamel(CESP-C, POSCENA-C)

(Unit : mm)



High Strength Cold Rolled Steel

(Unit : mm)



Size Tolerance

Thickness Allowance

POSCO Standards

| width(mm) thickness(mm) | 250~400 | 400~630 | 630~1,000 | 1,000~1,250 | 1,250~1,600 | 1,600~ |
|----------------------------|---------|---------|-----------|-------------|-------------|--------|
| ~0.25 | ±0.030 | ±0.030 | ±0.030 | ±0.030 | - | - |
| 0.25~0.40 | ±0.035 | ±0.035 | ±0.040 | ±0.040 | - | - |
| 0.40~0.60 | ±0.040 | ±0.040 | ±0.050 | ±0.050 | ±0.060 | - |
| 0.60~0.80 | ±0.045 | ±0.045 | ±0.060 | ±0.060 | ±0.060 | ±0.070 |
| 0.80~1.00 | ±0.050 | ±0.050 | ±0.060 | ±0.070 | ±0.080 | ±0.090 |
| 1.00~1.25 | ±0.060 | ±0.060 | ±0.070 | ±0.080 | ±0.090 | ±0.110 |
| 1.25~1.60 | ±0.080 | ±0.080 | ±0.090 | ±0.100 | ±0.110 | ±0.130 |
| 1.60~2.00 | ±0.080 | ±0.080 | ±0.110 | ±0.120 | ±0.130 | ±0.150 |
| 2.00~2.50 | ±0.080 | ±0.090 | ±0.130 | ±0.140 | ±0.150 | ±0.170 |
| 2.50~3.21 | ±0.090 | ±0.100 | ±0.150 | ±0.160 | ±0.170 | ±0.170 |

KS, JIS Standards

| width(mm) thickness(mm) | ~630 | 630~1,000 | 1,000~1,250 | 1,250~1,600 | 1,600~ |
|----------------------------|-------|-----------|-------------|-------------|--------|
| ~0.25 | ±0.03 | ±0.03 | ±0.03 | - | - |
| 0.25~0.40 | ±0.04 | ±0.04 | ±0.04 | - | - |
| 0.40~0.60 | ±0.05 | ±0.05 | ±0.05 | ±0.06 | - |
| 0.60~0.80 | ±0.06 | ±0.06 | ±0.06 | ±0.06 | ±0.07 |
| 0.80~1.00 | ±0.06 | ±0.06 | ±0.07 | ±0.08 | ±0.09 |
| 1.00~1.25 | ±0.07 | ±0.07 | ±0.08 | ±0.09 | ±0.11 |
| 1.25~1.60 | ±0.08 | ±0.09 | ±0.10 | ±0.11 | ±0.13 |
| 1.60~2.00 | ±0.10 | ±0.11 | ±0.12 | ±0.13 | ±0.15 |
| 2.00~2.50 | ±0.12 | ±0.13 | ±0.14 | ±0.15 | ±0.17 |
| 2.50~3.15 | ±0.14 | ±0.15 | ±0.16 | ±0.17 | ±0.20 |
| 3.15~ | ±0.16 | ±0.17 | ±0.19 | ±0.20 | - |

Width Allowance

POSCO, KS, JIS Standards

| Cutting Method | Width(mm) | POSCO | KS, JIS Allowance(mm) |
|-------------------|-----------|-------|-----------------------|
| Standard Cutting | ~1250 | 0~+5 | 0~+7 |
| | 1250~ | | 0~+10 |
| Precision Cutting | ~1250 | 0~+2 | 0~+3 |
| | 1250~ | | 0~+4 |

Length Allowance

POSCO, KS, JIS Standards

| Length(mm) Cutting Method | ~1,000 | 1,000~2,000 | 2,000~3,000 | 3,000~4,000 | 4,000~6,000 |
|--------------------------------|--------|-------------|-------------|-------------|-------------|
| Standard Cutting | 0~+10 | | 0~+15 | | 0~+20 |
| Re-cutting & Precision Cutting | 0~+3 | 0~+4 | 0~+6 | 0~+8 | - |

Planarization

POSCO, KS, JIS Standards

| Width(mm) Types | Curvature | Edge deformation | Center deformation |
|--------------------|-----------|------------------|--------------------|
| ~1000 | 12(2) | 8(2) | 6(2) |
| 1000~1250 | 15(3) | 9(2) | 8(2) |
| 1250~1600 | 15(4) | 11(3) | 8(2) |
| 1600~ | 20(5) | 13(4) | 9(2) |

- In general, numbers inside parentheses are applied to stretcher leveler processed steel.
- Curvature: bending of the entire plate. There are two axes of bending: in the rolling direction and perpendicular to the rolling direction.
- Edge deformation: Bending occurs at the edges in the width axes and the center remains flat.
- Center deformation: Bending occurs in the center and the edges remain flat.

Horizontal Bending

POSCO, KS, JIS Standards

| Width(mm) Division | Steel Plates(mm) | | Steel Rods |
|-----------------------|------------------|------------------------------|------------|
| | Length ~2000 | Length 2000~ | |
| ~630 | 4 | 4 per random length of 2,000 | |
| 630~ | 2 | 2 per random length of 2,000 | |

Surface Finishes and Oiling

Surface Finishes

Dull Finish, also called Pear-Skin Finish or Egg-Shell Texture, is a steel surface finish in which designated roughness is produced in its surface. To create these fine roughness, roll surface is grinded and treated with special abrasive blasting method. This surface finish allows lubricant to adhere to the surface more evenly, thus reducing friction during subsequent machining. Also, paint adheres better and lasts longer.

Bright Finish, created by passing the steel through highly polished rollers, produces exquisite surface smoothness and a mirror-like luster. Its highly luminous surface makes such treated steel well suited for decorative use.

* Please consult with our sales representative when ordering steel products with Bright Finish.

| Dull Finish, Ra (μm) | | | | Bright Finish, Ra (μm) | |
|----------------------|-----------|-----------|-----------|------------------------|-----------|
| D3 | D5 | D7 | D9 | B2 | B4 |
| 1.50~2.50 | 1.00~1.80 | 0.70~1.30 | 0.40~0.80 | 0.30~0.50 | 0.15~0.30 |

Oiling

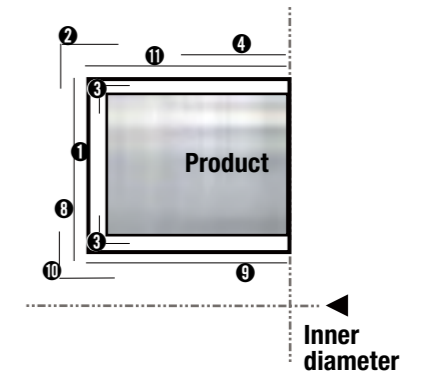
POSCO protects finished products by spraying rust-preventative oil on the steel surface to stop rust from occurring during shipment and warehousing. Upon ordering, our customers can specify the type and amount of oil applied in accordance with their machining needs. Of course, no-oiled steels are very rust-prone and require extreme care to avoid it. Also, rusting remains a likely occurrence with DOS oiled steels.

| Specification | Code | Amount of oil used on surfaces(mg/m ²) | |
|----------------|-------------|--|-------------|
| Regular Oiling | Heavy | AH | 3,000~4,500 |
| | General | AG | 1,800~3,000 |
| | Light | AL | 800~1,800 |
| | Thin | AT | 200~800 |
| Dos | Deep | BD | 50~100 |
| | Slight | BS | 25~50 |
| | Ultra light | BU | 10~25 |
| No Oiling | XX | - | |

Packaging & Marking



Name of outer pack



Name of cross-sectional pack

| NO | Name | Material |
|----|---------------------|-----------------|
| ① | PP VCI WRAP | VINYL |
| ② | OUTER RING | STEEL |
| ③ | CORNER WRAP | ANTI-RUST BOARD |
| ④ | OUTER PROTECT BOARD | STEEL |
| ⑤ | HORIZONTAL BAND | STEEL |
| ⑥ | CENTER BAND | PET |
| ⑦ | VERTICAL BAND | STEEL |
| ⑧ | SIDE BOARD | PLASTIC |
| ⑨ | INNER PROTECT BOARD | PLASTIC |
| ⑩ | INNER RING | STEEL |
| ⑪ | OUTER PROTECT BOARD | ANTI-RUST BOARD |

* Packing Type and materials are changeable.

Appendix

KS Standards

■ Chemical Composition

| Specification | C(%) | Mn(%) | P(%) | S(%) |
|---------------|-------|-------|--------|--------|
| KS-SPCC | ~0.15 | ~0.60 | ~0.050 | ~0.050 |
| KS-SPCD | ~0.12 | ~0.50 | ~0.040 | ~0.040 |
| KS-SPCE | ~0.10 | ~0.45 | ~0.030 | ~0.030 |
| KS-SPCF | ~0.08 | ~0.45 | ~0.030 | ~0.030 |
| KS-SPCG | ~0.02 | ~0.25 | ~0.020 | ~0.020 |

■ Mechanical Properties

| Specification | Yield Strength (N/mm ²) | Tensile Strength (N/mm ²) | Ductility(%) | | | | | | | Hardness | | |
|---------------|-------------------------------------|---------------------------------------|--------------|--------|-----------|----------|----------|----------|----------|----------|---------|-----|
| | | | 0.25t~ | 0.25t~ | 0.25~0.3t | 0.3~0.4t | 0.4~0.6t | 0.6~1.0t | 1.0~1.6t | 1.6~2.5t | 2.5t~ | HRB |
| KS-SPCC | - | - | - | - | - | - | - | - | - | - | - | - |
| KS-SPCCT | - | 270~ | 28~ | 31~ | 34~ | 36~ | 37~ | 38~ | 39~ | - | - | - |
| KS-SPCD | *(~240) | 270~ | 30~ | 33~ | 36~ | 38~ | 39~ | 40~ | 41~ | - | - | - |
| KS-SPCE | *(~220) | 270~ | 32~ | 35~ | 38~ | 40~ | 41~ | 42~ | 43~ | - | - | - |
| KS-SPCF | *(~210) | 270~ | - | - | 40~ | 42~ | 43~ | 44~ | 45~ | - | - | - |
| KS-SPCG | *(~190) | 270~ | - | - | 42~ | 44~ | 45~ | 46~ | - | - | - | - |
| KS-SPCC-1 | - | - | - | - | - | - | - | - | - | 85~ | 170~ | - |
| KS-SPCC-2 | - | - | - | - | - | - | - | - | - | 74~89 | 135~185 | - |
| KS-SPCC-4 | - | - | - | - | - | - | - | - | - | 65~80 | 115~150 | - |
| KS-SPCC-8 | - | - | - | - | - | - | - | - | - | 50~71 | 95~130 | - |

Remarks) 1. Target Temper Grade: (S) Standard, (A) As-annealed. *Rigid steel products (8, 4, 2, and 1) are excluded.
 2. SPCF: Non-aging deep drawing quality, SPCG: Non-aging extra deep drawing quality. We guarantee deep drawing qualities for six months from date of purchase.
 3. *The yield strength value in parentheses is for reference only. The delivered yield performance will be subject to agreement between the customer and manufacturer.

JIS Standards

■ Chemical Composition

| Specification | C(%) | Mn(%) | P(%) | S(%) |
|---------------|-------|-------|--------|--------|
| JS-SPCC | ~0.15 | ~0.60 | ~0.100 | ~0.035 |
| JS-SPCD | ~0.10 | ~0.50 | ~0.040 | ~0.035 |
| JS-SPCE | ~0.08 | ~0.45 | ~0.030 | ~0.030 |
| JS-SPCF | ~0.06 | ~0.45 | ~0.030 | ~0.030 |
| JS-SPCG | ~0.02 | ~0.25 | ~0.020 | ~0.020 |

■ Mechanical Properties

| Specification | Yield Strength (N/mm ²) | Tensile Strength (N/mm ²) | Ductility(%) | | | | | | | Hardness | | |
|---------------|-------------------------------------|---------------------------------------|--------------|--------|-----------|----------|----------|----------|----------|----------|---------|-----|
| | | | 0.25t~ | 0.25t~ | 0.25~0.3t | 0.3~0.4t | 0.4~0.6t | 0.6~1.0t | 1.0~1.6t | 1.6~2.5t | 2.5t~ | HRB |
| JS-SPCC | - | - | - | - | - | - | - | - | - | - | - | - |
| JS-SPCCT | - | 270~ | 28~ | 31~ | 34~ | 36~ | 37~ | 38~ | 39~ | - | - | - |
| JS-SPCD | *(~240) | 270~ | 30~ | 33~ | 36~ | 38~ | 39~ | 40~ | 41~ | - | - | - |
| JS-SPCE | *(~220) | 270~ | 32~ | 35~ | 38~ | 40~ | 41~ | 42~ | 43~ | - | - | - |
| JS-SPCF | *(~210) | 270~ | - | - | 40~ | 42~ | 43~ | 44~ | 45~ | - | - | - |
| JS-SPCG | *(~190) | 270~ | - | - | 42~ | 44~ | 45~ | 46~ | - | - | - | - |
| JS-SPCC-1 | - | (550~) | - | - | - | - | - | - | - | 85~ | 170~ | - |
| JS-SPCC-2 | - | (440~590) | - | - | - | - | - | - | - | 74~89 | 135~185 | - |
| JS-SPCC-4 | - | (370~490) | (10~) | | | | | | | 65~80 | 115~150 | - |
| JS-SPCC-8 | - | (290~410) | (25~) | | | | | | | 50~71 | 95~130 | - |

Remarks) The numbers marked with an asterisk in the Yield Strength, Tensile Strength, and Ductility sections are for reference only. The actual delivered performance will be subject to agreement between the customer and manufacturer.

Appendix

ASTM Standards

■ Chemical Composition

| Specification | C(%) | Mn(%) | SI(%) | P(%) | S(%) | AL(%) | CU(%) | NI(%) | CR(%) | MO(%) | V(%) | NB(%) | TI(%) | N(%) | B(%) |
|---------------|-----------|-------|-------|--------|--------|-------|-------|-------|-------|-------|--------|--------|--------|------|------|
| A1008 CSA | ~0.10 | ~0.60 | - | ~0.030 | ~0.035 | - | ~0.20 | ~0.20 | ~0.15 | ~0.06 | ~0.008 | ~0.008 | ~0.025 | - | - |
| A1008 CSB | 0.02~0.15 | ~0.60 | - | ~0.030 | ~0.035 | - | ~0.20 | ~0.20 | ~0.15 | ~0.06 | ~0.008 | ~0.008 | ~0.025 | - | - |
| A1008 CSC | ~0.08 | ~0.60 | - | ~0.100 | ~0.035 | - | ~0.20 | ~0.20 | ~0.15 | ~0.06 | ~0.008 | ~0.008 | ~0.025 | - | - |
| A1008 DSA | ~0.08 | ~0.50 | - | ~0.020 | ~0.030 | 0.01~ | ~0.20 | ~0.20 | ~0.15 | ~0.06 | ~0.008 | ~0.008 | ~0.025 | - | - |
| A1008 DSB | 0.02~0.08 | ~0.50 | - | ~0.020 | ~0.030 | 0.02~ | ~0.20 | ~0.20 | ~0.15 | ~0.06 | ~0.008 | ~0.008 | ~0.025 | - | - |
| A1008 DDS | ~0.06 | ~0.50 | - | ~0.020 | ~0.025 | 0.01~ | ~0.20 | ~0.20 | ~0.15 | ~0.06 | ~0.008 | ~0.008 | ~0.025 | - | - |
| A1008 EDDS | ~0.02 | ~0.40 | - | ~0.020 | ~0.020 | 0.01~ | ~0.10 | ~0.10 | ~0.15 | ~0.03 | ~0.10 | ~0.10 | ~0.15 | - | - |

■ Mechanical Properties

| Specification | Yield Strength (N/mm ²) | Tensile Strength (N/mm ²) | Ductility(%) | Hardness(HRB) | r _m value | n value |
|---------------|-------------------------------------|---------------------------------------|--------------|---------------|----------------------|-----------|
| A1008 CSA | 140~275 | - | 30~ | ~70 | - | - |
| A1008 CSB | 140~275 | - | 30~ | ~70 | - | - |
| A1008 CSC | 140~275 | - | 30~ | ~70 | - | - |
| A1008 DSA | 150~240 | - | 30~ | ~60 | 1.3~1.7 | 0.17~0.22 |
| A1008 DSB | 150~240 | - | 30~ | ~60 | 1.3~1.7 | 0.17~0.22 |
| A1008 DDS | 115~200 | - | 30~ | ~55 | 1.4~1.8 | 0.20~0.25 |
| A1008 EDDS | 105~170 | - | 30~ | ~45 | 1.7~2.1 | 0.23~0.27 |

EN Standards

■ Chemical Composition

| Specification | C(%) | Mn(%) | SI(%) | P(%) | S(%) | CU(%) | NI(%) | CR(%) | MO(%) | V(%) | NB(%) | TI(%) |
|---------------|-------|-------|-------|--------|--------|-------|-------|-------|-------|------|-------|-------|
| DC01 | ~0.12 | ~0.60 | - | ~0.045 | ~0.045 | - | - | - | - | - | - | - |
| DC03 | ~0.10 | ~0.45 | - | ~0.035 | ~0.035 | - | - | - | - | - | - | - |
| DC04 | ~0.08 | ~0.40 | - | ~0.030 | ~0.030 | - | - | - | - | - | - | - |
| DC05 | ~0.06 | ~0.35 | - | ~0.025 | ~0.025 | - | - | - | - | - | - | - |
| DC06 | ~0.02 | ~0.25 | - | ~0.020 | ~0.020 | - | - | - | - | - | - | ~0.3 |
| DC07 | ~0.01 | ~0.20 | - | ~0.020 | ~0.020 | - | - | - | - | - | - | ~0.2 |

■ Mechanical Properties


| Specification | Yield Strength(N/mm ²) | | | Tensile Strength (N/mm ²) | Ductility(%) | | | Anisotropy | | R90 | N |
|---------------|------------------------------------|-------------|------------|---------------------------------------|--------------|-------------|------------|--|------------------------|-----------|------|
| | 0.23~0.501 | 0.501~0.701 | 0.701~3.01 | | 0.23~0.501 | 0.501~0.701 | 0.701~3.01 | Sampling Lot/Length/Width/Orientation of Test Sample | Number of Test Samples | | |
| DC01 | 140~320 | 140~300 | 140~280 | 270~410 | 24~ | 26~ | 28~ | - | - | - | - |
| | 0.500~0.501 | 0.501~0.701 | 0.701~3.01 | - | 0.500~0.501 | 0.501~0.701 | 0.701~3.01 | 05~2.01 | | 2.01~3.21 | |
| DC03 | 140~280 | 140~260 | 140~240 | 270~370 | 30~ | 32~ | 34~ | 51/T/C/C | 05 | 1.3~ | 1.1~ |
| DC04 | 140~250 | 140~230 | 140~210 | 270~350 | 34~ | 36~ | 38~ | 51/T/C/C | 05 | 1.6~ | 1.4~ |
| DC05 | 140~220 | 140~200 | 140~180 | 270~330 | 36~ | 38~ | 40~ | 51/T/C/C | 05 | 1.9~ | 1.7~ |
| DC06 | 120~210 | 120~190 | 120~170 | 270~330 | 37~ | 39~ | 41~ | 51/T/C/C | 05 | 2.1~ | 1.9~ |
| DC07 | 100~190 | 100~170 | 100~150 | 250~310 | 40~ | 42~ | 44~ | 51/T/C/C | 05 | 2.5~ | 2.3~ |

COLD ROLLED STEEL

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