



**SUN STEEL JOINT STOCK COMPANY**  
Group Company of Maruichi Japan

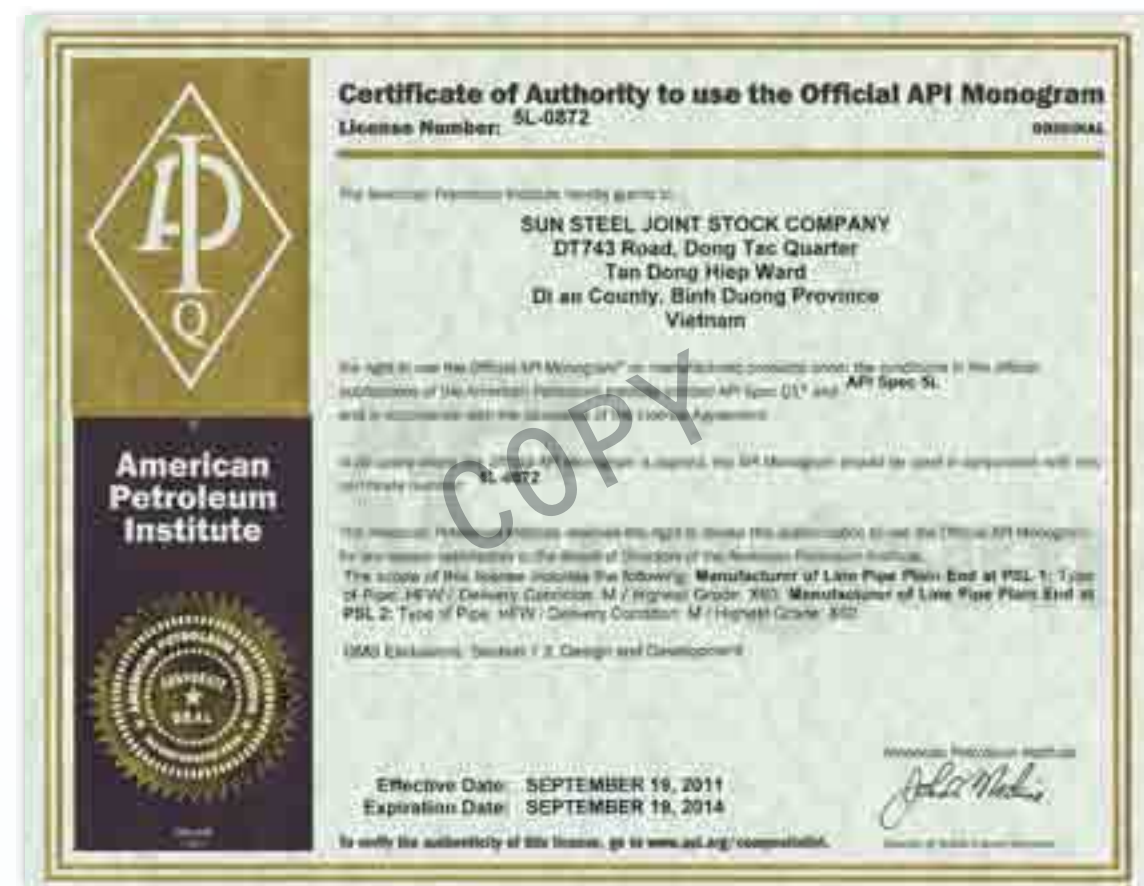
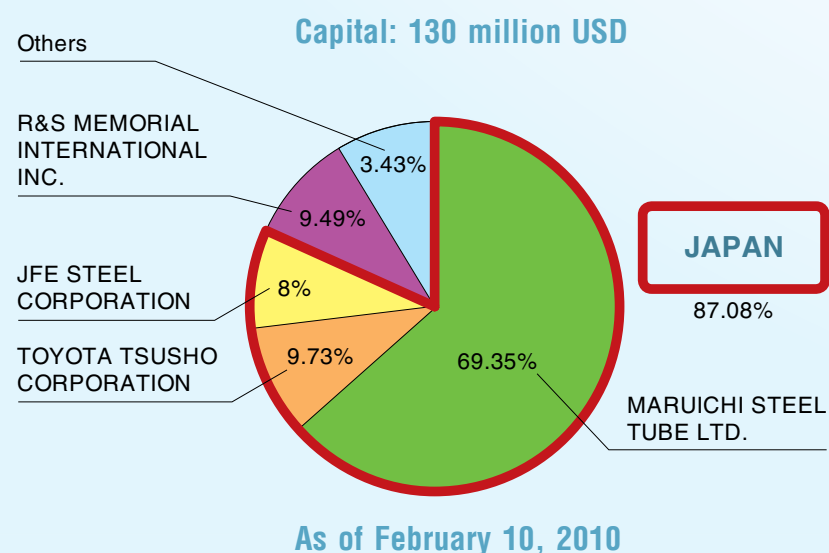
# API Spec 5L

PLAIN-END LINE PIPE



# INTRODUCTION

Sun Steel Joint Stock Company (SUNSCO), a 100% foreign capital company, was established in 1996 with the purpose of supplying High Quality steel products to Vietnamese local market. After starting the operation of Steel Pipe Mill in 1998, we have continued to expand our production facilities such as Bar Rolling Mill, Color Coating Line, Continuous Galvanizing Line, Cold Rolling Mill and Push-Pull Pickling Line till today, including our own Power Generating Plant. Recently, we also started our newest Steel Pipe Mill in 2010 with which we can produce up to 16" of outside diameter, so far the largest available size in Vietnam, and also received the certification of API SPEC 5L in 2011. API SPEC is the most serious specification specified by American Petroleum Institute and used in Petroleum and Natural Gas Industries. Utilizing all those above mentioned facilities, we are currently manufacturing and selling following products; Carbon Steel Pipe, Galvanized Steel Pipe, Stainless Steel Pipe, Hot-Dip 55% Al-Zn Alloy Coated Steel Coil and Pre-painted Hot-Dip 55% Al-Zn Alloy Coated Steel Coil. We are supplying those products not only in Vietnamese local market but also to overseas market as well, such as to ASEAN countries, Australia and USA. We commit ourselves that, as a group company of MARUICHI STEEL TUBE LTD., Japan, we will exert for further quality improvement in order to increase our market shares in the high quality market such as in Australia, Japan and USA and to be more competitive company in the world market.



API SPEC 5L Certificate



ISO 9001 Certificate



ISO 14001 Certificate



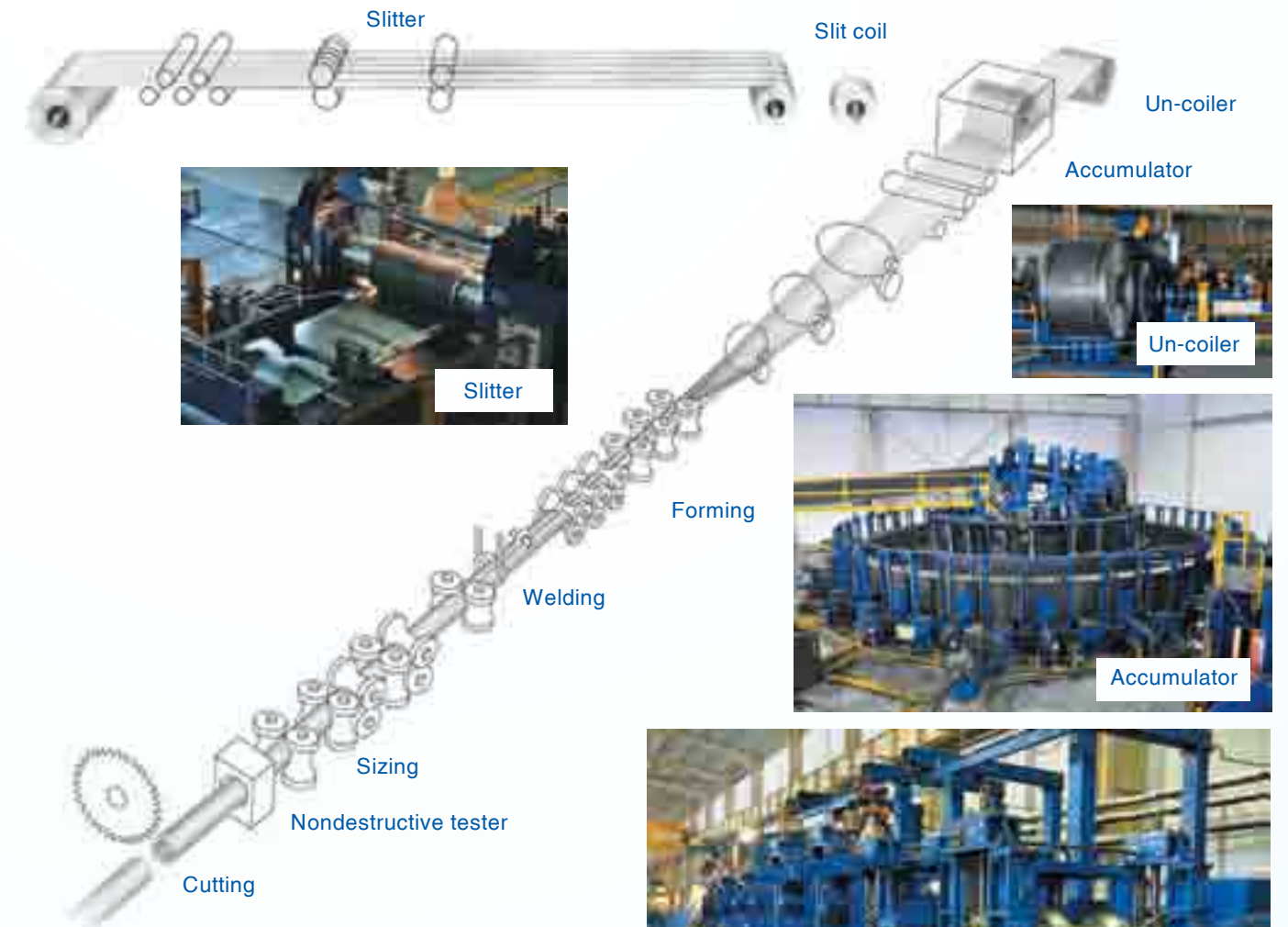
**SERVING CUSTOMERS THROUGH TUBE MAKING**

Maruichi Steel Tube Ltd. and its group companies (MARUICHI Group) are a world leader in the welded tube industry, having been offering customers dedicated services through tube making since their establishment in Japan in 1947.

MARUICHI Group in Japan have been engaged only in tube making, amassing in the process technological knowhow and expertise in that chosen field and having lined up scores of specialized state of the art tube mills as well as cold reduction and continuous hot dip galvanizing lines, which enable them to accommodate their customers needs for a wide range of round (from 8mm to 508mm), and similar size square and rectangular tube (up to 400mmX400mmX19mm). With their production in Japan running around 1,500,000 metric tons per year in various product lines and sizes, they can be considered one of the very few general tube manufacturers in the world. Through the twelve strategically located manufacturing facilities in each regional market of Japan and 18 marketing outlets, they are capable of offering quality products and speedy service to each and every local customer. They are serving customers not only in Japan but also overseas end users through the affiliates operating in Vietnam, China, Indonesia, India and USA.



**PRODUCTION PROCESS**



**JAPAN**

**Maruichi Steel Tube Ltd.**  
Sales Offices : Sapporo, Tokyo, Nagoya, Osaka, Hiroshima, Fukuoka  
Mfg. Plants : Tokyo, Nagoya, Osaka, Sakai, Takuma, Kashima

**Hokkaido Maruichi Steel Tube Ltd.**  
Mfg. Plants : Tomakomai, Sapporo

**Shikoku Maruichi Steel Tube Ltd.**  
Mfg. Plants : Takuma, Sakai

**Kyushu Maruichi Steel Tube Ltd.**  
Mfg. Plants : Kumamoto

**Maruichi Kohan Ltd.**  
Sales Offices : Sendai, Tokyo, Yokohama, Hamamatsu, Niigata, Hokuriku, Nagoya, Osaka, Okayama, Shikoku, Fukuoka

**Okinawa Maruichi Ltd.**  
Sales Offices : Okinawa

**ASIA**

- 1 Maruichi Metal Product(Tianjin)Co.,Ltd. Zhongnan three street west Tianjin economic development zone area Tianjin City China
- 2 Maruichi Metal Product(Foshan)Co.,Ltd. (MMP) Huabao Nan Road, Chengxi Industrial Park, Foshan National HI-TECH Industries Zone, Chancheng District, Foshan City, Guangdong Province, P.R.China
- 3 Sun Steel(Hanoi)Co.,Ltd. Binh Xuyen Industrial Zone, Binh Xuyen District, Vinh Phuc Province, Vietnam
- 4 Sun Steel Joint Stock Company (SUNSCO) DT 743RD., Dong Tac Quarter, Tan Dong Hiep Ward, Di An Country, Binh Duong Province, Vietnam
- 5 PT.Indonesia Steel Tube Works (ISTW) Jl. Rawa Sumur (No.1, Kawasan Industri Pulogadung, Jakarta, Indonesia
- 6 Ji. Simongan 105, Semarang, Indonesia
- 7 Maruichi KUMA Steel Tube Ltd. Plot No.27 Sector 2A, IMT Manesar, Gurgaon-122050(Haryana), India

**USA**

- 8 Maruichi American Corporation(MAC) 11529 Greenstone Avenue, Santa Fe Springs,CA 90670-4697, U.S.A  
Leavitt Tube Company, LLC(LTC)
- 9 1717 W 115th Street, Chicago, Illinois 60643, U.S.A
- 10 211 Industrial Drive North Madison, Mississippi 39130-1186, U.S.A

- Maruichi Steel Tube's Head Office
- Maruichi's sales offices
- Domestic Plants of the parent company and those of the affiliates





## API Specification 5L / ISO 3183

### Steel Pipe for pipeline transportation system - Petroleum and Natural Gas industries

#### Available Grades

PSL	Grade
PSL1	L210 or A
	L245 or B
	L290 or X42
	L320 or X46
	L360 or X52
	L390 or X56
PSL2	L415 or X60
	L245M or BM
	L290M or X42M
	L320M or X46M
	L360M or X52M
L390M or X56M	
L415M or X60M	

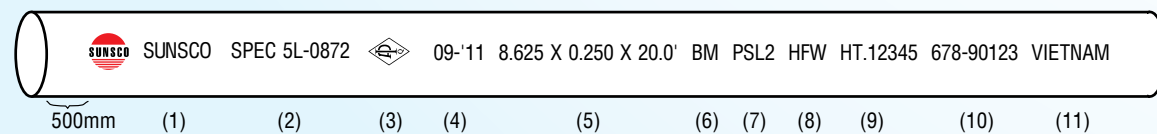
#### Manufacture

- The material is the thermo-mechanically rolled steel coils, and the HFW is applied at a frequency higher than 70 kHz, followed by the cold sizing 1.5% or less to finish.
- The thermal treatments shown in the following table are applied to the welded parts.
- End finish: beveled 30°(-0,+5°) when t > 3.2 mm (0.125 in), coated with rust prevention varnish

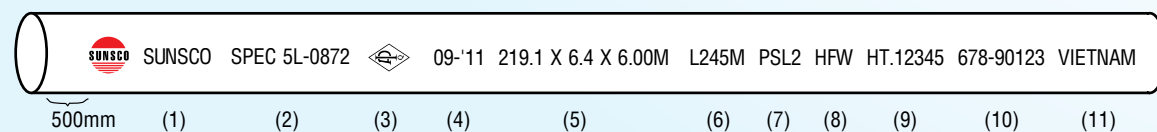
PSL	Grade	Thermal treatments
PSL1	≤ L290 or X42	Thermal treatment that does not leave untempered martensite
	≥ L320 or X46	Normalizing
PSL2	All grades	Normalizing

#### Marking

Marking example for USC unit: PSL2 Gr.BM 8.625" X 0.250" X 20ft



Marking example for SI unit: PSL2 Gr.L245M 219.1mm X 6.4mm X 6M



- |   |                                 |
|---|---------------------------------|
| (1) Manufacturer  | (6) Pipe Grade                  |
| (2) SPEC and License No.  | (7) Product specification level |
| (3) API Monogram  | (8) Type of Pipe                |
| (4) Date of manufacture (Month-Year)                                      | (9) Heat No.                    |
| (5) Size (Specified outside diameter X Specified wall thickness X Length) | (10) Control No. - Pipe No.     |
|   | (11) Origin                     |

#### Available Size Range and Standard Packing

For Gr. L290M/X42M and lower

: Inquiry

Specified outside diameter (mm)	SI unit		Specified outside diameter (in.)	USC unit		Number of pipes per one bundle (pcs)
	Specified wall thickness (mm)	Mass per unit length (kg/m)		Specified wall thickness (in.)	Mass per unit length (lb/ft) (kg/m)	
141.3	4.0	13.54	5.563	0.156	9.02	10
	4.8	16.16		0.188	10.80	
	5.6	18.74		0.219	12.51	
	6.6	21.92		0.258	14.63	
	7.1	23.50		0.281	15.87	
168.3	7.9	25.99	6.625	0.312	17.51	10
	4.8	19.35		0.188	12.94	
	5.6	22.47		0.219	15.00	
	6.4	25.55		0.250	17.04	
	7.1	28.22		0.280	18.99	
219.1	7.9	31.25	8.625	0.312	21.06	7
	8.7	34.24		0.344	23.10	
	4.8	25.37		0.188	16.96	
	5.2	27.43		0.203	18.28	
	5.6	29.48		0.219	19.68	
	6.4	33.57		0.250	22.38	
	7.0	36.61		0.277	24.72	
	7.9	41.14		0.312	27.73	
	8.2	42.65		0.322	28.58	
	8.7	45.14		0.344	30.45	
	9.5	49.10		0.375	33.07	
	10.3	53.03		0.406	35.67	
11.1	56.94	0.438	38.33			
12.7	64.64	0.500	43.43			
273.1	4.8	31.76	10.750	0.188	21.23	5
	5.2	34.35		0.203	22.89	
	5.6	36.94		0.219	24.65	
	6.4	42.09		0.250	28.06	
	7.1	46.57		0.279	31.23	
	7.8	51.03		0.307	34.27	
	8.7	56.72		0.344	38.27	
	9.3	60.50		0.365	40.52	
	11.1	71.72		0.438	48.28	
	12.7	81.55		0.500	54.79	
	323.9	6.4		50.11	12.750	
7.1		55.47	0.281	37.46		
7.9		61.56	0.312	41.48		
8.4		65.35	0.330	43.81		
8.7		67.62	0.344	45.62		
9.5		73.65	0.375	49.61		
10.3		79.65	0.406	53.57		
11.1		85.62	0.438	57.65		
12.7	97.46	0.500	65.48			
355.6	6.4	55.11	14.000	0.250	36.75	1
	7.1	61.02		0.281	41.21	
	7.9	67.74		0.312	45.65	
	8.7	74.42		0.344	50.22	
	9.5	81.08		0.375	54.62	
	11.1	94.30		0.438	63.50	
	11.9	100.86		0.469	67.84	
12.7	107.39	0.500	72.16			
406.4	6.4	63.13	16.000	0.250	42.09	1
	7.1	69.91		0.281	47.22	
	7.9	77.63		0.312	52.32	
	8.7	85.32		0.344	57.57	
	9.5	92.98		0.375	62.64	
	11.1	108.20		0.438	72.86	
	11.9	115.77		0.469	77.87	
	12.7	123.30		0.500	82.85	

Note: For Gr. L320/X46 and higher, please contact with us.

Length	5.5~6M		-		12M		
	20', 21'		24'		40', 40'2", 42', 45'		
Number of straps per one bundle (straps)	Domestic delivery	3		4		5	
	Oversea delivery	5		6		7	

## Chemical Compositions

### PSL-1

Grade	Mass contents by heat and product analyses (Maximum %)									Carbon equivalent (%)	
	C <sup>(2)</sup>	Si	Mn <sup>(2)</sup>	P	S	V	Nb	Ti	Others	CE <sub>IW</sub>	CE <sub>Pcm</sub>
L210 or A	0.22	-	0.90	0.030	0.030	-	-	-	(1)	-	-
L245 or B	0.26	-	1.20	0.030	0.030	(3)(4)	(3)(4)	(4)	(1)	-	-
L290 or X42	0.26	-	1.30	0.030	0.030	(4)	(4)	(4)	(1)	-	-
L320 or X46	0.26	-	1.40	0.030	0.030	(4)	(4)	(4)	(1)	-	-
L360 or X52	0.26	-	1.40	0.030	0.030	(4)	(4)	(4)	(1)	-	-
L390 or X56	0.26	-	1.40	0.030	0.030	(4)	(4)	(4)	(1)	-	-
L415 or X60	0.26 <sup>(5)</sup>	-	1.40 <sup>(5)</sup>	0.030	0.030	(6)	(6)	(6)	(1)	-	-

- (1) The contents of other elements should be Cu ≤ 0.50 %, Ni ≤ 0.50 %, Cr ≤ 0.50 %, and Mo ≤ 0.15 %. For the grades up to L350/X52, Cu, Cr, and Ni should not be added intentionally.
- (2) The maximum content of Mn may be increased by 0.05 % for the decrease of the maximum content of C by 0.01 %. However, the maximum content of Mn should be 1.65 % for L245/B to L360/X52, and 1.75 % for L390/X56 to L415/X60.
- (3) Unless otherwise agreed: Nb+V ≤ 0.06 %.
- (4) Nb+V+Ti ≤ 0.15 %.
- (5) Unless otherwise agreed
- (6) Unless otherwise agreed: Nb+V+Ti ≤ 0.15 %.

### PSL-2

Grade	Mass contents by heat and product analyses (Maximum %)									Carbon equivalent (%)	
	C <sup>(2)</sup>	Si	Mn <sup>(2)</sup>	P	S	V	Nb	Ti	Others	CE <sub>IW</sub>	CE <sub>Pcm</sub>
L245M or BM	0.22	0.45	1.20	0.025	0.015	0.05	0.05	0.04	(4)	0.43	0.25
L290M or X42M	0.22	0.45	1.30	0.025	0.015	0.05	0.05	0.04	(4)	0.43	0.25
L320M or X46M	0.22	0.45	1.30	0.025	0.015	0.05	0.05	0.04	(4)	0.43	0.25
L360M or X52M	0.22	0.45	1.40	0.025	0.015	(3)	(3)	(3)	(4)	0.43	0.25
L390M or X56M	0.22	0.45	1.40	0.025	0.015	(3)	(3)	(3)	(4)	0.43	0.25
L415M or X60M	0.12 <sup>(5)</sup>	0.45 <sup>(5)</sup>	1.60 <sup>(5)</sup>	0.025	0.015	(6)	(6)	(6)	(7)	0.43	0.25

- (1) Evaluate from the product analysis. When C > 0.12 %, apply CE<sub>IW</sub> and when C ≤ 0.12 %, apply CE<sub>Pcm</sub>.
- (2) The maximum content of Mn may be increased by 0.05 % for the decrease of the maximum content of C by 0.01 %. However, the maximum content of Mn should be 1.65 % for L245M/BM to L360M/X52M, and 1.75 % for L390M/X56M to L415M/X60M.
- (3) Nb+V ≤ 0.06 %.
- (4) Unless otherwise agreed: Cu ≤ 0.50 %, Ni ≤ 0.30 %, Cr ≤ 0.30 % and Mo ≤ 0.15%.
- (5) Unless otherwise agreed
- (6) Unless otherwise agreed: Nb+V+Ti ≤ 0.15 %.
- (7) Unless otherwise agreed: Cu ≤ 0.50%, Ni ≤ 0.50 %, Cr ≤ 0.50 % and Mo ≤ 0.50 %.

- For the calculation of carbon equivalent, the following equations shall be used. The notations for the chemical components shall be calculated in units of mass content (%).

$$CE_{IW} = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$$

$$CE_{Pcm} = C + Si/30 + Mn/20 + Cu/20 + Ni/60 + Cr/20 + Mo/15 + V/10 + 5B$$

(If the content of B in the heat analysis is less than 0.0005 %, B shall not be included in the product analyses, and the B content may be considered to be 0 for CE<sub>Pcm</sub> calculation)

## Tensile Properties

### PSL-1

Grade	Pipe body			Weld seam
	Yield strength <sup>(1)</sup> MPa (psi)	Tensile strength MPa (psi)	Elongation <sup>(2)</sup> (%)	Tensile strength MPa (psi)
	Minimum value	Maximum value	Minimum value	Minimum value
L210 or A	210 (30500)	335 (48600)	Refer to (2)	335 (48600)
L245 or B	245 (35500)	415 (60200)		415 (60200)
L290 or X42	290 (42100)	415 (60200)		415 (60200)
L320 or X46	320 (46400)	435 (63100)		435 (63100)
L360 or X52	360 (52200)	460 (66700)		460 (66700)
L390 or X56	390 (56600)	490 (71100)		490 (71100)
L415 or X60	415 (60200)	520 (75400)		520 (75400)

### PSL-2

Grade	Pipe body				Yield ratio <sup>(3)</sup> Maximum value	Elongation <sup>(2)</sup> (%) Minimum value	Tensile strength MPa (psi) Minimum value
	Yield strength <sup>(1)</sup> MPa (psi)		Tensile strength MPa (psi)				
	Minimum value	Maximum value	Minimum value	Maximum value			
L245M or BM	245 (35500)	450 <sup>(4)</sup> (65300) <sup>(4)</sup>	415 (60200)	760 (110200)	0.93	Refer to (2)	415 (60200)
L290M or X42M	290 (42100)	495 (71800)	415 (60200)	760 (110200)	0.93		415 (60200)
L320M or X46M	320 (46400)	525 (76100)	435 (63100)	760 (110200)	0.93		435 (63100)
L360M or X52M	360 (52200)	530 (76900)	460 (66700)	760 (110200)	0.93		460 (66700)
L390M or X56M	390 (56600)	545 (79000)	490 (71100)	760 (110200)	0.93		490 (71100)
L415M or X60M	415 (60200)	565 (81900)	520 (75400)	760 (110200)	0.93		520 (75400)

- (1) The yield strength shall be calculated from the load when the extension of gauge length is 0.5 %.
- (2) The specified minimum elongation shall be calculated using the following equation:

$$EL = C \times A^{0.2} / U^{0.9}$$

EL : the specified minimum elongation (%)

C : constant (1.940 in the SI units system, and 625000 in the USC units system)

A : the cross-sectional area of the test piece (the specified width of the test piece x the specified thickness of the pipe) rounded to the nearest 10 mm<sup>2</sup> (0.01 in<sup>2</sup>) and the maximum value should be 485 mm<sup>2</sup> (0.75 in<sup>2</sup>)

U : the specified minimum tensile strength of MPa in the SI units system and psi in the USC units system.

- (3) The yield ratio (= yield strength/tensile strength) shall be applied to the steel pipes whose outside diameter D > 323.9 mm (12.750 in).
- (4) For the steel pipes with the outside diameters D < 219.1 mm (8.625 in), the maximum yield strength shall be 495 MPa (71800 psi).

## Charpy Impact Test

### PSL-2 Only Minimum values of absorption energies in the average of 3 test pieces

Sizes of the test pieces in units of mm				Test temperature
10 × 10	10 × 7.5	10 × 6.7	10 × 5	
27 J (20 ft · lbs)	20 J (15 ft · lbs)	18 J (13 ft · lbs)	14 J (10 ft · lbs)	0° C ± 1° C

- Individual test values for any test piece shall be more than 75 % of the values shown in above.

### Flattening Test

Classification	Distance between flat plates	
	Weld	Other than Weld
Grade of L415 or X60 with t=12.7mm(0.500in)	66% D	33% D
Other than above	50% D	

### Non Destructive Inspection

Type	Ultrasonic Test
Applied	Full length(100%) of the weld seam
Reference standard	N10 notch
Acceptance limit	100% of the signal of reference standard

### Hydrostatic Test

- The hydrostatic test is applied for all products.
- The pressure in the hydrostatic tests shall be calculated from the following equation. Note that below table should be referred for the S-value in the equation below.

$$P = 2 S t / D$$

P : Pressure in the hydrostatic test MPa (psi)  
 S : See the following table.  
 t : Specified wall thickness mm (in)  
 D : Specified outside diameter mm (in)

Grade	Specified outside diameter D mm (in)	Percentage of specified minimum YS for determination S-value		S-value		
		Standard test pressure (STD)	Alternative test pressure (ALT)	Standard test pressure (STD)	Alternative test pressure (ALT)	
PSL1	PSL2	%	%	MPa (psi)	MPa (psi)	
L210 or A	-	All outside diameter	60 <sup>a</sup>	75 <sup>a</sup>	126.00 (18300)	157.50 (22875)
L245 or B	L245M or BM	All outside diameter	60 <sup>a</sup>	75 <sup>a</sup>	147.00 (21300)	183.75 (26625)
L290 or X42	L290M or X42M	≤ 141.3 (5.563)	60 <sup>b</sup>	75 <sup>c</sup>	174.00 (25260)	217.50 (31575)
		141.3 < D ≤ 219.1 (8.625)	75 <sup>b</sup>	75 <sup>c</sup>	217.50 (31575)	217.50 (31575)
L320 or X46	L320M or X46M	≤ 141.3 (5.563)	60 <sup>b</sup>	75 <sup>c</sup>	192.00 (27840)	240.00 (34800)
		141.3 < D ≤ 219.1 (8.625)	75 <sup>b</sup>	75 <sup>c</sup>	240.00 (34800)	240.00 (34800)
L360 or X52	L360M or X52M	≤ 141.3 (5.563)	60 <sup>b</sup>	75 <sup>c</sup>	216.00 (31320)	270.00 (39150)
		141.3 < D ≤ 219.1 (8.625)	75 <sup>b</sup>	75 <sup>c</sup>	270.00 (39150)	270.00 (39150)
L390 or X56	L390M or X56M	≤ 141.3 (5.563)	60 <sup>b</sup>	75 <sup>c</sup>	234.00 (33960)	292.50 (42450)
		141.3 < D ≤ 219.1 (8.625)	75 <sup>b</sup>	75 <sup>c</sup>	292.50 (42450)	292.50 (42450)
L415 or X60	L415M or X60M	≤ 141.3 (5.563)	60 <sup>b</sup>	75 <sup>c</sup>	249.00 (36120)	311.25 (45150)
		141.3 < D ≤ 219.1 (8.625)	75 <sup>b</sup>	75 <sup>c</sup>	311.25 (45150)	311.25 (45150)
		219.1 (8.625)	85 <sup>b</sup>	85 <sup>c</sup>	352.75 (51170)	352.75 (51170)

a : The maximum test pressure P should be 19.0 MPa (2760 psi).  
 b : The maximum test pressure P should be 20.5 MPa (2970 psi).  
 c : The maximum test pressure P should be 50.0 MPa (7260 psi).

The test pressure must be maintained for more than 5 sec, and it must not decrease below the standard pressure within the holding time.

### Dimension Tolerance

#### Diameter

Specified outside diameter D mm (in)	Tolerances of outside diameter mm (in)		Tolerance of out - of - roundness	
	Pipe except the end <sup>a)</sup>	Pipe end <sup>a)</sup>	Pipe except the end <sup>a)</sup>	Pipe end <sup>a)</sup>
D ≤ 168.3 (6.625)	± 0.0075 D	-0.4, +1.6 (-0.016, +0.063)	0.020 D	0.015 D
D > 168.3 (6.625)	± 0.0075 D but maximum of ± 3.2 (0.125)	± 0.005 D but maximum of ± 1.6 (0.063)		

a) The pipe end is defined in the range of 100 mm (4.0 in) from the pipe extremities.

#### Wall Thickness

Specified wall thickness t mm (in)	Tolerances mm (in) <sup>a)</sup>
t ≤ 5.0 (0.197)	± 0.5 (0.020)
5.0 (0.197) < t ≤ 12.7 (0.500)	± 0.1 t

a) The plus tolerance for wall thickness does not apply to the weld area.

#### Dimension of the Weld Seam

Portion	Specified wall thickness t mm (in)	Tolerance
Outside bead-cut	-	Trim to an essentially flush condition
Inside bead-cut	Height	1.5 mm (0.060 in)
	Depth	t ≤ 4.0 (0.156)
		4.0(0.156) < t ≤ 8.0 (0.312)
8.0 (0.312) < t	0.40 mm (0.016 in)	
		0.05t

#### Random Length Pipe

Random length designation	Minimum length	Minimum average length for each order item	Maximum length
6 m (20ft)	2.74 m (9.0 ft)	5.33 m (17.5 ft)	6.86 m (22.5 ft)
9 m (30ft)	4.11 m (13.5 ft)	8.00 m (26.2 ft)	10.29 m (33.8 ft)
12 m (40ft)	4.27 m (14.0 ft)	10.67 m (35.0 ft)	13.72 m (45.0 ft)

- The length can be usually specified by the random length designation. In this case, the tolerance of length shall be (specified length) - 0, + 50 mm.

#### Straightness

Kind of deviation	Tolerance
Total deviation from a straight line	Less than 0.2 % of the entire pipe length
Local deviation from a straight line	Less than 4.0 mm (0.156 in)

### Tolerance of Mass

Category	Tolerance
Mass of one pipe	- 3.5%, + 10.0 %
Mass of car load	More than - 1.75 %





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