



[Product Manual]

# PICKLED AND OILED STEEL COILS



CHINA STEEL AND NIPPON STEEL  
VIETNAM JOINT STOCK COMPANY

Our Quality, Your Better Life

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## 1. FOREWORD



China Steel and Nippon Steel Vietnam Joint Stock Company, a delicate steel-manufacturing company, we commit to continually improve our Quality Management System and provide good products and will endeavor to pursue both internal and external satisfactions.

China Steel and Nippon Steel Vietnam Joint Stock Company (abbreviated as CSVC) is a joint stock company of Taiwanese and Japanese companies. The main investors are China Steel Corporation (Taiwan, R.O. China) and Nippon Steel Corporation (Japan). CSVC started its construction in September 2011 and start commercial running in November 2013.

CSVC can provide P/O (Pickled & Oiled) CR (Cold Rolled), ASCR (As Cold Rolled), Galvanized (GI & GA) and ES (Electrical Steel) product with high quality. The total annual production capacity is 1.2 million metric tons.

CSVC implemented its quality management system based on ISO 9001 requirement, we especially stress on meeting customer requirement and continually improving products quality. That's why it makes CSVC to be a reliable and trustworthy supplier of steel products. Besides, in order to commit our responsibility to the environment, CSVC also put much effort in reducing or even eliminating of any hazardous substance to make our products eco-friendly.

## 2. PRODUCT CERTIFICATES

CSVC achieve many certificates such as:

ISO 9001:2015, IATF16949:2016, SIRIM Mark, SNI Mark, QUATEST Mark, TISI Mark, ...

**ISO 9001:2015**



**IATF1694**



**Quatest3 Mark**



**SIRIM Mark**



**SIRIM**

**ISO 17025:2005**



**JAPAN Mark**



**SNI Mark**



### 3. FEATURES OF P/O STEEL

Pickled and oiled steel sheets are widely used in modern society, such as automobile parts, wheels, brackets, rack, sheathing and so on. To meet the multiple requirements, the specifications of P/O steel became more and more diversified. Customers shall always need to choose appropriate specifications based on end usage. Brief introductions of products are as below:

- ✦ JIS G3131 SPHC/D/E/F, JFS A1001 JSH270C/D/E JIS/JFS standard of P/O products, grade from commercial quality to deep drawing quality, which can be used in various applications, mainly focus on their deforming properties.
- ✦ JIS G3101 SS330~540, ASTM A1011/1018 SS Grade 30-80 P/O steel coils used for general structure with minimum tensile strength from 330 to 620 N/mm<sup>2</sup>, which are widely used in various structures or other strength-required parts.
- ✦ JIS G3113 SAPH310/370/400/440 JIS SAPH 310~440 products are specially designed for automobile structural use, tensile strength from 310 to 440 N/mm<sup>2</sup>, which can be used in automobile structural applications.
- ✦ ASTM A1011 HSLA High strength low-alloy P/O steel coils mainly applicable to structural use such as sections and stiffening plates.
- ✦ JIS G3134 SPFH490/540(Y)/590(Y), JSH540Y~590Y P/O steel with high strength, excellent stretch ability, which are widely used in automobile structural reinforce members to reduce vehicle.
- ✦ EN10149-2 S315MC~S500MC P/O steel coils with high yield strength from the range 315 ~ 500 N/mm<sup>2</sup>, mainly applicable to cold forming used and yield strength-required parts.

## 4. MANUFACTURING PROCESS

Pickled and oiled steel coils are produced from hot-rolled coils, the typical manufacturing processes are described as Fig.1



**Fig.1:** Manufacturing process flow of P/O products

CSVC produce its P/O products by the pickling line, which is a part of PLTCM (abbreviated from Pickling and Tandem cold-rolling Mill).

Some pictures of Pickled and Oiled line



**Picture 1:**  
Two Pay-Off Reel  
In The Entry Section



**Picture 2:**  
Laser Beam Welder



**Picture 3:**  
Polypropylene Pickling Tank



**Picture 4:** Electrostatic Oiler  
Located In The Delivery Section



**Picture 5:** Tension Reel

## 5. SPECIFICATIONS

While much effort has been made to ensure the accuracy of the information contained within this publication, the use of the information is at the user's risk and no warranty is implied or expressed by CSVC with respect to the use of information contained herein. The information in this publication is subject to change without notice. Please contact CSVC office for the latest information.

### 5.1 Chemical Compositions and Mechanical Properties

#### 5.1.1. JIS G3131 Hot- Rolled Mild Steel Plate, Sheets and Strip

Grade				SPHC	SPHD	SPHE	SPHF
Chemical Composition %	C			0.12 max.	0.10 max.	0.08 max.	0.08 max.
	Mn			0.60 max.	0.45 max.	0.40 max.	0.35 max.
	P			0.045 max.	0.035 max.	0.030 max.	0.025 max.
	S			0.035 max.	0.035 max.	0.030 max.	0.025 max.
Tensile Test	Tensile Strength N/mm <sup>2</sup>			270 min.			
	Elongation %	Thickness (t) mm	t < 1.6	27 min.	30 min.	32 min.	37 min.
			1.6 ≤ t < 2.0	29 min.	32 min.	34 min.	38 min.
			2.0 ≤ t < 2.5	29 min.	33 min.	35 min.	39 min.
			2.5 ≤ t < 3.2	29 min.	35 min.	37 min.	39 min.
			3.2 ≤ t < 4.0	31 min.	37 min.	39 min.	40 min.
	t ≥ 4.0	31 min.	39 min.	41 min.	42 min.		
Test piece			No.5, in rolling direction				
Bendability	Angle of Bending			180	—	—	—
	Inside radius	Thickness (t) mm	t < 3.2	Flat on itself	—	—	—
			t ≥ 3.2	0.5 t	—	—	—
	Test piece			No.3, in rolling direction			

**Remark:**

- Grade SPHF is manufactured by a special process, such as made of killed steel to improve drawability.
- The values specified shall not apply to the irregular portions t both ends of steel strip.
- The bend test may be omitted by the manufacturer's decision, but the bendability shall satisfy the specification. However, when the purchaser designates, the test shall be performed.

#### 5.1.2 JIS G3101 Hot-Rolled Steel for General Structure

Grade	Chemical Composition %				Tensile Test				Bendability		
	C	Mn	P	S	Yield Strength N/mm <sup>2</sup>	Tensile Strength N/mm <sup>2</sup>	Elongation %		Angle of Bending	Inside radius	Test Piece
							No.5 Test Piece	No.1A Test Piece		Thickness(t) (mm)	
							Thickness(t) mm				
t ≤ 5	t > 5										
SS330	—	—	0.05 max	0.05 max	205 min	330 - 430	26 min	21 min	180°	0.5 t	No.1
SS400					245 min	400 - 510	21 min	17 min		1.5t	
SS490					285 min	490 - 610	19 min	15 min		2.0t	
SS540	0.3 max	1.6 max	0.04 max	0.04 max	400 min	540 min	16 min	13 min		2.0t	

**Remark:**

- Alloy elements other than those shown in the above table may be added if necessary.
- The bend test may be omitted by the manufacturer's decision, but the bendability shall satisfy the specification. However, when the purchaser designates, the test shall be performed.



## 5.1.3 JIS G3113 Hot-Rolled Steel Plates, Sheets and Strip for Automobile Structural Uses

Classification symbol	C	Si	Mn	P	S
SAPH310	-	-	-	≤0.040	≤0.040
SAPH370					
SAPH400					
SAPH440					

Grade	Tensile Test								Bendability				
	Tensile Strength N/mm <sup>2</sup>	Yield Point N/mm <sup>2</sup>		Elongation %					Test piece	Angle of Bending	Inside radius		Test piece
		Thickness (t) mm		Thickness (t) mm							Thickness (t) mm		
		t < 6.0	t = 6.0	1.6 ≤ t < 2.0	2.0 ≤ t < 2.5	2.5 ≤ t < 3.15	3.15 ≤ t < 4.0	4.0 ≤ t ≤ 6.0			t < 2.0	t ≥ 2.0	
SAPH310	310 min	185 min	185 min	33 min	34 min	36 min	38 min	40 min	No.05 test piece in rolling direction	180°	Flat on itself	1.0 t	No.03 test piece in transverse to rolling direction
SAPH370	370 min	225 min	225 min	32 min	33 min	35 min	36 min	37 min			0.5 t	1.0 t	
SAPH400	400 min	255 min	235 min	31 min	32 min	34 min	35 min	36 min			1.0 t	1.0 t	
SAPH440	440 min	305 min	295 min	29 min	30 min	32 min	33 min	34 min			1.0 t	1.0 t	

**Remark:**

- 1) Values in parentheses mean reference values.
- 2) The values specified shall not apply to the irregular portions at both ends of steel strip.

## 5.1.4 JIS G3132 Hot-Rolled Carbon Steel Strip for Pipes and Tubes

Grade	Chemical Composition %					Tensile Test					Bendability				
	C	Si	Mn	P	S	Tensile Strength N/mm <sup>2</sup>	Elongation %				Test piece	Angle of Bending	Inside radius		Test piece
							Thickness (t) mm						Thickness (t) mm		
							t < 1.6	1.6 ≤ t < 3.0	3.0 ≤ t < 6.0	t = 6.0			t ≤ 3.0	0.3 ≤ t ≤ 6.0	
SPHT1	0.10 max	0.35 max	0.50 max	0.040 max	0.040 max	270 min	30 min	32 min	35 min	37 min	No.5 in rolling direction	180°	Flat on itself	0.5 t	No.3 in rolling direction
SPHT2	0.18 max		0.60 max			340 min	25 min	27 min	30 min	32 min			1.0 t	1.5 t	
SPHT3	0.25 max		0.30 - 0.90			410 min	20 min	22 min	25 min	27 min			1.5 t	2.0 t	
SPHT4	0.30 max		0.30 - 1.00			490 min	15 min	18 min	20 min	22 min			1.5 t	2.0 t	

**Remark:**

- 1) The Si content of SPHT1 can be modified to 0.04% max. upon agreement between the purchaser & manufacturer.
- 2) Values in parentheses mean reference values.
- 3) The values specified shall not apply to the irregular portions at both ends of steel strip.
- 4) The bend test may be omitted by the manufacturer's decision, but the bendability shall satisfy the specification. However, when the purchaser designates, the test shall be performed.

## 5.1.5 JIS G3134 Hot-Rolled High Strength Steel Sheets with Improved Formability for Automobile Structural Uses

Grade	Tensile Test							Bendability			
	Tensile Strength N/mm <sup>2</sup>	Yield Point or Proof Stress N/mm <sup>2</sup>	Elongation %				Test piece	Angle of Bending	Inside radius		Test piece
			Thickness (t) mm						Thickness (t) mm		
			1.6 ≤ t < 2.0	2.0 ≤ t < 2.5	2.5 ≤ t < 3.25	3.25 ≤ t			1.6 ≤ t < 3.25	3.25 ≤ t ≤ 6.00	
SPFH 490	490min	325min	22min	23min	24min	25min	No.5 transverse to rolling direction	180°	0.5 t	1.0 t	No.3 transverse to rolling direction
SPFH 540	540min	355min	21min	22min	23min	24min			1.0 t	1.5 t	
SPFH 590	590min	420min	19min	20min	21min	22min			1.5 t	1.5 t	
SPFH 540Y	540min	295min	—	24min	25min	26min			1.0 t	1.5 t	
SPFH 590Y	590min	325min	—	22min	23min	24min			1.5 t	1.5 t	

**Remark:**

- 1) The chemical composition shall be agreed upon by the purchaser and supplier, if necessary.
- 2) The bend test may be omitted by the manufacturer's decision, but the bendability shall satisfy the specification. However, when the purchaser designates, the test shall be performed.

### 5.1.6 JIS G4051 Carbon Steels for Machine Structural Use

Chemical Composition %					
Grade	C	Si	Mn	P	S
S10C	0.08 – 0.13	0.15~0.35	0.30 – 0.60	0.030max.	0.035max.
S12C	0.10 – 0.15				
S15C	0.13 – 0.18				
S17C	0.15 – 0.20				
S20C	0.18 – 0.23				
S22C	0.20 – 0.25				
S25C	0.22 – 0.28				
S28C	0.25 – 0.31		0.60 – 0.90		
S30C	0.27 – 0.33				
S33C	0.30 – 0.36				
S35C	0.32 – 0.38				
S38C	0.35 – 0.41				
S40C	0.37 – 0.43				
S45C	0.42 – 0.48				
S48C	0.45 – 0.51				
S50C	0.47 – 0.53				

### 5.1.7 JFS A1001 Hot Rolled Steel Sheet and Strip for Automobile Use

#### a) JFS A1001 Chemical Composition

Unit :%

Type & Designation		Chemical Composition						
		C Max.	Si Max.	Mn Max.	Al Max.	Nb Max.	Ti Max.	B Max.
Mild Steel Sheet	JSH270C	0.15	0.05	0.60	0.10	0.10		
	JSH270D	0.1						
	JSH270E							
Commercial Type Steel Sheet W	JSH370W	0.25	0.06	2.0				
	JSH400W							
	JSH440W		1.00					
	JSH490W							
	JSH540W							
High Yield Ratio Type Steel Sheet	JSH440R	0.20	2.0					0.20
	JSH540R							

Type & Designation		Tensile Test				Bendability						
		Tensile strength N/mm <sup>2</sup>	Yield strength (N/mm <sup>2</sup> )		Elongation (%)	Test Piece	Angle of Bending	Inside radius		Test Piece		
			t<2.5	2.5 ≤t≤6.0				2.6t<3.2	3.2≤t			
Mild Steel Sheet	JSH270C	270min.	185~325	175~305	35~52	JIS No 5 Rolling direction	180°	Flat on itself	0.5t	JIS No 3 Rolling direction		
	JSH270D	270min.	175~305	165~285	37~55				Flat on itself			
	JSH270E	270min.	155~275	145~255	40~56				Flat on itself			
Commercial Type Steel Sheet W	JSH370W	370min.	215~355	205~335	33~50			JIS No 5 perpendicular to rolling direction	1.0t	1.0t	1.0t	JIS No 3 Perpendicular to Rolling direction
	JSH400W	400min.	235~375	225~355	31~49							
	JSH440W	440min.	275~400	265~390	29~47							
	JSH490W	490min.	325~460	315~450	25~41							
High Yield Ratio Type Steel Sheet	JSH540W	540min.	365~510	355~500	22~38			JIS No 5 Rolling direction	1.5t	1.5t	1.5t	JIS No 5 perpendicular to rolling direction
	JSH440R	440min.	325~450	315~440	26~41						1.0t	
	JSH540R	540min.	420~570	410~560	21~35						1.5t	
Low Yield Ratio Type Steel Sheet	JSH590R	590min.	470~630	450~620	17~33	JIS No 5 perpendicular to rolling direction	1.5t	1.5t	1.5t	JIS No 5 perpendicular to rolling direction		
JSH590Y	590min.	325~500	325~490	22~39	1.5t							

**Remark:**

The bend test may be omitted by the manufacturer's decision, but the bendability shall satisfy the specification. However, when the purchaser designates, the test shall be performed.

### 5.1.8 ASTM A1011 Carbon, structural, High-Strength Low-Alloy Steel and High-Strength Low-Alloy with Improved Formability.

#### a. Chemical composition

Grade	Chemical Composition (%)											
	C	Mn	P	S	Al	Cu	Ni	Cr	Mo	V	Nb	Ti
CS Type B	0.02 - 0.15	0.60 max	0.030 max	0.035 max	—	0.20 max	0.20 max	0.15 <sup>(1)</sup> max	0.06 max	0.008 max	0.008 max	0.025 <sup>(1)</sup> max
DS Type B	0.02 - 0.08	0.50 max	0.020 max	0.030 max	0.01 min							
SS Grade 33	0.25	0.90	0.035	0.04	—							
SS Gr. 36 Type 1	0.25 max	0.90 max	0.35 max	0.04 max	—							
SS Gr. 36 Type 2	0.25 max	1.35 max	0.035 max	0.040 max	—							
HSLAS Gr.45 Class 1	0.22 max	1.35 max	0.040 max	0.040 max	—							
HSLAS-F Gr.50	0.15 max	1.65 max	0.020 max	0.025 max	—	0.20 max	0.20 max	0.15 <sup>(1)</sup> max	0.06 max	0.005 min	0.005 min	0.005 min
HSLAS-F Gr.60									0.16 max			
HSLAS-F Gr.70												
HSLAS-F Gr.80												

**Remark:**

- 1) Cr is 0.25% maximum when C $\leq$ 0.05%. Ti is permitted for SS designations to the lesser of (3.4N + 1.5S) or 0.025% maximum, when C $\geq$ 0.02%.
- 2) Nb, Ti and V are 0.005% min. when specified.

**b. Mechanical properties**

Grade	Tensile Test						Bendability		
	Tensile Strength MPa	Yield Strength MPa	Elongation % G.L.= 50 mm				Test piece	Inside Radius	Test piece
			t<6.0 (mm)	t<1.6 (mm)	1.6 $\leq$ t<2.5 (mm)	t=2.5 (mm)		2.5<t<6.0 (mm)	
CS Type B	-	205~340	25 min	25 min	25 min	25 min	In rolling direction	-	Transverse to rolling direction
DS Type B	-	205~310	28 min	28 min	28 min	28 min		-	
SS Grade 33	360	230	18 min	18 min	22 min	23 min		1 1/2 t	
SS Gr. 36 Type 1	365	250	17 min	17 min	21 min	22 min		1 t	
SS Gr. 36 Type 2	400~550	250 min	16 min	16 min	21 min	21 min		2.0 t	
HSLAS Gr.45 Class 1	410 min	310 min	23 min	23 min	23 min	25 min		1.5 t	
HSLAS-F Gr.50	410 min	340 min	22 min	22 min	22 min	24 min		1.0 t	
HSLAS-F Gr.60	480 min	410 min	20 min	20 min	20 min	22 min		1.5 t	
HSLAS-F Gr.70	550 min	480 min	18 min	18 min	18 min	20 min		2.0 t	
HSLAS-F Gr.80	620 min	550 min	16 min	16 min	16 min	18 min		2.0 t	

**5.1.9 EN 10149-2 Hot-rolled flat products made of high yield strength steels for cold forming**

**a. Chemical composition**

Grade	Steel No.	Chemical Composition %										
		C	Mn	Si	P	S <sup>(2)</sup>	Al total	Nb <sup>(1)</sup>	V <sup>(1)</sup>	Ti <sup>(1)</sup>	Mo	B
S315MC	1.0972	0.12 max	1.30 max	0.50 max	0.025 max	0.020 max	0.015 min	0.09 max	0.20 max	0.15 max	-	-
S355MC	1.0976		1.50 max			0.015 max						
S420MC	1.0980		1.60 max									
S460MC	1.0982		1.60 max									
S500MC	1.0984		1.7max									
S550MC	1.0986		1.80 max									

**Remark:**

- 1) Nb+V+Ti $\leq$ 0.22
- 2) The S content can be modified to 0.010% max upon agreement between the purchaser and the manufacturer.

**b. Mechanical properties**

Grade	Steel No.	Yield Strength N/mm <sup>2</sup>	Tensile Strength N/mm <sup>2</sup>	Elongation% (in rolling direction)		Bend Test (Inside diameter)
				Thickness (t) mm		
				t<3 G.L.=80mm	3 $\leq$ t G.L.=5.65 $\sqrt{S_0}$	180° (in transverse to rolling direction)
S315MC	1.0972	315 min	390-510	20min.	24min.	Flat on itself
S355MC	1.0976	355 min	430-550	19min.	23min.	0.5t
S420MC	1.0980	420 min	480-620	16min.	19min.	0.5t
S460MC	1.0982	460 min	520-670	14min.	17min.	1.0t
S500MC	1.0984	500 min	550-700	12min.	14min.	1.0t
S550MC	1.0986	550 min	600-760	12min.	14min.	1.5t

**Remark:**

"S<sub>0</sub>" Test piece section area.

## 5.1.10 EN 10111 Continuously hot rolled low carbon steel sheet and strip for cold forming

### a. Chemical composition

Grade	Chemical Composition			
	C	Mn	P	S
DD11	0.12	0.6	0.045	0.045
DD12	0.1	0.45	0.035	0.035
DD13	0.08	0.4	0.3	0.3
DD14	0.08	0.35	0.025	0.025

### b. Mechanical properties

Grade	Yield Strength N/mm <sup>2</sup>		Tensile Strength N/mm <sup>2</sup>	Elongation			
	1.0≤t<2	2≤t≤11		L0= 80 mm			L0= 5.65√S <sub>0</sub>
				1≤e<1.5	1.5≤t2	2≤t<3	t≥3
DD11	170-360	170-340	440	22	23	24	28
DD12	170-340	170-320	420	24	25	26	30
DD13	170-330	170-310	400	27	28	29	33
DD14	170-310	170-290	380	30	31	32	36

**Note:** As long as the width of the product permits, the test pieces for the tensile test shall be taken transverse to the direction of roll.

## 5.1.11 SAE J403 Carbon Steel

Grade	Chemical Composition %				
	C	Si	Mn	P	S
1002 <sup>(1)</sup>	0.02~0.04	---	0.35max.	0.030max	0.030max
1003 <sup>(1)</sup>	0.02~0.06		0.35max.		
1004 <sup>(1)</sup>	0.02~0.08		0.35max.		
1005 <sup>(2)</sup>	0.06max.		0.35max.		
1006 <sup>(2)</sup>	0.08max.		0.25~0.40		
1007 <sup>(1)</sup>	0.02~0.10		0.50max.		
1008 <sup>(2)</sup>	0.10max.		0.30~0.50		
1009 <sup>(2)</sup>	0.15max.		0.60max.		
1010	0.08~0.13		0.30~0.60		
1012	0.10~0.15		0.30~0.60		
1013	0.11~0.16		0.30~0.60		
1015	0.13~0.18		0.30~0.60		
1016	0.13~0.18		0.60~0.90		
1017	0.15~0.20		0.30~0.60		
1018	0.15~0.20		0.60~0.90		
1019	0.15~0.20		0.70~1.00		
1020	0.18~0.23		0.30~0.60		
1021	0.18~0.23		0.60~0.90		
1022	0.18~0.23		0.70~1.00		

**Remark:**

Ultra low carbon, interstitial free stabilized and non-stabilized steel shall not be supplied for these grades.

Ultra low carbon, interstitial free stabilized and non-stabilized steel may be supplied for these grades.

**Note:**

Manganese limits for Structural Shapes, Plates, Strip, Sheets and Welded Tubing shall be as follows:

SAE1006 requires Mn 0.45% maximum and SAE1008 requires Mn 0.50% maximum.

## 5.2 Tolerances

### 5.2.1 Thickness Tolerances

#### (1) JIS G3131 Thickness Tolerances

Unit: mm

Thickness (t)	Width(w)		
	w < 1200	1200 ≤ w < 1500	1500 ≤ w ≤ 1600
1.60 ≤ t < 1.60	±0.14	±0.15	±0.16 <sup>(1)</sup>
1.60 ≤ t < 2.00	±0.16	±0.17	±0.18
2.00 ≤ t < 2.50	±0.17	±0.19	±0.21
2.50 ≤ t < 3.15	±0.19	±0.21	±0.24
3.15 ≤ t < 4.00	±0.21	±0.23	±0.26
4.00 ≤ t < 5.00	±0.24	±0.26	±0.28
5.00 ≤ t < 6.00	±0.26	±0.28	±0.29
t = 6.00	±0.29	±0.30	±0.31

**Remark:**

1) The above table applies to SPHC, SPHD, SPHE and SPHF grades.

2) Thickness shall be measured at any point of 20mm and over inside the edges.

3) The values specified shall not apply to the irregular portions at both ends of steel coils.

**Note:** The value shall be applied to the steel strip under 1600mm in width.

#### (2) JIS G3113 Thickness Tolerances

Unit: mm

Thickness (t)	Width(w)		
	w < 1200	1200 ≤ w < 1500	1500 ≤ w ≤ 1600
1.60 ≤ t < 2.00	±0.16	±0.17	±0.18
2.00 ≤ t < 2.50	±0.17	±0.19	±0.21
2.50 ≤ t < 3.15	±0.19	±0.21	±0.24
3.15 ≤ t < 4.00	±0.21	±0.23	±0.26
4.00 ≤ t < 5.00	±0.24	±0.26	±0.28
5.00 ≤ t < 6.00	±0.26	±0.28	±0.29
t = 6.00	±0.29	±0.30	±0.31

**Remark:**

1) The positions where the thickness is to be measured shall be as follows:

(A) For mill-edged products, any point 25mm and over inward from the edge.

(B) For cut-edged products, any point 15mm and over inward from the edge.

2) The values specified shall not apply to the irregular portions at both ends of steel coils.

#### (3) JIS G3132 Thickness Tolerances of Hot-Rolled Steel Coils (SPHT1 ~ SPHT3)

##### a) (SPHT1 ~ SPHT3)

Unit: mm

Thickness (t)	Width(w)		
	w < 1200	1200 ≤ w < 1500	1500 ≤ w ≤ 1600
t < 1.60	(±0.14) <sup>(2)</sup>	±0.15	±0.16 <sup>(1)</sup>
1.60 ≤ t < 2.00	±0.16	±0.17	±0.18
2.00 ≤ t < 2.50	±0.17	±0.19	±0.21
2.50 ≤ t < 3.15	±0.19	±0.21	±0.24

$3.15 \leq t < 4.00$	$\pm 0.21$	$\pm 0.23$	$\pm 0.26$
$4.00 \leq t < 5.00$	$\pm 0.24$	$\pm 0.26$	$\pm 0.28$
$5.00 \leq t < 6.00$	$\pm 0.26$	$\pm 0.28$	$\pm 0.29$
$T = 6.00$	$\pm 0.29$	$\pm 0.30$	$\pm 0.31$

## b) (SPHT4)

Unit: mm

Thickness (t) \ Width(w)	$w < 1200$	$1200 \leq w < 1500$	$1500 \leq w \leq 1600$
$t < 1.60$	$(\pm 0.14)^{(2)}$	$\pm 0.15$	$\pm 0.16^{(1)}$
$1.60 \leq t < 2.00$	$\pm 0.16$	$\pm 0.19$	$\pm 0.20$
$2.00 \leq t < 2.50$	$\pm 0.18$	$\pm 0.22$	$\pm 0.23$
$2.50 \leq t < 3.15$	$\pm 0.20$	$\pm 0.24$	$\pm 0.26$
$3.15 \leq t < 4.00$	$\pm 0.23$	$\pm 0.26$	$\pm 0.28$
$4.00 \leq t < 5.00$	$\pm 0.26$	$\pm 0.29$	$\pm 0.31$
$5.00 \leq t < 6.00$	$\pm 0.29$	$\pm 0.31$	$\pm 0.32$
$t = 6.00$	$\pm 0.32$	$\pm 0.33$	$\pm 0.34$

### Remark:

- 1) The above table applies to SPHT4 grades.
- 2) Thickness shall be measured at any point 20mm and over inside the edges.
- 3) The values specified shall not apply to the irregular portions at both ends of steel coils.

### Note:

- (1) The value shall be applied to the steel strip under 1600mm in width.
- (2) Values in parentheses mean reference values.

## (4) JIS G3134 Thickness Tolerances of Hot-Rolled High Strength Steel Sheets with improved for Formability for Automobile Structural Use

Unit: mm

Thickness (t) \ Width(w)	$w < 1200$	$1200 \leq w < 1500$	$1500 \leq w \leq 1600$
$1.60 \leq t < 2.00$	$\pm 0.16$	$\pm 0.19$	$\pm 0.20^{(1)}$
$2.00 \leq t < 2.50$	$\pm 0.18$	$\pm 0.22$	$\pm 0.23^{(1)}$
$2.50 \leq t < 3.15$	$\pm 0.20$	$\pm 0.24$	$\pm 0.26^{(1)}$
$3.15 \leq t < 4.00$	$\pm 0.23$	$\pm 0.26$	$\pm 0.28$
$4.00 \leq t < 5.00$	$\pm 0.26$	$\pm 0.29$	$\pm 0.31$
$5.00 \leq t < 6.00$	$\pm 0.29$	$\pm 0.31$	$\pm 0.32$
$t = 6.00$	$\pm 0.32$	$\pm 0.33$	$\pm 0.34$

### Remark:

- 1) The positions where the thickness is to be measured shall be as follows:
  - (A) For mill-edged products, any point 25mm and over inward from the edges.
  - (B) For cut-edged products, any point 15mm and over inward from the edges.
- 2) The values specified shall not apply to the irregular portions at both ends of steel coils.

### Note:

- (1) The values are applicable to the steel sheets and coils under 1600 mm in width.

## (5) JIS G3193 Thickness Tolerances

Unit: mm

Thickness (t) \ Width(w)	$W < 1600$	$W = 1600$
$t < 1.25$	$\pm 0.16$	—
$1.25 \leq t < 1.60$	$\pm 0.18$	—
$1.60 \leq t < 2.00$	$\pm 0.19$	$\pm 0.23$

2.00≤t<2.50	±0.20	±0.25
2.50≤t<3.15	±0.22	±0.29
3.15≤t<4.00	±0.24	±0.34
4.00≤t<5.00	±0.45	±0.55
5.00t<6.00	±0.50	±0.60

**Remark:**

- 1) The above table applies to SS, SAPH-X, and SXXC grades.
- 2) The positions where the thickness is to be measured shall be as follows:
  - (A) For mill-edged products, any point 25mm and over inward from the edges.
  - (B) For cut-edged products, any point 15mm and over inward from the edges.
- 3) Tolerance given in the table may be limited to either plus side or minus side upon the agreement between the purchaser and the supplier. The total tolerance range in this case shall be equal to that given in this table.

**(6) JFS A1001 Thickness Tolerances (Class A)**

**Unit: mm**

Specified minimum tensile strength	Width (w)			
	Thickness (t)	w<1200	1200≤w<1500	1500≤w≤1600
TS ≤ 440 N/mm <sup>2</sup>	1.40≤t<1.60	±0.14	±0.15	±0.16
	1.60≤t<2.00	±0.16	±0.17	±0.18
	2.00≤t<2.50	±0.17	±0.19	±0.21
	2.50≤t<3.15	±0.19	±0.21	±0.24
	3.15≤t<4.00	±0.21	±0.23	±0.26
	4.00≤t<5.00	±0.24	±0.26	±0.28
	5.00≤t<6.00	±0.26	±0.28	±0.29
	t=6.00	±0.29	±0.30	±0.31
TS > 440 N/mm <sup>2</sup>	1.60≤t<2.00	±0.16	±0.19	±0.20
	2.00≤t<2.50	±0.18	±0.22	±0.23
	2.50≤t<3.15	±0.20	±0.24	±0.26
	3.15≤t<4.00	±0.23	±0.26	±0.28
	4.00≤t<5.00	±0.26	±0.29	±0.31
	5.00≤t<6.00	±0.29	±0.31	±0.32
	t=6.00	±0.32	±0.33	±0.34

**Remark:**

Thickness shall be measure at any point not less than 25mm from a side edge in the case if mill edge, and not less than 15mm from a side edge in the case of cut edge.

**(7) ASTM A568 Thickness Tolerances (Carbon Steel)**

**Unit: in.**

Specified Width, in.	Specified Ordered Thickness, in. <sup>A</sup>				
	Over 0.051 to 0.057 incl	Over 0.057 to 0.071 incl	Over 0.071 to 0.098 incl	Over 0.098 to 0.180 excl	0.180 to 0.230 excl
	Thickness Tolerances, Over, in., No Tolerance Under <sup>B</sup>				
Over 20 to 40 incl	0.010	0.012	0.014	0.014	0.016
Over 40 to 48 incl	0.012	0.012	0.014	0.016	0.018
Over 48 to 60 incl	0.012	0.014	0.014	0.016	0.020
Over 60 to 72 incl	0.014	0.014	0.016	0.016	0.022



**Remark:**

- 1) The above table is referred from the table S1.1 in A568/A568M-14 standard.
- 2) Thickness shall be measured at any point across the width not less than 9.5mm from a cut edge and not less than 19mm from a mill edge.
- 3) The above table does not apply to the uncropped ends if mill-edged coils.

**(8) ASTM A568 Thickness Tolerances (High-Strength Low-Alloy Steel)**

Unit: in.

Specified Width, in.	Specified Ordered Thickness, in. <sup>A</sup>					
	Under 0.059 incl	Over 0.059 to 0.070 incl	Over 0.070 to 0.082 incl	Over 0.082 to 0.098 incl	Over 0.098 to 0.180 excl	0.180 to 0.230 excl
	Thickness Tolerances, Over, in., No Tolerance Under <sup>B</sup>					
Over 20 to 32 incl	0.012	0.014	0.014	0.014	0.016	0.018
Over 32 to 40 incl	0.012	0.014	0.014	0.016	0.016	0.018
Over 40 to 48 incl	0.014	0.014	0.014	0.016	0.020	0.020
Over 48 to 60 incl	0.014	0.014	0.014	0.016	0.020	0.020
Over 60 to 72 incl	..... <sup>C</sup>	0.016	0.016	0.018	0.022	0.022

**Remark:**

- 1) The above table is referred from the table S1.2 in A568/A568M-14 standard.
  - A. The specified thickness range captions apply independent of whether the ordered thickness is started as a nominal or minimum.
  - B. 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.
  - C. Where an ellipsis (.....) appears in the table, the requirements have not been defined.
- The above table does not apply to the uncropped ends of mill-edged coils.

**(9) ASTM A635 Thickness Tolerances**

Unit : mm

Width(w)	850 ≤ w < 1017	1017 ≤ w < 1220	1220 ≤ w < 1525	1525 ≤ w ≤ 1600
Thickness(t) 5.84 ≤ t < 6.00	±0.20	±0.22	±0.24	±0.24

**Remark:**

- 1) The above table is referred from the table S1.1 in A633-15 standard applies to ASTM A1011 and a1018 specifications
- 2) The values in the above table are converted for inh-pound units.
- 3) Thickness shall be measured at any point across the width not less than 15.875 mm from a cut edge and not less than 25.4 mm from a mill edge.
- 4) The above table does not apply to the uncropped ends of mill-edged coils.

**(10) EN 10051 Thickness Tolerances**

Unit: mm

Specified minimum tensile strength	Width (w)	w < 1200	1200 ≤ w < 1500	1500 ≤ w ≤ 1600
	Thickness (t)			
300 ≤ YS ≤ 360 N/mm <sup>2</sup>	t ≤ 2.00	±0.20	±0.22	±0.24
	2.00 < t ≤ 2.50	±0.21	±0.24	±0.26
	2.50 < t ≤ 3.00	±0.23	±0.25	±0.28
	3.00 < t ≤ 4.00	±0.25	±0.28	±0.30
	4.00 < t ≤ 5.00	±0.28	±0.30	±0.32
	5.00 < t ≤ 6.00	±0.30	±0.32	±0.33
360 ≤ YS ≤ 420 N/mm <sup>2</sup>	t ≤ 2.00	±0.22	±0.25	-
	2.00 < t ≤ 2.50	±0.23	±0.27	±0.30
	2.50 < t ≤ 3.00	±0.26	±0.29	±0.31
	3.00 < t ≤ 4.00	±0.29	±0.31	±0.34
	4.00 < t ≤ 5.00	±0.31	±0.34	±0.36
	5.00 < t ≤ 6.00	±0.34	±0.36	±0.38
342 ≤ YS ≤ 550 N/mm <sup>2</sup>	t ≤ 2.00	±0.24	±0.27	±0.29
	2.00 < t ≤ 2.50	±0.25	±0.29	±0.32
	2.50 < t ≤ 3.00	±0.28	±0.31	±0.34
	3.00 < t ≤ 4.00	±0.31	±0.34	±0.36
	4.00 < t ≤ 5.00	±0.34	±0.36	±0.39
	5.00 < t ≤ 6.00	±0.36	±0.39	±0.41

**5.2.2 Width, Camber and Flatness Tolerances**

**(1) JIS G3193 Width Tolerances**

Unit: mm

Width(w)	Thickness (t)	Tolerances			
		Mill edge		Cut edge (by ordinary cutting)	
		max	min	max	min
w<1000	1.40≤t≤6.00	25	0	10	0
1000≤w<1250	t<6.00	30	0	10	0
	t=6.00			15	
1250≤w<1600	t<6.00	35	0	10	0
	t=6.00			15	
w=1600	t<6.00	40	0	10	0
	t=6.00			20	

**(2) JIS G3193 Camber Tolerances**

Unit: mm

Width (w)	Maximum value
w≥850	5 in any 2000 length

**(3) JIS G3193 Flatness Tolerances**

Unit : mm

Thickness (t) \ Width(w)	w < 1250	1250 ≤ w < 1600	w = 1600
t < 1.60	18max.	20max.	—
1.60 ≤ t < 3.15	16max.	18max.	20max.
3.15 ≤ t < 4.00	16max.		
4.00 ≤ t < 5.00	14max.		
5.00 ≤ t < 6.00	13max.		

**Remark:**

- 1) The table is not applicable by the plate and sheet leveling done after leveling machine.
- 2) Values in this table shall be applied to any 2000 mm length. For the steel plate and sheet under 2000 mm in length, the values shall be applied to the full length. For the steel plate and sheet over 2000 mm in wave pitch, the values in this table shall be applied to any pitch of the wave. For those over 4000 mm in wave pitch, however, the above values shall be applied to any 4000mm length.
- 3) Unless otherwise specified, 1.5 times the maximum deviation from flatness specified in this table shall be applied to the steel plate and sheet of which the lower limit of yield point or proof strength in tensile test is at least 460N/mm<sup>2</sup>, or chemical position on hardness is equivalent thereto, or quenched and tempered.
- 4) The table does not apply to rolled edge (mill edge) steel plate.
- 5) Measurement of flatness, as a rule, shall be made on a flat surface plate.

**(4) JFS A1001 Width Tolerances (Class A)**

Unit: mm

Width (w)	Thickness (t)	Tolerance			
		Mill edge		Cut edge	
		max.	min.	max.	min.
w<1000	t < 60	25	0	10	0
	t = 6.0				
1000≤w<1250	t < 60	30	0	10	0
	t = 6.0			15	
1250≤w<1600	t < 60	35	0	10	0
	t = 6.0			15	
w = 1600	t < 60	40	0	10	0
	t = 6.0			15	

**(5) JFS A1001 Flatness Tolerances (Class B)**

Unit: mm

Specified minimum tensile strength	Width (w)		w<1250	1250≤w<1600	1600≤w
	Thickness (t)				
TS ≤ 440	1.40≤t<1.60		11	12	13
	1.60≤t<3.15		10	11	12
	3.15≤t<4.00		10	10	10
	4.00≤t<6.00		8	8	8
	t = 6.00		8	8	8
440<TS<590	1.60≤t<3.15		10	11	12
	3.15≤t<4.00		10	11	12
	4.00≤t<6.00		8	10	11
	t = 6.00		8	9	10

**(6) JFS A1001 Camber Tolerances**

Unit: mm

Width (w)	Maximum value
All	5 in any 2000 length

**(7) ASTM A568 Width Tolerances**

Unit: mm

Width(w)	Tolerances		
	Mill edge		Cut Edge
	Carbon Steel	High strength low alloy Steel	
w<890	+ 28 - 0	+ 28 - 0	+ 4.7 - 0
890≤w<1220	+ 28 - 0	+ 31 - 0	+ 4.7 - 0
1220≤w<1270	+ 28 - 0	+ 31 - 0	+ 6.3 - 0
1270≤w<1525	+ 38 - 0	+ 38 - 0	+ 6.3 - 0
1525≤w<1651	+ 38 - 0	+ 41 - 0	+ 7.9 - 0

**Remark:**

- 1) The above table applies to ASTM A1011 specifications.
- 2) The values in the above table are converted from inch-pound units.
- 3) The above table does not apply to the uncropped ends of mill-edged coils.

**(8) ASTM A635 Width Tolerances of Hot-Rolled Heavy-Thickness Carbon Steel Coils**

Unit: mm

Width (w)	Tolerances	
	Mill Edge	Cut Edge
720≤w<763	-0 / +28	-0 / +3.1
763≤w<890	-0 / +28	-0 / +4.7
890≤w<1220	-0 / +31	-0 / +4.7
1220≤w<1271	-0 / +31	-0 / +6.3
1271≤w<1525	-0 / +38	-0 / +6.3
1525≤w=1600	-0 / +41	-0 / +7.9

**Remark:**

- 1) The above table applies to A1011 specifications.
- 2) The values in the above table are converted from inch-pound units.
- 3) The above table does not apply to the uncropped ends of mill-edged coils.

**(9) ASTM A653/A568 Camber Tolerances**

Unit: mm

Width (w)	Maximum value
All	5 in any 2000 length

(10) EN 10051 Width Tolerances for sheet/plate

Unit: mm

Width (w)	Tolerance			
	Mill edge		Cut edge	
	max.	min.	max.	min.
w<1200	20	0	3	0
1200≤w<1600	20	0	5	0

(11) EN 10051 Flatness tolerance for steels with a specified minimum yield strength (300<YS≤550)

Nominal thickness	Nominal width	Tolerance on flatness	
		B	C
t≤25	w≤1200	18	23
	1200<w≤1500	23	30
	1500<w	28	38

(12) EN 10051 Camber Tolerances

Unit: mm

Width (w)	Maximum value	
	Mill edge	Cut edge
All	≤20mm in any 2000 length	≤15mm in any 2000 length

5.3 Classification of Quality

Classification	Common specifications	Property and purpose
Commercial Quality(CQ)	JIS G3131 SPHC SAE 1008~1023 CQ	Appropriate for normal forming, bending and welding, such as water pipe, electric wire pipe, parts with non-strength demand, cover, etc...
Drawing Quality(DQ)	JIS G3131 SPHD JSH 270D 270E SAE 1006~1008 DQ	Appropriate for drawing work or forming, such as bicycle bead, handle grip, 5-way pipe, etc...
Structure Quality(SQ)	SS400~SS490	Appropriate for simple bending work, welding and rivet joint with strength demand, such as ship hull, bridge, scaffold, etc...
Automobile Structure Quality (ASQ)	JIS G3113 SAPH310~SAPH440 JIS G3134 SPFH490~SPFH590	Appropriate for automobile parts, with strict inner quality and forming demand, normally used for automobile wheel rim, suspension system, chassis beam, brake back panel, etc...
Line Pipe Steel(LPS)	JIS G3132 SPHT1~ SPHT4	Strength, low temperature toughness, welding, formability, inner quality is all strictly demanded. Mainly used for gasoline, gas vapor, liquid transportation.
Re-Rolling Quality(RRQ)	SAE1006 (RRQ)~SAE1022 (RRQ)	Such steel is designed according to customer quality demand and process ability. It can be produced to cold rolling steel, galvanizing steel, color steel.

6. PRODUCT AVAILABILITY

6.1 Unit mass

Item	Product Type	Maximum Unit Mass
Coil	Pickled and Oiled, Mill Edge	20MT /Coil
	Pickled and Oiled, Cut Edge	

6.2 Available Sizes

HR Product	Thickness Range	Mill Edge/Cut Edge	Inner Diameter
Pickled and Oiled Coil	1.40~6.0	850~1600	610

**Remark:**

The above data is reference only. Actual available sizes range shall be confirmed with CSVC sales department.

## 7. MARKING AND PACKING

### 7.1 Marking for pickled and oiled steel

<b>CÔNG TY CỔ PHẦN CHINA STEEL &amp; NIPPON STEEL VIỆT NAM</b> <b>CHINA STEEL AND NIPPON STEEL VIETNAM JOINT STOCK COMPANY</b> Địa chỉ: Khu công nghiệp Mỹ Xuân A2, Phường Mỹ Xuân, Thị xã Phú Mỹ, Tỉnh Bà Rịa Vũng Tàu, Việt Nam. Address: My Xuan A2 Industrial Zone, My Xuan Ward, Phu My Town, Ba Ria-Vung Tau Province, Vietnam.			
Tên Sản Phẩm Product Name	<b>HOT ROLLED COIL P&amp;O</b>		 <b>QUATEST3</b> JIS G 3131:2010
Khách Hàng Customer	<b>DENYO VIETNAM</b>		
Tiêu Chuẩn Specification	<b>JIS G3131</b>		Mã Nhiệt Heat no. <b>2D268</b> Ngày Sản Xuất Product Date <b>31.01.2020</b>
Mác Thép Steel Grade	<b>SPHC-PO</b>		
Kích Thước Size	<b>2.000mm x1219.0mm × COIL</b>		Mã Cuộn Coil ID <b>3596352</b>
Khối Lượng Tịnh Net mass	<b>8,450</b>	kg	
Khối Lượng Tổng Gross mass	<b>8,510</b>	kg	 <b>3596352</b>
Sản Xuất Tại Việt Nam Made in Viet Nam		 <b>8,450</b>	

(The label is a sample and just for reference)

### 7.2 Packing for pickled and oiled steel



Case1

Film/Paper/VCI paper wrapping + Paper edge protector + Metal edge protector + Hard board paper + Metal protector + Circumferential strapping + Eye strapping



Case 2

Film/Paper/VCI paper wrapping +Paper edge Protector + Hard Board paper + Circumferential strapping + Eye Strapping

## 8. SURFACE QUALITY CONTROL

The surface quality controls for hot rolled products when producing are based on the requirements of downstream uses. Such controls are roughly classified as Un-Exposed (UE), General Purposes (GP) as follows:

Hot rolled surface, quality and suitable application recommendation

Class	GP (General Purposes)	UE (Unexposed)
Application	Bicycle Gear Hanger, Jack, Square Pipe, Compressor Case, Motorcycle, Tube, Drawing Tube, Tubes for Automobile Cushion, Automobile Parts, Automobile Rear Axle, Drive Shaft, Boiler Parts, Water Stop of Slurry, Wall For LNG Tank, Oil Drum, Oil Tank, Gardening Tool, Gas Cylinder, Hand Tool –SxxC, Cold Re-Rolling, Warehouse, Non-Expanded Welded Line, Pipe, Speaker Washer Free Wheel For Motorcycle, Bicycle Tube ,Container Trailer Chassis, Container Locking Rod , Wheel Disk or Wheel Rim ( For Painting)	Container, Angle Plate, Tubes For Structural Use, Chain Plate, Black or Hot-Dipped, ERW Pipe, Chain, Retaining Wall Spiral Pipe, Fence Parts, Guardrail of Highway, Dust Tube for Thermal, Power Plant, Chain Plate(Re-Rolling)

## 9. APPLICATIONS



Rims and disks



Automobile parts



Hydraulic jack



Wrench

## 10. ORDERING INFORMATION

For promptly and properly processing of your orders, please clearly specify the items as shown in the table below. If you need to confirm any information about CSVC's products or services, please feel free to contact with CSVC's sales or QC/QA department.

Required Ordering Data				Example
1	Product Name	P/O Coil	Pickled and Oiled Coil	P/O Coil
2	Specification and Designation of Grade			JIS G3131 SPHC
3	Cut Edge or Mill Edge			Mill Edge
4	Surface Quality			General Expose
5	Dimensions (Thickness × Width × coil)			1.0mm×1219mm×Coil
6	Inner Diameter			610
7	Mass	Maximum Mass		10 MT
		Order Mass		150 MT
8	Application and Fabricating Methods			Automobile parts
9	Oil Amount			800-1200 mg/ mm <sup>2</sup>
10	Special Requirements (if Required)			Show hardness test

### Notes:

- (1) The contents of this catalog are for reference only. Customers are recommended to consult the specifications published by the corresponding associations.
- (2) Information of the available steel grades, sizes, marking and packing as shown herein may be updated without notice to comply with actual production situations.
- (3) Customers are recommended to confirm with CSVC, should you have any questions concerning steel specifications or ordering requirements.

## 11. NOTIFICATION

- (1) If the sides of PO product are mill edge, they will have the potential dangers of scratching hands.
- (2) PO coil has been packed by steel straps, customers are reminded to be careful when unpack the coil.
- (3) For rust prevention, customer can choose oil amount based on application. Even though steel sheets were applied rust preventive oil, we still recommend that customers should use product as soon as possible, because rust could be occurred due to environment condition (Ex: humidity, acid, ...).

The information in this catalog is intended for reference only and may be subject to change without notice. For more information regarding either sales or techniques. Please contact to C1, C2 - Sale Department or P5-Quality Control and Quality Assurance department.

## 12. UNIT CONVERSION TABLE

Length	ft	in	mm	m
	1	12	304.8	0.3048
	0.08333	1	25.4	0.0254
	0.003281	0.03937	1	0.001

<b>Weight</b>	1kg=2.20462 lb
---------------	----------------

<b>Force</b>	1kgf=9.80665 N
--------------	----------------

Stress	ksi (=1000psi)	psi	kgf/mm <sup>2</sup>	N/mm <sup>2</sup> (MPa)
	1	1000	0.70307	6.89476
	0.001	1	0.703070×10 <sup>-4</sup>	6.89476×10 <sup>-3</sup>
	1.42233	1422.33	1	9.80665
	0.145038	145.038	0.101972	1

Absorbed Energy	ft-lbf	kgf-m	N-m (=Joule)
	1	0.138255	1.35582
	7.23301	1	9.80665
	0.737562	0.101972	1