

# Cold Rolled Steel

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Cold rolled steel sheet product is cold reduced coil of hot-rolled, pickled product to a thinner thickness.

The cold reduction operation induces excellent finish and superb mechanical properties.



## Main application



**Automobile**

Construction, Door,  
Door Frame, Front or  
Rear Fender, Oil Filter, etc.



**Electronics**

Refrigerator, Toaster,  
Fluorescent Lamp  
Reflector, etc.



**Construction**

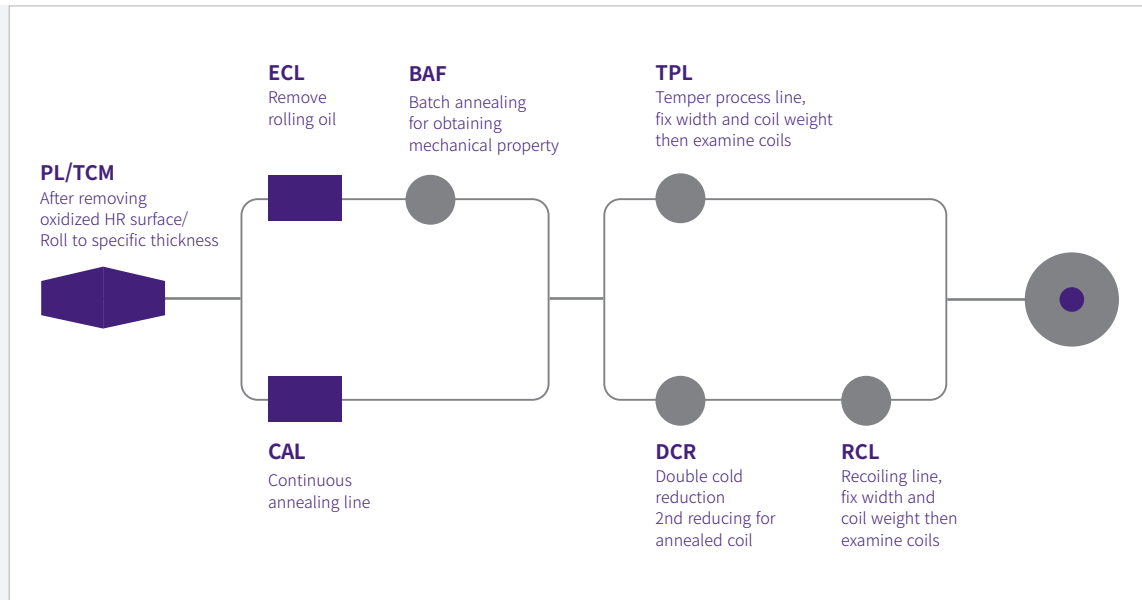
Lightweight section  
steel, Switchboard, Pipe,  
Welding, Equipment outer  
sheet, Roofing, etc.



**Others**

Toys, Furniture ,  
Office Machine Parts, etc.

## Manufacturing Process



## Specification

<b>Thickness(mm)</b>	0.13 ~ 3.0
<b>Width(mm)</b>	600 ~ 1,600
<b>Coil Weight</b>	Max. 45T
<b>Coil ID(mm)</b>	508/610

## Characteristics

Controlled Sheet Thickness
Beautiful Surface Finish
Excellent Flatness
High Formability

## Classification by Steel Quality

Classification	Characteristic
<b>Commercial Quality</b>	Standard product for general application such as bending and simple drawing.
<b>Drawing Quality</b>	Product for applications requiring drawing steel characteristics compared SPCC.
<b>Deep Drawing Quality</b>	Improved drawability compared with SPCC. Provides excellent finish even after deep drawing.
<b>Non-aging Deep Drawing Quality</b>	Best for deep drawing, will not induce stretcher strain.
<b>High Strength Steel</b>	Satisfied For Automotive parts, high-strength, high-formed technical needs ※ Specifications : high strength steel 340 / 440 / 590

### Classification by Surface Finish

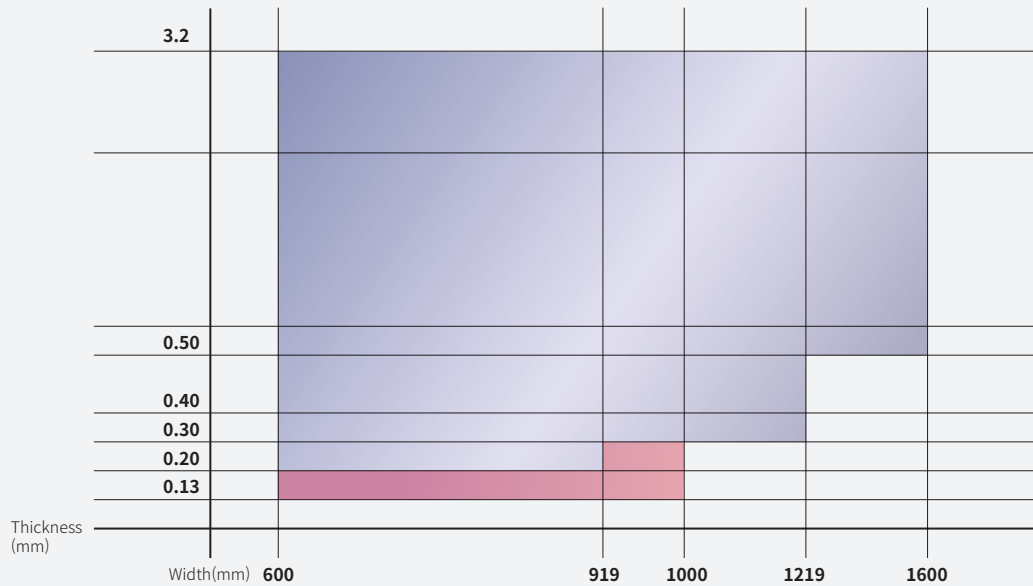
Classification	Characteristic
<b>Dull Finish</b>	Widely used for most application. Uniform dull finish is suitable for painting and lacquering.
<b>Bright Finish</b>	Additionally buffed and polished after plating. Suitable for smooth, reflective bright finish application.

### Classification by Edge

Classification	Characteristic
<b>Mill Edge</b>	Edges produced by trimming hot rolled coils during the pickling process prior to cold rolling.
<b>Slit Edge(Trimmed Edge)</b>	Edges produced by shearing or slitting at the cold rolling process.

※ Rust Preventive Oils : Provides protection from corrosion (rusting) during shipment & storage.  
Customer can choose Anti Rust Oil (Heavy, Normal, Light Oiling), DOS Oiling or Unoining.

### Available Size



- Sizes indicated in   will be subjected to negotiation.
  - Coils are available inside diameter to be 508mm (20 in) or 610mm (24 in).
  - Coils are available in weight ranging between 2.5Tons(5,500 lbs) and 20Tons(44,000 lbs).
- ※ There may be restrictions for each type of steel, so please consult with the sales and quality department in advance when ordering new products.

# Special Products

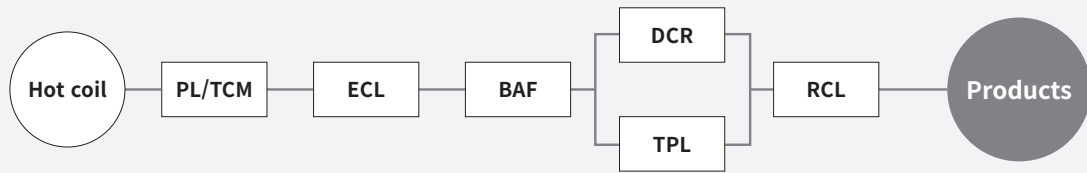
## Bright

Excellent Surface Finish



• Main use: stationery (binder, tongs), stove reflector, rail, various accessories, jewelry, etc.

## Manufacturing Process



## Size Availability

Classification	Thickness(mm)	Width(mm)
CQ, 1/4H, 1/8H	0.20 ~ 0.49	700 ~ 1219
	0.49 ~ 2.30	700 ~ 1600
1/2H	0.20 ~ 0.60	700 ~ 1219
	0.61 ~ 0.70	700 ~ 914

## Mechanical Properties

Classification	Grade	Hardness(HRB)	Surface Roughness( $\mu$ Ra)	Gloss(Gu20")
Commodity	SB	55 $\geq$	Max. 0.20	400 $\leq$
	1/8H (8B)	50 ~ 71		400 $\leq$
Hard Type	1/4H (4B)	65 ~ 80	Max. 0.20	250 $\leq$
	1/2H (2B)	74 ~ 89		250 $\leq$
	F/H (1B)	85 $\leq$	Max. 0.40	

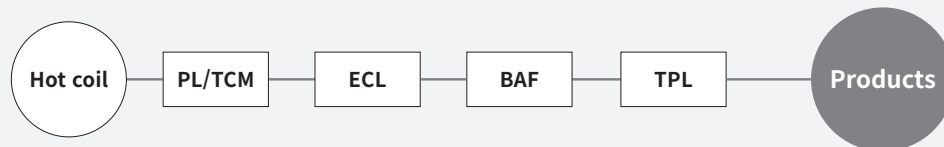
## Door Frame



• Maintains window glass, reduces noises, water tights, supports car structure

Automobile door frame

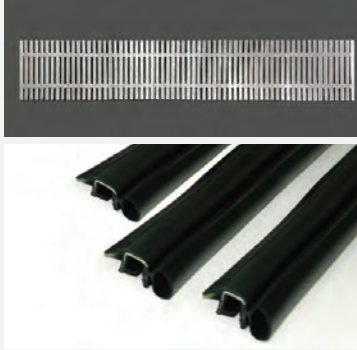
## Manufacturing Process



## Size Availability

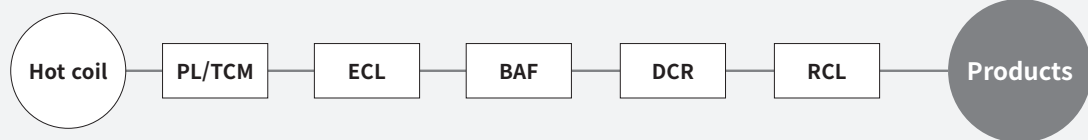
Thickness(mm)	Width(mm)
0.7 ~ 1.5	914 ~ 1600

## Weather Strip Reinforcement



- Weather Strip
  - Waterproof packing that prevents water, dust, etc. from entering by attaching the opening and closing doors of motor vehicles.
- Weather Strip Reinforcement
  - It plays the role of fixing the shape of the car weather strip

## Manufacturing Process



## Size Availability

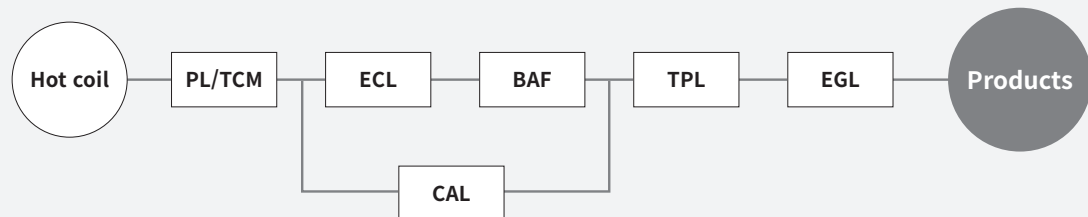
Thickness(mm)	Width(mm)
0.3 ~ 0.7	700 ~ 1220

## EMBO Steel sheet



- Embossing treatment on the surface of the cold-rolled steel sheet gives a gorgeous feeling and has anti-fingerprint properties
- Can be produced as EGI coated products

## Manufacturing Process



## Size Availability

	Thickness(mm)	Width(mm)
CR	0.6 ~ 2.0	700 ~ 1600
EGI	0.6 ~ 1.6	700 ~ 1219

※ Prior consultation is required when requesting a new design.

## Classification & Chemical Composition (only for reference)

Symbol	Quality	Chemical composition(%)			
		C	Mn	P	S
SPCC	Commercial Quality	Max. 0.15	Max. 1.00	Max. 0.100	Max. 0.035
SPCD	Drawing Quality	Max. 0.10	Max. 0.50	Max. 0.040	Max. 0.035
SPCE	Deep Drawing Quality	Max. 0.08	Max. 0.45	Max. 0.030	Max. 0.030

**Remarks**

- When the steel sheet and coil of standard temper grade and as-annealed one in quality SPCC are requested by the purchaser to guarantee tensile test values, letter symbol T shall be suffixed to the symbol of quality, thus appears SPCC T.
- When the steel sheet and coil of standard temper grade in quality SPCE are requested by the purchaser to guarantee non-aging property, letter symbol N shall be suffixed to the symbol of quality, thus appears SPCE N.

## Mechanical Properties

### Tensile Strength, Elongation and non-aging

Tension test Symbol	Tensile strength N/mm <sup>2</sup>	Elongation(%)							Tension test piece
		0.25 and over	0.25 to 0.30, excl.	0.30 to 0.40, excl.	0.40 to 0.60, excl.	0.60 to 1.0, excl.	1.0 to 1.6, excl.	1.6 to 2.5, excl.	
SPCC	( Min. 270)	(Min. 28)	(Min. 31)	(Min. 34)	(Min. 36)	(Min. 37)	(Min. 38)	( Min. 39)	No.3 in the direction of rolling
SPCD	Min. 270	Min. 30	Min. 33	Min. 36	Min. 38	Min. 39	Min. 40	Min. 41	
SPCE	Min. 270	Min. 32	Min. 35	Min. 38	Min. 40	Min. 41	Min. 42	Min. 43	

**Remarks**

- The tension test value does not usually to Class 1 When required by the purchaser, however, the value in paren these applies.
- For those less than 0.60 mm in thickness, the tension test shall generally be omitted.
- This Table applies to those of 30 mm or more in width.
- When the non-aging is designated for the normally refined steel sheet and strip of Class 3, it shall be guaranteed for 6 months after being delivered by the manufacturing factory. The term "non-aging" means the property not to produce stretcher strain during the time of being worked.
- Units and numerical values indicated within the parentheses(except the value shown in the upper side of the first column and in the following columns in the Class 1 line) are based on the International System of Units(SI)and are added as informative notes, where 1 n/mm<sup>2</sup>=1 MPa.

### Bending

Temper grade	Symbol of temper grade	Bend test		
		Bend angle	Inside radius	Test piece
As annealed	A	180°	Close contact	No.3 in the direction of rolling
Standard temper grade	S	180°	Close contact	
1/8 hard	8	180°	Close contact	
1/4 hard	4	180°	0.5 x Thickness	
1/2 hard	2	180°	1.0 x Thickness	
Full hard	1	-	-	

**Remarks** The test maybe omitted for the steel sheet and strip as annealed and standard temper grade.

### Hardness

Temper grade	Symbol of temper grade	Hardness	
		HRB	HV
1/8 hard	8	50 ~ 71	95 ~ 130
1/4 hard	4	65 ~ 80	115 ~ 150
1/2 hard	2	74 ~ 89	135 ~ 185
Full hard	1	Min. 85	Min. 170

**Remarks** Either Rockwell or Vickers hardness shall be used to the hardness.

## Permissible Variations in Dimension & Shapes

### Thickness Tolerances

(Unit : mm)

Division by nominal thickness	Division by nominal width				
	Under 600	600 to 1,000, excl.	1,000 to 1,250, excl.	1,250 to 1,600, excl.	1,600 and over
Under 0.25	±0.03	±0.03	±0.03	-	-
0.25 to 0.40, excl.	±0.04	±0.04	±0.04	-	-
0.40 to 0.60, excl.	±0.05	±0.05	±0.05	±0.06	-
0.60 to 0.80, excl.	±0.06	±0.06	±0.06	±0.06	±0.07
0.80 to 1.00, excl.	±0.06	±0.06	±0.07	±0.08	±0.09
1.00 to 1.25, excl.	±0.07	±0.07	±0.08	±0.09	±0.11
1.25 to 1.60, excl.	±0.08	±0.09	±0.10	±0.11	±0.13
1.60 to 2.00, excl.	±0.10	±0.11	±0.12	±0.13	±0.15
2.00 to 2.50, excl.	±0.12	±0.13	±0.14	±0.15	±0.17
2.50 to 3.15, excl.	±0.14	±0.15	±0.16	±0.17	±0.20
3.15 and over	±0.16	±0.17	±0.19	±0.20	-

### Width Tolerances

(Unit : mm)

Division by nominal width	
Under 1,250	1,250 or over
+7	+10
0	0

**Remarks** To the stretcher-leveler finished steel sheet, the plus side tolerance does not apply.

### Length Tolerances

(Unit : mm)

Division by nominal length	
Under 2,000	2,000 to 4,000 excl.
+10 - 0	+15 - 0
	4,000 to 6,000 excl.
	+20 - 0

**Remarks** To the stretcher-leveler finished steel sheet, the plus side tolerance does not apply.

### Flatness Tolerances

(Unit : mm)

Division by nominal thickness	Classification of warpage		
	Bow	Edge wave	Centre buckle
Under 1,000	Max. 12	Max. 8	Max. 6
1,000 to 1,250, excl.	Max. 15	Max. 9	Max. 8
1,250 to 1,600, excl.	Max. 15	Max. 11	Max. 8
1,600 and over	Max. 20	Max. 13	Max. 9

**Remarks** Flatness shall be measured by the steel sheets put on the surface plate, the value of flatness is the remainder of the maximum strain from which the specified thickness of the steel is subtracted, shall apply to the upper surface of the steel sheets.

### Camber Tolerances

(Unit : mm)

Division by nominal thickness	Steel sheet	
	Under 2,000 in length	Under 2,000 and over in length
30 to 40, excl.	Max. 8	Max. 8mm/2,000mm At any point
40 to 600, excl.	Max. 4	Max. 4mm/2,000mm At any point
600 or over	Max. 2	Max. 2mm/2,000mm At any point

**Remarks** The above table does not apply to the abnormal part of steel strip.

**Classification & Chemical Composition (only for reference)**

Designation	C	Mn	P	S	Al	YP		EL(%)
						ksi	Mpa	
CS Type A ①②③④	Max. 0.10	Max. 0.60	Max. 0.025	Max. 0.035	-	20 to 40	140 to 275	≥ 30
	Max. 0.02 to 0.15							
DS Type A ②	Max. 0.08	Max. 0.50	Max. 0.020	Max. 0.020	Min. 0.01	22 to 35	150 to 240	≥ 36
	Max. 0.02 to 0.08				Min. 0.02			
DDS	Max. 0.06	Max. 0.50	Max. 0.020	Max. 0.020	Min. 0.01	17 to 29	115 to 200	≥ 38
EDDS	Max. 0.02	Max. 0.40	Max. 0.020	Max. 0.020	Min. 0.01	15 to 25	105 to 170	≥ 40

- ① When an aluminum deoxidized steel is required for the application, it is permissible to order Commercial Steel (CS) to a minimum of 0.01% total aluminum.
- ② Specify Type B to avoid Carbon levels below 0.02%
- ③ It is permissible to furnish as a vacuum degassed or chemically stabilized steel, or both, at the producer's option.
- ④ For carbon levels less than or equal to 0.02%, it is permissible to use vanadium, columbium, or titanium, or combination thereof, as stabilizing elements at the producer's option. In such cases, the applicable limit for vanadium or columbium shall be 0.10% max. and the limit on titanium shall be 0.15 max.

**Permissible variations in Dimension & Shapes, ASTM A568/568M**

**Thickness Tolerances**

Specified Width, mm		Specified Ordered Thickness, mm <sup>B</sup>				
Over	Through	Through 0.4	Over 0.4 to 1.0, incl.	Over 1.0 to 1.2, incl.	Over 1.2 to 2.5, incl.	Over 2.5 to 4.0, incl.
Thickness Tolerances Over, mm, No Tolerance Under <sup>C</sup>						
...	1800	0.05	0.08	0.10	0.12	0.15
1800	2000	... <sup>D</sup>	0.08	0.10	0.15	0.18
2000	... <sup>D</sup>	... <sup>D</sup>	0.15	0.15	0.18	0.20

- A 0.55 mm minimum thickness for high-strength low-alloy.
- B The specified thickness range captions apply independent of whether the ordered thickness is stated as a nominal or minimum.
- C The tolerances provided in the table are based on minimum thickness (tolerance over, no tolerance under). For nominal thickness, the tolerance is divided equally over and under.
- D Where an ellipsis (...) appears in the table, the requirements have not been defined.

**With Tolerances**

Specified Width, mm		Width Tolerance, Over Only, mm
Over	Through	
...	600 A	3
600	1200	5
1200	1500	6
1500	1800	8
1800	...	10

**Length Tolerances**

Specified Length, mm		Tolerance Over Specified Length (No Tolerance Under), mm
Over	Through	
300	1500	6
1500	3000	20
3000	6000	35
6000	...	45

## Flatness Tolerances

It has not been practical to formulate flatness tolerance for cold-rolled carbon steel strip to represent the wide range of widths and thicknesses and variety of tempers produced.

## Temper and Hardness

Temper	Thickness, in.	Rockwell Hardness	
		Min.	Max.(approx)
No.1 (hard)	Under 0.300 to 0.070, incl.	B84.0	-
	Under 0.070 to 0.040, incl.	B90.0	-
	Under 0.040 to 0.025, incl.	30T 76	-
	Under 0.025	15T 90	-
Softer Tempers <sup>A</sup>			
No.2 (half-hard)	Under 0.300 to 0.040, incl.	B 70.0	B85
	Under 0.040 to 0.025, incl.	30T 63.5	30T 73.5
	Under 0.025	30T 83.5	15T 88.5
No.3 (quarter-hard)	Under 0.300 to 0.040, incl.	B60	B75
	Under 0.040 to 0.025, incl.	30T 56.5	30T 67
	Under 0.025	15T 80	15T 85
No.4 <sup>B</sup> (skin-rolled)	Under 0.300 to 0.040, incl.	-	B 70.0
	Under 0.040 to 0.025, incl.	-	B65
	Under 0.025	-	B65
No.5 <sup>B</sup> (dead-soft)	Under 0.300 to 0.040, incl.	-	B55
	Under 0.040 to 0.025, incl.	-	30T 53
	Under 0.025	-	15T 78.5

A Rockwell hardness values apply at time of shipment. Aging may cause slightly higher values when tested at a later date.

B Number 4 and 5 temper may sometime be ordered with a carbon range of 0.15-0.25%. In each instance the maximum hardness requirement is established by agreement.

## Camber Tolerances

Specified Width, in (mm)		Camber Tolerance, in (mm)
Over	Through	
...	1200	4
<b>1200</b>	1800	5
<b>1800</b>	2400	6
<b>2400</b>	3000	8
<b>3000</b>	3700	10
<b>3700</b>	4300	13
<b>4300</b>	4900	16
<b>4900</b>	5500	19
<b>5500</b>	6000	22
<b>6000</b>	9000	32
<b>9000</b>	12200	38

A The Camber tolerance for coils is 25.0 mm in any 6000 mm.

- Note**
1. Camber is the greatest deviation of a side edge from a straight line, the measurement being taken on the concave side with a straight edge.
  2. Camber tolerances as shown in the table are for any 8 ft.(2000 mm) of length. For strip length under 8 ft.(2000 mm), camber tolerance shall be subject to negotiation.
  3. When the camber tolerances shown in Table are suitable for a particular purpose, cold-rolled strip is sometimes machine straightened.