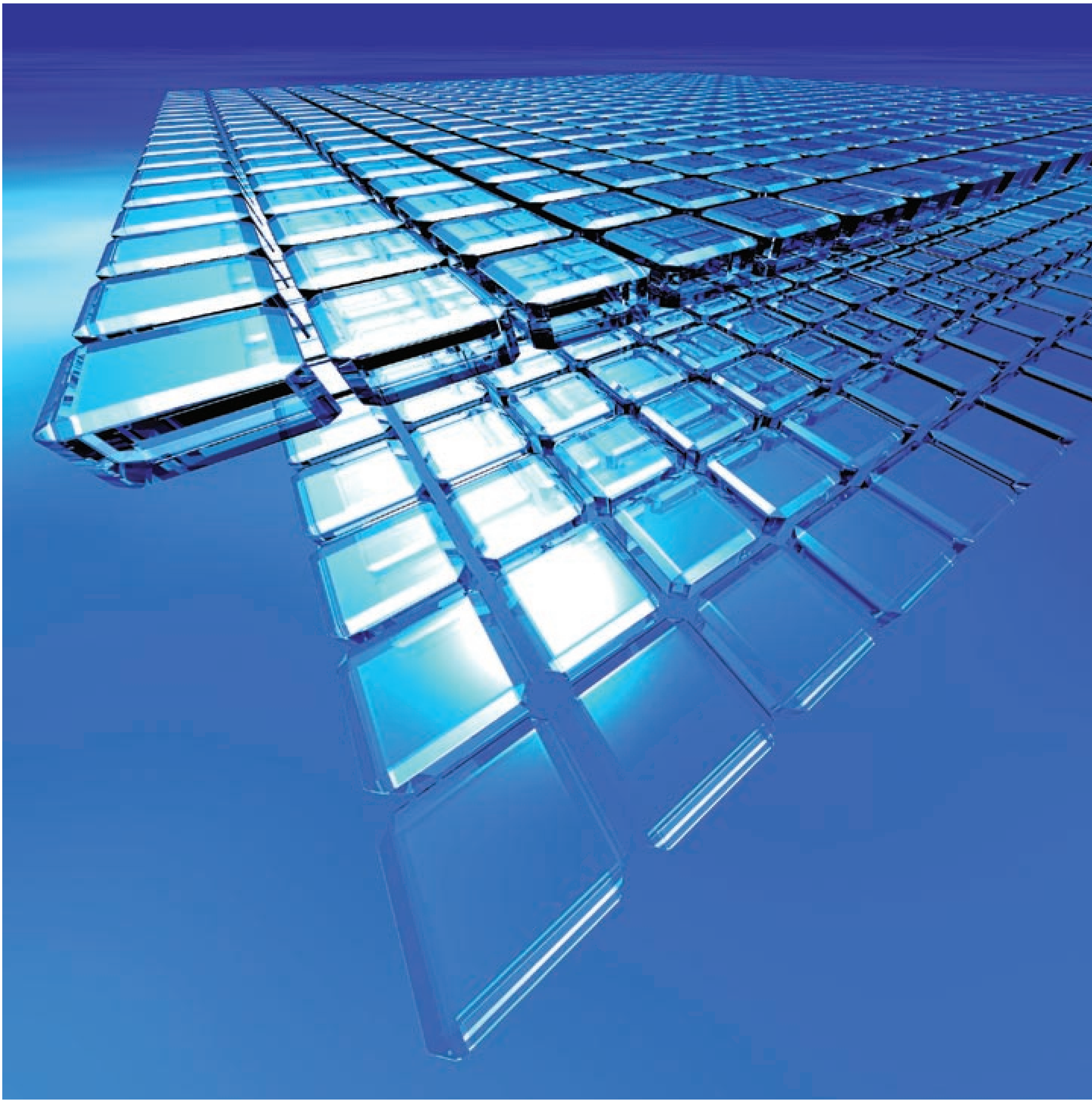
COLD ROLLED STEEL SHEET



JFE Steel Corporation

Cold rolled steel sheets offer a variety of outstanding properties, including easy formability and a smooth, clean surface, and are used in automobiles, appliances, furniture, and many other everyday items.

JFE Steel Corporation who holds ISO9001, QS-9000 and ISO14001 certifications, produces a full range of cold rolled products for these and other applications. Because strict quality requirements are now applied to meet the needs of improved product functions, JFE has adopted an integrated quality control system. Customer requirements are reflected in products from the quality design stage in order to supply customers with the optimum material for each application in a timely manner.

Based on a wealth of experience and an advanced production system, JFE is continuing to develop new technologies and products which meet the needs of the times.

West Japan Works (Fukuyama)

Contents

West Japan Works (Kurashiki)

East Japan Works (Chiba)

Characteristics

Superior workability

JFE's cold rolled products have excellent formability and minimal deviation in mechanical properties thanks to the company's accumulated technical expertise, newly constructed and modernized facilities and innovative technologies, and integrated quality control system extending from raw materials to the final product.

Superior surface quality and dimensional accuracy

Modern facilities, advanced operational technologies, strict inspection, and integrated quality control ensure excellent surface quality. Dimensional accuracy is guaranteed by an automatic thickness control system using advanced numerical models.

Wide range of product standards

JFE produces cold rolled products to meet a wide range of product standards, including JIS and other public standards, as well as internal JFE standards. Products range from general use, including extra deep drawing quality and bake hardening sheets, to high strength sheets and sheets for enameling and other special applications.

Wide range of sizes

The available size range includes thickness from 0.14mm to 3.2 mm and width up to 1,850mm.

Superior shape

Applying tension leveler ensures superior strip flatness.

Outstanding technical service

To meet the requirements of diverse clients, JFE has established a complete technical servicing system with advises clients on questions ranging from material properties to processing technologies.

East Japan Works (Keihin)

Manufacturing process

Fully continuous cold strip mill

Cold rolling

The thickness accuracy of cold rolled products is determined by the cold rolling process. Rolling force and strip tension are computer-controlled to minimize thickness deviations during rolling, based on measurements of the strip thickness at the entry and delivery sides of the mill.

Cleaning

Rolling oil on the cold rolled strip is burned off during annealing, which is the next process after cold rolling. Other types of rolling oil are removed by electrolytic cleaning prior to annealing. In particular, electrolytic cleaning is used with products which require a clean surface to ensure good paintability.

Annealing

The formability of products is determined by annealing. Because cold rolling significantly increases material hardness, making forming difficult, annealing is performed to improve ductility by inducing a recrystallized structure in the steel. As the annealing process, coils are piled and covered by the box and annealed and this is called the batch annealing. The other is the continuous annealing process, in which coils are continuously treated. JFE uses two annealing technologies, depending on product requirements.
JFE is among the world's leaders in process technology for the continuous annealing line (CAL), and has also used the CAL to develop a wide range of new products, from 1500N/mm^2 high strength steel to non-aging extra deep drawing grade. JFE's advanced CALs are highly computerized and feature automatic quality assurance equipment, such as an automatic surface inspection device which was developed by JFE.

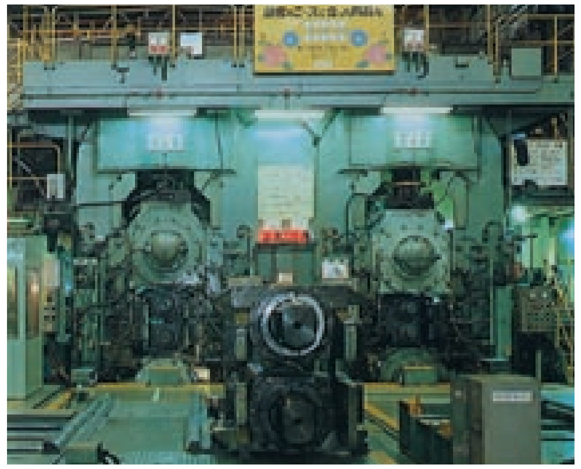
Continuous annealing line

Skinpass rolling

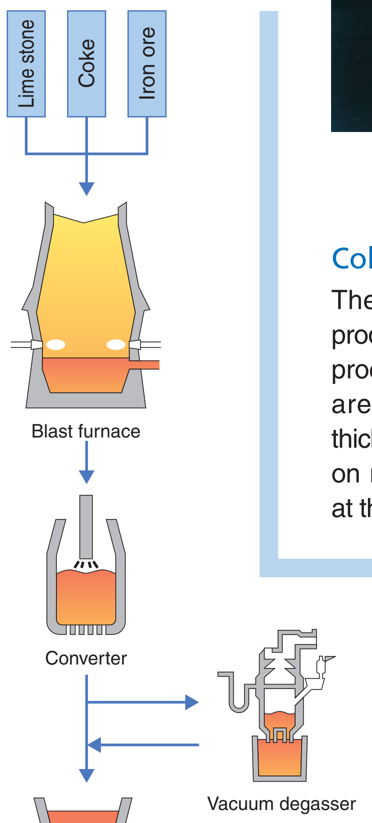
Annealed coils are lightly rolled by the skinpass mill to prevent a defect called stretcher strain, improve strip shape, and adjust mechanical properties. Skinpass rolling is also used to produce dull finish and bright finish products.

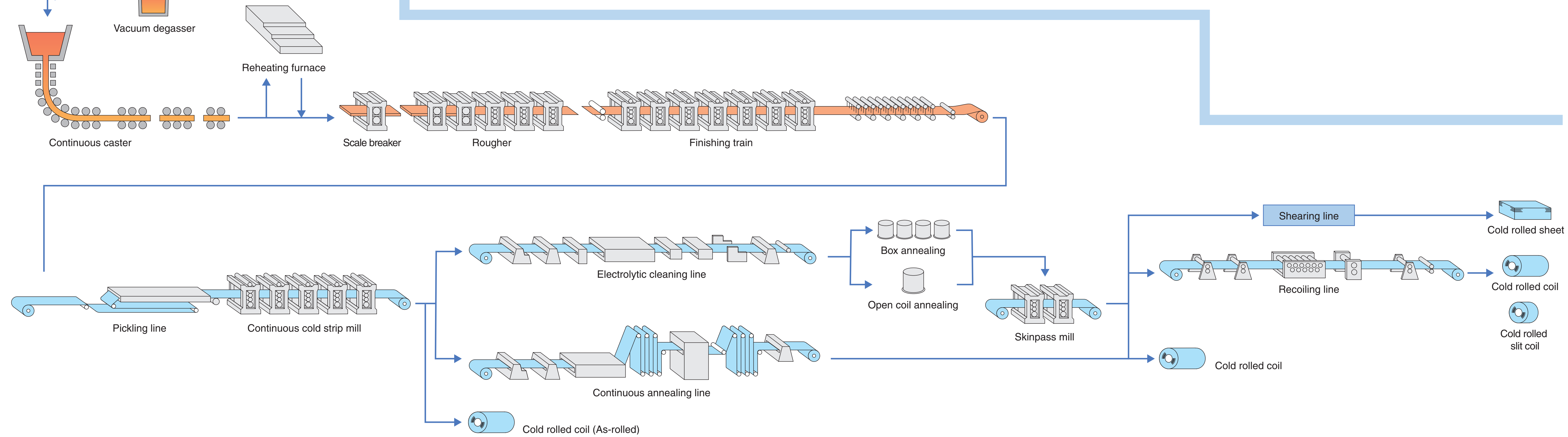
Finishing

After skinpass rolling, coils are processed at the recoiling line, where they are cut to produce product coils of the specified weight, or at the shearing line, where they are cut to sheets of the specified dimensions. Product thickness, width, shape, and surface quality are inspected, and mechanical properties are tested using specimens taken at the finishing line.



Skinpass mill





Correspondence with JFE standards to public standards

Classification	JFE standard	JIS	ASTM	Others
Steel sheets for general uses	JFE-CC JFE-CD JFE-CE	G3141 SPCC SPCD SPCE	A109 A1008	BS1449 Part1 DIN1623-2 BS EN10130 DIN EN10130 BS EN10139 DIN EN10139
High strength steel sheets	JFE-CA	G3135 SPFC	A980 A1008	
Atmospheric corrosion resistance steel sheets	JFE-CCUP	G3125 SPA-C	A606	BS EN10155 DIN EN10155
Corrosion resistance steel sheets	JFE-ASA			
Steel sheets for porcelain enameling	JFE-CPE	G3133 SPP	A424	BS EN10209 DIN EN10209
Steel sheets for electric wire sheath	JFE-HWD			
Steel sheets for galvanizing	JFE-HKT			
Steel sheets without annealing	JFE-CNA			
Steel sheets in high temperature atmosphere	JFE-CHCR			

Product Standards, Characteristics and Application

JFE Steel is producing wide range of products which have excellent characteristics based on the public standards like Japanese Industrial Standard(JIS) to original JFE standard, at the East Japan Works (Chiba and Keihin plants) and the West Japan Works (Fukuyama and Kurashiki plants).

Public Standard Products

JFE Steel is producing products based on following public standards.

Japanese Industrial Standard (JIS)

Classification		Designation	Characteristics and Application
G 3141	Cold-reduced carbon steel sheets and strip	SPCC、SPCC-T SPCD、SPCE、SPCEN	Best suited for automobiles, electrical appliances, etc. due to wider workable ranges from commercial to deep drawing qualities.
G 3135	Cold rolled high strength steel sheets with improved formability for automobile structure use	SPFC SPFC***Y SPFC***H	Mainly used for automobiles due to high strength and improved formability.
G 3125	Superior atmospheric corrosion resisting rolled steels	SPA-C	Best suited for rolling stock bodies or constructions due to superior atmospheric corrosion resistance.

The Japan Iron and Steel Federation Standard (JFS)

Classification		Designation	Characteristics and Application
A 2001	Cold rolled steel sheets for automobile use	JSC	Specifying cold rolled steel products for automobile use (General use to high strength steel)

JFE Standard Products

JFE Steel is producing cold rolled steel sheets for general use, high strength steel sheets and cold rolled steel sheets for special use based on JFE standards.

Cold rolled steel sheets for general use

Classification	Designation	Pages	Characteristics and Application
Commercial quality	JFE-CC	8〜9	JFE produces six grades of cold rolled soft steel products, ranging from commercial quality JFE-CC (equivalent to JIS-SPCC) to extra deep drawing quality JFE-CG, which is superior to JIS-SPCEN, and ultra deep drawing quality JFE-CGX, which features an extremely high plastic strain ratio (mean r-value). JFE also produces two grades of bake handenable (BH) cold rolled steel products which have a increased yield point during baking after painting.
Drawing quality	JFE-CD		
Deep drawing quality 1	JFE-CE		
Deep drawing quality 2	JFE-CF		
Extra deep drawing quality	JFE-CG		
Ultra deep drawing quality	JFE-CGX		
Bake hardenability quality	JFE-CEH		
Deep drawing quality with bake hardenability	JFE-CGH		

Cold rolled high strength steel sheets

Classification	Designation	Pages	Tensile Strength (N/mm^2)												Characteristics	Application for automobile
			340	370	390	440	490	540	590	780	980	1180	1370	1470		
Commercial quality	JFE-CA···	10〜13	○	○	○	○	○	—	○	○	○	○	○	○	Suitable for general processing like drawing or bending. Applying the water-quenching by a continuous annealing process, maximum 1,470N/mm^2 tensile strength is available.	· Structure · Reinforce
Deep drawing quality with bake hardenability	JFE-CA···H		○	—	—	—	—	—	—	—	—	—	—	—	Superior in deep drawability and bake-hardening. Suitable for outer parts of automobiles which require anti-dent properties.	· Outer panel
Drawing quality	JFE-CA···F		○	○	○	○	—	—	—	—	—	—	—	—	Superior ductility and suitable to drawing application.	· Outer panel · Inner part
Deep drawing quality	JFE-CA···P		○	○	○	○	—	—	—	—	—	—	—	—	Having excellent ductility and high r-value, suitable materials for deep drawing.	· Outer panel · Inner part
Extra deep drawing quality	JFE-CA···G		○	○	○	○	—	—	—	—	—	—	—	—	Adding excellent r-value and ductility with attaining super fine grain structure, suitable materials for extra deep drawing because of having good secondary-embrittlement resistance.	· Outer panel · Inner part
High stretch flange formability quality	JFE-CA···SF		—	—	—	○	—	—	○	○	○	○	—	—	Having excellent ductility and high stretch flange formability, suitable for drawing with flange expansion forming.	· Structure · Reinforce
Low yield ratio quality type 1	JFE-CA···Y1		—	—	—	○	—	—	○	○	○	○	—	—	Having excellent ductility and high work hardening coefficient, suitable material for deep drawing processing.	· Structure · Reinforce
Low yield ratio quality type 2	JFE-CA···Y2		—	—	—	—	—	—	○	○	○	○	—	—		
High elongation quality	JFE-CA···A		—	—	—	—	—	—	○	○	—	—	—	—	Applying TRIP (Transformation Induced Plasticity) effects, excellent ductility and work hardening coefficient are achieved at the high strain range.	· Structure · Reinforce

Cold rolled steel sheets for special use

Classification	Designation	Pages	Characteristics and Application
Cold rolled steel sheets for porcelain enameling	JFE-CPE	14	Chemical compositions are adjusted for porcelain enameling use. General use or deep drawing, 1-coat or 2-coat usages are available.
Cold rolled steel sheets for electric wire sheath	JFE-CWD	15	Products especially developed for electric wire sheathing. Superior for welding and working.
Cold rolled steel sheets for galvanizing	JFE-CKT	15	Annealed cold-rolled sheet as the mother material for galvanizing is available.
Cold rolled steel sheets without annealing	JFE-CNA	16	Non-annealed cold-rolled sheet of thinner gages are available. Suitable for application needed strength without forming.
Cold rolled corrosion resistance steel sheets	JFE-ASA	16	Having superior resistance against sulfuric acid corrosion and atmospheric corrosion. Suitable to the air pre-heater of boilers, heat exchangers, chemical plants and exhaust chambers.
Cold rolled atmospheric corrosion resistance high strength steel sheets	JFE-CCUP	17	Having the superior corrosion resistance without painting due to the stable oxide film. Suitable to rolling stock bodies and structures.
Cold rolled steel sheets in high temperature atmosphere	JFE-CHCR	17	Having superior anti-oxidation properties and keeping strength under high temperature(450-600˚C). Suitable to application like chimney ducts, needed heat resistance and workability.

Product standards, Characteristics and Application

JFE Standards

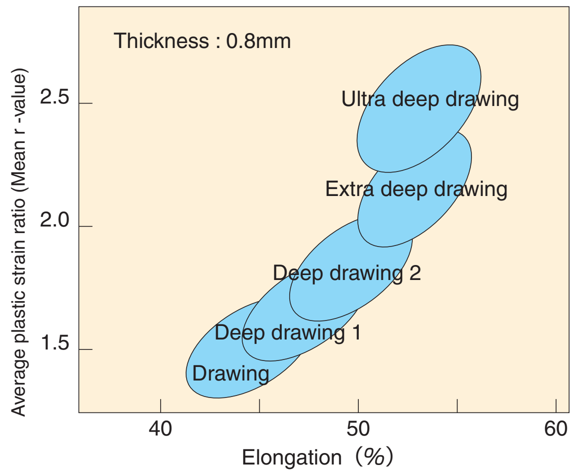
Cold rolled steel sheets for general use JFE-C

JFE produces six grades of cold rolled soft steel products, according to formability, ranging from commercial quality JFE-CC (equivalent to JIS-SPCC) to extra deep drawing quality JFE-CG, which is superior to JIS-SPCEN, and ultra deep drawing quality JFE-CGX, which features an extremely high plastic strain ratio (mean r-value). JFE also produces two grades of bake-hardening (BH) cold rolled sheets, which display yield point increase when baked after painting.

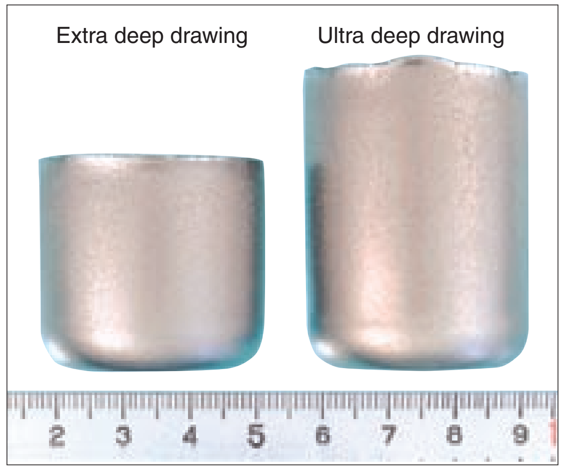
Automobile part (Front fender)

Automobile part (Side panel outer)

Relation between elongation and average plastic strain ratio (mean r-value) of cold rolled steel



Comparison of height of cups cylinder between extra deep drawing and ultra deep drawing quality



● Mechanical Properties

Classification	Designation	Tensile Test													Mean r-value min.		BH Value min. (N/mm²)
		Yield Point min. (N/mm²)			Tensile Strength min. (N/mm²)	Elongation min. (%)											
		Thickness mm				Thickness mm									Thickness mm		
		0.4 ≦ < 0.8	0.8 ≦ < 1.0	1.0 ≦ ≦ 3.2		0.4 ≦ < 0.6	0.6 ≦ < 0.8	0.8 ≦ < 1.0	1.0 ≦ < 1.2	1.2 ≦ < 1.6	1.6 ≦ < 2.0	2.0 ≦ < 2.5	2.5 ≦ ≦ 3.2		0.5 ≦ ≦ 1.0	1.0< ≦ 1.6	
Commercial quality	JFE-CC	(145)	(135)	(125)	(270)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)		—	—	—
Drawing quality	JFE-CD	135	125	115	270	40	41	42	43	44	45	46	47		(1.2)	(1.1)	—
Deep drawing quality 1	JFE-CE	130	120	110	270	42	43	44	45	46	47	48	49		(1.4)	(1.3)	—
Deep drawing quality 2	JFE-CF	120	110	100	270	44	45	46	47	48	49	50	51		(1.6)	(1.5)	—
Extra deep drawing quality	JFE-CG	100		90	260	46	47	48	49	50	51	52	—		1.8	1.7	—
Ultra deep drawing quality	JFE-CGX	100		90	260	46	47	48	49	50	—	—	—		2.1	2.0	—
Bake hardenability quality	JFE-CEH	135	125	115	270	40	41	42	43	44	45				(1.4)	(1.3)	30
Deep drawing quality with bake hardenability	JFE-CGH	135	125	115	260	—	44	45	46	—					(1.6)	(1.4)	30

Reference 1. JIS No.5 test piece for tensile test taken in rolling direction.
2. For thickness less than 0.6mm, the above tests are omitted if not specifically requested.
3. Figures in parentheses are reference values.

●Dimensional tolerance

Size tolerances conform JIS G 3141(Cold-reduced carbon steel sheets and strip). Refer to page 18.

● Available product size range

The available size range is shown on page 20.

Cold rolled high strength steel sheets (1) JFE-CA

Cold rolled high strength steel sheets produced by JFE have varieties from a commercial quality to an extra deep drawing quality. Applying the original JFE technology of the continuous annealing line, a wide range of tensile strength from 340N/mm² class to 1,470N/mm² class is available.

Automobile part (Door assembly)

Automobile part (Door outer)

Mechanical Properties

<table>
<tr><th rowspan="4">Classification</th><th rowspan="4">Designation</th><th colspan="12">Tensile Test</th><th colspan="2">Mean r-value min.</th><th rowspan="4">BH Value min. (N/mm²)</th><th rowspan="4">Hole Expanding Ratio min. λ (%)</th></tr>
<tr><th colspan="3">Yield Point min. (N/mm²)</th><th rowspan="3">Tensile Strength min. (N/mm²)</th><th colspan="8">Elongation min. (%)</th><th colspan="2" rowspan="2">Thickness mm</th></tr>
<tr><th colspan="3">Thickness mm</th><th colspan="8">Thickness mm</th></tr>
<tr><th>0.4 ≦ < 0.8</th><th>0.8 ≦ < 1.0</th><th>1.0 ≦ ≦ 3.2</th><th>0.4 ≦ < 0.6</th><th>0.6 ≦ < 0.8</th><th>0.8 ≦ < 1.0</th><th>1.0 ≦ < 1.2</th><th>1.2 ≦ < 1.6</th><th>1.6 ≦ < 2.0</th><th>2.0 ≦ < 2.5</th><th>2.5 ≦ ≦ 3.2</th><th>0.5 ≦ ≦ 1.0</th><th>1.0 < ≦ 1.6</th></tr>
<tr><td>Commercial quality</td><td>JFE-CA340</td><td>205</td><td>195</td><td>185</td><td>340</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td colspan="3">38</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>Commercial quality</td><td>JFE-CA370</td><td>205</td><td>195</td><td>185</td><td>370</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td colspan="3">35</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>Commercial quality</td><td>JFE-CA390</td><td>245</td><td>235</td><td>225</td><td>390</td><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td colspan="3">34</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
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<tr><td>Commercial quality</td><td>JFE-CA590</td><td>430</td><td>420</td><td>410</td><td>590</td><td>—</td><td colspan="2">17</td><td colspan="4">18</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>Commercial quality</td><td>JFE-CA780</td><td>420</td><td>410</td><td>400</td><td>780</td><td>—</td><td>12</td><td>13</td><td>14</td><td>15</td><td colspan="2">16</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>Commercial quality</td><td>JFE-CA980</td><td>600</td><td>590</td><td>580</td><td>980</td><td>—</td><td>(8)</td><td>(9)</td><td>(10)</td><td>(11)</td><td colspan="2">(12)</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>Commercial quality</td><td>JFE-CA1180</td><td>—</td><td>—</td><td>825</td><td>1180</td><td colspan="3">—</td><td>(6)</td><td>(7)</td><td colspan="2">(8)</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>Commercial quality</td><td>JFE-CA1370</td><td>—</td><td>—</td><td>950</td><td>1370</td><td colspan="3">—</td><td colspan="4">(5)</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>Commercial quality</td><td>JFE-CA1470</td><td>—</td><td>—</td><td>1000</td><td>1470</td><td colspan="5">—</td><td colspan="2">(4)</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>Deep drawing quality with bake hardenability</td><td>JFE-CA340H</td><td>185</td><td>175</td><td>165</td><td>340</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td colspan="3">39</td><td>(1.5)</td><td>(1.4)</td><td>30</td><td>—</td></tr>
<tr><td>Drawing quality</td><td>JFE-CA340F</td><td>185</td><td>175</td><td>165</td><td>340</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td colspan="3">38</td><td>(1.4)</td><td>(1.3)</td><td>—</td><td>—</td></tr>
<tr><td>Drawing quality</td><td>JFE-CA370F</td><td>195</td><td>185</td><td>175</td><td>370</td><td>31</td><td>32</td><td>33</td><td colspan="2">34</td><td colspan="3">35</td><td>(1.4)</td><td>(1.3)</td><td>—</td><td>—</td></tr>
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<tr><td>Drawing quality</td><td>JFE-CA440F</td><td>265</td><td>255</td><td>245</td><td>440</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td colspan="3">31</td><td>(1.3)</td><td>(1.2)</td><td>—</td><td>—</td></tr>
<tr><td>Deep drawing quality</td><td>JFE-CA340P</td><td>165</td><td>155</td><td>145</td><td>340</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td colspan="2">40</td><td>—</td><td>(1.5)</td><td>(1.4)</td><td>—</td><td>—</td></tr>
<tr><td>Deep drawing quality</td><td>JFE-CA370P</td><td>175</td><td>165</td><td>155</td><td>370</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td colspan="2">38</td><td>—</td><td>(1.5)</td><td>(1.4)</td><td>—</td><td>—</td></tr>
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<tr><td>Deep drawing quality</td><td>JFE-CA440P</td><td>245</td><td>235</td><td>225</td><td>440</td><td>28</td><td>29</td><td>30</td><td>31</td><td>32</td><td colspan="2">33</td><td>—</td><td>(1.4)</td><td>(1.3)</td><td>—</td><td>—</td></tr>
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<tr><td>Extra deep drawing quality</td><td>JFE-CA370G</td><td>165</td><td>155</td><td>145</td><td>370</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td colspan="2">38</td><td>—</td><td>1.7</td><td>1.6</td><td>—</td><td>—</td></tr>
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</table>

Reference 1. JIS No.5 test piece for tensile test taken transverse to rolling direction.
2. For thickness less than 0.6mm, the above tests are omitted if not specifically requested.
3. Figures in parentheses are reference values.

JFE Standards

Cold rolled high strength steel sheets (2) JFE-CA

● Mechanical Properties (Cont.)

Classification	Designation	Tensile Test: Yield Point min. (N/mm²), Thickness mm: 0.4 ≦ < 0.8	0.8 ≦ < 1.0	1.0 ≦ ≦ 3.2	Tensile Strength min. (N/mm²)	Elongation min. (%), Thickness mm: 0.4 ≦ < 0.6	0.6 ≦ < 0.8	0.8 ≦ < 1.0	1.0 ≦ < 1.2	1.2 ≦ < 1.6	1.6 ≦ < 2.0	2.0 ≦ < 2.5	2.5 ≦ ≦ 3.2	Mean r-value min., Thickness mm: 0.5 ≦ ≦ 1.0	1.0 < ≦ 1.6	BH Value min. (N/mm²)	Hole Expanding Ratio min. λ (%)
High stretch flange formability quality	JFE-CA440SF	320	310	300	440	—	24	25	26	27	28			—	—	—	80
High stretch flange formability quality	JFE-CA590SF	430	420	410	590	—	17		18				—	—	—	—	60
High stretch flange formability quality	JFE-CA780SF	—	—	500	780	—	—	—	(14)				—	—	—	—	50
High stretch flange formability quality	JFE-CA980SF	—	—	630	980	—	—	—	(10)				—	—	—	—	40
High stretch flange formability quality	JFE-CA1180SF	—	—	875	1180	—	—	—	(7)				—	—	—	—	40
Low yield ratio quality type 1	JFE-CA440Y1	235	225	215	440	—	29	30	31	32	33			—	—	—	—
Low yield ratio quality type 1	JFE-CA590Y1	—	315	305	590	—	—	21	23	23	24			—	—	—	—
Low yield ratio quality type 1	JFE-CA780Y1	—	—	400	780	—	—	—	14	15	16		—	—	—	—	—
Low yield ratio quality type 1	JFE-CA980Y1	—	—	530	980	—	—	—	10	11	—	—	—	—	—	—	—
Low yield ratio quality type 1	JFE-CA1180Y1	—	—	710	1180	—	—	—	—	7	—	—	—	—	—	—	—
Low yield ratio quality type 2	JFE-CA590Y2	325	315	305	590	—	22	23	24	25	26			—	—	—	—
Low yield ratio quality type 2	JFE-CA780Y2	—	—	360	780	—	—	—	19	20	21		—	—	—	—	—
Low yield ratio quality type 2	JFE-CA980Y2	—	—	530	980	—	—	—	12	13	14		—	—	—	—	—
Low yield ratio quality type 2	JFE-CA1180Y2	—	—	710	1180	—	—	—	8	9	10		—	—	—	—	—
High elongation quality type (Retained austenite)	JFE-CA590A	355			590	—	27	28	29	30	31			—	—	—	—
High elongation quality type (Retained austenite)	JFE-CA780A	—	—	400	780	—	—	—	23	24	25			—	—	—	—

Reference 1.JIS No.5 test piece for tensile test taken transverse to rolling direction.
2.For thickness less than 0.6mm, the above tests are omitted if not specifically requested.
3.Figures in parentheses are reference values.

● Dimensional tolerance

Size tolerances conform JIS G 3141(Cold-reduced carbon steel sheets and strip). Refer to page 18.

● Available product size range

Available size range is shown on page 21.

Automobile part (Body in white)

Automobile part (Center pillar inner)

JFE Standards

Cold rolled steel sheets for porcelain enameling JFE-CPE

JFE's cold rolled steel sheets for porcelain enameling are for general use, deep drawing quality and for 1-coat, 2-coat depending on application. Chemical compositions of the steel are severely controlled.

Manufacturing Standard

Classification		Designation
1-Coat	Drawing 1	JFE-CPE1D1
	Drawing 2	JFE-CPE1D2
2-Coat, 2-Bake	Flat sheet use	JFE-CPE2P
	Commercial use	JFE-CPE2C
	Drawing	JFE-CPE2D
	Deep drawing	JFE-CPE2E

As wall material

Typical Chemical Composition (wt.%)

Designation	C	Si	Mn	P	S	Al	N	O	Cu	Others
JFE-CPE1D1	0.0012	0.01	0.29	0.008	0.018	—	0.0018	0.055	0.030	—
JFE-CPE1D2	0.0015	0.01	0.25	0.008	0.018	—	0.0080	0.020	0.030	added
JFE-CPE2P	0.0030	0.01	0.25	0.012	0.015	—	0.0080	0.014	0.030	added
JFE-CPE2C	0.0230	0.01	0.18	0.013	0.013	0.050	0.0060	—	0.030	added
JFE-CPE2D	0.0504	0.02	0.15	0.011	0.007	0.055	0.0077	—	0.030	added
JFE-CPE2E	0.0020	0.01	0.25	0.008	0.030	0.040	0.0080	—	0.035	added

Mechanical Properties

Designation	Yield point min. (N/mm^2)			Tensile Strength min.. (N/mm^2)	Elongation min. (%)										Mean r-value min.	
	Thickness mm				Thickness mm										Thickness mm	
	0.4 ≦ <0.8	0.8 ≦ < 1.0	1.0 ≦ ≦ 3.2		0.2 ≦ <0.5	0.5 ≦ <0.6	0.6 ≦ <0.8	0.8 ≦ <1.0	1.0≦ < 1.2	1.2 ≦ < 1.6	1.6 ≦ < 2.0	2.0 ≦ <2.3	2.3< < 2.5	2.5 ≦ ≦ 3.2	0.5 ≦ < 1.2	1.2 ≦ ≦ 1.6
JFE-CPE1D1	135	125	115	270	39	40	41	42	43	44	45	46	46	47	(1.2)	(1.1)
JFE-CPE1D2	135	125	115	270	39	40	41	42	43	44	45	46	—	—	(1.2)	(1.1)
JFE-CPE2P	—	—	—	275	30	35	36	36	38	38	39	39	40	40	—	—
JFE-CPE2C	145	135	125	270	30	37	38	39	40	41	42	43	43	44	—	—
JFE-CPE2D	135	125	115	270	39	40	41	42	43	44	45	46	—	—	(1.2)	(1.1)
JFE-CPE2E	120	110	100	275	43	44	45	46	47	48	49	50	50	51	1.6	1.5

Reference 1.JIS No.5 test piece for the tensile test taken to the rolling direction.
2. In case of thickness less than 0.6mm, above tests are skipped if not requested.
3. Figures in the parentheses are the reference values.

Example of Mechanical Properties

Designation	Thickness mm	Yield point (N/mm^2)	Tensile Strength (N/mm^2)	Elongation (%)	Mean r-value	n-Value
JFE-CPE1D1	0.80	165	282	51.4	1.50	0.22
JFE-CPE1D2	1.00	165	313	46.0	1.77	0.26
JFE-CPE2P	0.30	252	351	39.0	—	—
JFE-CPE2C	0.50	201	325	41.8	1.42	0.21
JFE-CPE2D	1.20	161	286	51.7	1.64	0.25
JFE-CPE2E	0.80	148	307	49.0	2.16	0.27

Dimensional tolerance Size tolerances conform JIS G 3141(Cold-reduced steel sheets and strip). Refer to page 18.

Available product size range Available size range is the same as for JFE-CF. Refer to page 20.

Cold rolled steel sheets for electric wire sheath　JFE-CWD

Developed by JFE for electric wire sheathing and has good weldability and workability.

Mechanical Properties

Designation	Tensile Test				
	Yield Point min. (N/mm²)	Tensile Strength min. (N/mm²)	Elongation min. (%)		
			Thickness mm		
			0.4 ≦ , < 0.6	0.6 ≦ , < 0.8	0.8 ≦ , ≦ 1.0
JFE-CWD	—	270	35	37	

Reference：1. JIS No.5 test for the tensile test piece taken to the rolling direction.

Dimensional tolerance

Size tolerances conform JIS G 3141(Cold-reduced steel sheets and strip). Refer to page 18.

Available product size range

Strip thickness from 0.30mm to 1.00mm and strip widths from 610mm to 1,600mm are available.
Strip products are available in widths of 50mm to 200mm.

Cold rolled steel sheets for galvanizing　JFE-CKT

Annealed cold rolled steel sheets are available for galvanizing.

Mechanical Properties

Designation	Tensile Test									
	Yield Point min. (N/mm²)	Tensile Strength min. (N/mm²)	Elongation min. (%)							
			Thickness mm							
			0.4 ≦ < 0.6	0.6 ≦ < 0.8	0.8 ≦ < 1.0	1.0 ≦ < 1.2	1.2 ≦ < 1.6	1.6 ≦ < 2.0	2.0 ≦ < 2.5	2.5 ≦ ≦ 3.2
JFE-CKT	—	—	(30)	(32)	(32)	(33)	(33)	(34)	(34)	(35)

Reference：1. JIS No.5 test piece for the tensile test taken to the rolling direction.
2. Figures in the parentheses are the reference values.

Dimensional tolerance

Size tolerances conform JIS G 3141(Cold-reduced steel sheets and strip). Refer to page 18.

Available product size range

Available size range is the same as for commercial quality JFE-CC. Refer to page 20.

Cold rolled steel sheets without annealing JFE-CNA

It is suitable for application which needs only toughness and no working.

Dimensional tolerance

Size tolerances conform JIS G 3141(Cold-reduced steel sheets and strip). Refer to page 18.

Available product size range

Available size range is shown on page 22.

Cold rolled corrosion resistance steel sheets JFE-ASA

It has superior corrosion resistance against sulfuric acid and superior atmospheric corrosion resistance.
It is suitable to the air pre-heater of boilers, heat exchangers and chimney ducts, etc.

Chemical Composition (wt.%)

Designation	C	Si	Mn	P	S	Cu	Ni	Cr	Sb	Sn	Mo
JFE-ASA400W	0.14max.	0.55max.	0.30-0.70	0.030max.	0.020max.	0.25-0.50	0.50max.	0.50-1.00	0.05-0.20	0.10max.	0.10max.
JFE-ASA440W	0.17max.	0.55max.	0.30-0.70	0.030max.	0.020max.	0.25-0.50	0.50max.	0.50-1.00	0.05-0.20	0.10max.	0.10max.

Mechanical Properties

Designation	Tensile Test			Bend Test	
	Yield Point min. (N/mm²)	Tensile Strength min. (N/mm²)	Elongation min. (%)	Bending Angle	Internal Radius
JFE-ASA400W	245	400	22	180°	1.0T
JFE-ASA440W	265	440	22	180°	1.0T

Reference : 1. JIS No.5 test piece for the tensile test taken transverse to the rolling direction.
2. JIS No.3 test piece for the bend test taken transverse to the rolling direction.

Dimensional tolerance

Size tolerances conform JIS G 3141(Cold-reduced steel sheets and strip). Refer to page 18.

Available product size range

Available size range is shown on page 22.

Cold rolled atmospheric corrosion resistance high strength steel sheets JFE-CCUP

Have unpainted corrosion resistance due to formation of a stable oxidation film on the strip surface.
Suitable for rolling stock bodies and exposed structures.

Chemical Composition (wt.%)

Designation	C	Si	Mn	P	S	Cu	Ni	Cr
JFE-CCUP	0.12max.	0.25-0.75	0.20-0.50	0.07-0.15	0.040max.	0.25-0.60	0.65max.	0.30-1.25

Mechanical Properties

Designation	Tensile Test		
	Yield Point min. (N/mm²)	Tensile Strength min. (N/mm²)	Elongation min. (%)
JFE-CCUP	315	450	26

Reference：1.JIS No.5 test piece for the tensile test taken transverse to the rolling direction.

Dimensional tolerance

Size tolerances conform JIS G 3141(Cold-reduced steel sheets and strip). Refer to page 18.

Available product size range

Available size range is shown on page 23.

Cold rolled steel sheets in high temperature atmosphere JFE-CHCR

Have cold formability and anti-oxidation properties combined with adequate high temperature strength (450-600°C).
Suitable for applications which require heat resistance and cold formability, such as chimney ducts.

Chemical Composition (wt.%)

Designation	C	Si	Mn	P	S	Cu	Ni	Cr	Sb	Sn
JFE-CHCR	0.10max.	—	0.40max.	0.035max.	0.035max.	(Including other chemicals)				

Mechanical Properties

Designation	Tensile Test		
	Yield Point min. (N/mm²)	Tensile Strength (N/mm²)	Elongation min. (%)
JFE-CHCR	—	(310-410)	(36)

Reference 1. JIS No.5 test piece for tensile test taken in rolling direction.
2. Figures in parentheses are reference values.

Dimensional tolerance

Size tolerances conform JIS G 3141(Cold-reduced steel sheets and strip). Refer to page 18.

Available product size range

Available size range is shown on page 23.

Dimensional and shape tolerances

Dimensional and shape tolerances as specified in JIS G 3141 (Cold-reduced carbon steel sheets and strip) are shown below. Normally, Table A is applied to thickness, width, and length tolerances. When stricter tolerances are required, Table B is applied.

Thickness tolerance

Thickness is measured at the normal point in case of strips or coils, and at any point 15mm from the strip edge in case of sheets.

Table A

Unit mm

Thickness \ Width	< 630	630 ≦ < 1000	1000 ≦ < 1250	1250 ≦ < 1600	1600 ≦
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	—

Table B

Unit mm

Thickness \ Width	< 160	160 ≦ < 250	250 ≦ < 400	400 ≦ < 630
< 0.1	±0.010	±0.020	—	—
0.10 ≦ , < 0.16	±0.015	±0.020	—	—
0.16 ≦ , < 0.25	±0.020	±0.025	±0.030	±0.030
0.25 ≦ , < 0.40	±0.025	±0.030	±0.035	±0.035
0.40 ≦ , < 0.60	±0.035	±0.040	±0.040	±0.040
0.60 ≦ , < 0.80	±0.040	±0.045	±0.045	±0.045
0.80 ≦ , <1.00	±0.04	±0.05	±0.05	±0.05
1.00 ≦ , < 1.25	±0.05	±0.05	±0.05	±0.06
1.25 ≦ , < 1.60	±0.05	±0.06	±0.06	±0.06
1.60 ≦ , < 2.00	±0.06	±0.07	±0.08	±0.08
2.00 ≦ , < 2.50	±0.07	±0.08	±0.08	±0.09
2.50 ≦ , < 3.15	±0.08	±0.09	±0.09	±0.10
3.15 ≦ ,	±0.09	±0.10	±0.10	±0.11

Width tolerance

Width is measured at the normal point in case strips and coils, and at any point in case of sheets.

Table A — Unit mm

< 1250	1250 ≦
+7 0	+10 0

Table B — Unit mm

< 1250	1250 ≦
+3 0	+4 0

Length tolerance

Length is measured at any point in case of sheets

Table A — Unit mm

Length	Tolerance
< 2000	+10, 0
2000 ≦ , < 4000	+15, 0
4000 ≦ , < 6000	+20, 0

Table B — Unit mm

Length	Tolerance
< 1000	+3, 0
1000 ≦ , < 2000	+4, 0
2000 ≦ , < 3000	+6, 0
3000 ≦ , <4000	+8, 0

Flatness

The maximum value of flatness is shown below. The flatness tolerance shall be classified into class A and class B as given Table A and Table B, respectively. These tables shall be applied to the steel sheet of standard temper grade which is 500mm or over in width during cold rolling.

Flatness shall be measured by lying a steel sheet under its own mass on flat surface plate, and the value of flatness shall be determined as the difference between the maximum deviation of convex from the flat surface and the nominal thickness of the steel sheet when its convex side is upper-most.

Table A — Unit mm

Width \ Strain	Warp	EdgeWave	Buckle
< 1000	12	8	6
1000 ≦ , < 1250	15	9	8
1250 ≦ , < 1600	15	11	8
1600 ≦	20	13	9

Table B — Unit mm

Width \ Strain	Warp	EdgeWave	Buckle
< 1000	2	2	2
1000 ≦ , < 1250	3	2	2
1250 ≦ , < 1600	4	3	2
1600 ≦	5	4	2

Reference：Table is not applied to the strip processed by a stretch leveler.

Camber — Unit mm

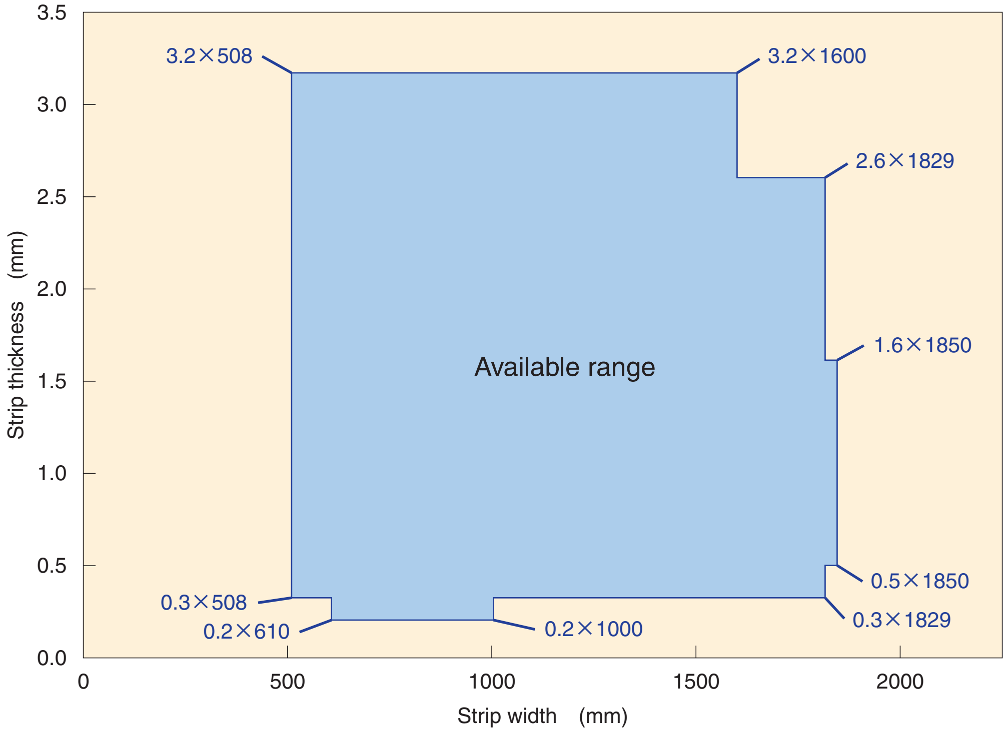
Width \ Strip,Band	Strip		Band
	Length < 2000	Length 2000 ≦	
30 ≦ , < 60	8	At any length of 2000 8	
60 ≦ , < 630	4	〃 4	
630 ≦	2	〃 2	

Reference：Table is not applied to the abnormal portion.

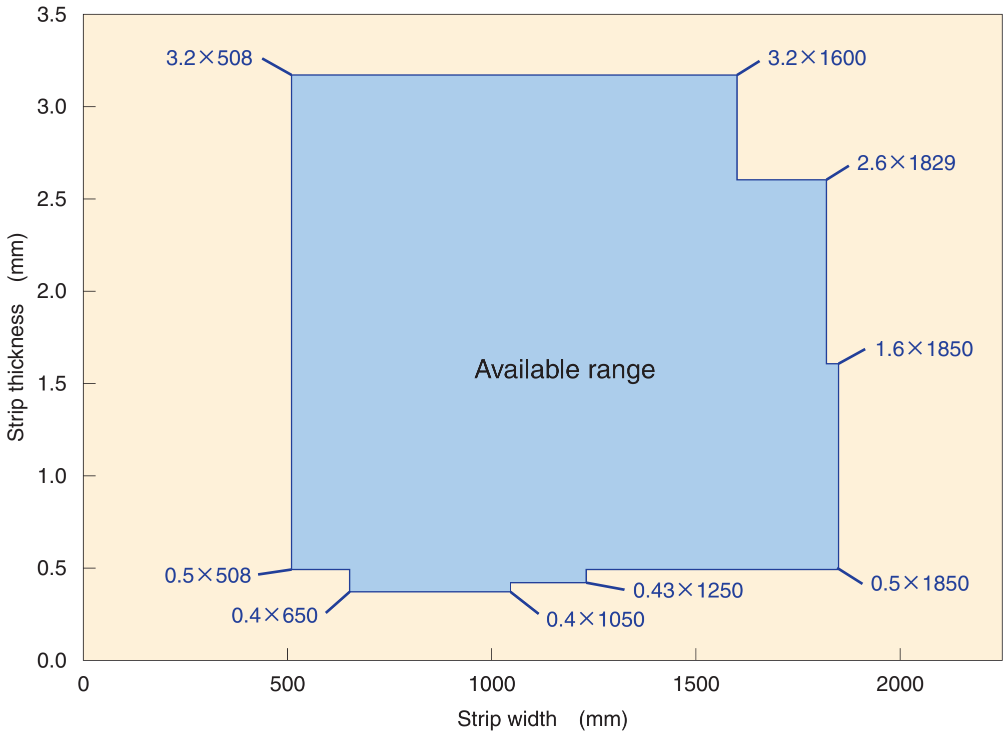
Available product size range

Examples of the available products size range are shown below.
Other size outside the available range and products not shown here are subject to negotiation.

Applicable Standard：JFE-CC

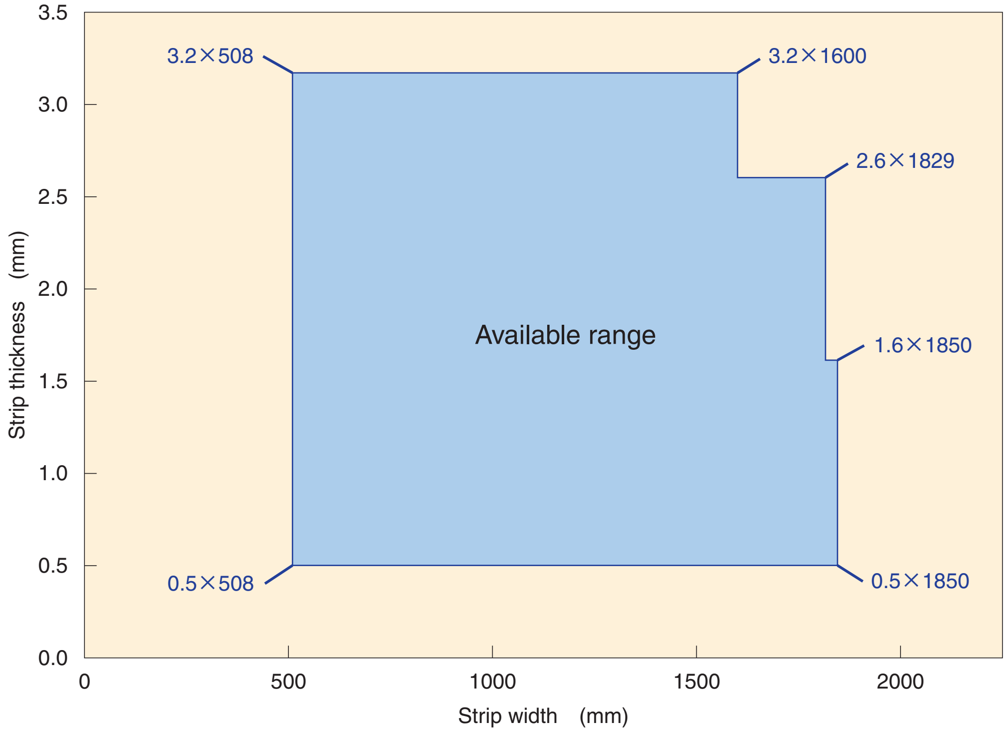


Applicable Standard：JFE-CF

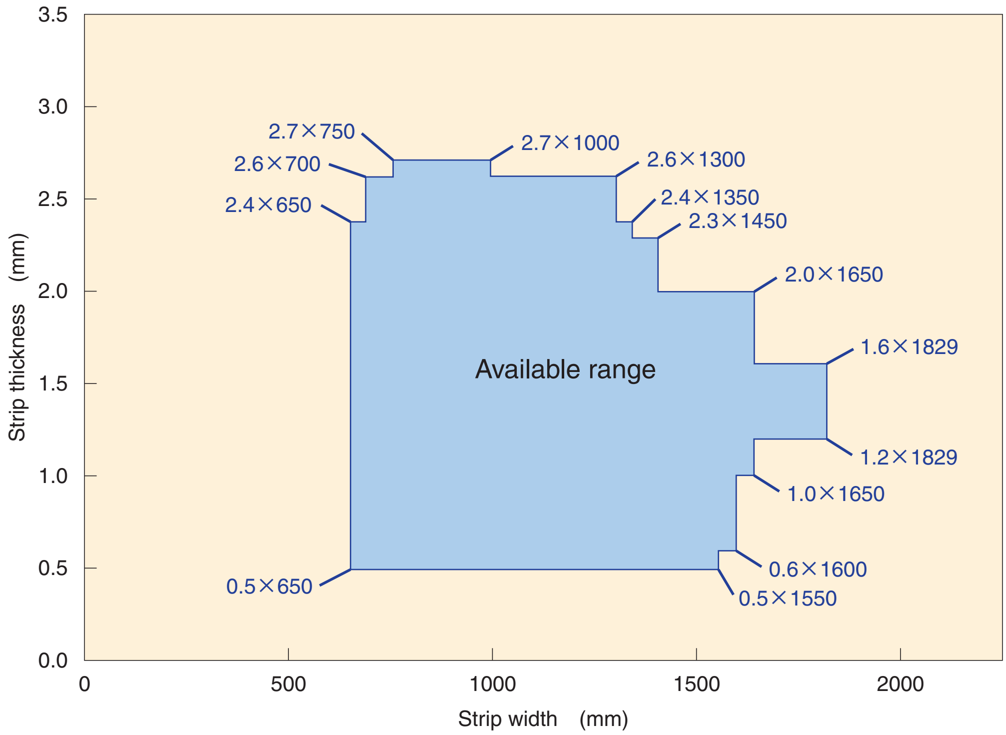


Other size outside the available range and products not shown here are subject to negotiation.

Applicable Standard：JFE-CA340

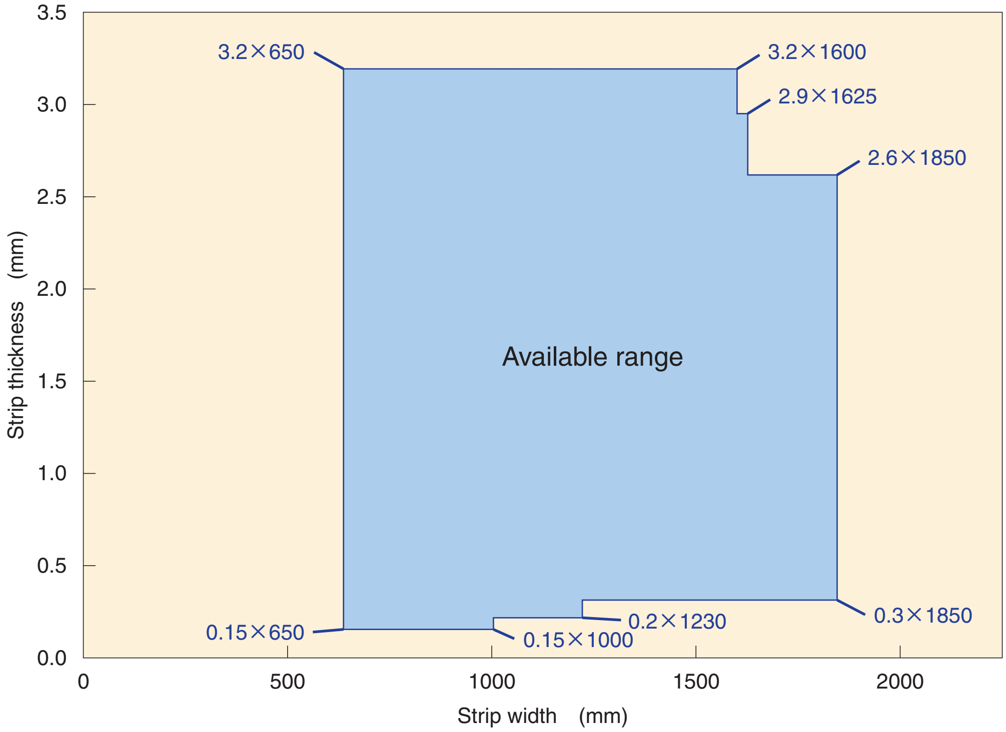


Applicable Standard：JFE-CA440

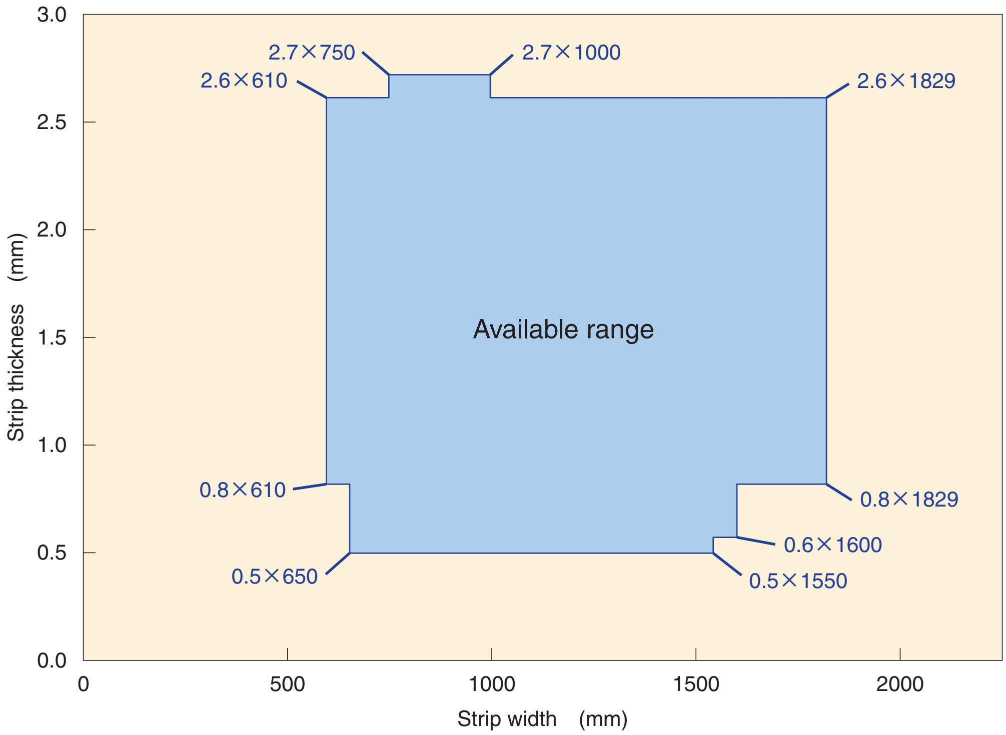


Examples of the available products size range are shown below.
Other size outside the available range and products not shown here are subject to negotiation.

Applicable Standard ：JFE-CNA



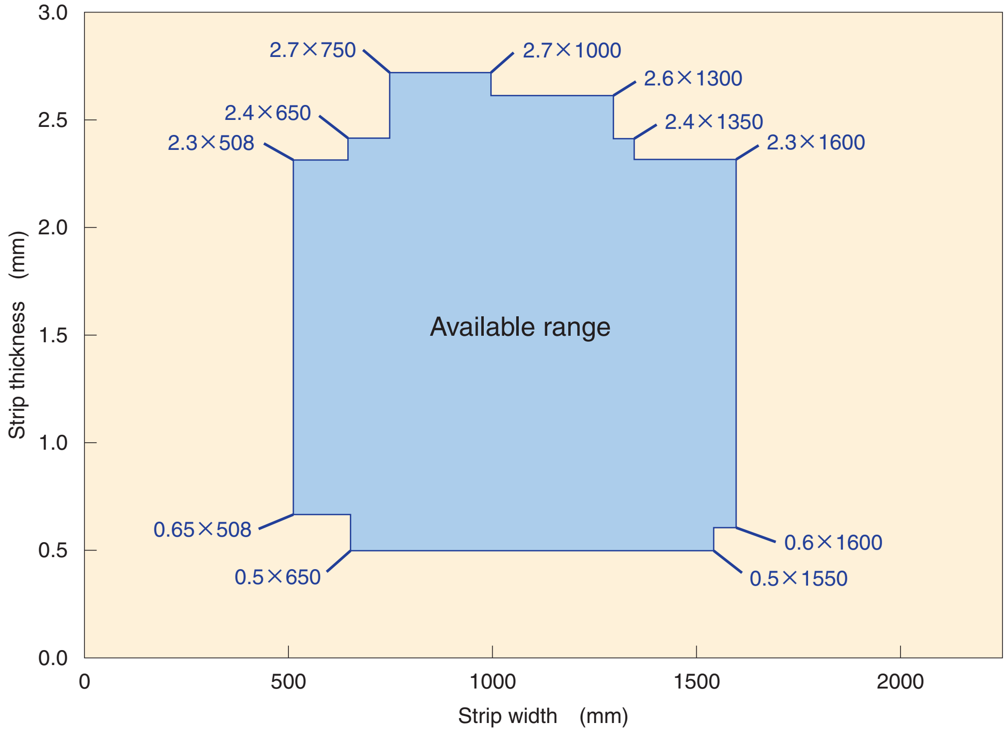
Applicable Standard ：JFE-ASA



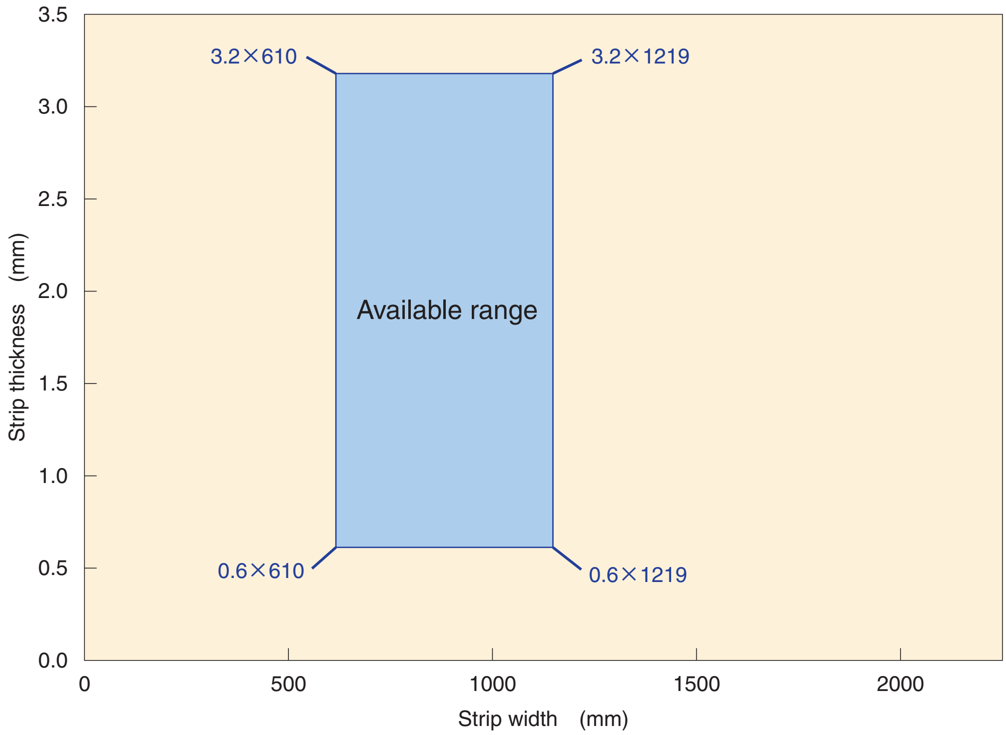
Available product size range

Other size outside the available range and products not shown here are subject to negotiation.

Applicable Standard：JFE-CCUP



Applicable Standard：JFE-CHCR



Available product size range

Surface finish and strip edge

Surface finish

Classification	Designation	Characteristics
Dull finish	SD	Finished with rough (dull) surface rolls which are processed mechanically or chemically. Dull surface products are widely used to improve pressing performance by ensuring even distribution of press oil and to improve paint adhesion. It is equivalent to D finish in JIS.
Bright finish	SB	Finished with smoothly polished rolls. Bright products are suitable for application which require attractive luster, such as metallic coated surfaces and for lightly painted surfaces. It is equivalent to B finish in JIS. Products brighter than JIS bright finish are also available and are subject to negotiation.

Reference：1. Normally dull finish is applied. Detailed discussion is requested for bright finish.
2. Not available in as-annealed products.
3. Other surface classifications are subject to negotiation.

Strip edge

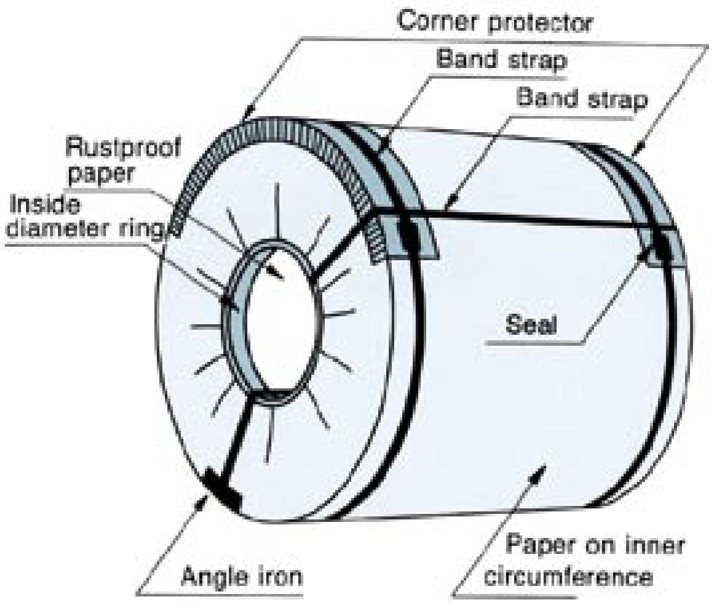
Classification	Contents
Mill edge	Products are normally edge trimmed at the pickling line and then cold rolled, and edge trimming is not performed at the finishing line. This is the standard edge specification for coil products. (However, edge trimming may be performed at the finishing line for operational reasons, even when mill edge is specified.)
Cut edge	Edge trimming is performed at the shearing line or slitting line. (Standard edge specification for cut sheet products).

Packaging and labeling

Packaging

Cold rolled products are packaged according to applicable standards and preserved in a properly controlled environment until shipment.

Example of coil package



Labeling

Labels showing the product standard, dimensions, mass and product serial no. are attached to the product. Sample is shown below.

COMMODITY COLD ROLLED STEEL			PACKAGE NO. 00001	CUSTOMER'S NAME DESTINATION
SPECIFICATION JFE-CC-SD OILED				
SIZE 0.80MMx914MM				
N/W KGS 5000	G/W KGS 5050			
COIL NO. C-1111-1		HEAT NO. E5555		
O/# C041111001				
JFE Steel Corporation West Japan Works (Fukuyama)				JFE MADE IN JAPAN

Instructions for ordering

When ordering, please include following information:

1	Classification of standard / Dimension / Quantity / Delivery date
2	Application or part name
3	Type of processing (In case of press forming, please show the part shape in detail)
4	Unit mass and packaging ● Coils : Maximum and minimum coil mass / Maximum coil outer diameter /Inner diameter / Acceptability of welded portion in coil ● Sheets : Maximum lot mass
5	Other requirements :Surface finish, edge form, strip shape, oiling, etc.

Remarks on product use and handling precautions

Product use

Cold rolled steel sheets include a wide range of products with diverse properties. More economical manufacturing can be expected if the user fully understands these differences. JFE will propose the optimum product for the customer's intended application. JFE can also provide advice on operational problems.

Handling precautions

In using cold rolled steel sheets, the following precautions should be taken in order to ensure optimum use:

JFE products are normally coated with rust preventive oil with a degreasing property. However, products should be used promptly, as rust can occur if products are held for long periods after unpacking.
Avoid exposure to water, including condensation, as this can cause rust even in case of oil-coated sheets.
The strip edge is sharp and must be handled carefully using gloves to avoid injury.

(Appendix) Extracts from Japanese Industrial Standard (JIS) (1)

JIS G 3141 (2002)

Table 1. Symbol of quality

Symbol of quality	Remarks
SPCC	Commercial quality
SPCD	Drawing quality
SPCE	Deep Drawing quality

Remark 1. 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 SPCCT.

2. When the steel sheet and coil of standard temper grade in quality SPCE are requested by the purchaser to guarantee non-aging properties, letter symbol N shall be suffixed to the symbol of quality, thus appears SPCEN.

JIS G 3141 (2002)

Table 2. Temper grade

Temper grade	Symbol of temper grade
As-annealed	A
Standard temper grade	S
1/8 hard	8
1/4 hard	4
1/2 hard	2
Full hard	1

(Appendix) Extracts from Japanese Industrial Standard (JIS) (2)

JIS G 3141 (2002)

Table 3. Surface finish

Surface finish	Symbol of surface finish	Remarks
Dull finish	D	A matt finish produced with a roll roughened its surface mechanically or chemically
Bright finish	B	A smooth finish produced with a roll finished its surface smoothly

Remarks : This table is not applicable to the steel sheet and coil as-annealed

JIS G 3141 (2002)

Table 4. Tensile strength, elongation and non-aging property

Symbol of quality	Tensile strength N/mm^2	Elongation %						Tensile test piece
	Discrimination according to nominal thickness mm							
	0.25 or over	0.25 or over to and excl. 0.40	0.40 or over to and excl. 0.60	0.60 or over to and excl. 1.0	1.0 or over to and excl. 1.6	1.6 or over to and excl. 2.5	2.5 or over	
SPCC	(270 min.)	(32 min.)	(34 min.)	(36 min.)	(37 min.)	(38 min.)	(39 min.)	No. 5, in rolling direction
SPCD	270 min.	34 min.	36 min.	38 min.	39 min.	40 min.	41 min.	
SPCE	270 min.	36 min.	38 min.	40 min.	41 min.	42 min.	43 min.	

Remarks 1. The tensile test value, as a rule, is not applicable to SPCC. When specified (SPCCT) by purchaser, however, the values in parentheses shall be applied.
2. For those less than 0.60mm in thickness, as a rule, the tensile test shall be omitted.
3. This table is applicable to those of 30 mm or over in width.
4. When the steel sheet and coil of standard temper grade in quality SPCE are specified non-aging properties (SPCEN), this shall be guaranteed for six months after shipment from the manufacturer's factory.

JIS G 3141 (2002)

Table 5. Hardness

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

Remarks : As to hardness, either HRB or HV shall be applied.

JIS G 3141 (2002)

Table 6. Bendability

Temper grade	Symbol of temper grade	Bend test		
		Bend angle	Inside Radius	Bend test piece
As-annealed	A	180°	Flat on itself	No. 3 test piece, in the rolling direction
Standard temper grade	S	180°	Flat on itself	
1/8 hard	8	180°	Flat on itself	
1/4 hard	4	180°	Thickness × 0.5	
1/2 hard	2	180°	Thickness × 1.0	
Full hard	1	—	—	

Remarks : The bend test may be omitted for the steel sheet and coil of as-annealed and of standard temper grade.

Cat.No.B1E-002-02

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Printed on recycled paper.

July.'04 Rev.(July.'03)-③-1, NKTS
Printed in Japan