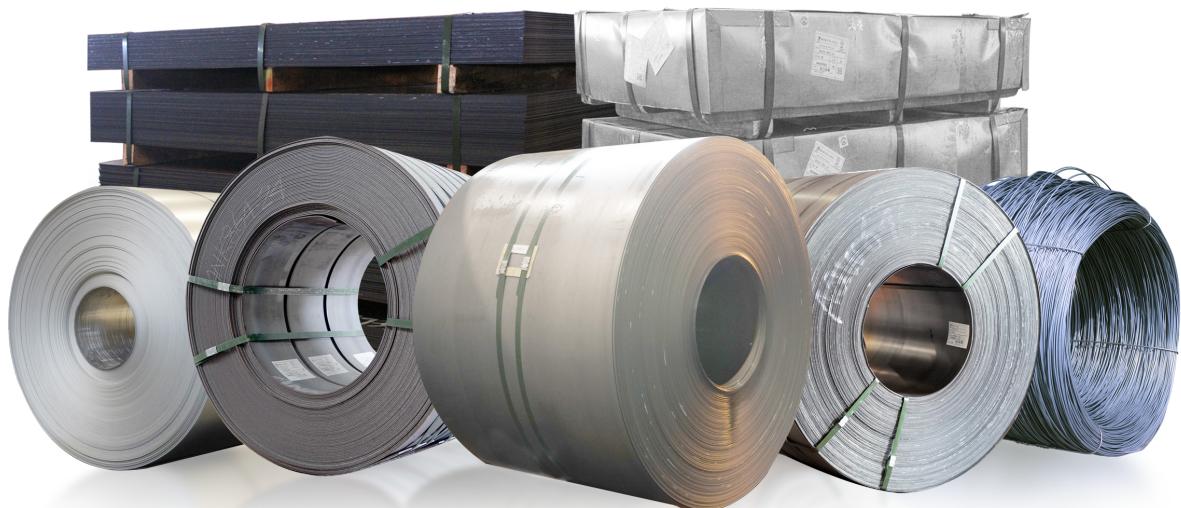
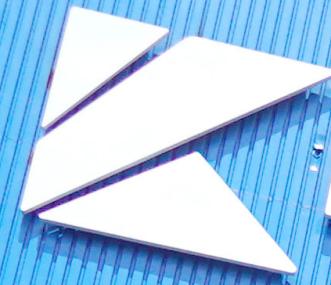


# SPECIFICATION PRODUCT





# KRAKATAU STEEL

## HOT STRIP MILL

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# VISION, MISSION, & VALUE

## Vision

### 1. A Competitive Corporation

- a. The Company as a provider of upstream to downstream steel solutions through strategic business cooperations.
- b. The Company's products must be able to compete with domestic and imported competitor products in terms of quality, price, delivery time and quality of service.
- c. Competitive advantage to create the Company's competitiveness is carried out through the use of more competitive raw materials and energy as well as the right technology.

### 2. Profitable and Trusted

- a. With its competitive advantages, the Company becomes the main option for steel users in Indonesia and the region.
- b. With superior performance, the Company earns the trust of shareholders and other stakeholders.
- c. The company can grow and evolve to become one of Indonesia's top 10 best performing state-owned enterprises.

## Mision

1. Realizing productive and efficient operational performance to produce profitable quality products and services.
2. Developing steel business through mutually beneficial cooperation with strategic partners.
3. Developing application of steel solutions and downstream steel products to increase added value and customer satisfaction.
4. Increase business value of the group to make a positive contribution and optimize supply chain.
5. Developing the best talents to be able to contribute optimally in all business processes.

## Value

**"EXPLORE TO EMPOWER"**



The Company is no longer present only as a steel company, but as a partner that has the ability to provide additional strength to its partners, through every asset owned by the Company (both in terms of human resources and infrastructure capabilities).

### Progressive

The Company is present as an innovative company, move hand in hand with industry, as well able to face all ready challenges that exist in the industry.

### Collaborative

The Company keeps its commitment as a "trusted partner" and mutually develop each other.

### Robust

The Company with its renewed spirit remains present among the stakeholders as a large company supported by strong infrastructure to lead the industry.

# COMPANY OVERVIEW

To retain the Company's leading position in the Indonesia's steel industry, the company make continuous investments and keep innovating both to improve efficiency and enhance production capacity.

As the continuation of Trikora Iron Steel Project initiated by President Soekarno, the Company was established in 1970 under the name PT Krakatau Steel. Within 10 years of its establishment, the Company had shown significant progress with the construction of a number of production facilities such as the Sponge Iron Plant, Steel Billet Plant, Wire Rod Plant, as well as the supporting infrastructure including the power plant generator, water treatment plant, port and telecommunications system. Driven by professional management, the Company is now known as the prominent steel producer in Indonesia. With its formidable infrastructure, the Company has became an integrated steel industry, which not only supplies steel products, but also supports the growth of the national industry.

In 1973, the Company produced spiral pipes with ASTM A252 and AWWA C200 specifications for the first time. Since 1977, the Company has acquired the API 5L Certification and since 2009 acquired the BC 1 Certification. With superior technical capabilities and a high level of productivity, in 1993 the Company was awarded the ISO 9001 certification. This was then renewed in 2003 through the ISO 9001:2000 Certification. With the commitment towards Occupational Health, Safety and the Environment, SGS International awarded the ISO 14001 certification in 1997. These achievements demonstrate the Company's commitment to strive for international quality standards. On November 10th 2010, Krakatau Steel launched its Initial Public Offering (IPO) and since

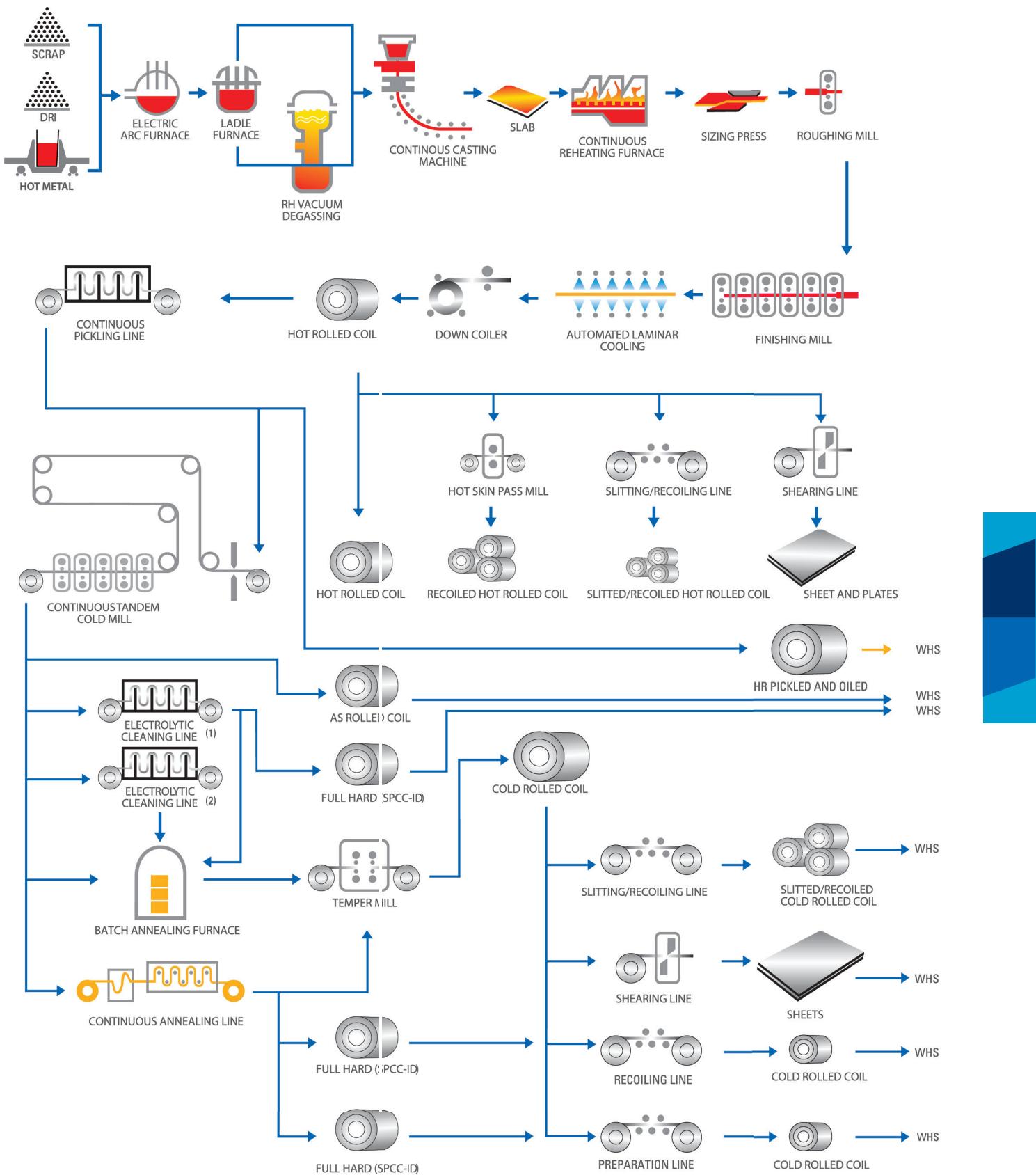
then, the Company's stock, known as KRAS, has been listed on the Indonesian Stock Exchange.

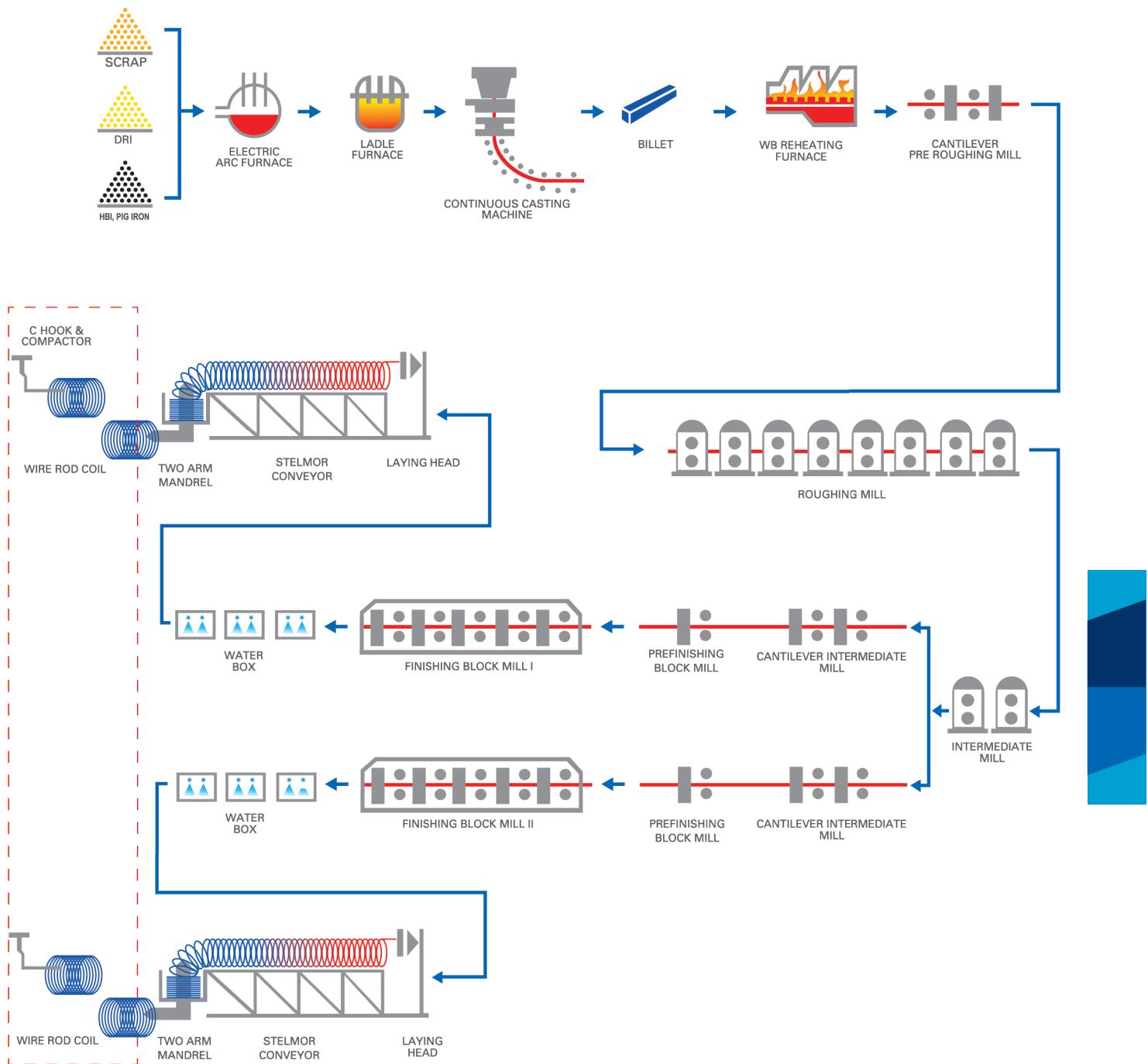
Today, the Company's production capacity reaches 4.65 million tons per year, with a number of major products such as Hot Rolled Coils, Cold Rolled Coils, and Wire Rods. Through its subsidiaries, the Company produces steel products for specific requirements, such as Spiral Pipes, Electrical Resistance Welding Pipes, Reinforcing Bars and Section Steel which are needed by the oil and gas industry as well as the construction sector.

With its capacity for producing steel products with specific requirements, particularly in supporting the national defense infrastructure, the Company is regarded as a strategic industry in Indonesia. To maintain its position as the leader in the steel industry in Indonesia, the Company is continuously investing and innovating, to improve both efficiency and production capacity. In addition to developing various infrastructure facilities such as port development and industrial water supply, which does not only support the development of the Company's production facility but also supports industrial growth around the area. The Company is committed to improve energy independency through the development of a power generator plant. Today, in addition to being at the forefront of the domestic market, the Company is also entrusted by a number of foreign companies to export high quality steel products.



# PRODUCTION PROCESS





# MAIN PRODUCT

## HOT ROLLED COIL



### DIMENSION

Thickness	: 1.4 - 25.0 mm
Width	: 600 - 2,000 mm
Coil Inner Diameter	: 760 mm
Coil Outer Diameter	: 2,000 mm max.
Coil Weight	: 30 Metric Ton max.

### Product Description

Hot Rolled Coil (HRC) is a steel product in form of coiled steel strip produced from hot rolling process in Hot Strip Mill facility. This product is often called as "black steel" by the users to distinguish this product with cold-rolled product which is often called as "white steel". The HRC which is produced by PTKS is processed with advanced and state-of-the-art technology complying to both international and national product quality standards. The steel slab as the raw material is reheated up to 1,200 °C then further rolled until achieving the final desired thickness. The cooling mechanism is combining both forced laminar water cooling prior to coiling process and air cooling in the product storage area.

### Application

General & Welded Structure, Rerolling, Oil & Gas Pipe, Automotive, Pipe & Tube, Container, Ship Building, Heavy Duty Vehicle, Weathering & Corrosion Resistant Steel, Boiler & Pressure Vessels.

### Product Excellence

- Compliance to international and national quality standards.
- Certified with ISO 9001.

## HOT ROLLED SLITTED COIL



### DIMENSION

Thickness	: 1.4mm-25mm
Width	: 128 - 990 mm
Coil Inner Diameter	: 760 mm
Coil Outer Diameter	: 2,000 mm max.
Coil Weight	: 30 Metric Ton max.

### Product Description

Hot Rolled Slitted Coil (HRS) is a steel product in form of coiled-then-slitted steel strip produced from hot rolling process in Hot Strip Mill facility. The HRS which is produced by PTKS is processed with advanced and state-of-the-art technology complying to both international and national product quality standards. The steel slab as the raw material is reheated up to 1,200 °C then further rolled until achieving the final desired thickness. The cooling mechanism is combining both forced laminar water cooling prior to coiling process and air cooling in the product storage area. The coiled steel is then "cut-to-width" (split/slitted) to be smaller coils in terms of narrower width, which is known as HRS.

### Application

General & Welded Structure, Oil & Gas Pipe, Automotive, Pipe & Tube

### Product Excellence

- Compliance to international and national quality standards.
- Certified with ISO 9001.

## HOT ROLLED PLATE



### DIMENSION

Thickness	: 1.4mm-25mm
Width	: 300 - 2,000 mm
Length	: 1,250 - 12,500 mm
Pallet Weight	: 6 Metric Ton max.

### Product Description

Hot Rolled Plate (HRP) is a steel product in form of coiled-then-sheared steel strip produced from hot rolling process in Hot Strip Mill facility. The HRS which is produced by PTKS is processed with advanced and state-of-the-art technology complying to both international and national product quality standards. The steel slab as the raw material is reheated up to 1,200 °C then further rolled until achieving the final desired thickness. The cooling mechanism is combining both forced laminar water cooling prior to coiling process and air cooling in the product storage area. The coiled steel is then "cut-to-length" (sheared) to be plates with various dimensions, which is known as HRP.

### Application

General & Welded Structure, Container, Ship Building, Heavy Duty Vehicle.

### Product Excellence

- Compliance to international and national quality standards.
- Certified with ISO 9001.

## HOT ROLLED PICKLED OIL



### DIMENSION

Thickness	: 1.8 - 5.7 mm
Width	: 620 - 1,250 mm
Coil Inner Diameter	: 610 mm
Coil Outer Diameter	: 2,000 mm max.
Coil Weight	: 23 Metric Ton max.

### Product Description

Hot Rolled Pickled Oil (HRPO) is a steel product in form of coiled steel strip produced from hot rolling process in Hot Strip Mill facility and further picked and oiled process in Pickling and Oiling Line. The HRS which is produced by PTKS is processed with advanced and state-of-the-art technology complying to both international and national product quality standards. The steel slab as the raw material is reheated up to 1,200 °C then further rolled until achieving the final desired thickness. The cooling mechanism is combining both forced laminar water cooling prior to coiling process and air cooling in the product storage area. The coiled steel is soaked in the chloric acid in Pickling Line and coated with rust-prevention oil in the Oiling Line, which is then known as HRPO.

### Application

Automotive, Pipe & Tube.

### Product Excellence

- Compliance to international and national quality standards.
- Certified with ISO 9001.

## COLD ROLLED COIL



### DIMENSION

Thickness	: 0.2 - 3.0 mm
Width	: 620 - 1,250 mm
Coil Inner Diameter	: 508 mm
Coil Outer Diameter	: 2,000 mm max.
Coil Weight	: 23 Metric Ton max.

### Product Description

Cold Rolled Coil (CRC) is a steel product in form of coiled steel sheet produced from cold rolling process in Cold Rolling Mill facility. This product is often called as "white steel" by the users to distinguish this product with hot-rolled product which is often called as "black steel". The CRC which is produced by PTKS is processed with advanced and state-of-the-art technology complying to both international and national product quality standards. The hot rolled coil is uncoiled, soaked with chloric acid, oiled, and tandem-rolled. For certain mechanical properties requirement, the process is continued with annealing, which is a heat treatment applied according to certain temperature curve. The final CRC product is close-packed to maintain its surface quality during transportation to customer's warehouse.

### Application

General Purpose, Galvalume Galvanized Sheet, Automotive, Pipe & Tube, Home & Office Appliances, Drum

### Product Excellence

- Compliance to international and national quality standards.
- Certified with ISO 9001.

## COLD ROLLED SHEET



### DIMENSION

Thickness	: 0.6 - 2.0 mm
Width	: 762 - 4,880 mm
Pallet Weight	: 3 Metric Ton max.

### Product Description

Cold Rolled Sheet (CRS) is a steel product in form of coiled steel sheet produced from cold rolling process in Cold Rolling Mill facility. This product is often called as "white steel" by the users to distinguish this product with hot-rolled product which is often called as "black steel". The CRC which is produced by PTKS is processed with advanced and state-of-the-art technology complying to both international and national product quality standards. The hot rolled coil is uncoiled, soaked with chloric acid, oiled, and tandem-rolled. For certain mechanical properties requirement, the process is continued with annealing, which is a heat treatment applied according to certain temperature curve. The coiled steel is then "cut-to-length" (sheared) to be sheets with various dimensions, which is known as CRS. The final CRC product is close-packed to maintain its surface quality during transportation to customer's warehouse.

### Application

General Purpose, Home & Office Appliances, Drum

### Product Excellence

- Compliance to int. & national quality standards.
- Certified with ISO 9001.

## WIRE ROD



### DIMENSION

Diameter	: 5.5 - 20.0 mm
Coil ID	: 860 mm
Coil OD	: 1250 mm
Coil Weight	: 2.2 MT (Max)

### Product Description

With the Production Capacity up to 450,000 tonnes Wire Rod per annum, our Wire Rod Mill has the facilities of Reheating Furnace, Roughing Mill, Intermediate Mill, Finishing Mill, Two-Arm Mandrel, C-Hook, and Compactor.

### Application

General purpose, wire mesh, galvanized wire, bolt, nut screws, pre-stressed concrete (PC) wires, wire ropes, steel core for cable (wire strand), welding electrode, general steel construction.

### Product Excellence

- Compliance to international and national quality standards.
- Certified with ISO 9001.



## AUTOMOTIVE PIPE & TUBE APPLICATION

Steel for automotive pipe and tube in major application is used for motorcycle and passenger car. It has function as frame in the body of vehicle. In addition, pipe & tube manufacturing is carried out by forming and welding process. Thus, it requires the steel with the following characteristic these:

- Low-Medium-High Strength
- Excellent in formability and weldability
- Good appearance (painting)

PT Krakatau Steel has produced products which comply with those characteristics.

Standard specification in accordance to the following:

Standard	Grade
JIS G 3132	SPHT 1, SPHT 2, SPHT 3, SPHT 4
JIS G 3141	SPCCT-SD, SPCD-SD
SNI	BJDD1-SR, BJDCT-SR
KRAKATAU STEEL	KS 290, KS 340, KS 370, KS 440

### Hot Rolled Coil

Spec.	Chemical Composition (%)					Mechanical Properties		
	C	Si	Mn	P	S	YS (MPa)	TS (MPa)	Elongation(%)
(*) SPHT 1	0,10 max	0,35 max	0,50 max	0,040 max	0,040 max	-	270 min	1,80≤T<3,00 : 32 min 3,00≤T<6,00 : 35 min 6,00≤T≤13,0 : 37 min
(*) SPHT 2	0,18 max	0,35 max	0,60 max	0,040 max	0,040 max	-	340 min	1,80≤T<3,00 : 27 min 3,00≤T<6,00 : 30 min 6,00≤T≤13,0 : 32 min
(*) SPHT 3	0,25 max	0,35 max	0,30 – 0,90	0,040 max	0,040 max	-	410 min	1,80≤T<3,00 : 22 min 3,00≤T<6,00 : 25 min 6,00≤T≤13,0 : 27 min
(*) SPHT 4	0,30 max	0,35 max	0,30 – 1,00	0,040 max	0,040 max	-	490 min	1,80≤T<3,00 : 18 min 3,00≤T<6,00 : 20 min 6,00≤T≤13,0 : 22 min
(*) KS 290	0,12 max	0,35 max	0,60 max	0,040 max	0,040 max	175 min	290 min	29 min
(*) KS 370	0,25 max	0,35 max	0,30 – 0,90	0,035 max	0,035 max	215 min	370 min	30 min
(*) KS 390	0,25 max	0,35 max	0,30 – 0,90	0,035 max	0,035 max	235 min	390 min	30 min
(*) KS 440	0,25 max	0,35 max	0,30 – 1,00	0,035 max	0,035 max	265 min	440 min	25 min

Note : \*) Also produce in Hot Rolled Pickled Oil

## Cold Rolled Coil

Spec.	Chemical Composition (%)				Mechanical Properties		
	C	Mn	P	S	YS (MPa)	TS (MPa)	Elongation (%)
SPCCT-SD	0,15 max	1,00 max	0,100 max	0,035 max	-	270 min	0,20≤T<0,25 : 25 min 0,25≤T<0,30 : 28 min 0,30≤T<0,40 : 31 min 0,40≤T<0,60 : 34 min 0,60≤T<1,00 : 36 min 1,00≤T<1,60 : 37 min 1,60≤T<2,50 : 38 min 2,50≤T<3,20 : 39 min
SPCD-SD	0,10 max	1,00 max	0,040 max	0,035 max	-	270 min	0,40≤T<0,60 : 36 min 0,60≤T<1,00 : 38 min 1,00≤T<1,60 : 39 min 1,60≤T<2,00 : 40 min
KS 290	0,12 max	0,60 max	0,040 max	0,040 max	175 min	290 min	34 min
KS 340	0,14 max	0,60 max	0,035 max	0,035 max	180 min	340 min	34 min
KS 370	0,18 max	0,30 – 0,90	0,035 max	0,035 max	215 min	370 min	30 min

## Dimension:

Dimension	Hot Rolled Coil (HRC)	Hot Rolled Pickled Oil (HRPO)	Cold Rolled Coil (CRC)
Thickness (mm)	1,80 – 13,00	1,80 – 5,70	0,20 – 3,00
Width (mm)	600 – 1.400	620 - 1250	620 - 1250

## AUTOMOTIVE STRUCTURE APPLICATION

### A. AUTOMOTIVE STRUCTURE

Steel for automotive structures in major application is used for heavy vehicle. Heavy vehicles such as medium-heavy truck and bus have heavy load which need material made from steel that resist its load. Chassis is one of component that functions to absorbe engine and driveline torque, endure shock loading, and accomodate twisting on uneven road surfaces. Therefore, it requires material made from steel which fulfill those functions. The main components of Chassis generally consist of Side Rail and Cross Member. PT Krakatau Steel has been producing the steel which comply with those requirements.

The excellences following these:

- Medium-High Strength
- Excellent in formability
- Good impact and fatigue resistance
- Good surface appearance (painting)

Standard specification in accordance to the following:

Standard	Grade
JIS G3113	SAPH 310, SAPH 370, SAPH 400, SAPH 440
KRAKATAU STEEL	KS 440, KSAPH 540, KSAPH 590, KSAPH 620

### Hot Rolled Coil

Spec.	Chemical Composition (%)				Mechanical Properties		
	C	Mn	P	S	YS (MPa)	TS (MPa)	Elongation (%)
(*) SAPH 310	-	-	0,04 max	0,04 max	T<8,00 : 185 min 8,00≤T≤14,00 : 175 min	310 min	2,00≤T<2,50 : 34 min 2,50≤T<3,15 : 28 min 3,15≤T<4,00 : 31 min 4,00≤T<6,30 : 34 min 6,30≤T≤14,0 : 28 min
(*) SAPH 370	-	-	0,04 max	0,04 max	T<8,00 : 225 min 8,00≤T≤14,00 : 215 min	370 min	2,00≤T<2,50 : 33 min 2,50≤T<3,15 : 35 min 3,15≤T<4,00 : 36 min 4,00≤T<6,30 : 37 min 6,30≤T≤14,0 : 38 min
(*) SAPH 400	-	-	0,04 max	0,04 max	T<6,00 : 255 min 6,00≤T≤14,00 : 235 min	400 min	2,00≤T<2,50 : 32 min 2,50≤T<3,15 : 34 min 3,15≤T<4,00 : 35 min 4,00≤T<6,30 : 36 min 6,30≤T≤14,0 : 37 min
(*) SAPH 440	-	-	0,04 max	0,04 max	T<6,00 : 305 min 6,00≤T≤8,00 : 295 min 8,00≤T≤14,00 : 275 min	440 min	2,00≤T<2,50 : 30 min 2,50≤T<3,15 : 32 min 3,15≤T<4,00 : 33 min 4,00≤T<6,30 : 34 min 6,30≤T≤14,0 : 35 min
(*) KS 440	0,20 max	1,20 max	0,05 max	0,03 max	2,00≤T<3,20 : 275 - 390 2,30≤T≤6,00 : 265 - 380	440 min	2,00≤T<2,50 : 30 - 43 2,50≤T<3,20 : 32 - 45 3,20≤T<4,00 : 33 - 46 4,00≤T<6,00 : 34 - 47
KSAPH 540	0,25 max	1,50 max	0,03 max	0,02 max	375 min	540 min	26 min
KSAPH 590	0,20 max	1,50 max	0,04 max	0,04 max	440 min	590 min	18 min
KSAPH 620	0,20 max	1,80 max	0,025 max	0,010 max	550 min	620 min	23 min

Note : Above dimension applies to the lowest tensile strength, for the higher need discussion.

Note : \*) Also produce in Hot Rolled Pickled Oil

## Dimension:

Dimension	Hot Rolled Coil (HRC)	Hot Rolled Pickled Oil (HRPO)
Thickness (mm)	2,00 – 14,00	2,00 – 5,70
Width (mm)	600 – 1.400	620 - 1250

### B. AUTOMOTIVE PART

Steel for automotive part in major application is used for passenger and commercial vehicles. Passenger vehicles such as Multi Purpose Vehicle (MPV) and Sport Utility Vehicle (SUV) and Commercial Vehicle such as Light Truck need parts that function as frame and connector made from steel. Kinds of the parts such as Panel Roof, Back Door, Pillar, Frame, Reinforce, etc.

The excellences of products made by PT Krakatau Steel following these:

- Low-Medium strength
- Good weldability and formability

- Excellent in formability and drawability
- Good flatness and stiffness
- Good appearance (painting)
- Non-ageing properties

Standard specification in accordance to the following:

JIS G3131	SPHC, SPHD
JIS G3141	SPCC-SD, SPCD-SD, SPCE-SD, SPCF-SD, SPCCT-SD
KRAKATAU STEEL	KSAPH 270C, KS 270C, KS 270D, KS 270E

## Hot Rolled Coil

Spec.	Chemical Composition (%)				Mechanical Properties		
	C	Mn	P	S	YS (MPa)	TS (MPa)	Elongation (%)
(*) SPHC	0,12 max	0,60 max	0,045 max	0,035 max	-	270 min	1,80≤T<3,20 : 29 min T<4,00 : 31 min
(*) SPHD	0,10 max	0,45 max	0,035 max	0,035 max	-	270 min	1,80≤T<2,00 : 32 min 2,00≤T<2,50 : 33 min 2,50≤T<3,20 : 35 min 3,20≤T<4,00 : 37 min T<4,00 : 39 min
(*) KSAPH 270C	0,15 max	0,60 max	0,05 max	0,05 max	2,00≤T<3,20 : 185 - 305 2,30≤T<6,00 : 175 - 295	270 min	2,00≤T<3,20 : 37 - 51 2,30≤T<6,00 : 38 - 52

Note : \*) Also produce in Hot Rolled Pickled Oil

## Cold Rolled Coil

Spec.	Chemical Composition (%)				Mechanical Properties		
	C	Mn	P	S	YS (MPa)	TS (MPa)	Elongation (%)
SPCCT-SD	0,15 max	1,00 max	0,100 max	0,035 max	-	270 min	0,20≤T<0,25 : 25 min 0,25≤T<0,30 : 28 min 0,30≤T<0,40 : 31 min 0,40≤T<0,60 : 34 min 0,60≤T<1,00 : 36 min 1,00≤T<1,60 : 37 min 1,60≤T<2,50 : 38 min 2,50≤T<3,20 : 39 min

Spec.	Chemical Composition (%)				Mechanical Properties		
	C	Mn	P	S	YS (MPa)	TS (MPa)	Elongation (%)
SPCD-SD	0,10 max	1,00 max	0,040 max	0,035 max	-	270 min	0,40≤T<0,60 : 36 min 0,60≤T<1,00 : 38 min 1,00≤T<1,60 : 39 min 1,60≤T<2,00 : 40 min
SPCE-SD	0,12 max	0,60 max	0,040 max	0,040 max	175 min	270 min	0,30≤T<0,40 : 35 min 0,40≤T<0,60 : 38 min 0,60≤T<1,00 : 40 min 1,00≤T<1,60 : 41 min 1,60≤T<2,00 : 42 min
SPCF-SD	0,14 max	0,60 max	0,035 max	0,035 max	180 min	270 min	0,40≤T<0,60 : 40 min 0,60≤T<1,00 : 42 min 1,00≤T<1,60 : 43 min 1,60≤T<2,00 : 44 min
KS 270C	0,06 max	0,04 max	0,020 max	0,015 max	0,60≤T<0,80 : 145 - 265 0,80≤T<1,00 : 135 - 255 1,00≤T<2,20 : 125 - 245	270 min	0,60≤T<0,80 : 37 - 47 0,80≤T<1,00 : 38 - 48 1,00≤T<1,20 : 39 - 49 1,20≤T<1,60 : 40 - 50 1,60≤T<2,00 : 41 - 53 2,00≤T<2,20 : 42 - 55
KS 270D	0,05 max	0,30 max	0,015 max	0,015 max	0,60≤T<0,80 : 135 - 225 0,80≤T<1,00 : 125 - 215 1,00≤T<2,20 : 115 - 205	270 min	0,60≤T<0,80 : 40 - 50 0,80≤T<1,00 : 41 - 51 1,00≤T<1,20 : 42 - 52 1,20≤T<1,60 : 43 - 53 1,60≤T<2,00 : 44 - 55 2,00≤T<2,20 : 45 - 57
KS 270E	0,045 max	0,25 max	0,015 max	0,015 max	0,60≤T<0,80 : 130 - 205 0,80≤T<1,00 : 120 - 195 1,00≤T<2,20 : 110 - 185	270 min	0,60≤T<0,80 : 42 - 52 0,80≤T<1,00 : 43 - 53 1,00≤T<1,20 : 44 - 54 1,20≤T<1,60 : 45 - 55 1,60≤T<2,00 : 46 - 56 2,00≤T<2,20 : 47 - 58

Note : Above dimension applies to the lowest tensile strength, for the higher need discussion.

## Dimension:

Dimension	Hot Rolled Coil (HRC)	Hot Rolled Pickled Oil (HRPO)	Cold Rolled Coil (CRC)
Thickness (mm)	2,00 – 25,00	2,00 – 5,70	0,20 – 3,00
Width (mm)	600 – 1.400	620 – 1.250	620 – 1.250

## GALVANIZED, GALVANNEALED, & GALVALUM APPLICATION

PT Krakatau Steel has produced hot and cold rolled steel for applications using galvanized, galvannealed or galvalum coating on the next process. The product needs requirements such as low-medium-high strength, excellent in weldability and formability, good coating and paintability, good flatness and stiffness, and accurate and precise dimensions. The applications for frame housing and general structure.

The available standard specification in accordance to the following:

Standard	Grade
JIS G3131	SPHC
JIS G3141	SPCC-SD, SPCC-1D, SPCC-2D, SPCC-4D, SPCD-1D, SPCC-80
SNI	BJDC-1R, BJDC-SR, BJDC-2R, BJDC-4R, BJDC-8R
KRAKATAU STEEL	SPCG 250, SPCG 300, SPCG 450, SPCG 550

### Hot Rolled Coil

Spec.	Chemical Composition (%)				Mechanical Properties		
	C	Mn	P	S	YS (MPa)	TS (MPa)	Elongation (%)
(*) SPHC	0,12 max	0,60 max	0,045 max	0,035 max	-	270 min	1,80≤T<3,20 : 29 min T<4,00 : 31 min

Note : \*) Also produce in Hot Rolled Pickled Oil

### Cold Rolled Coil

Spec.	Chemical Composition (%)				Mechanical Properties			
	C	Mn	P	S	YS (MPa)	TS (MPa)	Elongation (%)	Hardness (HRB)
SPCC-SD	0,15 max	1,00 max	0,100 max	0,035 max	-	-	-	65 max
SPCC-1D	0,15 max	1,00 max	0,100 max	0,035 max	-	550 min	-	85 min
SPCD-1D	0,10 max	1,00 max	0,040 max	0,035 max	-	550 min	-	85 min
SPCC-2D	0,15 max	1,00 max	0,100 max	0,035 max	-	440 – 590	-	65 – 80
SPCC-4D	0,15 max	1,00 max	0,100 max	0,035 max	-	370 - 490	10 min	74 - 89
SPCC-8D	0,15 max	1,00 max	0,100 max	0,035 max	-	290 - 410	25 min	50 - 71
SPCG 250	0,06 max	0,40 max	0,40 max	0,020 max	250 min.	320 min.	25 min	-
SPCG 300	0,06 max	0,40 max	0,40 max	0,020 max	300 min.	340 min.	20 min	-
SPCG 350	0,06 max	0,40 max	0,40 max	0,020 max	350 min.	420 min.	15 min	-
SPCG 450	0,06 max	0,40 max	0,40 max	0,020 max	450 min.	480 min.	10 min	-
SPCG 500	0,06 max	0,40 max	0,40 max	0,020 max	500 min.	520 min.	8 min	-
SPCG 550	0,09 max	0,60 max	0,020 max	0,020 max	550 min.	550 min.	2 min	-

### Dimension:

Dimension	Hot Rolled Coil (HRC)	Hot Rolled Pickled Oil (HRPO)	Cold Rolled Coil (CRC)
Thickness (mm)	1,80 – 6,00	1,80 – 5,70	0,20 – 3,00
Width (mm)	600 – 2.000	620 – 1.250	620 – 1.250

Note : Above dimension applies to the lowest tensile strength, for the higher need discussion.

## GENERAL PURPOSE APPLICATION

PT Krakatau Steel (Persero) Tbk has produced cold rolled steel for general purpose application which has properties are low strength, excellent in weldability and formability, good paintability, and accurate dimensions.

The available standard specification in accordance to the following:

Standard	Grade
JIS G3141	SPCC-SD, SPCCT-SD, SPCC-1D
SNI	BJDC-SR, BJDCT-SR, BJDC-1R

### Dimension:

Dimension	Cold Rolled Coil (CRC)
Thickness (mm)	0,20 – 3,00
Width (mm)	620 – 1.250

*Note : Above dimension applies to the lowest tensile strength, for the higher need discussion.*

## Cold Rolled Coil

Spec.	Chemical Composition (%)				Mechanical Properties			
	C	Mn	P	S	YS (MPa)	TS (MPa)	Elongation (%)	Hardness (HRB)
SPCC-SD	0,15 max	1,00 max	0,100 max	0,035 max	-	-	-	65 max
SPCCT-SD	0,15 max	1,00 max	0,100 max	0,035 max	-	270 min	0,20≤T<0,25 : 25 min 0,25≤T<0,30 : 28 min 0,30≤T<0,40 : 31 min 0,40≤T<0,60 : 34 min 0,60≤T<1,00 : 36 min 1,00≤T<1,60 : 37 min 1,60≤T<2,50 : 38 min 2,50≤T<3,20 : 39 min	65 max
SPCC-1D	0,15 max	1,00 max	0,100 max	0,035 max	-	550 min	-	85 min

## ENAMELWARES APPLICATION

Our everyday enamel cookwares are made of cold rolled steel sheet which coated by glass-like vitreous porcelain enamel. The benefits of this economical product are countless: safe and non-toxic for our food, high temperature fire resistant, hard, clean, non-stick and non-stained surfaces, and its beautiful colour and graphical designs; the all households qualities to make our life easier, healthier and brighter. However, it is not easy to produce highest quality of enamelware products, as well as its raw materials: cold rolled steel sheet. The steel specification for enamelwares should have good formability, surface adherence, non-aging properties, and excellent enamellability, which means its resistancace against unacceptable enamelling defects such as: carbon boil, hair line or fish scale. PT Krakatau Steel has been producing JIS G3133 SPP cold rolled sheet use ultra low carbon and

titanium-stabilized steel to ensure excellent ground and cover coat formation during and after enamelling process (usually 3 times firing at 810°C). For moderate quality of enamelwares with slight enamelling process, we offers SPCC sheet with special treatments to enhance its drawability and enamelability.

The available standard specification in accordance to the following:

Standard	Grade
JIS G3141	SPCCT-SD, SPCD-SD, SPCE-SD
JIS G3133	SPP
SNI	BJDC-SR, BJDCT-SR, BJDC-1R, BJDD1-SR, BJDD2-SR

### Cold Rolled Coil

Spec.	Criteria	Chemical Composition (%)				Mechanical Properties		
		C	Mn	P	S	YS (MPa)	TS (MPa)	Elongation (%)
SPCCT-SD	Drawability & enamellability not guaranteed	0,15 max	1,00 max	0,100 max	0,035 max	-	270 min	0,20≤T<0,25 : 25 min 0,25≤T<0,30 : 28 min 0,30≤T<0,40 : 31 min 0,40≤T<0,60 : 34 min 0,60≤T<1,00 : 36 min 1,00≤T<1,60 : 37 min 1,60≤T<2,50 : 38 min 2,50≤T<3,20 : 39 min
SPCD -SD	Drawability guaranteed & enamellability not guaranteed	0,10 max	1,00 max	0,040 max	0,035 max	-	270 min	0,40≤T<0,60 : 36 min 0,60≤T<1,00 : 38 min 1,00≤T<1,60 : 39 min 1,60≤T<2,00 : 40 min
SPCE-SD	Drawability guaranteed & enamellability not guaranteed	0,12 max	0,60 max	0,040 max	0,040 max	175 min	270 min	0,30≤T<0,40 : 35 min 0,40≤T<0,60 : 38 min 0,60≤T<1,00 : 40 min 1,00≤T<1,60 : 41 min 1,60≤T<2,00 : 42 min
SPP	Drawability & enamellability guaranteed	0,01 max	0,50 max	0,040 max	0,040 max	220 min	270 min	0,40≤T<0,60 : 38 min 0,60≤T<1,00 : 40 min 1,00≤T<1,60 : 41 min 1,60≤T<2,50 : 42 min

### Dimension:

Dimension	Cold Rolled Coil (CRC)
Thickness (mm)	0,20 – 3,00
Width (mm)	620 – 1.250

*Note : Above dimension applies to the lowest tensile strength,  
for the higher need discussion.*

## COLD ROLLED STEEL FOR HOME, OFFICE,& ELECTRICAL APPLIANCES

PT Krakatau Steel (Persero) Tbk has produced cold rolled steel for home, office, and electrical appliances. The steel have some properties such as low - medium strength, good weldability and forming, good flatness and paintability.

The available standard specification in accordance to the following:

Standard	Grade
JIS G3141	SPCCT-SD, SPCD-SD, SPCE-SD, SPCC-SD, SPCF-SD
SNI	BJDC-SR, BJDC-SR, BJDC-1R, BJDD1-SR, BJDD2-SR, BJDD-SR

### Cold Rolled Coil

Spec.	Chemical Composition (%)				Mechanical Properties		
	C	Mn	P	S	YS (MPa)	TS (MPa)	Elongation (%)
SPCC-SD	0,15 max	1,00 max	0,100 max	0,035 max	-	-	-
SPCCT-SD	0,15 max	1,00 max	0,100 max	0,035 max	-	270 min	0,20≤T<0,25 : 25 min 0,25≤T<0,30 : 28 min 0,30≤T<0,40 : 31 min 0,40≤T<0,60 : 34 min 0,60≤T<1,00 : 36 min 1,00≤T<1,60 : 37 min 1,60≤T<2,50 : 38 min 2,50≤T<3,20 : 39 min
SPCD-SD	0,10 max	1,00 max	0,040 max	0,035 max	-	270 min	0,40≤T<0,60 : 36 min 0,60≤T<1,00 : 38 min 1,00≤T<1,60 : 39 min 1,60≤T<2,00 : 40 min
SPCE-SD	0,12 max	0,60 max	0,040 max	0,040 max	175 min	270 min	0,30≤T<0,40 : 35 min 0,40≤T<0,60 : 38 min 0,60≤T<1,00 : 40 min 1,00≤T<1,60 : 41 min 1,60≤T<2,00 : 42 min
SPCF-SD	0,14 max	0,60 max	0,035 max	0,035 max	180 min	270 min	0,40≤T<0,60 : 40 min 0,60≤T<1,00 : 42 min 1,00≤T<1,60 : 43 min 1,60≤T<2,00 : 44 min

### Dimension:

Dimension	Cold Rolled Coil (CRC)
Thickness (mm)	0,20 – 3,00
Width (mm)	620 – 1.250

*Note : Above dimension applies to the lowest tensile strength, for the higher need discussion.*

## HEAVY EQUIPMENT & MINING APPLICATION

High strength structural steel plate for heavy equipment application such as excavator, tractor or dump truck requires high strength and also impact due to its operations in critical condition. The tensile strength required varies depending on the components and specifications, ranging from 440 MPa, 490 MPa, 590 MPa, and 620 MPa or higher. PT Krakatau Steel has been producing hot rolled steel having tensile strength ranging from 400 to 620 MPa for heavy equipment application using High Strength Low Alloy Steel.

The requirements of steel specification for heavy equipments must have characteristics following these:

- High strength and impact to withstand the impact loads in critical condition
- Good fatigue resistance to improve the life time
- Good weldability while manufacturing process

The available standard specification in accordance to the following:

Standard	Grade
JIS G3101	SS 400
JIS G3106	SM 490YA, SM 490YB
KRAKATAU STEEL	KSAPH 540, KSAPH 590, KSAPH 620

### Hot Rolled Coil

Spec.	Chemical Composition (%)				Mechanical Properties			
	C	Mn	P	S	YS	TS (MPa)	Elongation (%)	Hardness (HRB)
SS 400	-	-	0,05 max	0,05 max	245 min	400 - 510	21 min	27 min
SM 490YA	0,20 max	1,65 max	0,035 max	0,035 max	365 min	490 min	19 min	27 min
SM 490YB								
KSAPH 540	0,18 max	1,50 max	0,02 max	0,02 max	375 min	540 min	26 min	27 min
KSAPH 590	0,18 max	1,50 max	0,02 max	0,02 max	440 min	590 min	18 min	27 min
KSAPH 620	1,60 max	1,60 max	0,02 max	0,02 max	550 min	620 min	23 min	27 min

### Dimension:

Dimension	Hot Rolled Coil (HRC)
Thickness (mm)	2,00 – 25,00
Width (mm)	600 – 1.400

*Note : Above dimension applies to the lowest tensile strength, for the higher need discussion.*

## CHECKERED PLATE

Steel checker plate (also known as floor plate) is a steel plate with a raised pattern on one side of the surface.

Application :

Stairs, walkways, ramps, infrastructure, automobile floor, and engineering stairs

STANDARD	GRADE	GROUP APPLICATION
KRAKATAU STEEL	Checkered	Floor Plate
KRAKATAU STEEL	Checkered 400	Floor Plate



Can be supplied in coil or plate

Gauge : Thin Gauge = 2.30 – 6.00 mm (for Checker)

= 3.50 – 6.00 mm (for Checker 400)

Thick Gauge = 6.00 – 12.70 mm

Width : 4 feet and 5 feet\* (Need for further discussion)

DIMENSION	STRIP THICKNESS	
	2.30 – 6.00 mm	6.00 – 12.70 mm
Length (L)	26.80 mm	33.00 mm
Width (W)	4.90 mm	7.70 mm
Height (H)	1.50 mm max.	1.50 mm max.
Pitch Size (P)	45.00 mm	60.00 mm
Angle of Profile to Rolling Direction ( $\alpha$ )	45	45

Specification	Yield Strength	Tensile Strength	Elongation
Checker 400	Min. 235 MPa	400 - 510 MPa	t 3,00 - 4,99 mm : Min. 21% (Lo : 50 mm) t 5,00 - 12,70 mm : Min. 17% (Lo : 200 mm)

## HOT ROLLED FOR BOILER AND PRESSURE VESSEL APPLICATION

Hot rolled steel plate for boiler and pressure vessel produced by PT Krakatau Steel (Persero) Tbk. has the following properties.

- Strength level according to standard specification
- Good weldability
- Good formability
- Good steel cleanliness achieved by clean steel practice in steelmaking.
- Accurate dimension according to standard

Application of these materials are boiler and pressure vessels in several industries such as power plants, coal gasifiers, refineries, process industries, and petrochemical exchangers. The steel for such applications are ASTM A285, ASTM A516, BSEN 10120, etc.

PT Krakatau Steel (Persero) Tbk. supplies the steel in the form of coils or plates with supply condition as as-rolled or thermomechanically controlled process (TMCP).

Other application of the steel is LPG bottle. PT Krakatau Steel (Persero) Tbk. has been supplying materials for LPG bottle 3 kg, 12 kg, and 50 kg according to JIS G3116 and SNI 07-3018-2006. As the addition of common mechanical testing, there are other testings which are required for LPG bottle application: bursting test and expansion resistance testing. PT Krakatau Steel (Persero) Tbk. material of SNI 07-3018-2006 Bj TG 255 and Bj TG 295 (equivalent to JIS G3116SG255 and SG295 respectively) shows good performance on the testing.

### Hot rolled steel plate for boiler and pressure vessel application

STANDARD	GRADE	GROUP APPLICATION
ASTM A53	ASTM A53 GRB	Pipe Hot Dipped, Zinc-Coated, Welded and Seamless
ASTM A283	ASTM A283 GRA	Plates, Carbon Steel, Low and Intermediate-Tensile Strength
	ASTM A283 GRB	
	ASTM A283 GRC	
	ASTM A283 GRD	
ASTM A285	ASTM A285 GRA	
	ASTM A285 GRB	
	ASTM A285 GRC	
ASTM A515	ASTM A515 GR70	Plates, Carbon Steel, for Intermediate and Higher - Temperature Service
ASTM A516	ASTM A516 GR70	Plates, Carbon Steel, for Moderate and Lower - Temperature Service
BSEN 10120	BSEN 10120 P265NB	Plates for building boilers and pressure vessels such as petroleum, chemical industry, reactor, etc.
SNI 07-3018-2006	Bj TG 255	Welded containers for high pressure gas holder of volume less than 500 l for LPG, acetylene and propane gas.
	Bj TG 295	
JIS G3116	SG255	
	SG295	
SAE 1019	SAE 1019	These steels are the lowest carbon steels of the plain carbon type, and are selected where cold formability is the primary requisite of the user. They are produced both as rimmed and killed steels
SAE 1020	SAE 1020	
SAE 1021	SAE 1021	
SAE 1022	SAE 1022	
SAE 1026	SAE 1026	

### Dimension:

Dimension	Hot Rolled Coil (HRC)
Thickness	1.80 - 25.0 mm
Width	600 - 2,000 mm
Coil weight	30 Ton Max
Length for Plate	12000 mm max

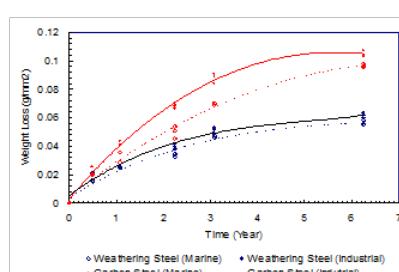
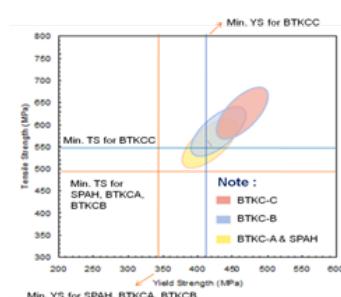
## HOT ROLLED FOR WEATHERING CORROSION RESISTANT

Weathering corrosion resistant High-Strength Low-Alloy (HSLA) steel is intended for structural applications where a combination of high strength and enhanced atmospheric corrosion resistance are desired. It has approximately 4 times the atmospheric corrosion resistance of structural carbon steel, good formability and

weldability. Thus atmospheric corrosion resistant steel have strength 35-40% higher than carbon steel (effect of vanadium addition). The extra strength of HSLA steel makes it more durable and offers a longer useful life span for chimney, bridge, tubular bridge, container and tank.

STANDARD	GRADE	GROUP APPLICATION
JIS G3125	SPAHL	Having Superior atmospheric corrosion resistance, it is applied to architecture, steel tower, steel container and other structures.
KRAKATAU STEEL	BTKC GRA	Weather corrosion resistance steel for structure
	BTKC GRB	
	BTKC GRC	
BS 4360	BS 4360 WR50A	Weathering resistant steel
ASTM A588	GRADE A	Atmospheric corrosion resistance

Specification	Chemical Compositions									Mechanical Properties		
	C	Si	Mn	P	S	Cu	Ni	Cr	V	Yield Strength (MPa)	Tensile Strength (MPa)	Elongation (%)
SPAHL	0.12 max	0.20	0.6 max	0.07	0.035	0.25	0.65 Max	0.30	-	355 min	490 min	22 min
		-		-	max	-		-	-			
		0.75		0.15		0.55		1.25				
BTKC-A	0.12 max	0.20	0.20	0.07	0.050 max	0.25	0.65 Max	0.30	-	345 min	485 min	22 min
		-	-	-		-		-	-			
		0.75	0.50	0.15		0.55		1.25				
BTKC-B	0.19 max	0.30	0.80	0.040 max	0.050	0.25	0.40 Max	0.40	0.02	345 min	485 min	21 min
		-	-		max	-		-	-			
		0.65	1.25			0.40		0.65	0.10			
BTKC-C	0.19 max	0.30	0.80	0.040 max	0.050	0.25	0.40 Max	0.40	0.04	415 min	550 min	21 min
		-	-		max	-		-	-			
		0.60	1.35			0.40		0.70	0.10			
ASTM A588	0.19 max	0.30- 0.65	0.80- 1.25	0.040 max	0.050 max	0.25- 0.40	0.40 Max	0.40- 0.65	0.02- 0.10	345 min	485 min	21 min
JIS G 3125 SPAHL	0.12	0.2 - 0.5	0.25 - 0.75	0.07 - 0.15	0.04 0.60	0.25 - 0.60	-	0.65 1.25	0.3 - 1.25	355 N/mm <sup>2</sup>		490 N/mm <sup>2</sup>



Thickness	2.35 - 25.0 mm
Width	600 - 2,000 mm
Coil weight	30 Ton Max
Length for Plate	12000 mm max

Weight Loss Testing and Measurement

## HOT ROLLED STEEL PLATE FOR SHIP BUILDING APPLICATION

Hot rolled steel plate for shipbuilding produced by PT Krakatau Steel (Persero) Tbk. has the following properties.

- Strength level according to standard
- High toughness
- Good formability
- Good weldability
- Excellent corrosion resistant

Some advantages of ship plate from PT Krakatau Steel (Persero) Tbk.

- Accurate dimension
- Suitable chemical composition
- Its high impact resistant at temperature up to as low as -40°C makes the plates suitable for extreme environment ranging from warm tropical ocean to cold polar ocean

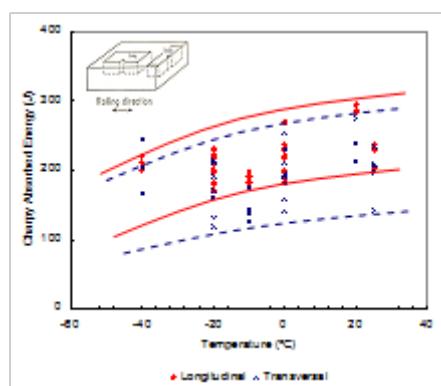
Application: Material for pier facilities, bridge, dock, and other construction near corrosive environment.

PT Krakatau Steel (Persero) Tbk. is currently capable of producing ship plate with various class of certifications, from the ordinary strength (Grade A and B) until higher strength (Grade A32 and A36).

STANDARD	GRADE
Klasifikasi Indonesia (KI)	KI Grade A, KI Grade B, KI A32, KI A36
ABS Register	ABS Grade A, ABS AH32, ABS AH36
BV Register	BV Grade A, BV Grade B, BV AH32, BV AH36
GL Register	GL Grade A, GL Grade B
LR Register	LR Grade A
NK Register	NK Grade A, NK A32, NK A36
DNV Register	NV Grade A, NV A32, NV A36

### Typical mechanical properties requirements of ship plate.

Ship Plate Grade	YS (MPa)	TS (MPa)	Elongation (%)	Impact Energy (Joule)
Grade A	235 min	400 – 520	22 min	Not Specificationified
Grade B	235 min	400 – 520	22 min	27 min (Long) at 0°C 20 min (Trans) at 0°C
Grade A32	315 min	440 – 590	22 min	31 min (Long) at 0°C 22 min (Trans) at 0°C
Grade A36	355 min	490 – 620	21 min	34 min (Long) at 0°C 24 min (Trans) at 0°C



Typical range of ship plate produced by PT Krakatau Steel (Persero) Tbk.

## HOT ROLLED STEEL FOR REROLLING

PT Krakatau Steel (Persero) Tbk. has been supplying hot rolled coil for rerolling application. The HRC has the following properties.

- Accurate dimension according to standard
- Suitable chemical composition according to standard
- Good profile and flatness
- Good surface quality
- Good pickability

Related to the formation of aluminum nitride precipitate in subsequent annealing process, hot rolled coil for rerolling requires a different cooling temperature. Generally, cooling temperature requirement is classified into two different value: high and low cooling temperature. High cooling temperature is employed for steel to be processed in continuous annealing, while low cooling temperature is for steel to be processed in batch annealing furnace. With the existing facilities in hot strip mill, PT Krakatau Steel (Persero) Tbk. is capable to fulfil these two requirements, making the steel suitable for the desired application.

List of hot rolled coil for rerolling produced by PT Krakatau Steel (Persero) Tbk.

Thickness	1.80 mm (min)
Width	600 – 2,000 mm

PT Krakatau Steel (Persero) Tbk. supplies HRC for rerolling with the following dimension

STANDARD	GRADE	GROUP APPLICATION
BSEN 10111	BSEN 10111 DD11	Mild steel/low carbon steel, may still fall under the category of special steel if any special properties is specified in the steel
SAE 1006	SAE 1006	These steels are the lowest carbon steels of the plain carbon type, and are selected where cold formability is the primary requisite of the user.
	SAE 1006 B	
	SAE 1006 C	
SAE 1008	SAE 1008	
SAE 1010	SAE 1010	They are produced both as rimmed and killed steels
	SAE 1012	
	SAE 1015	
SAE 1016	SAE 1016	
SAE 1018	SAE 1018	
SAE 1019	SAE 1019	
SAE 1020	SAE 1020	
	SAE 1021	
SAE 1022	SAE 1022	
	SAE 1026	
ASTM A1006	ASTM A1006	
ASTM A1008	ASTM A1008	
	ASTM A1008 CS TYPE B	
ASTM A1010	ASTM A1010	
	ASTM A1010M1	
	ASTM A1010M2	
ASTM A1011	ASTM A1011	
ASTM A1011	ASTM A1011B	
	ASTM A1011 CS TYPE B	
ASTM A1012	ASTM A1012	

## OIL AND GAS PIPELINE APPLICATION

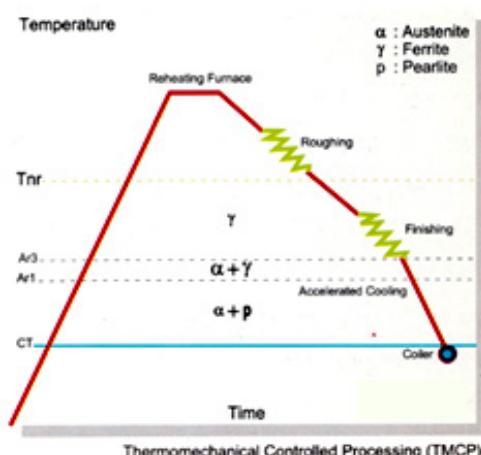
With over 20 years' experience, Krakatau Steel supplies more than 1.5 million metric tons of Hot Rolled Coil (HRC) for oil and gas pipeline application with various type of specification both API-5L Series for application in offshore to sour gas as well as API-5CT series for casing tube application. HRC for oil and gas pipeline application has very stringent requirements so parameter process in steel making and hot rolling mill should be controlled precisely.

Slab produced for this application should have a good internal quality and surface quality with implementation of Clean Steel Practice. Processing condition in steel making Krakatau Steel :

- Killed Steel
- Secondary Metallurgy : Vacuum Degasser and Laddle Furnace
- Continuous Casting

Thus, Thermo Mechanical Controlled Process (TMCP) is should be applied in hot rolling mill to achieve HRC with the following properties :

- Strength level according to standard
- High toughness
- Good formability
- Good weldability
- No Bauschinger Effect



### Scheme of TMCP

1. Reheating slab before hot rolling process
2. Controlled rolling above non-recrystallization temperature
3. Controlled rolling at recrystallization temperature
4. Cooling after rolling

STANDARD	GRADE	GROUP APPLICATION
API 5CT	API 5CT H40	Hot rolled steel for casing, pipe and tubing is used for drilling, high weldability and excellent fracture resistance.
	API 5CT J55	
	API 5CT K55	
API 5L	API 5L GRA	Hot rolled steels makes excellent pipeline material because of its strength, low temperature toughness, weldability and hydrogen induced crack resistance (sour services). Use in pipeline transportation system in the petroleum and natural gas industries.
	API 5L GRB PSL 1	
	API 5L GRB M	
	API 5L GRB N	
	API 5L X42	
	API 5L X42 M	
	API 5L X42 MO	
	API 5L X46 M	
	API 5L X52 M	
	API 5L X52 MO	
	API 5L X52 MS	
	API 5L X56 M	
	API 5L X60 M	
	API 5L X60 MO	
	API 5L X60 MS	
ASTM A139	API 5L X65 M	These use in pipeline transportation systems in the petroleum and natural gas industries, for use as casing and tubing for wells, as well as for other applications, applies to pipe piles in which the steel cylinder acts as a permanent load-carrying member, or as a shell to form cast-in-place concrete piles.
	API 5L X65 MO	
	API 5L X65 MS	
	API 5L X70 M	
	API 5L X80	
DNV 485	ASTM A139 GRB	For Electric-Fusion (Arc)-Welder Steel
DNV OS F101	DNV 485	Sub marine pipe line system
	OS F101 GR450	
	USF	

Thickness	1.80 - 25.0 mm
Width	600 - 2,000 mm
Coil weight	30 Ton Max

## WEAR RESISTANT STEEL PLATE

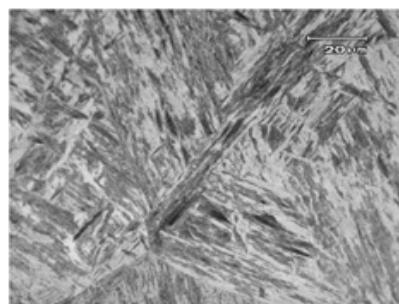
Wear resistant steel plate for mining industry, exploration, forestry or agro-industry can be produced in the country with quality no less than imported steel plates. PT Krakatau Steel (Persero) Tbk as the state owned and the largest company in the field of steel industry in Indonesia has stepped up with its own resources to build the roll-quencher and temper machine, which has been able to produce wear plate with a hardness value equivalent to 500 HBW.

### End-use application :

Recommended end-use application are: bucket, chute, mixer, bearing, crusher, grinder, wear line, dump truck etc.

Specification	Thickness (mm)	Hardness (HBW)
KSTA 400	6,00 - 20,00	380 - 420
KSTA 450	6,00 - 20,00	420 - 480
KSTA 500	6,00 - 20,00	480 - 540

HBW : Brinell Harness Number



Typical Microstructure

### Certification & Test Result

The wear resistance test result of KSTA 500 which performed at Laboratory of Materials Testing Department of Metallurgy & Materials Engineering University of Indonesia shows specific abrasion values  $0.3 \times 10^{-7}$  mm<sup>3</sup>/kg, which is equal and even better than imported plates.

Spec.	Thickness (mm)	Chemical Composition, max in wt%					Carbon Equivalent, Typical
		C	Mn	Cr	Ni	Mo	
KSTA 400	6,00 - 20,00	0,28	1,4	0,8	0,30	0,25	0,50
KSTA 450	6,00 - 20,00	0,30	1,4	0,8	0,30	0,25	0,55
KSTA 500	6,00 - 20,00	0,30	1,4	1,0	0,50	0,40	0,60

### Available Dimension

Available dimensions of KSTA 400, 450 and 500 steel plates are in the table below. Ordering for special dimensions can also be accepted as far as in the range of roll-quencher machine capacity, in particular for the length of the plate which is now limited to 3 meters. Likewise, for booking with a particular plate shapes can also be met through sales representatives who have been appointed.

Specification	Thickness (mm)	Width (mm)	Length (mm)
KSTA 400	6,00 - 20,00	1000 - 1600	3000 max
KSTA 450	6,00 - 20,00	1000 - 1600	3000 max
KSTA 500	6,00 - 20,00	1000 - 1600	3000 max

## INFRASTRUCTURE APPLICATION

Steel in modern decades is always playing a significant role as a major material for all construction buildings, brigdes, towers and other structural appli-

ances to build our cities, town and countries. In other words, steel is indeed a national power.

### General & Welded Structures

For general and welded structures as for building and bridges, hot rolled steel grades are supplied with medium-high strength and good weldability. The available standard specifications are:

- JIS G 3101 SS 400, SS 490, SS 540 for structural steel application
- DIN 17100 St 37, St 44, St 50, St 52 for structural steel application
- BS 4360 43A, 43B, 43C, 50A, 50B, 50C for structural steel application
- BSEN 10025 S275 (JO, JR, J2), S355 (JO, JR, J2) for welded structure application
- JIS G 3136 SN 400A, B, C, SN 490A, B, C for square pipe application
- JIS G 3106 SM 400A, B, C, SM490YA, YB, SM570 for superior strength and weldability structure
- ASTM A570 Gr 30, 33, 36, 40, 45, 50 for structural steel application
- DIN 17175 15Mo3 for fire resistant steel application

### JIS G 3101 (Rolled Steel for General Structure)

Specification	Yield Strength (MPa)		Tensile Strength (MPa)	Elongation (%)	
	t ≤ 16 mm	16 < t ≤ 25 mm		5 < t ≤ 16 mm	16 < t ≤ 25mm
SS 300					
SS 400	245 min	235 min	400 – 510	17 min	21 min
SS 490	285 min	275 min	490 – 610	15 min	19 min
SS 540	400 min	390 min	540 min	13 min	17 min

### JIS G 3106 (Rolled Steel for Welded Structure)

Specification	Yield Strength (MPa)		Tensile Strength (MPa)	Elongation (%)	
	t ≤ 16 mm	16 < t ≤ 25 mm		5 < t ≤ 16 mm	16 < t ≤ 25mm
SM 400 A,B,C	245 min	235 min	400 – 510	18 min	22 min
SM 490 A,B,C	325 min	315 min	490 – 610	17 min	21 min
SM 490 YA,YB	365 min	355 min	490 – 610	15 min	19 min
SM 520 B, C	365 min	355 min	520 – 640	15 min	19 min
SM 570	460 min	450 min	570 - 720	19 min	26 min (16 < t ≤ 20mm) 20 min (20 < t ≤ 25mm)

### Detail Specification for Infrastructure Application

STANDARD	GRADE	GROUP APPLICATION
AS/NZ 1594 - 2002	HA 200	General Structures for Building, Bridges Ships
	HA 250	
	HA 300	
	HA 350	
	HA 400	
ASTM A36	ASTM A36	Carbon steel of structural quality for use welded construction of bridges and buildings and general structural purpose.
ASTM A242	ASTM A242 GR2	High Strength Low-Alloy Structural Steel
ASTM A366		

STANDARD	GRADE	GROUP APPLICATION
ASTM A572	ASTM A572 GR42	High Strength Low-Alloy Columbium-Vanadium Structural Steel
	ASTM A572 GR50	
	ASTM A572 GR55	
	ASTM A572 GR60	
	ASTM A572 GR65	
ASTM A573	ASTM A573 GR70	Structural Carbon Steel Plates of Improved Toughness
ASTM A792	ASTM A792 GR50A	This product is intended for applications requiring corrosion resistance or heat resistance, or both.
	ASTM A792 GR50B	
BS 4360	BS 4360 GR43A	High - Strength low Alloy Columbium-Vanadium Steel for Structural Quality
	BS 4360 GR50B	
	BS 4360 GR50C	
	BS 4360 GR55C	
BSEN 10025	BSEN S235 J0	Welded Structure for Building, Bridges, ships, Petroleum Storage, Tank Containers
	BSEN S235 JR	
	BSEN S275 JO	
	BSEN S275 JR	
	BSEN S275 J2	
	BSEN S355 JO	
	BSEN S355 JR	
	BSEN S355 J2	
	BSEN S355 J2+M	
MS EN 10025-2:2011	S275 JR+AR	Hot Rolled Products of Structural Steel
	S275 J0+AR	
	S275 J2+AR	
	S355 JR+AR	
	S355 J0+AR	
	S355 J2+AR	
CSA G4021	CSA G4021 300W	Structural, Carbon & HSLA Steel Plate
	CSA G4021 350W	
DIN 1543	DIN 1543 ST37-2 CU3	Welded Structure for Building, Bridges, ships, Petroleum Storage, Tank Containers
	DIN 1543 ST52-2 CU3	
DIN 17100	DIN 17100 ST37-2	Applies to steel sections (including wide flange beams), steel bars, wire rod, flat products(strip, plate, wide flats) seamless and welded, square and rectangular hollow sections, forgings and semi-finished products in the general structural steels named, which are delivered in the hot formed or normalized condition after production
	DIN 17100 ST44-2	
	DIN 17100 ST52-3	



STANDARD	GRADE	GROUP APPLICATION
DIN 17175	DIN 17175 15Mo3	Seamless Steel Pipe/ tube It is used for the pipelines of boiler industry
EN 10025	EN 10025 S235JR+AR	Hot rolled products of non-alloy structural steels
	EN 10025 S355J0C	
	EN 10025 S355J0G	
	EN 10025 S355JRG	
JIS G3101	SS330	Having each strength level, it is applied to structural materials for architecture, bridge, ships, rolling stocks and other structures.
	SS400	
	SS490	
	SS540	
JIS G3106	SM400A	Having superior strength and weldability, it is applicable to architecture, bridge, ships, rolling stock body, petroleum storage tanks, container and other constructions.
	SM400B	
	SM400C	
	SM490A	
	SM490B	
	SM490C	
	SM490YA	
	SM490YB	
	SM520B	
	SM520C	
JIS G3136	SN400B	Hot rolled – seismic improved structural steels, used for structural members buildings, architecture structures.
	SN490B	
JIS G3466	STKR 400	Carbon steel Square for general structural purposes
SNI 07 0601	BJPC	General Fabrication & Drawing Quality
	BJPS	
	BJPE	
MS 1705 : 2003	SPHIC	Corrugated Steel Structures
		Carbon steel strip and sheet of commercial and drawing qualities

## Product Dimension

Thickness	1.80 - 25.0 mm
Width	600 - 2,000 mm
Coil weight	30 Ton Max
Length for Plate	12000 mm max

## GENERAL PIPE & TUBES

For general pipes and tubes, as for small-medium welded pipes & tubes for structural and/or non-structural uses, hot rolled steel grades are supplied with low-medium strength, good formability and bendability, and good weldability. The available standard specifications

are:

- JIS G 3132 SPHT 1, 2, 3, 4 for pipe and tube application
- ASTM A252 Grade 1, 2, 3 for piling pipe application

### JIS G 3132 (Hot rolled carbon steel for pipes & tubes)

Spec	Yield Strength (MPa)	Tensile Strength (MPa)		
		270 min	32 min	35 min
SPHT 1	270 min	32 min	35 min	37 min
SPHT 2	340 min	27 min	30 min	32 min
SPHT 3	410 min	22 min	25 min	27 min
SPHT 4	490 min	17 min	20 min	22 min

### ASTM A252 (Hot rolled carbon steel for piling pipe)

Spec	Yield Strength (MPa)	Tensile Strength (MPa)	Elongation (%)
Grade 1	205 min	345 min	30 min
Grade 2	240 min	415 min	25 min
Grade 3	310 min	455 min	20 min

## PRODUCT SPECIFICATION FOR GENERAL PIPE AND TUBE APPLICATION

STANDARD	GRADE	GROUP APPLICATION
JIS A5525	SKK400	Welded pipes with low and high frequency welding.
	SKK490	
JIS G3232	SPHT1	
	SPHT2	
	SPHT3	
	SPHT4	
MS 1768:2004	SPHT1	Hot-Rolled Carbon Steel Strip for Pipes and Tubes
	SPHT2	
ASTM A252	ASTM A252 GR 1	Electrical Resistance Welded Carbon steel for Boiled Tube
	ASTM A252 GR 2	
	ASTM A252 GR 3	
ASTM A53	ASTM A53 GR B	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
KRAKATAU STEEL	SPHK 1	Welded steel pipes and tubes
	SPHK 2	

*Mechanical prop or chem.comp and dimensions (if any)*

### Product Dimension

Thickness	1,80 - 25.0 mm
Width	600 - 2,000 mm
Coil Inner Diameter	760 - 2,000 mm
Coil weight	30 Ton Max

## WIRE ROD FOR COLD HEADING QUALITY

Wire rod for the manufacture of low carbon steel wires by cold heading and cold forging. Forged to make bolts, nuts and screws. This steel requires strict quality control, because the steel is placed under severe working

conditions and used for Specificational purpose. The Specificational steel for cold heading application grade SWRCH 8A, 10A, 12A and 18A

Specification	KRAKATAU STEEL	Chemical Composition (%)					
		C	Si	Mn	P	S	Al
JIS G3507 SWRCH 8A	KS 1008 ACH	0.10 max	0.10 max	0.60 max	0.30 max	0.035 max	0.02 min
JIS G3507 SWRCH 10A	KS 1010 ACH	0.08-0.13	0.10 max	0.30-0.60	0.30 max	0.035 max	0.002 min
JIS G3507 SWRCH 12A	KS 1012 ACH	0.10 - 0,15	0,10 max	0,30-0,60	0,30 max	0,035 max	0,002 min
JIS G3507 SWRCH 18A	KS 1018 ACH	0.15-0.20	0.10 max	0.60-0.90	0.30 max	0.035 max	0.002 min

Fabrication Performance:	
Drawability	5*
Headability	A
Weldability	5*
Coating	5*

\*1-Limited to 5-Excellent

\*\*A-Applicable

\*\*NA-Not Applicable

Specification	Mechanical Properties :		
	(Typical)		
	YS (Kg/mm <sup>2</sup> )	TS (Kgmm <sup>2</sup> )	EL (%)
SWRCH 8A	—	40 max	25 min
SWRCH 10A	—	45 max	25 min
SWRCH 12A	—	46 max	23 min
SWRCH 18A	—	48 max	23 min

\*Basis in diameter 5,5-7,0 mm.

## WIRE ROD FOR WELDING ELECTRODE

Welding Electrode Wire is a low carbon steels for stick electrode applications in carbon grades For covered electrode wire which are principally used for arc welding. Precise component control is required to ensure weld-

ability and deposit metal quality. It is supplied with low strength, good drawability and Specificational chemical compositions.

Specification	Chemical Composition						Mechanical properties (Typical)		
	C	Si	Mn	P	S	Cu	YS (Kg/mm <sup>2</sup> )	TS (Kg/mm <sup>2</sup> )	El (%)
JIS G3503 SWRY11	0.09 max	0.03 max	0.35-0.65	0.020 max	0.023 max	0.20 max	24-34	35-45	20 min

Fabrication Performance:	
Drawability	5*
Headability	NA**
Weldability	5*
Coating	5*

\*1-Limited to 5-Excellent

\*\*NA-Not Applicable

## WIRE ROD HIGH CARBON GRADE SWRH

High Carbon Steel Wire Rod are used for high carbon steel for prestressed concrete (PC) wires, wire ropes, steel core for cable ( wire strand), etc., and are supplied with medium-high strength, medium formability & drawability, and excellent cleanliness. Available spec-

ifications are JIS G 3506 SWRH 42A, 62A, 62B, 67A, 67B, 72A, 72B, 77B and 82B. High carbon steel used for shafting bar automotive application medium strength, good formability and excellent cleanliness. Available specification are JIS G 4051 S 30C, 35C and 45C.

Specification	EQUIVALENT	GROUP APPLICATION
JIS G 4051 S 30C	KS 1030	Carbon Steel for Shafting Bar
JIS G 4051 S 35C	KS 1035	
JIS G 4051 S 45C	KS 1045	
JIS G 3506 SWRH 42A	KS 1042A	Umbrella Ribs, Helical Wire
JIS G 3506 SWRH 62A	KS 1062A	Screw Driver, Spring Wire
JIS G 3506 SWRH 62B	KS 1062B	Screw Driver, Spring Bed
JIS G 3506 SWRH 67A	KS 1067A	Cable Housing, Spring Bed, Wire Rope Strand
JIS G 3506 SWRH 67B	KS 1067B	Bead Wire, Spring Bed, Wire Rope Strand
JIS G 3506 SWRH 72A	KS 1072A	ACSR, Bead Wire, Wire Rope Strand
JIS G 3506 SWRH 72B	KS 1072B	
JIS G 3506 SWRH 77B	KS 1077B	Frame Spring Bed, Wire for Rolling Door
JIS G 3506 SWRH 82 B	KS 1082B	Wire Rope, PC Strand
	KS 1082B1	PC Strand, PC Wire

Fabrication Performance:	
Drawability	5*
Headability	NA
Weldability	2*
Coating	3*

\*1-Limited to 5-Excellent

\*\*A-Applicable

\*\*NA-Not Applicable

Mechanical Properties :		
	Standard	Typical
Yield Strength (kg/mm <sup>2</sup> )	-	57 – 108
Tensile Strength (kg/mm <sup>2</sup> )	-	68 – 130
Elongation (%)	-	8 – 14

\*Basis in diameter 5,5-7,0.

### Chemical Composition & Mechanical Properties

Specification	Diameter	Chemical Composition (%)				Mechanical Properties		
		C	Mn	P	S	YS (Kg/mm <sup>2</sup> )	TS (Kg/mm <sup>2</sup> )	Elongation (%)
KS 1042A	5,5-14	0.39-0.46	0.15-0.35	0.30-0.60	0.030 max	57-68	68-78	8-14
KS 1062A	5,5-7,0	0.59-0.66	0.15-0.35	0.30-0.60	0.030 max	71-81	86-98	8-12
KS 1062B	5,5-7,0	0.59-0.66	0.15-0.35	0.60-0.90	0.030 max	78-87	94-104	8-12
KS 1067A	5,5-7,0	0.64-0.71	0.15-0.35	0.30-0.60	0.030 max	79-88	98-105	8-12
KS 1067B	5,5-7,0	0.64-0.71	0.15-0.35	0.60-0.90	0.030 max	81-90	98-108	8-12
KS 1072A	5,5-7,0	0.69-0.76	0.15-0.35	0.30-0.60	0.030 max	83-91	99-109	8-12
KS 1072B	5,5-7,0	0.69-0.76	0.15-0.35	0.60-0.90	0.030 max	88-96	108-115	8-12
KS 1077B	5,5-7,0	0.74-0.81	0.15-0.35	0.60-0.90	0.030 max	92-100	110-120	7-12
KS 1082B	5,5-7,0	0.79-0.86	0.15-0.35	0.60-0.90	0.030 max	96-108	115-130	7-12
KS 1082B1	8,0-11,0	0.79-0.86	0.15-0.35	0.60-0.90	0.030 max	96-108	115-130	7-12

### Chemical Composition for Shafting Bar Automotive Application

Specification	Chemical Composition (%)				
	C	Si	Mn	P	S
KS 1030	0.27-0.33	0.15-0.35	0.60-0.90	0.030 max	0.035 max
KS 1035	0.32-0.38	0.15-0.35	0.60-0.90	0.030 max	0.035 max
KS 1045	0.42-0.48	0.15-0.35	0.60-0.90	0.030 max	0.035 max

## WIRE ROD LOW-MEDIUM CARBON

Low-medium Carbon Steel Wire Rod are used for general wires, wire mesh, general fasteners, fence, galvanish etc., and are supplied with low-medium strength, good

formability & drawability and good weldability. Available Specificationifications are JIS G 3505 SWRM 6, 8, 10, 12, 15, 20.

Specification	EQUIVALENT		GROUP APPLICATION
	KRAKATAU STEEL	AISI / SAE	
JIS G 3505 SWRM 6	KS 1006	1006	Nails, Wire Mesh
JIS G 3505 SWRM 8	KS 1008	1008	
JIS G 3505 SWRM 8	KS 1008	1008	Shafting bar, Automotif
JIS G 3505 SWRM 10	KS 1010	1010	Nails Wire Galvanish
JIS G 3505 SWRM 12	KS 1012	1012	Wire Mesh
JIS G 3505 SWRM 15	KS 1015	1015	Nails, Wire Mesh
JIS G 3505 SWRM 20	KS 1020	1020	Nails, Wire Mesh

Fabrication Performance:	
Drawability	5*
Headability	NA**
Weldability	5*
Coating	5*

\*1-Limited to 5-Excellent

\*\*NA-Not Applicable

Specification	Diameter	Chemical Composition				Mechanical properties (Typical)		
		C	Mn	P	S	YS (Kg/mm <sup>2</sup> )	TS (Kg/mm <sup>2</sup> )	EL (%)
SWRM 6	5,5-20.0	0.08 max	0.60 max	0.040 max	0.040 max	22-35	32-44	21-31
SWRM 8	5,5-20.0	0.10 max	0.60 max	0.040 max	0.040 max	22-35	35-46	21-31
SWRM 10	5,5-20.0	0.08-0.13	0.30-0.60	0.040 max	0.040 max	22-35	36-47	21-31
SWRM 12	5,5-20.0	0.10-0.15	0.30-0.60	0.040 max	0.040 max	24-36	38-48	21-31
SWRM 15	5,5-20.0	0.13-0.18	0.30-0.60	0.040 max	0.040 max	26-40	41-56	21-29
SWRM 20	5,5-20.0	0.15-0.20	0.30-0.60	0.040 max	0.040 max	27-40	45-58	19-28

\*Basis in diameter 5,5-7,0

## WIRE ROD FOR DEFORMED BAR IN COIL

Deformed bar in coil was manufactured PT Krakatau Steel (Persero) Tbk. by using lines of wire rod mill production process. Diameter of 6-16 mm were used commercially, have been used for the support of construction with the customize size. Excellence deformed bar in coil compared with deformed bars such as have high tensile strength, high elongation, good weldability, zero

waste, save costs and saving time. Market demand for wire mesh will now move to the high product segment high tensile elongation, thus forcing manufacturers for the fulfillment these demand. Deformed bar in coil applications for the manufacturing industry, EPC, Precon and wire mesh.

KRAKATAU STEEL	EQUIVALENT	GROUP APPLICATION	
KS1318	JIS G 3112 SD 490	Low Carbon (Good Weldability)	Deformed Bar In coil for General construction
KS1325V	JIS G 3112 SD 490	Medium Carbon	

Mechanical Properties :		
	Standard	Typical
Yield Strength (kg/mm <sup>2</sup> )	50 - 63	50 - 56
Tensile Strength (kg/mm <sup>2</sup> )	63 min	65 - 75
Elongation (%)	13 min	16 - 25
Ratio TS/YS	-	1,25 min

Specification	Diameter	Chemical Composition				
		C	si	Mn	P	S
KS 1318	6.0-13.0	0.17-0.21	0.16-0.20	1.50-1.7	0.030 max	0.030 max
KS1325V	6.0-13.0	0.25-0.27	0.20-0.30	1.40-1.50	0.030 max	0.030 max

## WIRE ROD FOR GRINDING BALL

Grinding Balls are made from high carbon steel (0.80-1.0%C) with controlled amounts of alloying. PT Krakatau Steel (Persero) Tbk. has been experienced to supply raw

material round bar for the grinding ball manufacture for Specification KS1082B2 and 1095GB

KRAKATAU STEEL	EQUIVALENT	GROUP APPLICATION
KS 1082 B2	JIS G 3507	Alloy Steel For Grinding Ball
KS 1095 GB	SWRH 82B	

### Chemical Composition

Specification	Chemical Composition				
	C	si	Mn	P	S
KS 1082B2	0.76-0.84	0.15-0.35	0.70-0.80	0.030 max	0.030max
KS 1095GB	0.92-1.0	0.15-0.35	0.70-0.80	0.030 max	0.030max

## PIPE INDUSTRIES

PT KHI Pipe Industries is one of the subsidiaries of PT Krakatau Steel, specialized in steel pipe producer and coating applicator. We supply major type of steel pipe and have established quality management system which is capable of responding to a wide range and stringent customer requirement.

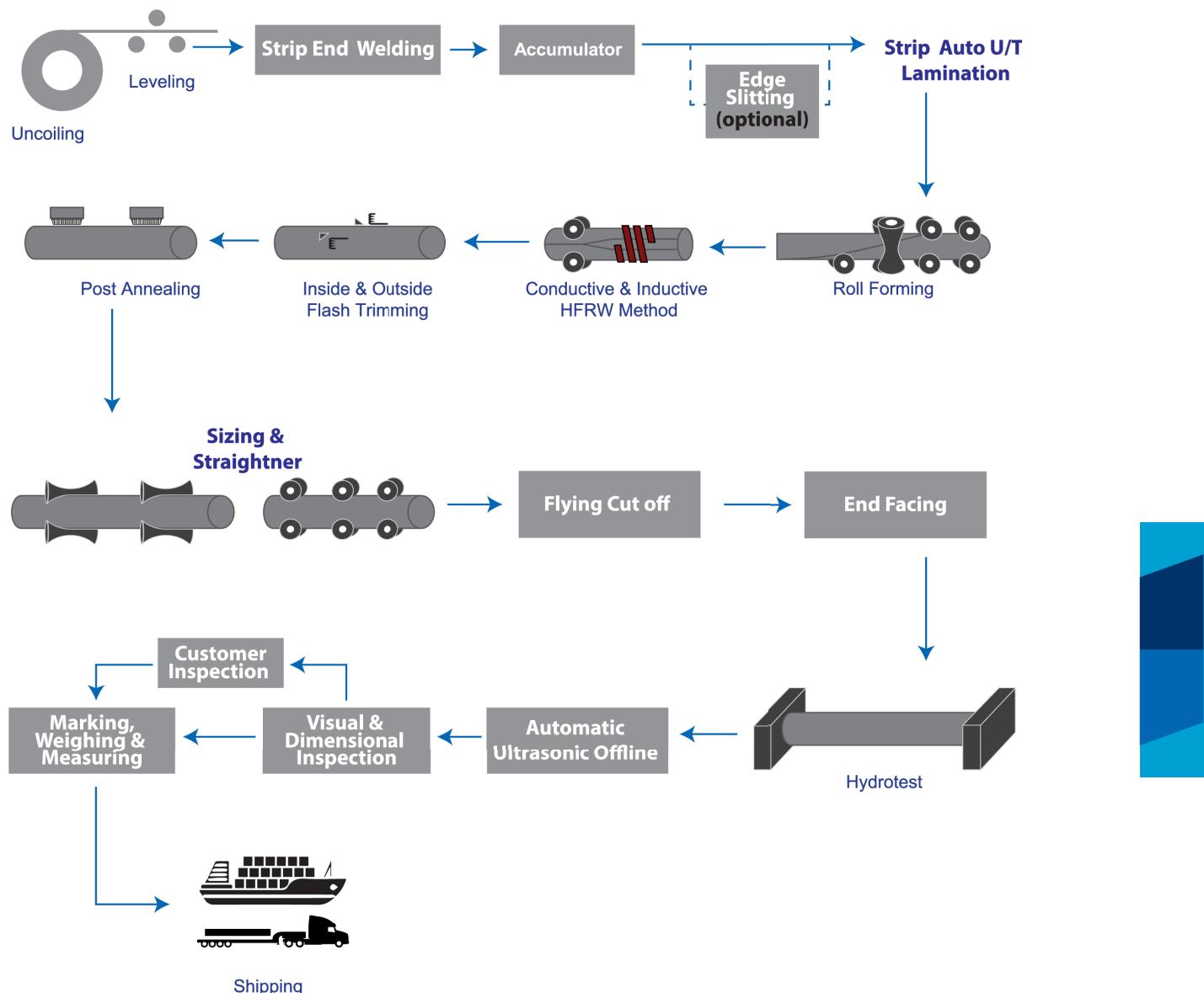
Established in 1972 as a pipe manufacturing company, PT KHI Pipe Industries gained excellence as a pipe manufacturing and coat-

ing applicator company through dedication and conscious efforts. We have grown into a mature and experienced organization, which have better understandings of the market needs and demands. We work with the objective of providing maximum customer satisfaction through our superior quality.

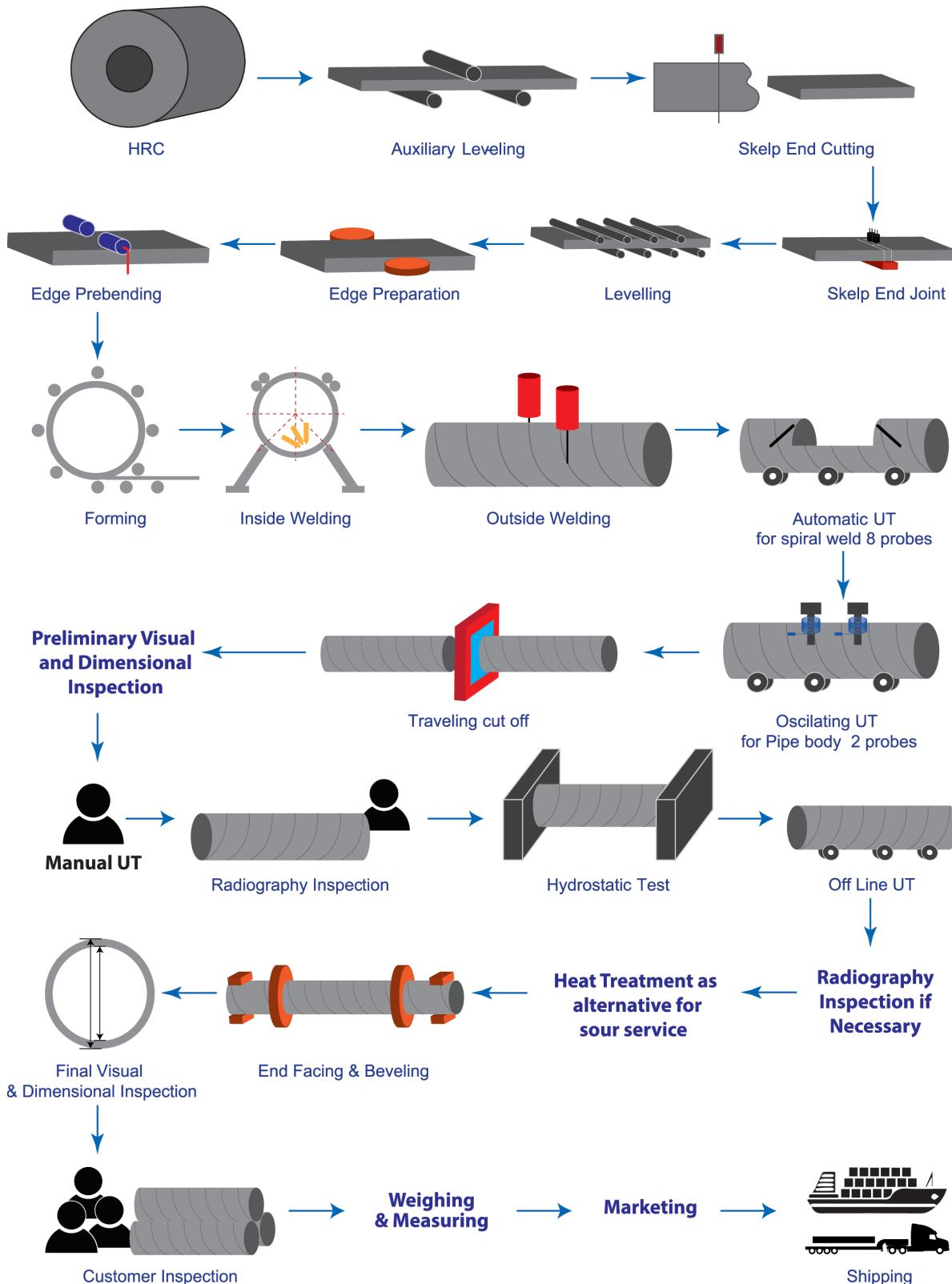
Pursuing of excellency in its wide range of products, we implement the utmost stringent quality management system such as API Monogram, ISO 9001:2015, ISO 14001:2015 and OHSAS 18001:2007.

# PIPE PROCESS PRODUCTION

## ELECTRIC RESISTANCE WELDED (ERW) PIPE



## SPIRAL WELDED PIPE



# PIPE PRODUCT



## A. Spiral Welded Steel Pipe Capacity & Capability

- Machine Capacity = 100.000 Tons/Year
- Diameter = 12-80 Inch
- Wall Thickness = 3.2 - 25 mm
- Material = Up to SMYS 80,000 Psi



## B. Electric Resistance Welded Steel Pipe Capacity & Capability

- Machine Capacity = 150.000 Tons/Year
- Diameter = 1/2-20 Inch
- Wall Thickness = 2,77 - 16 mm
- Material = Up to SMYS 70,000 Psi

# COATING PRODUCT



## C. FBE/3LPE/3LPP Coating Capacity & Capability

- Machine Capacity = 1,600,000 sqm/Year
- Diameter = 4 - 48 Inch



## D. Concrete Weight Coating (CWC) Capacity & Capability

- Machine Capacity = 500,000 MT/Year
- Diameter = 4 - 48 Inch
- Coating Thickness = up to 150 mm



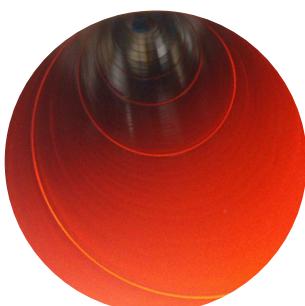
#### E. Asphalt Enamel Coating Capacity & Capability

- Machine Capacity = 800,000 sqm/Year
- Diameter = 4 - 48 Inch
- Coating Thickness = up to 5,5 mm



#### F. External Painting Capacity & Capability

- Machine Capacity = 800,000 sqm/Year
- Diameter = 4 - 80 Inch



#### G. Internal Painting Capacity & Capability

- Machine Capacity = 800,000 sqm/Year
- Diameter = 4 - 48 Inch



#### H. Cement Lining Capacity & Capability

- Machine Capacity = 800,000 sqm/Year
- Diameter = 4 - 60 Inch

## MATERIAL & PIPE SPECIFICATION

Standard Specification	Chemical Composition (%)						Mechanical Strength			
	Grade	Application	C	Mn	P	S	Yield Strength		Ultimate Tensile Strength	
			max	max	max	max	Psi	N/mm <sup>2</sup>	Psi	N/mm <sup>2</sup>
API 5L (*)	A25	Oil & Gas Line Pipe	0.21	0.60	0.03	0.03	25,382.00	175.0	44,962.40	310.0
	A		0.22	0.90	0.03	0.03	30,458.40	210.0	48,588.40	336.0
	B		0.26	1.20	0.03	0.03	35,534.80	245.0	60,191.60	415.0
	X42		0.26	1.30	0.03	0.03	42,061.60	290.0	74,695.60	515.0
	X46		0.26	1.40	0.03	0.03	46,412.80	320.0	63,092.40	435.0
	X52		0.26	1.40	0.03	0.03	52,214.40	360.0	66,718.40	460.0
	X56		0.26	1.40	0.03	0.03	56,565.60	390.0	71,069.60	490.0
	X60		0.26	1.40	0.03	0.03	60,191.60	415.0	75,420.80	520.0
	X65		0.26	1.45	0.03	0.03	65,268.00	450.0	77,596.40	535.0
	X70		0.26	1.65	0.03	0.03	70,344.40	485.0	82,672.80	530.0
API 5CT	H40	OCTG	-	-	0.03	0.03	40,030.5	276	60,045.7	414
	J55		-	-	0.03	0.03	54,969.4	379	74,984.6	517
	K55		-	-	0.03	0.03	54,969.4	379	94,999.9	655
ASTM A252	1	Steel Pipe Piles	-	-	0.050	-	29,733.20	205.0	50,038.80	345.0
	2		-	-	0.050	-	34,809.60	240.0	60,191.60	415.0
	3		-	-	0.050	-	44,962.40	310.0	65,993.20	455.0
ASTM A139	A	Steel Pipe Piles	0.25	1.00	0.0350	0.0350	29,733.20	205.0	47,863.20	330.0
	B		0.26	1.00	0.0350	0.0350	34,809.60	240.0	60,191.60	415.0
	C		0.28	1.20	0.0350	0.0350	42,061.60	290.0	60,191.60	415.0
	D		0.30	1.30	0.0350	0.0350	45,687.60	315.0	60,191.60	415.0
	E		0.30	1.40	0.0350	0.0350	52,214.40	360.0	65,993.20	455.0
ASTM A283	A	Steel Pipe Piles	0.14	0.9	0.035	0.04	23,931.60	165.0	44,962.40	310.0
	B		0.17	0.9	0.035	0.04	26,832.40	185.0	60,191.60	415.0
	C		0.24	0.9	0.035	0.04	29,733.20	205.0	50,038.80	345.0
	D		0.27	0.9	0.035	0.04	33,359.20	230.0	65,268.00	450.0
ASTM A53	A	Electric Resistance Welded	0.25	0.95	0.05	0.045	29,733.20	205.0	55,115.20	380.0
	B		0.30	1.20	0.05	0.045	34,809.60	240.0	74,695.60	515.0
ASTM A134	THE STEEL GRADE CONFORM TO ASTM A283									
JIS A5525	SKK 41/400	Steel Pipe Piles	0.25	-	0.04	0.04	34,084.40	235.0	60,191.60	415.0
	SKK 50/490		0.18	1.50	0.04	0.04	45,687.60	315.0	71,069.60	490.0
JIS A5330	SKY 41/400	Steel Pipe Piles	0.25	-	0.04	0.04	34,084.40	235.0	58,016.00	400.0
	SKY 50/480		0.18	1.50	0.04	0.04	45,687.60	315.0	71,069.60	490.0

Standard Specification	Chemical Composition (%)							Mechanical Strength			
	Grade	Application	C	Mn	P	S	Yield Strength		Ultimate Tensile Strength		
			max	max	max	max	Psi	N/mm <sup>2</sup>	Psi	N/mm <sup>2</sup>	
JIS G3444	STK 30/290	General Structural Purpose	-	-	0.05	0.05	-	-	42,061.60	290.0	
	STK 41/400		0.25	-	0.04	0.04	34,084.40	235.0	58,016.00	400.0	
	STK 51/500		0.24	1.30	0.04	0.04	51,489.20	355.0	72,520.00	500.0	
	STK 50/490		0.18	1.50	0.04	0.04	45,687.60	315.0	71,069.60	490.0	
	STK 55/540		0.23	1.50	0.04	0.04	54,565.60	390.0	78,321.60	540.0	
JIS G31001	SS 380	General Structural Purpose	-	-	0.050	0.050	28,282.80	195.0	47,863.20	330.0	
	SS 400		-	-	0.050	0.050	34,084.40	235.0	62,367.20	430.0	
	SS490		-	-	0.050	0.050	39,886.00	275.0	58,016.00	400.0	
	SS540		0.30	1.60	0.040	0.040	56,565.60	390.0	73,970.40	510.0	
									71,069.60	490.0	
									88,474.40	610.0	
AWWA C200	THE STEEL GRADE CONFORM TO ASTM A283										
SA 4360**	50B (1)	General Truc-tural Purpose	0.20(2) (3)	1.50 (2)	0.05	0.05	51,489	355	71,069/ 92,825	490/ 640(7)	
	50C (1)		0.22	1.6	0.04	0.04	79,772/ 101,528	550/ 700	62,367	430	



## ERW/HFRW

Normal Size	: Diameter 1/2"-20"				General Purposes: AWWA C200, AS 1163, AS 1396,					
Wall Thickness	: 3.2-16 mm				BS 1387, JIS G3444, SNI					
Pipe Length	: 5 up to 18 meter/pcs									
Line Pipe	: API 5L Grade A up to API 5L X 80									
Structural	: ASTM A53, ASTM A252									

## ASTM A53 Steel Line Pipe Grade A & B

Nominal Size In	Outside Diameter		0.719 Wall Thickniss		Sch. No.	Weight		2800 Test Pressure				
	In	mm	In	mm		lbs/ft	kg/m	Grade A	Grade b	psi	kPa	psi
	0.840	21.3	0.109	2.77	40/STD	0.85	1.27	700	4800	700	4800	
1/2	0.840	21.3	0.109	2.77	40/STD	0.85	1.27	700	4800	700	4800	
3/4	1.050	26.7	0.113	2.87	40/STD	1.13	1.69	700	4800	700	4800	
1	1.315	33.4	0.133	3.38	40/STD	1.68	2.50	700	4800	700	4800	
1 1/4	1.660	42.2	0.140	3.56	40/STD	2.27	3.39	1200	8300	1300	9000	
1 1/2	1.900	48.3	0.145	3.68	40/STD	2.72	4.05	1200	8300	1300	9000	
2	2.375	60.3	0.154	3.91	40/STD	3.66	5.44	2300	15900	2500	17200	
2 1/2	2.875	73	0.203	5.16	40/STD	5.80	8.63	2500	17200	2500	17200	
3	3.500	88.9	0.125	3.18	-	4.51	6.72	1290	8900	1500	1000	
			0.156	3.96	-	5.58	8.29	1600	11000	1870	12900	
			0.188	4.78	-	6.66	9.92	1930	13330	2260	15600	
			0.216	5.49	40/STD	7.58	11.29	2220	15300	2500	17200	
4	4.500	114.3	0.188	4.78	-	8.66	12.91	1500	10340	1750	12070	
			0.219	5.56	-	10.01	14.9	1750	12070	2040	14070	
			0.237	6.02	40/STD	10.79	16.07	1900	13100	2210	15240	
			0.250	6.35	-	11.35	16.90	2000	13790	2330	16060	
6	6.625	168.3	0.188	4.78	-	12.92	19.27	1020	7030	1190	8200	
			0.219	5.56	-	14.98	22.31	1190	8200	1390	9580	
			0.250	6.35	-	17.02	25.36	1360	9380	1580	10890	
			0.280	7.11	40/STD	18.97	28.26	1520	10480	1780	12270	
			0.312	7.92	-	21.04	31.32	1700	11720	1980	13650	
			0.344	8.74	-	23.08	34.39	1870	12890	2180	15030	
			0.375	9.52	-	25.03	37.28	2040	14070	2380	16410	
8	8.625	219.1	0.188	4.78	-	16.94	25.26	780	5380	920	6340	
			0.203	5.16	-	18.26	27.22	850	5860	1000	6890	
			0.219	5.56	-	19.66	29.28	910	6270	1070	7380	
			0.250	6.35	23	22.36	33.31	1040	7170	1220	8410	
			0.277	7.04	30	24.70	36.31	1160	7800	1350	9310	
			0.312	7.92	-	27.70	41.24	1300	8960	1520	10480	
			0.322	8.17	40/STD	28.55	42.55	1340	9240	1570	10820	
			0.344	8.74	-	30.42	45.34	1440	9930	1680	11580	
			0.375	9.52	-	33.04	49.20	1570	10820	1830	12620	
			0.406	10.31	60	35.64	53.08	1700	11720	2000	13790	
			0.438	11.13	-	38.30	57.08	1830	12620	2130	14690	
			0.500	12.70	80	43.39	64.64	2090	14410	2430	16750	



Nominal Size In	Outside Diameter		0.719 Wall Thickniss		Sch. No.	Weight		2800 Test Pressure				
	In	mm	In	mm		lbs/ft	kg/m	Grade A		Grade b		
								psi	kPa	psi	kPa	
10	10.750	273.0	0.188	4.78	-	21.23	31.62	630	4300	730	5000	
			0.203	5.16	-	22.89	34.08	680	4700	800	5500	
			0.219	5.56	-	24.65	36.37	730	5000	860	5900	
			0.250	6.35	20	28.06	41.75	740	5800	980	6800	
			0.279	7.09	-	32.23	46.49	930	5400	1090	7500	
			0.307	7.80	30	34.27	51.01	1030	7100	1200	8300	
			0.344	8.74	-	39.27	56.96	1150	7900	1340	9200	
			0.365	9.27	40/STD	40.52	60.29	1220	8400	1430	9900	
			0.438	11.13	-	48.28	71.87	1470	10100	1710	11800	
			0.500	12.70	60/XS	54.79	81.52	1670	11500	1950	13400	
			0.594	15.09	80	95.97	95.97	1990	13700	2320	16000	
			0.719	18.26	100	114.70	114.70	2410	16600	2800	19300	
			0.844	21.44	120	133.00	133.00	2800	19300	2800	19300	
			1.000	25.40	140/XS	155.09	155.09	2800	19300	2800	19300	
			1.125	28.57	160	172.21	172.21	2800	19300	2800	19300	
12	12.750	323.8	0.203	5.16	-	27.23	40.55	570	3900	670	4600	
			0.219	5.56	-	29.34	43.63	620	4300	720	5000	
			0.250	6.35	20	33.41	49.71	710	4900	820	5700	
			0.281	7.14	-	37.46	55.75	790	5400	930	6400	
			0.312	7.92	-	41.48	61.69	880	6100	1030	7100	
			0.330	8.38	30	43.81	65.18	930	6400	1090	7500	
			0.344	8.74	-	45.62	67.90	970	6700	1130	7800	
			0.375	9.52	STD	49.61	73.78	1060	7300	1240	8500	
			0.406	10.31	40	53.57	79.70	1150	7900	1340	9200	
			0.438	11.13	-	57.65	85.82	1240	8500	1440	9900	
			0.500	12.70	XS	65.48	97.43	1410	9700	1650	11400	
			0.562	14.27	60	73.22	108.92	1590	11000	1850	12800	
			0.688	17.48	80	88.71	132.04	1940	13400	2270	15700	
			0.844	21.44	100	107.42	159.86	2390	16500	2780	19200	
			1.000	25.40	120/XXS	125.61	186.91	2800	19300	2800	19300	
			1.125	28.57	140	139.81	208.00	2800	19300	2800	19300	
			1.312	33.32	160	160.42	238.68	2800	19300	2800	19300	



Nominal Size In	Outside Diameter		0.719 Wall Thickniss		Sch. No.	Weight		2800 Test Pressure			
								Grade A		Grade b	
	In	mm	In	mm		lbs/ft	kg/m	psi	kPa	psi	kPa
14	14.000	355.6	0.210	5.33	-	30.96	46.04	540	3700	630	4300
			1.219	5.56	-	32.26	47.99	560	3900	660	4500
			0.250	6.35	10	36.75	54.69	640	4400	750	5200
			0.281	7.14	-	41.21	61.35	720	5000	840	5800
			0.312	7.92	20	45.65	67.90	800	5500	940	6500
			0.344	8.74	-	50.22	74.76	880	6100	1030	7100
			0.375	9.52	30/STD	54.62	81.25	960	6600	1120	7700
			0.438	11.13	40	63.50	94.55	1130	7800	1310	9000
			0.469	11.91	-	67.84	100.94	1210	8300	1410	9700
			0.500	12.70	XS	72.16	107.39	1290	8900	1500	10300
14	14.000	355.6	0.594	15.09	60	85.13	126.71	1530	10500	1790	12300v
			0.750	19.05	80	106.23	158.10	1930	13300	2250	15500
			0.938	23.83	100	130.98	194.96	2410	16600	2800	19300
			1.094	27.79	120	150.93	224.65	2800	19300	2800	19300
			1.250	31.75	140	170.37	253.56	2800	19300	2800	19300
			1.406	35.71	160	189.29	281.70	2800	19300	2800	19300
			2.000	50.80	-	256.56	381.83	2800	19300	2800	19300
			2.125	53.97	-	269.76	401.44	2800	19300	2800	19300
			2.200	55.88	-	277.51	413.01	2800	19300	2800	19300
			2.500	63.50	-	307.34	457.40	2800	19300	2800	19300
16	16.000	406.4	0.219	5.56	-	36.95	54.96	490	3400	570	3900
			0.250	6.35	10	42.09	62.64	560	3900	660	4500
			0.281	7.14	-	47.22	70.30	630	4300	740	5100
			0.312	7.92	20	52.32	77.83	700	4800	820	5700
			0.344	8.74	-	57.57	85.71	770	5300	900	6200
			0.375	9.52	30/STD	62.64	93.17	840	5800	980	6800
			0.438	11.13	-	72.86	108.49	990	6800	1150	7900
			0.469	11.91	-	82.85	115.86	1060	7300	1230	8500
			0.500	12.70	40/XS	107.60	123.30	1120	7700	1310	9000
			0.656	16.66	60	136.74	160.12	1480	10200	1720	11900
			0.844	21.44	80	164.98	203.53	1900	13100	2220	15300
			1.031	26.19	100	192.61	245.56	2320	16000	2710	18700
			1.219	30.96	120	223.85	286.64	2740	18900	2800	19300
			1.438	36.53	140	223.85	333.19	2800	19300	2800	19300
			1.594	40.49	160	245.48	365.35	2800	19300	2800	19300

Nominal Size In	Outside Diameter		0.719 Wall Thickniss		Sch. No.	Weight		2800 Test Pressure			
								Grade A		Grade b	
	In	mm	In	mm		lbs/ft	kg/m	psi	kPa	psi	kPa
18	18.000	457	0.250	6.35	10	47.44	70.60	500	3400	580	4000
			0.281	7.14	-	53.23	79.24	560	3900	660	4500
			0.312	7.92	20	58.99	87.75	620	4300	730	5000
			0.344	8.74	-	64.93	96.66	690	4800	800	5500
			0.375	9.52	STD	70.65	105.10	750	5200	880	6100
			0.406	10.31	-	76.36	113.62	810	5600	950	6500
			0.438	11.13	30	82.23	122.43	880	6100	1020	7000
			0.469	11.91	-	87.89	130.78	940	6500	1090	7500
			0.500	12.70	XS	93.54	139.20	1000	6900	1170	8100
			0.562	14.27	40	104.76	155.87	1120	7700	1310	9000
			0.750	19.05	60	138.30	205.83	1500	10300	1750	12100
			0.938	23.83	80	171.08	254.67	1880	13000	2190	15100
			1.156	29.36	100	208.15	309.76	2310	15900	2700	18600
			1.375	34.92	120	244.37	363.64	2750	19000	2800	19300
			1.562	39.67	140	274.48	408.45	2800	19300	2800	19300
			1.781	45.24	160	308.79	459.59	2800	19300	2800	19300
20	20.000	508	0.250	6.35	10	52.78	78.55	450	3100	520	3600
			0.281	7.14	-	59.23	88.19	510	3500	590	4100
			0.312	7.92	-	65.66	97.67	560	3900	660	4500
20	20.000	508	0.344	8.74	-	72.28	107.60	620	4300	720	5000
			0.375	9.52	20/STD	78.67	117.02	680	4700	790	5400
			0.406	10.31	-	84.04	126.53	730	5000	850	5900
			0.438	11.13	-	91.59	136.37	790	5400	920	6300
			0.469	11.91	-	97.92	145.70	850	5900	950	6500
			0.500	12.70	30/XS	104.23	155.12	900	6200	1050	7200
			0.594	15.09	40	123.23	183.42	1170	8100	1250	8600
			0.812	20.62	60	166.56	247.83	1460	10100	1710	11800
			1.031	26.19	80	209.06	311.17	1860	12800	2170	15000
			1.281	32.54	100	256.34	381.53	2310	15900	2690	18500
			1.500	38.10	120	296.65	441.49	2700	18600	2800	19300
			1.750	44.45	140	341.41	508.11	2800	19300	2800	19300
			1.969	50.01	160	379.53	564.81	2800	19300	2800	19300



### Chemical Composition (%)

ASTM A53	Carbon	Manganese	Phosphorus	Sulfur	Copper	Nickel	Chromium	Molybdenum	Vanadium	Cu+Ni+Cr +Mo+V
Grade A	0.25	0.950	0.05	0.045	0.40	0.40	0.40	0.15	0.08	1.00
Grade B	0.30	1.200	0.05	0.045	0.40	0.40	0.40	0.15	0.08	1.00

### Mechanical Properties

	Yield Strength (mm)	Tensile Strength (mm)
Grade A	30,000 ps (205 Mpa)	48,000 psi (330 Mpa)
Grade B	35,000 ps (240 Mpa)	60,000 psi (415 Mpa)

## SPIRAL WELDED

Size Outsize Diameter		Weight		Wall Thickness		Inside Diameter	Minimum Pressure, kpa x 100											
in	mm	lb/ft	kg/m	in	mm	mm	Grade A		Grade B		Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
D	t			d	Std	Alt	Std	Alt										
12 3/4	323.9	29.31	43.96	0.219	5.6	312.7	43	53	50	62	65	92	105	113	121	131	141	162
12 3/4	323.9	33.38	50.11	0.250	6.4	311.1	49	61	56	71	96	105	119	129	138	150	162	185
12 3/4	323.9	37.42	55.47	0.281	7.1	309.7	54	68	64	80	108	119	134	145	155	168	181	207
12 3/4	323.8	41.45	61.56	0.312	7.9	308.1	61	76	71	88	121	132	149	161	172	186	200	207
12 3/4	323.8	43.77	65.35	0.330	8.4	307.1	64	80	75	94	127	139	158	169	182	197	207	207
12 3/4	323.8	45.58	67.62	0.344	8.7	306.5	67	83	78	98	132	145	165	177	189	205	207	207
14	355.6	32.23	48.33	0.219	5.6	344.4	.....	.....	.....	.....	77	84	95	103	110	119	128	148
14	355.6	36.71	55.11	0.250	6.4	342.8	44	55	52	65	88	96	109	117	125	136	147	169
14	355.6	41.17	61.02	0.281	7.1	341.4	50	62	58	72	99	108	122	132	141	153	163	187
14	355.6	45.61	67.74	0.312	7.9	339.8	55	69	65	61	110	120	136	146	156	169	183	207
14	355.6	50.17	74.42	0.344	8.7	338.2	61	76	71	89	121	132	150	161	173	187	261	207
14	355.6	54.57	81.08	0.375	9.5	336.6	66	83	77	97	132	144	163	176	188	204	207	207
16	406.4	31.75	47.54	0.188	4.8	396.8	29	37	34	43	58	63	72	77	83	90	96	111
16	406.4	34.25	51.45	0.203	5.2	396.0	32	39	37	46	63	68	77	83	89	96	104	120
16	406.4	36.91	55.39	0.219	5.6	395.2	34	43	39	50	68	74	83	90	96	104	112	129
16	406.4	42.05	63.13	0.250	6.4	393.6	39	48	45	56	77	84	95	103	110	119	128	148
16	406.4	47.17	69.91	0.281	7.1	392.2	43	54	51	63	86	94	107	115	123	134	144	164
16	406.4	51.27	77.63	0.312	7.9	390.6	48	61	56	70	96	105	119	128	137	148	160	82
16	406.4	57.52	85.32	0.344	8.7	389.0	53	67	62	78	106	116	131	141	151	164	176	201
16	406.4	62.58	92.98	0.375	9.5	387.4	58	72	68	85	115	126	143	154	165	178	192	207
16	406.4	67.62	100.61	0.406	10.3	385.8	.....	.....	.....	125	136	154	167	178	193	207	207	207
16	406.4	72.80	108.20	0.438	11.1	384.2	68	85	79	99	134	147	167	180	192	207	207	207
16	406.4	77.79	115.77	0.496	11.9	382.6	.....	.....	.....	144	158	178	192	206	207	207	207	207
16	406.4	82.32	123.30	0.500	12.7	381.0	77	97	90	113	154	168	190	205	207	207	207	207
16	406.4	92.66	138.27	0.563	14.3	377.8	87	97	90	113	154	168	190	205	207	207	207	207
16	406.4	102.63	153.11	0.626	15.9	374.6	63	121	113	141	192	207	207	207	207	207	207	207
18	457.0	35.76	53.53	0.188	4.8	447.4	26	32	30	38	52	56	63	68	74	79	85	98
18	457.0	41.59	62.34	0.219	5.6	445.8	30	38	35	44	60	65	74	80	85	92	100	115
18	457.0	47.39	71.12	0.250	6.4	444.2	34	43	40	50	68	75	85	91	98	105	114	131
18	457.0	53.18	78.77	0.281	7.1	442.8	39	43	45	56	76	84	95	103	110	119	128	146

Size Outsize Diameter		Weight		Wall Thickness		Inside Diameter	Minimum Pressure, kpa x 100											
in	mm	lb/ft	kg/m	in	mm	mm	Grade A		Grade B		Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
D				t	d	Std	Alt	Std	Alt	X42	X46	X52	X56	X60	X65	X70	X80	
18	457.0	58.94	87.49	0.312	7.9	441.2	43	54	50	63	85	94	105	114	122	132	142	162
18	457.0	64.87	96.18	0.344	8.7	439.6	48	59	55	69	94	103	116	127	136	145	156	178
18	457.0	70.59	104.84	0.375	6.5	438.0	52	65	61	75	103	112	127	136	146	158	171	195
18	457.0	76.29	113.46	0.406	10.3	436.4	....	....	....	....	111	121	137	148	158	172	185	207
18	457.0	82.15	122.05	0.438	11.1	434.8	61	76	70	88	120	131	148	160	171	185	207	207
18	457.0	87.81	130.62	0.469	11.9	433.2	....	....	....	....	128	141	158	171	183	198	207	207
18	457.0	93.45	139.15	0.500	12.7	431.6	69	86	81	101	136	150	169	182	195	207	207	207
18	457.0	104.67	156.11	0.563	14.3	428.4	77	96	90	113	154	168	190	205	207	207	207	207
18	457.0	115.98	172.95	0.626	15.9	425.2	86	107	101	125	171	187	207	207	207	207	207	207
20	508.0	16.27	69.38	0.219	5.6	496.8	27	34	32	39	57	63	71	77	82	89	96	109
20	508.0	52.73	79.16	0.250	6.4	495.2	31	39	36	45	65	72	81	83	94	102	109	125
20	508.0	59.18	87.70	0.281	7.1	493.8	35	43	41	51	71	80	90	97	104	113	121	139
20	508.0	65.60	97.43	0.312	7.9	492.2	39	48	45	56	81	89	100	108	116	125	135	154
20	508.0	72.21	107.12	0.344	8.7	490.6	43	53	50	62	89	98	111	119	128	138	149	170
20	508.0	78.60	116.78	0.375	6.5	489.0	47	58	54	68	97	107	121	130	139	151	162	185
20	508.0	84.96	126.41	0.406	10.3	487.4	....	....	....	....	106	116	131	141	151	164	176	201
20	508.0	91.51	136.01	0.438	11.1	485.8	54	68	63	79	114	125	141	152	163	176	190	207
20	508.0	97.83	145.58	0.469	11.9	484.2	....	....	....	....	122	134	151	163	174	189	204	207
20	508.0	104.13	155.12	0.500	12.7	482.6	62	77	72	90	147	143	161	174	186	202	207	207
20	508.0	116.67	174.10	0.563	14.3	479.4	70	87	81	102	163	161	182	196	207	207	207	207
20	508.0	129.33	192.95	0.626	15.9	476.2	77	97	90	113	180	179	202	207	207	207	207	207
20	508.0	141.90	211.68	0.689	17.5	473.0	85	107	99	125	196	197	207	207	207	207	207	207
20	508.0	154.19	230.27	0.752	19.1	469.8	93	116	109	136	207	207	207	207	207	207	207	207
20	508.0	166.40	247.60	0.811	20.6	466.8	101	126	118	147	207	207	207	207	207	207	207	207
22	559.0	50.94	76.42	0.219	5.6	547.8	25	31	29	36	52	57	65	70	75	81	87	99
22	559.0	58.07	87.21	0.250	6.4	546.2	28	35	33	41	60	65	74	80	85	92	99	114
22	559.0	65.18	96.63	0.281	7.1	544.8	32	39	37	46	66	73	82	88	95	102	110	126
22	559.0	72.27	107.36	0.312	7.9	543.2	35	44	41	51	74	81	91	99	105	114	123	140
22	559.0	79.56	118.06	0.344	8.7	541.6	39	48	45	56	81	89	100	108	116	126	135	154
22	559.0	86.61	128.73	0.375	6.5	540.0	42	53	50	61	89	97	110	118	127	137	148	169
22	559.0	93.63	139.37	0.406	10.3	538.4	....	....	....	....	96	105	119	128	137	149	160	183
22	559.0	100.86	149.97	0.438	11.1	536.8	50	62	58	72	104	114	128	138	148	160	173	197
22	559.0	107.85	180.55	0.469	11.9	535.2	....	....	....	....	111	122	137	148	159	172	185	207
22	559.0	114.81	171.09	0.500	12.7	533.6	56	70	65	82	118	130	147	158	169	183	197	207
22	559.0	128.67	192.08	0.563	14.3	530.4	63	79	74	92	133	146	165	178	190	207	207	207
22	559.0	142.68	212.95	0.626	15.9	527.2	70	88	82	103	148	162	184	198	207	207	207	207
22	559.0	156.60	233.68	0.689	17.5	524.0	78	97	90	113	163	179	202	207	207	207	207	207
22	559.0	170.21	254.30	0.752	19.1	520.8	85	105	99	123	178	195	207	207	207	207	207	207

Size Outside Diameter		Weight		Wall Thickness		Inside Diameter	Minimum Pressure, kpa x 100											
in	mm	lb/ft	kg/m	in	mm	mm	Grade A		Grade B		Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
D	t			d	Std	Alt	Std	Alt	Std	Alt								
22	559.0	183.75	273.51	0.811	20.6	517.8	92	114	107	134	192	207	207	207	207	207	207	207
24	610.0	63.41	95.26	0.250	6.35	596.9	26	32	30	38	54	59	68	72	77	84	91	104
24	610.0	71.18	105.56	0.281	7.14	594.3	29	37	34	42	61	67	76	81	87	94	101	115
24	610.0	78.93	117.30	0.312	7.92	593.8	32	40	38	47	68	74	84	90	96	105	113	128
24	610.0	86.91	129.45	0.344	8.7	592.6	36	44	41	52	74	81	92	99	106	115	124	154
24	610.0	94.62	140.94	0.375	9.5	591.0	39	48	45	56	81	89	101	108	116	126	135	154
24	610.0	102.31	152.39	0.406	10.3	589.4	....	....	....	....	88	96	109	117	126	136	147	167
24	610.0	110.22	164.17	0.438	11.1	587.8	45	56	53	66	95	104	118	127	136	147	158	180
24	610.0	117.86	175.55	0.469	11.2	586.2	....	....	....	....	102	112	126	136	145	158	169	193
24	610.0	125.49	186.92	0.500	12.7	584.6	52	65	61	75	109	119	134	145	155	158	181	206
24	610.0	156.03	232.94	0.626	15.9	578.2	65	81	75	94	136	149	168	181	194	207	207	207
24	610.0	171.29	255.69	0.689	17.5	575.0	71	89	83	103	150	164	185	199	207	207	207	207
24	610.0	186.23	278.32	0.752	19.1	571.8	77	97	90	113	163	179	202	207	207	207	207	207
24	610.0	201.09	299.41	0.811	20.6	568.8	84	105	98	123	176	193	207	207	207	207	207	207
26	660.0	68.75	103.15	0.250	6.4	647.2	24	30	28	34	50	55	62	67	72	78	84	96
26	660.0	77.18	114.31	0.281	7.1	645.8	27	34	31	39	56	61	70	75	81	87	93	107
26	660.0	85.60	127.04	0.312	7.9	644.2	30	37	34	43	63	68	77	83	90	96	104	119
26	660.0	94.26	139.73	0.344	8.7	642.6	33	41	39	48	69	76	85	92	99	107	115	131
26	660.0	102.63	152.39	0.375	9.5	641.0	36	45	42	52	75	82	93	100	107	116	125	143
26	660.0	110.98	165.02	0.406	10.3	639.4	....	....	....	....	81	89	101	108	116	126	136	155
26	660.0	119.57	177.62	0.438	11.1	637.8	42	52	49	61	88	96	109	117	125	136	146	167
26	660.0	127.88	190.19	0.469	11.9	636.2	....	....	....	....	94	103	116	125	134	138	157	179
26	660.0	152.68	227.70	0.563	14.3	631.4	54	67	63	78	113	124	140	151	161	175	188	207
26	660.0	169.38	252.55	0.626	15.9	628.2	60	74	70	87	126	138	155	167	179	184	207	207
26	660.0	185.99	277.27	0.689	17.5	625.0	65	82	76	96	138	151	165	184	201	207	207	207
26	660.0	202.00	301.87	0.752	19.1	621.8	72	90	83	104	151	165	187	201	207	207	207	207
26	660.0	218.43	324.81	0.811	20.6	618.8	77	97	90	113	163	178	201	207	207	207	207	207
28	711.0	74.09	110.36	0.250	6.4	698.5	22	28	25	32	47	51	58	62	66	72	78	89
28	711.0	83.19	123.91	0.281	7.1	696.9	25	31	29	37	52	57	65	70	74	81	87	99
28	711.0	92.26	137.42	0.312	7.9	695.4	28	34	32	40	58	63	72	77	83	90	96	110
28	711.0	101.61	151.35	0.344	8.7	693.7	....	....	....	....	64	70	79	85	92	99	107	121
28	711.0	110.64	164.80	0.375	9.5	692.2	33	41	39	48	70	76	86	93	100	108	116	133
28	711.0	119.65	178.22	0.406	10.3	690.6	....	....	....	....	76	83	94	101	108	117	126	144
28	711.0	128.93	192.04	0.438	11.1	688.9	39	48	45	56	81	90	101	109	116	126	136	155
28	711.0	137.90	205.40	0.469	11.9	687.4	....	....	....	....	88	96	108	116	125	135	145	166
28	711.0	146.85	218.69	0.500	12.7	685.6	44	55	52	65	93	102	115	124	133	144	155	177
28	711.0	164.69	245.68	0.563	14.3	682.4	50	62	58	72	105	114	130	139	150	162	174	199
28	711.0	182.73	272.54	0.626	15.9	679.2	55	69	65	81	116	127	144	155	166	180	194	207

Size Out tside Diameter		Weight		Wall Thickness		Inside Diameter	Minimum Pressure, kpa x 100											
in	mm	lb/ft	kg/m	in	mm	mm	Grade A		Grade B		Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
D	t			d	Std	Alt	Std	Alt	Std	Alt								
28	711.0	200.68	299.28	0.689	17.5	676.0	61	76	71	89	128	140	158	171	183	198	207	207
28	711.0	218.27	325.89	0.752	19.1	672.8	66	83	77	91	139	153	173	186	199	207	207	207
28	711.0	235.78	350.72	0.811	20.6	669.8	72	90	84	105	151	165	187	201	207	207	207	207
30	762.0	79.45	118.31	0.250	6.4	749.3	21	25	24	30	43	48	54	58	62	68	72	83
30	762.0	89.19	131.85	0.281	7.1	747.7	23	29	27	34	49	54	61	65	70	76	81	92
30	762.0	98.93	147.36	0.312	7.9	746.2	25	32	30	38	54	59	67	72	77	84	90	103
30	762.0	108.95	162.28	0.344	8.7	744.5	....	....	....	....	60	65	74	80	85	92	99	113
30	762.0	118.65	176.73	0.375	9.5	743.0	31	39	36	45	65	72	81	87	93	101	109	124
30	762.0	128.32	191.13	0.406	10.3	741.4	....	....	....	....	70	77	88	94	101	109	118	134
30	762.0	138.29	205.98	0.438	11.1	739.7	37	45	42	53	76	83	94	101	109	118	127	144
30	762.0	147.92	220.32	0.469	11.9	738.2	....	....	....	....	81	89	101	109	116	126	136	155
30	762.0	157.53	234.64	0.500	12.7	736.6	41	52	48	61	87	95	107	116	124	134	145	165
30	762.0	176.69	263.18	0.562	14.3	733.5	46	58	54	68	98	107	121	130	139	151	163	186
30	762.0	196.08	292.54	0.625	15.9	730.2	52	65	61	75	109	119	134	145	155	168	181	207
30	762.0	215.38	321.29	0.689	17.5	727.0	57	71	66	83	119	131	148	159	171	185	199	207
30	762.0	234.29	349.91	0.752	19.1	723.8	62	77	72	90	130	143	161	174	186	201	207	207
30	762.0	253.12	376.63	0.811	20.6	720.8	67	84	79	98	141	154	174	188	201	207	207	207
30	762.0	272.17	405	0.874	22.2	717.6	72	90	84	105	152	167	188	203	207	207	207	207
32	813.0	84.77	126.26	0.250	6.4	800.1	19	24	23	28	41	45	50	54	58	63	63	78
32	813.0	95.19	141.79	0.281	7.1	798.5	22	28	25	32	45	50	56	61	65	71	76	87
32	813.0	105.59	157.28	0.312	7.9	797.0	24	30	28	35	51	56	63	68	72	79	85	96
32	813.0	116.30	173.23	0.344	8.7	795.3	....	....	....	....	56	61	70	74	80	87	93	106
32	813.0	126.66	188.66	0.375	9.5	793.8	29	37	34	43	61	67	76	81	88	94	102	116
32	813.0	136.99	204.05	0.406	10.3	792.2	....	....	....	....	66	72	82	95	94	102	110	126
32	813.0	147.64	219.91	0.438	11.1	790.5	34	43	39	50	71	78	88	102	102	110	119	135
32	813.0	157.94	235.25	0.469	11.9	798.0	....	....	45	....	76	83	94	109	109	118	127	145
32	813.0	168.21	250.55	0.500	12.7	787.4	39	48	51	56	81	89	101	109	116	126	136	155
32	813.0	188.70	281.07	0.562	14.3	784.3	43	54	56	63	92	100	113	122	131	141	152	174
32	813.0	209.43	312.54	0.625	15.9	781.0	48	61	56	71	102	112	126	136	145	158	169	194
32	813.0	230.08	343.30	0.689	17.5	778.0	53	67	62	78	112	123	138	150	160	174	187	207
32	813.0	250.31	373.93	0.752	19.1	774.8	58	72	68	85	122	134	151	163	174	189	203	207
32	813.0	270.47	402.54	0.811	20.6	771.8	63	79	74	92	132	145	164	176	189	205	207	207
32	813.0	290.86	432.93	0.874	22.2	768.6	68	85	79	99	143	156	176	190	203	207	207	207
34	864.0	90.11	134.22	0.250	6.4	850.9	18	23	21	27	39	42	48	51	54	59	66	73
34	864.0	101.19	150.72	0.281	7.1	849.3	21	25	24	30	43	47	53	57	61	67	72	82
34	864.0	112.25	167.20	0.312	7.9	847.8	23	28	27	33	48	52	59	63	68	74	80	91
34	864.0	123.65	184.18	0.344	8.7	848.1	....	....	....	....	52	58	65	70	75	81	88	100
34	864.0	134.67	200.58	0.375	9.5	844.6	28	34	32	40	57	63	71	76	82	89	96	109

Size Out side Diameter		Weight		Wall Thickness		Inside Diameter	Minimum Pressure, kpa x 100											
in	mm	lb/ft	kg/m	in	mm	mm	Grade A		Grade B		Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
D	t			d	Std	Alt	Std	Alt	Std	Alt								
34	864.0	145.67	216.85	0.406	10.3	843.0	....	....	....	....	62	68	77	83	89	104	103	118
34	864.0	157.00	233.85	0.438	11.1	841.3	32	40	37	47	67	74	83	90	96	111	112	127
34	864.0	167.95	250.16	0.469	11.9	839.8	....	....	....	....	72	79	89	96	103	119	120	137
34	864.0	178.89	266.46	0.500	12.7	838.2	37	45	43	53	76	84	95	102	110	133	127	146
34	864.0	200.70	298.94	0.562	14.3	835.1	41	51	48	60	86	94	107	115	123	148	143	164
34	864.0	222.78	331.83	0.625	15.9	831.8	45	57	53	67	96	105	119	127	137	148	160	183
34	864.0	244.77	365.31	0.689	17.5	829.0	50	63	59	73	105	116	130	141	151	163	176	201
34	864.0	266.33	397.95	0.752	19.1	825.8	54	68	64	80	115	126	142	153	164	178	192	207
34	864.0	287.81	428.44	0.811	20.6	822.8	59	74	69	86	125	136	154	166	178	192	207	207
34	864.0	309.55	460.85	0.874	22.2	819.6	64	80	74	93	134	147	166	178	192	207	207	207
36	914.0	95.45	142.17	0.250	6.35	901.1	17	21	20	25	36	40	45	48	52	56	61	89
36	914.0	107.20	159.67	0.281	7.14	900.1	19	24	23	28	41	45	50	54	58	63	68	77
36	914.0	118.92	177.12	0.312	7.92	898.6	21	27	25	31	45	50	58	60	65	70	75	86
36	914.0	131.00	195.12	0.344	8.74	896.9	....	....	....	....	50	54	61	66	71	77	83	94
36	914.0	142.68	212.52	0.375	9.52	895.4	26	32	30	38	54	59	68	72	77	84	90	103
36	910.0	154.34	142.17	0.406	10.3	893.8	....	....	....	....	59	64	73	79	84	91	98	112
36	910.0	166.35	247.78	0.438	11.1	892.1	30	38	35	44	63	70	79	85	90	98	105	120
36	910.0	177.97	265.09	0.469	11.9	890.6	....	....	....	....	68	74	84	90	97	105	113	129
36	910.0	189.57	282.36	0.500	12.7	889.0	34	43	40	40	72	79	90	96	103	112	121	138
36	910.0	212.70	316.82	0.562	14.3	885.9	39	48	45	56	81	89	101	108	116	125	136	155
36	910.0	236.13	351.72	0.625	15.9	882.6	43	54	50	63	90	99	112	121	130	140	151	173
36	910.0	259.47	386.88	0.689	17.5	879.0	48	59	55	69	99	109	123	133	142	154	166	190
36	910.0	282.35	421.50	0.752	19.1	875.8	52	65	61	75	109	119	134	145	155	168	181	207
36	910.0	305.16	453.84	0.811	20.6	872.8	56	70	65	81	118	129	145	157	168	182	196	207
36	910.0	328.24	488.22	0.874	22.2	869.6	61	75	70	88	127	138	157	168	181	196	207	207
38	965.0	125.58	187.05	0.312	7.9	949.4	21	25	23	30	43	47	53	57	61	66	71	81
38	965.0	138.35	206.07	0.344	8.7	949.7	23	28	26	33	47	52	59	63	68	73	79	89
38	965.0	153.69	224.45	0.375	9.5	966.2	25	30	28	36	52	56	63	68	74	79	85	98
38	965.0	163.01	242.80	0.406	10.3	944.6	26	33	31	39	56	61	69	74	79	86	93	106
38	965.0	175.71	261.72	0.438	11.1	942.9	28	36	33	42	60	65	70	80	85	92	99	114
38	965.0	187.99	280.01	0.469	11.9	941.4	30	39	36	45	64	70	80	85	92	99	107	122
38	965.0	200.25	298.27	0.500	12.7	939.8	32	41	38	48	68	75	85	92	98	106	114	131
38	965.0	224.71	324.71	0.562	14.3	936.7	37	46	45	54	77	84	As	103	110	119	128	147
38	965.0	249.48	371.60	0.625	15.9	933.4	41	51	48	59	85	94	106	107	123	132	143	163
38	965.0	274.16	408.89	0.689	17.5	930	45	56	52	65	94	103	116	126	135	146	157	180
38	965.0	298.37	445.52	0.752	19.1	926.8	49	61	57	72	103	112	127	137	147	159	172	196
38	965.0	322.50	479.75	0.811	20.6	923.8	53	66	62	77	112	122	138	148	159	172	185	207
38	965.0	346.93	516.14	0.874	22.2	920.6	57	72	67	83	120	132	149	160	172	185	200	207

Size Out side Diameter		Weight		Wall Thickness		Inside Diameter	Minimum Pressure, kpa x 100											
in	mm	lb/ft	kg/m	in	mm	mm	Grade A		Grade B		Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
D	t			d	Std	Alt	Std	Alt	Std	Alt								
40	1,016.0	132.25	196.99	0.312	7.9	1,000.2	19	24	23	28	41	45	50	54	58	63	68	77
40	1,016.0	145.69	217.01	0.344	8.7	998.5	21	23	25	31	45	49	55	60	64	70	81	85
40	1,016.0	158.70	236.38	0.375	9.5	997.0	23	29	27	34	49	54	61	65	70	76	74	93
40	1,016.0	171.68	255.72	0.406	10.3	995.4	25	32	30	37	53	68	65	70	76	82	83	101
40	1,016.0	185.06	275.65	0.438	11.1	993.7	27	34	32	39	57	63	70	76	81	88	95	108
40	1,016.0	198.01	294.94	0.469	11.9	992.2	29	37	34	43	61	67	76	81	88	94	102	116
40	1,016.0	210.93	314.18	0.500	12.7	990.6	31	39	36	45	65	72	81	87	93	101	109	124
40	1,016.0	236.71	352.58	0.562	14.3	987.5	35	43	41	51	73	80	91	98	105	113	122	140
40	1,016.0	262.83	391.49	0.625	15.9	984.2	39	48	45	56	81	89	101	109	116	126	136	155
40	1,016.0	288.86	430.26	0.688	17.5	981.0	43	53	50	62	90	98	111	119	128	138	150	171
40	1,016.0	314.39	468.28	0.750	19.1	977.9	47	58	54	68	98	107	121	130	139	152	163	186
40	1,016.0	339.84	506.19	0.812	20.6	974.8	50	63	59	74	105	116	131	141	151	164	176	201
40	1,016.0	365.62	544.59	0.875	22.2	971.6	54	68	63	79	114	125	141	152	163	176	190	207
42	1,067.0	153.04	227.95	0.344	8.7	1,049.3	20	25	23	30	43	47	53	57	61	66	71	81
42	1,067.0	166.71	248.31	0.375	9.5	1,047.8	22	28	26	32	47	51	58	62	66	72	78	88
42	1,067.0	18,035	268.63	0.406	10.3	1,046.2	24	30	28	35	50	55	62	67	72	78	84	96
42	1,067.0	194.42	289.59	0.438	11.1	1,044.5	26	32	38	54	59	68	72	78	84	90	103	
42	1,067.0	208.03	309.86	0.469	11.9	1,043.0	28	34	32	41	58	63	72	78	83	90	97	111
42	1,067.0	221.61	330.09	0.500	12.7	1,041.4	30	37	34	43	62	68	76	83	89	96	103	118
42	1,067.0	248.72	370.47	0.562	14.3	1,038.3	33	41	39	48	70	76	86	93	100	108	116	133
42	1,067.0	276.18	411.37	0.625	15.9	1,935.0	37	46	43	54	77	85	96	103	111	120	130	148
42	1,067.0	303.55	452.14	0.688	17.5	1,031.8	41	51	48	59	85	94	105	114	122	132	142	163
42	1,067.0	339.41	492.15	0.750	19.1	1,028.7	44	55	52	65	93	102	115	124	133	144	155	148
42	1,067.0	357.19	532.03	0.812	20.6	1,025.8	48	60	56	70	101	110	125	134	144	156	168	163
42	1,067.0	384.31	572.43	0.875	22.2	1,022.6	52	65	61	75	109	119	134	145	155	168	181	178
44	1,118.0	160.39	237.99	0.344	8.7	1,100.9	19	24	23	28	41	45	50	54	59	63	68	77
44	1,118.0	174.72	259.69	0.375	9.5	1,099.0	21	26	25	31	44	49	55	59	63	69	74	84
44	1,118.0	189.03	281.35	0.406	10.3	1,090.4	23	29	27	33	48	52	59	64	69	74	80	91
44	1,118.0	203.78	302.99	0.438	11.1	1,095.8	25	31	29	36	52	56	64	69	74	80	86	98
44	1,118.0	218.04	324.59	0.469	11.9	1,094.2	26	33	31	39	56	61	69	74	79	86	92	106
44	1,118.0	232.29	346.16	0.500	12.7	1,092.6	28	25	33	41	59	65	73	79	85	92	99	113
44	1,118.0	260.72	389.21	0.562	14.3	1,089.4	32	39	37	46	67	73	83	89	95	103	111	127
44	1,118.0	289.53	432.13	0.625	15.9	1,086.2	35	44	41	52	74	81	92	99	105	114	123	141
44	1,118.0	318.25	474.92	0.688	17.5	1,083.0	39	48	55	56	81	89	101	109	116	126	136	155
44	1,118.0	346.43	517.59	0.750	19.1	1,079.8	42	53	50	61	89	97	110	119	127	137	148	169
44	1,118.0	374.53	557.47	0.812	20.6	1,076.8	45	57	54	67	96	105	119	128	137	149	161	183
44	1,118.0	403.00	599.90	0.875	22.2	1,073.6	50	61	58	72	103	114	128	138	148	161	173	197

Size Out tsize Diameter		Weight		Wall Thickness		Inside Diameter	Minimum Pressure, kpa x 100											
in	mm	lb/ft	kg/m	in	mm	mm	Grade A		Grade B		Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
D	t			d	Std	Alt	Std	Alt	Std	Alt								
46	1,168.0	167.74	249.85	0.344	8.7	1,150.9	19	23	21	27	39	43	48	52	56	60	65	74
46	1,168.0	182.73	272.18	0.375	9.5	1,149.4	20	25	23	30	43	47	52	56	61	65	71	81
46	1,168.0	197.70	294.47	0.406	10.3	1,147.8	22	28	25	32	46	50	57	61	65	71	76	87
46	1,168.0	213.13	317.46	0.438	11.1	1,146.1	23	30	28	34	50	54	61	66	71	76	83	94
46	1,168.0	228.06	339.70	0.469	11.9	1,144.6	25	32	30	37	53	58	65	71	76	82	88	101
46	1,168.0	242.97	361.90	0.500	12.7	1,143.0	27	34	32	39	56	62	70	76	81	88	94	108
46	1,168.0	272.73	406.23	0.562	14.3	1,139.9	30	38	35	44	63	70	79	85	91	99	106	121
46	1,168.0	302.88	451.14	0.625	15.9	1,136.6	34	42	39	49	71	77	88	94	101	110	118	135
46	1,168.0	332.95	495.93	0.688	17.5	1,133.4	37	46	43	54	48	85	96	104	112	121	130	149
46	1,168.0	362.45	539.87	0.750	19.1	1,130.3	41	50	47	59	85	93	105	113	121	132	141	162
46	1,168.0	391.88	583.70	0.812	20.6	1,126.8	44	54	51	64	92	101	114	123	132	143	153	175
46	1,168.0	421.69	627.27	0.875	22.2	1,123.6	47	59	55	69	99	109	123	132	141	154	165	189
48	1,219.0	175.08	260.78	0.344	8.74	1,201.7	18	22	21	26	37	37	46	50	53	58	62	71
48	1,219.0	190.74	284.11	0.375	9.52	1,200.2	19	24	23	28	41	41	50	54	58	63	68	77
48	1,219.0	206.37	307.11	0.406	10.31	1,198.6	21	26	25	30	44	44	54	59	63	68	74	84
48	1,219.0	222.49	331.40	0.438	11.13	1,196.9	23	28	26	33	48	48	59	63	74	74	79	90
48	1,219.0	238.08	354.62	0.469	11.91	1,196.4	24	30	28	35	51	51	63	68	73	79	85	97
48	1,219.0	253.65	377.81	0.500	12.70	1,193.8	26	32	30	38	54	54	68	72	77	84	90	103
48	1,219.0	284.73	424.11	0.562	14.3	1,190.7	29	37	34	42	61	61	76	81	87	94	102	116
48	1,219.0	316.23	417.02	0.625	15.9	1,187.4	32	41	38	47	68	68	84	90	97	105	113	129
48	1,219.0	347.64	517.81	0.688	17.5	1,184.2	36	44	41	52	74	74	92	99	107	116	125	142
48	1,219.0	378.47	563.47	0.750	19.1	1,181.1	39	48	45	56	81	81	101	109	116	126	136	155
48	1,219.0	409.22	609.53	0.812	20.6	1,177.8	42	52	49	61	88	96	109	118	126	136	147	168
48	1,219.0	440.38	655.94	0.875	22.2	1,174.6	45	56	53	66	95	104	118	127	136	147	158	181
52	1,321.0	206.76	307.97	0.375	9.5	1,301.8	18	22	21	26	39	41	47	50	54	58	63	71
52	1,321.0	223.72	333.23	0.406	10.3	1,300.2	19	24	23	28	41	45	50	54	58	63	68	77
52	1,321.0	241.20	359.27	0.438	11.1	1,298.5	21	26	24	30	44	48	54	59	63	68	73	83
52	1,321.0	258.11	384.45	0.469	11.9	1,297.0	22	28	26	32	47	52	58	63	67	73	89	95
52	1,321.0	275.01	409.63	0.500	12.7	1,295.4	24	30	28	34	50	55	62	67	72	78	83	95
52	1,321.0	208.74	459.87	0.562	14.3	1,292.3	27	34	31	39	56	61	70	75	81	87	94	107
52	1,321.0	342.93	510.79	0.625	15.9	1,289.1	30	37	34	43	63	69	78	83	90	97	104	119
52	1,321.0	377.03	561.59	0.688	17.5	1,285.8	33	41	39	48	69	76	85	92	99	107	115	131
52	1,321.0	410.51	611.45	0.750	19.1	1,281.7	36	45	42	52	75	82	98	100	107	116	125	143
52	1,321.0	443.91	661.2	0.812	20.6	1,279.8	39	48	45	56	81	89	101	108	116	126	138	155
52	1,321.0	477.76	711.62	0.875	22.2	1,276.6	42	52	49	61	88	96	109	117	125	136	146	167
56	1,422.0	222.78	331.83	0.375	9.5	1,403.4	17	21	19	24	35	38	43	46	50	54	58	66
56	1,422.0	241.06	359.06	0.406	10.3	1,401.8	18	23	21	26	38	41	47	50	54	59	63	72

Size Outside Diameter		Weight		Wall Thickness		Inside Diameter	Minimum Pressure, kpa x 100											
in	mm	lb/ft	kg/m	in	mm	mm	Grade A		Grade B		Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
D	t			d	Std	Alt	Std	Alt	Std	Alt								
56	1,422.0	259.91	387.14	0.438	11.1	1,400.1	19	24	23	28	41	45	50	54	58	63	68	77
56	1,422.0	278.15	414.30	0.469	11.9	1,398.6	21	26	24	30	43	48	54	58	62	68	73	83
56	1,422.0	269.37	441.44	0.500	12.7	1,397.0	22	28	26	32	47	51	58	62	66	72	78	89
56	1,422.0	332.75	495.63	0.562	14.3	1,393.9	25	31	29	37	52	57	65	70	74	81	87	100
56	1,422.6	369.63	550.56	0.625	15.9	1,390.7	28	34	32	41	58	63	72	77	83	90	97	111
56	1,422.0	406.42	605.36	0.688	17.5	1,387.4	30	38	36	45	64	70	79	85	92	99	107	122
56	1,422.0	442.55	659.18	0.750	19.1	1,384.3	33	41	39	48	70	76	86	93	100	108	116	133
56	1,422.0	478.60	712.87	0.812	20.6	1,330.8	36	45	42	52	76	83	94	101	108	117	126	144
56	1,422.0	515.14	767.30	0.872	22.2	1,377.6	39	48	55	56	81	89	101	108	116	126	136	155
60	1,524.0	238.80	355.69	0.375	9.5	1,505.0	16	19	18	23	32	36	41	43	47	50	54	62
60	1,524.0	258.40	384.89	0.406	10.3	1,503.4	17	21	19	25	35	39	43	47	50	54	59	67
60	1,524.0	278.62	415.00	0.438	11.1	1,501.7	18	23	21	26	38	41	47	51	54	59	63	72
60	1,524.0	298.19	444.15	0.469	11.9	1,500.2	19	24	23	28	41	45	50	47	58	63	68	77
60	1,524.0	317.73	473.26	0.500	12.7	1,498.6	21	26	24	30	43	48	54	58	62	68	72	83
60	1,524.0	356.76	531.39	0.562	14.3	1,495.5	23	29	27	34	49	54	61	65	70	76	81	93
60	1,524.0	396.33	590.33	0.625	15.9	1,492.3	26	32	30	38	54	59	68	72	78	84	90	103
60	1,524.0	435.81	649.14	0.688	17.5	1,489.0	28	36	33	41	60	65	74	80	85	92	99	114
60	1,524.0	474.59	706.90	0.750	19.1	1,485.9	31	39	37	45	65	71	81	87	93	101	109	124
60	1,524.0	513.29	764.54	0.812	20.6	1,482.8	34	42	39	49	71	77	88	94	101	109	118	134
60	1,524.0	552.52	822.98	0.875	22.2	1,479.6	37	45	42	53	76	83	94	101	109	118	127	144
64	1,626.0	297.33	442.87	0.438	11.1	1,603.3	17	21	20	25	36	39	44	48	51	55	59	66
64	1,626.0	318.22	473.99	0.469	11.9	1,601.8	18	23	21	26	38	42	48	51	54	59	63	73
64	1,626.0	339.09	505.07	0.500	12.7	1,600.2	19	24	23	28	41	45	50	54	58	63	68	78
64	1,626.0	380.76	567.14	0.562	14.3	1,597.1	22	28	25	32	45	50	56	61	65	71	76	87
64	1,626.0	423.03	630.10	0.625	15.9	1,593.9	24	30	28	35	54	56	63	68	72	79	85	97
64	1,626.0	465.21	692.93	0.688	17.5	1,590.6	27	33	31	39	56	61	70	74	80	87	93	107
64	1,626.0	506.63	754.63	0.750	19.1	1,587.5	29	37	34	43	61	67	76	81	88	94	102	117
64	1,626.0	547.98	818.21	0.812	20.6	1,584.8	32	39	37	46	66	72	82	88	94	102	110	126
64	1,626.0	589.90	878.65	0.875	22.2	1,581.6	34	43	39	50	71	78	88	95	102	110	119	136
68	1,727.0	338.26	503.84	0.469	11.9	1,703.4	17	21	20	25	36	39	45	48	51	56	60	68
68	1,727.0	360.45	536.89	0.500	12.7	1,701.8	18	23	21	27	39	42	48	51	54	59	64	73
68	1,727.0	404.77	602.90	0.562	14.3	1,698.7	21	25	24	30	43	47	53	57	61	67	72	82
68	1,727.0	449.73	669.87	0.625	15.9	1,695.5	23	28	27	33	48	52	59	64	68	74	80	91
68	1,727.0	494.60	736.71	0.688	17.5	1,692.2	25	32	29	37	52	58	65	70	75	81	88	101
68	1,727.0	538.67	802.35	0.750	19.1	1,698.1	28	34	32	40	57	63	71	76	82	89	96	110
68	1,727.0	582.66	869.64	0.812	20.6	1,685.8	30	37	34	43	62	68	77	83	89	96	103	118
68	1,727.0	627.28	936.24	0.875	22.2	1,682.6	32	40	37	47	67	74	83	90	96	104	112	127

Size Outsize Diameter		Weight		Wall Thickness		Inside Diameter	Minimum Pressure, kpa x 100											
in	mm	lb/ft	kg/m	in	mm	mm	Grade A		Grade B		Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
D	t			d	Std	Alt	Std	Alt	Std	Alt								
72	1,829.0	381.81	568.83	0.500	12.7	1,803.6	17	21	20	25	37	39	45	48	52	56	60	69
72	1,829.0	428.78	639.93	0.562	14.3	1,800.4	19	24	23	28	41	45	50	54	58	63	68	78
72	1,829.0	476.43	710.91	0.625	15.9	1,797.2	21	27	25	32	45	50	56	60	65	70	75	86
72	1,829.0	523.99	781.75	0.688	17.5	1,794.0	23	30	28	34	50	54	61	66	71	77	83	95
72	1,829.0	570.71	852.47	0.750	19.1	1,790.8	26	32	30	38	54	59	68	72	78	84	90	104
72	1,829.0	617.35	918.66	0.811	20.6	1,787.8	28	35	32	41	59	64	73	79	84	91	98	112
72	1,829.0	664.66	989.14	0.874	22.2	1,784.6	30	38	35	44	63	70	79	84	90	98	105	120
76	1,930.0	403.17	600.46	0.500	12.7	1,904.6	17	21	19	24	37	37	43	45	49	53	57	53
76	1,930.0	452.79	675.55	0.562	14.3	1,901.4	19	23	21	27	39	42	48	52	55	60	64	60
76	1,930.0	503.13	750.51	0.625	15.9	1,898.2	21	25	24	30	43	47	53	57	61	66	72	66
76	1,930.0	553.38	825.34	0.688	17.5	1,895.0	23	28	26	33	47	52	59	63	68	73	79	73
76	1,930.0	602.75	900.05	0.750	19.1	1,891.8	25	30	28	36	52	56	63	68	74	79	85	79
76	1,930.0	652.04	969.97	0.812	20.6	1,888.8	26	33	31	39	56	61	69	74	79	86	93	86
76	1,930.0	702.04	1,044.43	0.875	22.2	1,885.6	28	36	33	41	60	65	74	80	85	93	100	93
80	2,032.0	476.80	710.19	0.562	14.3	2,003.5	17	22	21	25	37	40	45	49	52	56	61	56
80	2,032.0	529.83	789.04	0.625	15.9	2,000.3	19	24	23	28	41	45	50	54	58	63	68	63
80	2,032.0	582.77	868.04	0.688	17.5	1,997.0	21	27	25	31	45	49	55	69	64	79	74	70
80	2,032.0	634.79	945.52	0.750	19.1	1,993.9	23	29	27	34	49	54	61	65	70	76	81	76
80	2,032.0	686.73	1,022.88	0.812	20.6	1,990.8	25	32	30	37	53	58	65	70	76	82	88	82
80	2,032.0	739.42	1,101.36	0.875	22.2	1,987.6	27	34	32	39	57	63	70	76	81	88	95	88

## ERW BS 1387 - 1985 PIPE FOR ORDINARY USERS (MEDIUM PIPE)

### Pipa Baja Medium Hitam (BSP) Pipa Baja Medium Galvanis (GSP)

Grade	Nominal Size		Diameter Luar				Tebal	Berat
			Minimum		Maximum			
	in	mm	in	mm	in	mm		
Medium	1/2	15	0.831	21.1	0.856	21.7	2.60	1.21
	3/4	20	0.831	26.6	1.072	27.2	2.60	1.56
	1	25	1.047	33.4	1.346	34.2	3.20	2.41
	1 1/4	32	1.316	42.1	1.678	42.9	3.20	3.10
	1 1/2	40	1.657	48	1.919	48.8	3.20	3.57
	2	50	1.889	59.8	2.394	60.8	3.60	5.03
	2 1/2	65	2.354	75.4	3.014	76.6	3.60	6.43
	3	80	2.969	88.1	3.524	89.5	4.00	8.37
	4	100	3.459	113.3	4.524	114.9	4.50	12.20
	5	125	5.461	138.7	5.535	140.6	5.00	16.60
	6	150	6.46	164.1	6.539	166.1	5.00	19.70

### Komposisi Kimia

Karbon	Manganese	Sulfur	Phosphorus
0.20 % Max	1.20 % Max	0.045 % Max	0.045 % Max

### Sifat Mekanik

Batas Mulur (N/mm <sup>2</sup> )	Kuat Tarik (N/mm <sup>2</sup> )	Regangan (Min)
195	320 - 460	20%

Panjang Pipa : 6 meter per batang

Toleransi Panjang : ± 2%

Toleransi Tebal : Plus tidak terbatas  
Minus (-) 12,5%

Catatan :

Pengujian Tekanan Akhir (Hydrostatic Test Pressure) : 50 kg/cm<sup>2</sup>

Pengujian Hydrostatic dapat diganti dengan Pengujian Ultrasonic atau

Pengujian Eddy Current

## API 5L STANDARD WEIGHTS PLAIN END LINE PIPE DIMENSIONS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Nominal Size Diameter	Specified Outside Diameter	Specified Wall Thickness		Weight	Calculated Inside Diameter	Minimum Test Pressure (kPa x 100)											
	D (mm)	(mm)	(in)	(kg/m)	d (mm)		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80	
4	114.3	4.8	0.19	12.96	104.70	STD	88	123	146	161	181	197	205	205	205	205	
						ALT	110	154	183	202	227	246	261	283	306	350	
			5.2	0.20	13.99	103.90	STD	96	134	158	175	197	205	205	205	205	
							ALT	119	167	198	218	246	266	283	307	331	379
		5.6	0.22	15.01	103.10		STD	103	144	170	188	205	205	205	205	205	
							ALT	129	180	213	235	265	287	305	331	356	408
		6.0	0.24	16.02	102.30		STD	110	154	183	202	205	205	205	205	205	
							ALT	138	190	228	252	283	307	327	354	382	437
		6.4	0.25	17.03	101.50		STD	118	165	195	205	205	205	205	205	205	
							ALT	147	190	244	269	302	328	349	378	407	466
6	168.3	4.8	0.19	19.35	158.68	STD	60	84	124	137	154	167	178	193	205	205	
						ALT	75	105	124	137	154	167	178	193	208	237	
			5.2	0.20	20.91	157.88	STD	65	91	134	148	167	181	192	205	205	
							ALT	81	114	134	148	167	181	192	209	225	257
		5.6	0.22	22.46	157.08		STD	70	98	145	160	180	195	205	205	205	
							ALT	87	122	145	160	180	195	207	225	242	277
		6.4	0.25	25.55	155.48		STD	80	112	165	183	205	205	205	205	205	
							ALT	100	140	165	183	205	222	237	257	277	317
		7.1	0.28	28.22	154.08		STD	89	124	184	203	205	205	205	205	205	
							ALT	111	155	184	203	228	247	263	285	307	351
		7.9	0.31	31.24	152.48		STD	99	138	204	205	205	205	205	205	205	
							ALT	123	173	204	225	254	275	292	317	342	391
		8.7	0.34	34.24	150.88		STD	109	152	205	205	205	205	205	205	205	
							ALT	136	190	225	248	279	302	322	349	376	430
		9.5	0.37	37.20	149.28		STD	119	166	205	205	205	205	205	205	205	
							ALT	148	190	246	271	305	330	351	381	411	470
8	219.1	4.8	0.19	25.36	209.48	STD	46	64	95	105	118	128	136	148	159	182	
						ALT	58	81	95	105	118	128	136	148	159	182	
		5.2	0.20	27.43	208.68	STD	50	70	103	114	128	139	148	160	173	198	
						ALT	62	87	103	114	128	139	148	160	173	198	
		5.6	0.22	29.48	207.88	STD	54	75	111	123	138	150	159	173	186	205	
						ALT	67	94	111	123	138	150	159	173	186	213	
		6.4	0.25	33.57	206.28	STD	61	86	127	140	158	171	182	197	205	205	
						ALT	77	107	127	140	158	171	182	197	213	243	
		7.0	0.28	36.61	205.08	STD	67	95	141	156	175	190	202	205	205	205	
						ALT	84	119	141	156	175	190	202	219	236	270	
		7.9	0.31	41.14	203.28	STD	76	106	157	173	195	205	205	205	205	205	
						ALT	95	133	157	173	195	211	224	243	262	300	



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Nominal Size Diameter	Specified Outside Diameter	Specified Wall Thickness		Weight	Calculated Inside Diameter	Minimum Test Pressure (kPa x 100)											
	D (mm)	(mm)	(in)	(kg/m)	d (mm)		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80	
8	219.1	8.2	0.32	42.64	202.68	STD	79	110	163	180	202	205	205	205	205	205	
						ALT	98	138	163	180	202	219	233	253	272	312	
		8.7	0.34	45.13	201.68	STD	83	117	173	191	205	205	205	205	205	205	
						ALT	104	146	173	191	214	232	247	268	289	331	
		9.5	0.37	49.10	200.08	STD	91	127	189	205	205	205	205	205	205	205	
						ALT	114	159	189	208	234	254	270	293	315	361	
		11.1	0.44	56.93	196.88	STD	106	149	205	205	205	205	205	205	205	205	
						ALT	133	186	220	243	274	296	315	342	369	422	
		12.7	0.50	64.63	193.68	STD	0	170	205	205	205	205	205	205	205	205	
						ALT	0	190	252	278	313	339	361	391	422	483	
10	273.1	4.8	0.19	31.75	263.45	STD	37	52	87	96	108	117	124	134	145	166	
						ALT	46	65	87	96	108	117	124	134	145	166	
		5.2	0.20	34.35	262.65	STD	40	56	94	104	117	126	134	146	157	180	
						ALT	50	70	94	104	117	126	134	146	157	180	
		5.6	0.22	36.93	261.85	STD	43	60	101	112	126	136	145	157	169	194	
						ALT	54	75	101	112	126	136	145	157	169	194	
		6.4	0.25	42.08	260.25	STD	49	69	116	128	143	155	165	179	193	205	
						ALT	62	86	116	128	143	155	165	179	193	221	
		7.1	0.28	46.56	258.85	STD	55	76	128	141	159	172	183	199	205	205	
						ALT	68	96	128	141	159	172	183	199	214	245	
		7.8	0.31	51.02	257.45	STD	60	84	141	155	175	189	202	205	205	205	
						ALT	75	105	141	155	175	189	202	219	236	270	
		8.7	0.34	56.71	255.65	STD	67	94	157	173	195	205	205	205	205	205	
						ALT	84	117	157	173	195	211	225	244	263	301	
		9.3	0.37	60.49	254.45	STD	72	100	168	185	205	205	205	205	205	205	
						ALT	89	125	168	185	208	226	240	261	281	321	
		11.1	0.44	71.70	250.85	STD	85	120	200	205	205	205	205	205	205	205	
						ALT	107	149	200	221	249	270	287	311	335	384	
		12.7	0.50	81.54	247.65	STD	98	137	205	205	205	205	205	205	205	205	
						ALT	122	171	229	253	285	308	328	356	383	439	
12	323.9	4.8	0.19	37.77	314.25	STD	31	44	73	81	91	98	105	113	122	140	
						ALT	39	54	73	81	91	98	105	113	122	140	
		5.2	0.20	40.86	313.45	STD	34	47	79	87	98	106	113	123	132	151	
						ALT	42	59	79	87	98	106	113	123	132	151	
		5.6	0.22	43.95	312.65	STD	36	51	85	94	106	115	122	132	143	163	
						ALT	45	64	85	94	106	115	122	132	143	163	
		6.4	0.25	50.10	311.05	STD	42	58	97	108	121	131	139	151	163	186	
						ALT	52	73	97	108	121	131	139	151	163	186	
		7.1	0.28	55.46	309.65	STD	46	64	108	119	134	145	155	168	181	207	
						ALT	58	81	108	119	134	145	155	168	181	207	



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Nominal Size Diameter	Specified Outside Diameter	Specified Wall Thickness		Weight	Calculated Inside Diameter	Minimum Test Pressure (kPa x 100)										
	D (mm)	(mm)	(in)	(kg/m)	d (mm)		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
12	323.9	7.9	0.31	61.55	308.05	STD	51	72	120	133	149	162	172	187	201	205
						ALT	64	90	120	133	149	162	172	187	201	230
		8.4	0.33	65.34	307.05	STD	54	76	128	141	159	172	183	198	205	205
						ALT	68	95	128	141	159	172	183	198	214	245
		8.7	0.34	67.61	306.45	STD	56	79	132	146	164	178	190	205	205	205
						ALT	71	99	132	146	164	178	190	206	221	253
		9.5	0.37	73.64	304.85	STD	62	86	145	160	180	194	205	205	205	205
						ALT	77	108	145	160	180	194	207	224	242	277
14	355.6	10.3	0.41	79.64	303.25	STD	67	94	157	173	195	205	205	205	205	205
						ALT	83	117	157	173	195	211	224	243	262	300
		11.1	0.44	85.61	301.65	STD	72	101	169	186	205	205	205	205	205	205
						ALT	90	126	169	186	210	227	242	262	283	323
		12.7	0.50	97.45	298.45	STD	82	115	193	205	205	205	205	205	205	205
						ALT	103	144	193	213	240	260	277	300	323	370
16	406.4	4.8	0.19	41.52	346.00	STD	28	40	67	73	83	89	95	103	111	127
						ALT	35	50	67	73	83	89	95	103	111	127
		5.2	0.20	44.93	345.20	STD	31	43	72	80	89	97	103	112	121	138
						ALT	38	54	72	80	89	97	103	112	121	138
		5.6	0.22	48.33	344.40	STD	33	46	78	86	96	104	111	120	130	149
						ALT	41	58	78	86	96	104	111	120	130	149
		6.0	0.24	51.73	343.60	STD	35	50	83	92	103	112	119	129	139	159
						ALT	44	62	83	92	103	112	119	129	139	159
		6.4	0.25	55.11	342.80	STD	38	53	89	98	110	119	127	138	148	170
						ALT	47	66	89	98	110	119	127	138	148	170
		7.1	0.28	61.02	341.40	STD	42	59	98	109	122	132	141	153	165	188
						ALT	52	73	98	109	122	132	141	153	165	188
		7.9	0.31	67.74	339.80	STD	47	65	110	121	136	147	157	170	183	205
						ALT	58	82	110	121	136	147	157	170	183	210
		8.2	0.32	70.25	339.20	STD	48	68	114	125	141	153	163	176	190	205
						ALT	61	85	114	125	141	153	163	176	190	218
		8.4	0.33	71.92	338.80	STD	50	69	116	129	145	157	167	181	195	205
						ALT	62	87	116	129	145	157	167	181	195	223
		8.7	0.34	74.42	338.20	STD	51	72	121	133	150	162	173	187	202	205
						ALT	64	90	121	133	150	162	173	187	202	231
		9.3	0.37	79.42	337.00	STD	55	77	129	142	160	173	185	200	205	205
						ALT	69	96	129	142	160	173	185	200	216	247
		9.5	0.37	81.08	336.60	STD	56	79	132	145	163	177	188	204	205	205
						ALT	70	98	132	145	163	177	188	204	220	252
		10.3	0.41	87.71	335.00	STD	61	85	143	158	177	192	204	205	205	205
						ALT	76	106	143	158	177	192	204	222	239	273



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Nominal Size Diameter	Specified Outside Diameter	Specified Wall Thickness		Weight	Calculated Inside Diameter	Minimum Test Pressure (kPa x 100)											
	D (mm)	(mm)	(in)	(kg/m)	d (mm)		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80	
14	355.6	11.1	0.44	94.30	333.40	STD	66	92	154	170	191	205	205	205	205	205	
						ALT	82	115	154	170	191	207	220	239	257	295	
		11.9	0.47	100.86	331.80	STD	70	98	165	182	205	205	205	205	205	205	
						ALT	88	123	165	182	205	222	236	256	276	316	
		12.0	0.47	101.68	331.60	STD	71	99	166	184	205	205	205	205	205	205	
						ALT	89	124	166	184	207	224	238	258	278	318	
		12.7	0.50	107.39	330.20	STD	75	105	176	194	205	205	205	205	205	205	
						ALT	94	131	176	194	219	237	252	273	294	337	
16	406.4	4.8	0.19	47.54	396.80	STD	25	35	58	64	72	78	83	90	97	111	
						ALT	31	43	58	64	72	78	83	90	97	111	
		5.2	0.20	51.45	396.00	STD	27	38	63	70	78	85	90	98	105	121	
						ALT	34	47	63	70	78	85	90	98	105	121	
		5.6	0.22	55.35	395.20	STD	29	41	68	75	84	91	97	105	114	130	
						ALT	36	51	68	75	84	91	97	105	114	130	
		6.0	0.24	59.24	394.40	STD	31	43	73	80	90	98	104	113	122	139	
						ALT	39	54	73	80	90	98	104	113	122	139	
		6.4	0.25	63.13	393.60	STD	33	46	78	86	96	104	111	120	130	149	
						ALT	41	58	78	86	96	104	111	120	130	149	
		7.1	0.28	69.91	392.20	STD	37	51	86	95	107	116	123	134	144	165	
						ALT	46	64	86	95	107	116	123	134	144	165	
		7.9	0.31	77.63	390.60	STD	41	57	96	106	119	129	137	149	160	183	
						ALT	51	71	96	106	119	129	137	149	160	183	
		8.2	0.32	80.52	390.00	STD	42	59	99	110	123	134	142	154	166	190	
						ALT	53	74	99	110	123	134	142	154	166	190	
		8.4	0.33	82.44	389.60	STD	43	61	102	112	126	137	146	158	170	195	
						ALT	54	76	102	112	126	137	146	158	170	195	
		8.7	0.34	85.32	389.00	STD	45	63	106	116	131	142	151	164	177	202	
						ALT	56	79	106	116	131	142	151	164	177	202	
		9.3	0.37	91.07	387.80	STD	48	67	113	124	140	152	161	175	189	205	
						ALT	60	84	113	124	140	152	161	175	189	216	
		9.5	0.37	92.98	387.40	STD	49	69	115	127	143	155	165	179	193	205	
						ALT	61	86	115	127	143	155	165	179	193	221	
		10.3	0.41	100.61	385.80	STD	53	75	125	138	155	168	179	194	205	205	
						ALT	67	93	125	138	155	168	179	194	209	239	
		11.1	0.44	108.20	384.20	STD	57	80	135	149	167	181	193	205	205	205	
						ALT	72	100	135	149	167	181	193	209	225	258	
		11.9	0.47	115.77	382.60	STD	61	86	144	159	179	194	205	205	205	205	
						ALT	77	108	144	159	179	194	207	224	241	276	
		12.0	0.47	116.71	382.40	STD	62	87	146	161	181	196	205	205	205	205	
						ALT	78	109	146	161	181	196	208	226	243	279	
16	406.4	12.7	0.50	123.30	381.00	STD	66	92	154	170	191	205	205	205	205	205	
						ALT	82	115	154	170	191	207	220	239	258	295	



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Nominal Size Diameter	Specified Outside Diameter	Specified Wall Thickness		Weight	Calculated Inside Diameter	Minimum Test Pressure (kPa x 100)										
	D (mm)	(mm)	(in)	(kg/m)	d (mm)		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
18	457.2	4.8	0.19	53.55	447.60	STD	22	31	52	57	64	70	74	80	87	99
						ALT	28	39	52	57	64	70	74	80	87	99
		5.2	0.20	57.96	446.80	STD	24	33	56	62	70	75	80	87	94	107
						ALT	30	42	56	62	70	75	80	87	94	107
		5.6	0.22	62.36	446.00	STD	26	36	60	67	75	81	86	94	101	116
						ALT	32	45	60	67	75	81	86	94	101	116
		6.0	0.24	66.76	445.20	STD	28	39	65	71	80	87	93	100	108	124
						ALT	34	48	65	71	80	87	93	100	108	124
		6.4	0.25	71.15	444.40	STD	29	41	69	76	86	93	99	107	115	132
						ALT	37	51	69	76	86	93	99	107	115	132
		7.1	0.28	78.81	443.00	STD	33	46	77	84	95	103	110	119	128	147
						ALT	41	57	77	84	95	103	110	119	128	147
		7.9	0.31	87.53	441.40	STD	36	51	85	94	106	115	122	132	142	163
						ALT	45	64	85	94	106	115	122	132	142	163
		8.2	0.32	90.79	440.80	STD	38	53	88	98	110	119	127	137	148	169
						ALT	47	66	88	98	110	119	127	137	148	169
		8.4	0.33	92.97	440.40	STD	39	54	91	100	112	122	130	141	151	173
						ALT	48	68	91	100	112	122	130	141	151	173
		8.7	0.34	96.22	439.80	STD	40	56	94	104	116	126	134	146	157	180
						ALT	50	70	94	104	116	126	134	146	157	180
		9.3	0.37	102.72	438.60	STD	43	60	100	111	124	135	144	156	168	192
						ALT	53	75	100	111	124	135	144	156	168	192
		9.5	0.37	104.88	438.20	STD	44	61	102	113	127	138	147	159	171	196
						ALT	55	76	102	113	127	138	147	159	171	196
		10.3	0.41	113.51	436.60	STD	47	66	111	123	138	149	159	172	186	205
						ALT	59	83	111	123	138	149	159	172	186	205
		11.1	0.44	122.11	435.00	STD	51	71	120	132	149	161	171	186	200	205
						ALT	64	89	120	132	149	161	171	186	200	229
		11.9	0.47	130.68	433.40	STD	55	77	128	142	159	173	184	199	205	205
						ALT	68	96	128	142	159	173	184	199	215	246
		12.0	0.47	131.74	433.20	STD	55	77	129	143	161	174	185	201	205	205
						ALT	69	96	129	143	161	174	185	201	216	248
		12.7	0.50	139.21	431.80	STD	58	82	137	151	170	184	196	205	205	250
						ALT	73	102	137	151	170	184	196	213	229	250
		14.0	0.55	153.01	429.20	STD	64	90	151	167	187	203	205	205	205	205
						ALT	80	113	151	167	187	203	216	234	250	250
		14.3	0.56	156.18	428.60	STD	66	92	154	170	191	205	205	205	205	205
						ALT	82	115	154	170	191	207	221	239	250	250
		15.0	0.59	163.57	427.20	STD	69	96	162	178	201	205	205	205	205	205
						ALT	86	121	162	178	201	218	231	250	250	250



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Nominal Size Diameter	Specified Outside Diameter	Specified Wall Thickness		Weight	Calculated Inside Diameter	Minimum Test Pressure (kPa x 100)										
	D (mm)	(mm)	(in)	(kg/m)	d (mm)		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
20	508	4.4	0.17	54.64	499.20	STD	18	25	45	50	56	61	65	70	76	87
						ALT	23	32	45	50	56	61	65	70	76	87
		4.8	0.19	59.56	498.40	STD	20	28	49	54	61	66	71	77	82	94
						ALT	25	35	49	54	61	66	71	77	82	94
		5.2	0.20	64.48	497.60	STD	21	30	53	59	66	72	76	83	89	102
						ALT	27	38	53	59	66	72	76	83	89	102
		5.6	0.22	69.38	496.80	STD	23	32	58	63	71	77	82	89	96	110
						ALT	29	41	58	63	71	77	82	89	96	110
		6.4	0.25	79.16	495.20	STD	26	37	66	73	82	88	94	102	110	126
						ALT	33	46	66	73	82	88	94	102	110	126
		7.1	0.28	87.70	493.80	STD	29	41	73	81	91	98	104	113	122	140
						ALT	37	51	73	81	91	98	104	113	122	140
		7.9	0.31	97.43	492.20	STD	33	46	81	90	101	109	116	126	136	155
						ALT	41	57	81	90	101	109	116	126	136	155
		8.2	0.32	101.07	491.60	STD	34	47	84	93	105	113	121	131	141	161
						ALT	42	59	84	93	105	113	121	131	141	161
		8.4	0.33	103.49	491.20	STD	35	49	86	95	107	116	124	134	144	165
						ALT	43	61	86	95	107	116	124	134	144	165
		8.7	0.34	107.12	490.60	STD	36	50	89	99	111	120	128	139	150	171
						ALT	45	63	89	99	111	120	128	139	150	171
		9.3	0.37	114.37	489.40	STD	38	54	96	105	119	129	137	148	160	183
						ALT	48	67	96	105	119	129	137	148	160	183
		9.5	0.37	116.78	489.00	STD	39	55	98	108	121	131	140	151	163	187
						ALT	49	69	98	108	121	131	140	151	163	187
		10.3	0.41	126.41	487.40	STD	43	60	106	117	131	142	151	164	177	203
						ALT	53	75	106	117	131	142	151	164	177	203
		11.1	0.44	136.01	485.80	STD	46	64	114	126	142	153	163	177	191	205
						ALT	57	80	114	126	142	153	163	177	191	218
		11.9	0.47	145.58	484.20	STD	49	69	122	135	152	164	175	190	205	205
						ALT	61	86	122	135	152	164	175	190	205	234
		12.0	0.47	146.78	484.00	STD	50	69	123	136	153	166	176	191	205	205
						ALT	62	87	123	136	153	166	176	191	206	236
		12.7	0.50	155.12	482.60	STD	53	74	131	144	162	176	187	203	205	205
						ALT	66	92	131	144	162	176	187	203	218	250
		14.0	0.55	170.55	480.00	STD	58	81	144	159	179	193	205	205	205	205
						ALT	72	101	144	159	179	193	206	223	241	250
		14.3	0.56	174.10	479.40	STD	59	83	147	162	182	198	205	205	205	205
						ALT	74	103	147	162	182	198	210	228	246	250
		15.9	0.63	192.95	476.20	STD	66	92	163	180	203	220	234	250	250	250
						ALT	82	115	163	180	203	220	234	250	250	250

Label		Outside diameter		Nominal linear mass	Wall thickness	Minimum Test Pressure (kPa x 100)									hoop	YS	
							Grade H40	Grade J55	Grade K55	H40	J55	K55	Grade H40	Grade J55	Grade K55		
1	2	mm	kg/m	mm													
4-1/2	9,50	114,30	14,14	5,21	STD	20,1	27,6	27,6	0,8	276	379	379	201,3	276,4	276,4		
4-1/2	9,50	114,30	14,14	5,21	ALT	20,1	27,6	27,6	0,8				201,3	276,4	276,4		
4-1/2	10,50	114,30	15,63	5,69	STD	22,0	30,2	30,2	0,8				219,8	301,9	301,9		
4-1/2	10,50	114,30	15,63	5,69	ALT	22,0	30,2	30,2	0,8				219,8	301,9	301,9		
4-1/2	11,60	114,30	17,26	6,35	STD	24,5	33,7	33,7	0,8				245,3	336,9	336,9		
4-1/2	11,60	114,30	17,26	6,35	ALT	24,5	33,7	33,7	0,8				245,3	336,9	336,9		
6-5/8	20,00	168,28	29,76	7,32	STD	19,2	26,4	26,4	0,8				192,1	263,8	263,8		
6-5/8	20,00	168,28	29,76	7,32	ALT	19,2	26,4	26,4	0,8				192,1	263,8	263,8		
8-5/8	24,00	219,08	35,72	6,71	STD	13,5	18,6	18,6	0,8				135,3	185,7	185,7		
8-5/8	24,00	219,08	35,72	6,71	ALT	13,5	18,6	18,6	0,8				135,3	185,7	185,7		
8-5/8	28,00	219,08	41,67	7,72	STD	15,6	21,4	21,4	0,8				155,6	213,7	213,7		
8-5/8	28,00	219,08	41,67	7,72	ALT	15,6	21,4	21,4	0,8				155,6	213,7	213,7		
8-5/8	32,00	219,08	47,62	8,94	STD	18,0	24,7	24,7	0,8				180,2	247,5	247,5		
8-5/8	32,00	219,08	47,62	8,94	ALT	18,0	24,7	24,7	0,8				180,2	247,5	247,5		
10-3/4	32,75	273,05	48,74	7,09	STD	8,6	11,8	11,8	0,6				86,0	118,1	118,1		
10-3/4	32,75	273,05	48,74	7,09	ALT	11,5	15,7	15,7	0,8				114,7	157,5	157,5		
10-3/4	40,50	273,05	60,27	8,89	STD	10,8	14,8	14,8	0,6				107,8	148,1	148,1		
10-3/4	40,50	273,05	60,27	8,89	ALT	14,4	19,7	19,7	0,8				143,8	197,4	197,4		
16	65,00	406,40	96,73	9,53	STD	7,8	10,7	10,7	0,6				77,7	106,6	106,6		
16	65,00	406,40	96,73	9,53	ALT	10,4	14,2	14,2	0,8				103,6	142,2	142,2		
16	75,00	406,40	111,61	11,13	STD	9,1	12,5	12,5	0,6				90,7	124,6	124,6		
16	75,00	406,40	111,61	11,13	ALT	12,1	16,6	16,6	0,8				120,9	166,1	166,1		
16	84,00	406,40	125,01	12,57	STD	10,2	14,1	14,1	0,6				102,4	140,7	140,7		
16	84,00	406,40	125,01	12,57	ALT	13,7	18,8	18,8	0,8				136,6	187,6	187,6		
16	109,00	406,40	162,21	16,66	STD	13,6	18,6	18,6	0,6				135,8	186,4	186,4		
16	109,00	406,40	162,21	16,66	ALT	18,1	24,9	24,9	0,8				181,0	248,6	248,6		
20	94,00	508,00	139,89	11,13	STD	7,3	10,0	10,0	0,6				72,6	99,6	99,6		
20	94,00	508,00	139,89	11,13	ALT	9,7	13,3	13,3	0,8				96,8	132,9	132,9		
20	106,50	508,00	158,49	12,70	STD	8,3	11,4	11,4	0,6				82,8	113,7	113,7		
20	106,50	508,00	158,49	12,70	ALT	11,0	15,2	15,2	0,8				110,4	151,6	151,6		
20	133,00	508,00	197,93	16,13	STD	10,5	14,4	14,4	0,6				105,2	144,4	144,4		
20	133,00	508,00	197,93	16,13	ALT	14,0	19,3	19,3	0,8				140,2	192,5	192,5		

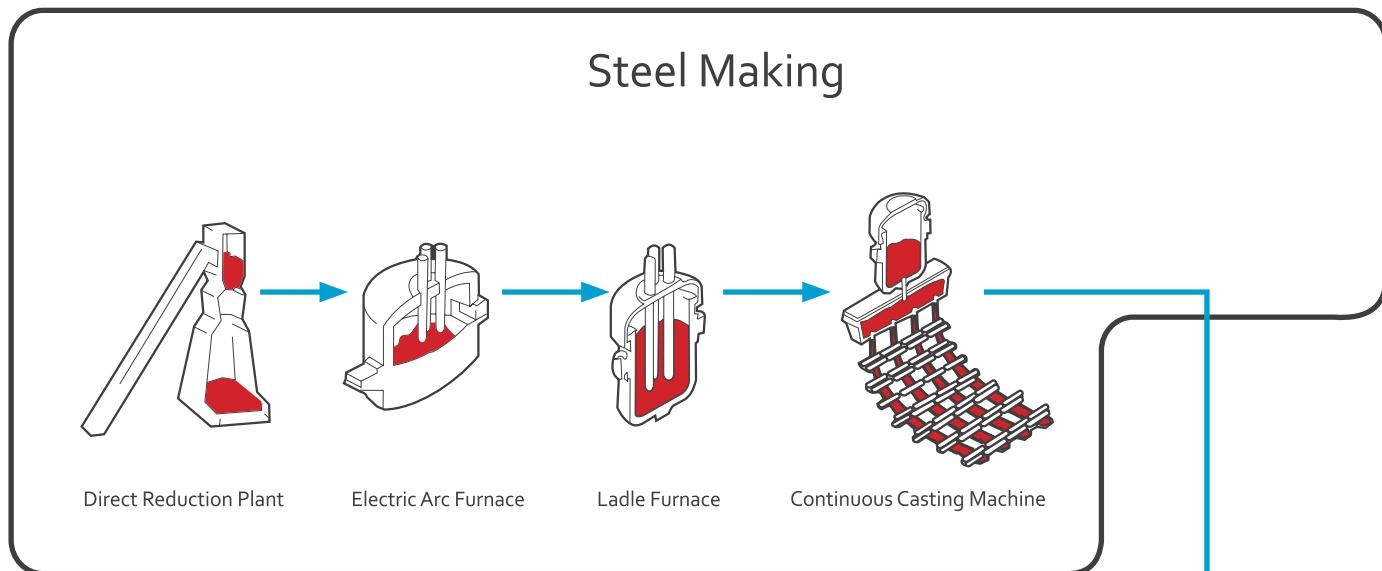
## KRAKATAU WAJATAMA

PT Krakatau Wajatama was established in 1992. Nowadays, it has been a foremost steel producer in Indonesia.

Our company produces high quality products such as Deformed Bar, Plain Bar, Equal Angle, Channel, Wide Flange, H Beam and I Beam.

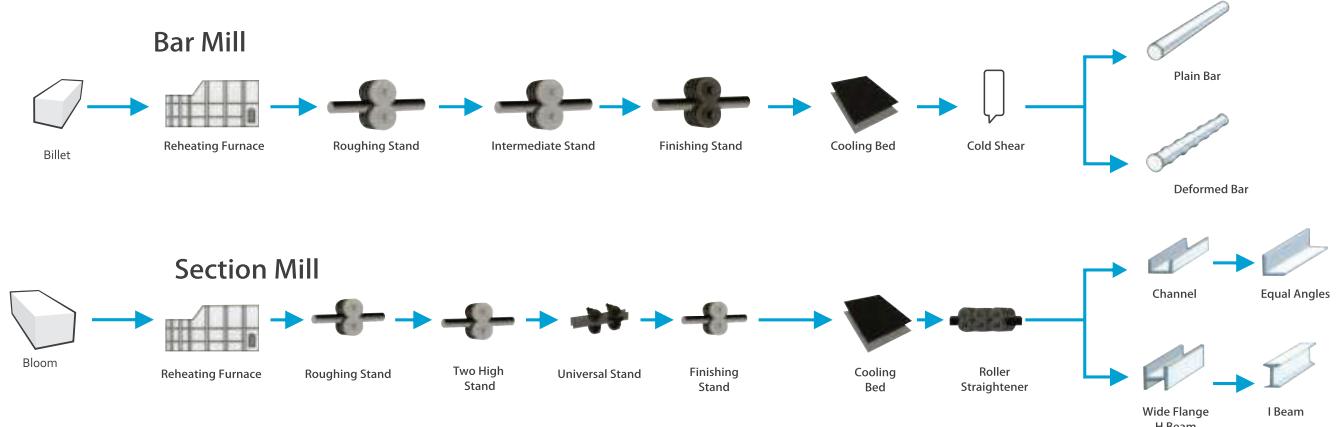
As a subsidiary company of PT. Krakatau Steel, we have always committed ourselves to deliver the highest product quality and the ultimate customer satisfaction.

# BAR & SECTION PROCESS PRODUCTION

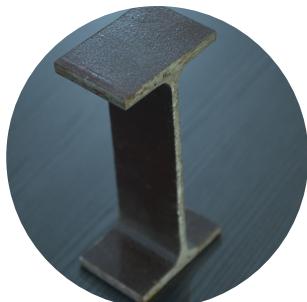
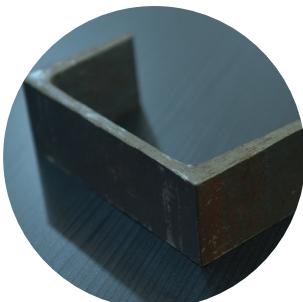


**PT KRAKATAU WAJATAMA PRODUCTION PROCESS**

**Rolling Mills**



## BAR & SECTION PRODUCT



### Products Table

No	Designation	Nimonal Size (mm)	Standart
1	Deformed Bar	S.10 ~ S.32	SNI 2052-2017 Equivalent : ASTM A 615, ASTM A 706, JIS G 3112
2	Plain Bar	P.8 ~ P.32	SNI 2052-2017 Equivalent : JIS G 3112
3	Equal Angles	L.40 ~ L.150	SNI 07-2054-2006 Equivalent : JIS G 3112
4	U Channels	U.150 ~ U.250	SNI 07-0052-2006 Equivalent : ASTM A 36, JIS G 3101
5	Wide Flange Beam	150 x 75 ~ 300 x 150	SNI 07-7178-2006 Equivalent : ASTM A 36, JIS G 3101
6	H Beam	100 x 100 ~ 150 x 150	SNI 2610 : 2011 Equivalent : ASTM A 36, JIS G 3101
7	I Beam	I.100	SNI 07-0329 : 2005 Equivalent : ASTM A 36, JIS G 3101

## DEFORMED BAR

### Mechanical Properties

According to SNI 2052-2017

Steel Class	Tensile Test			Bend Test		TS/YS Ratio	Color Marking
	Yield TS/YS Strength (YS)	Tensile Strength (TS)	Min Elongation (Min)	Bending Angle	Inside Radius		
	MPa	MPa	%		mm		
BjTS 280	Min. 280 Maks. 405	Min. 350	11 (d ≤ 10 mm)	180°	3,5d (d ≤ 16 mm)	Min. 1,25	
			12 (d ≥ 13 mm)	180°	5d (d ≥ 19 mm)		
BjTS 420A	Min. 420 Maks. 545	Min. 525	9 (d ≤ 19 mm)	180°	3,5d (d ≤ 16 mm)	Min. 1,25	
			8 (22 ≤ d ≤ 25 mm)	180°	5d (19 ≤ d ≤ 25 mm)		
			7 (d ≥ 29 mm)	180°	7d (29 ≤ d ≤ 36 mm)		
				90°	9d (d > 36 mm)		
BjTS 420B	Min. 420 Maks. 545	Min. 525	14 (d ≤ 19 mm)	180°	3,5d (d ≤ 16 mm)	Min. 1,25	
			12 (22 ≤ d ≤ 36 mm)	180°	5d (19 ≤ d ≤ 25 mm)		
			10 (d > 36 mm)	180°	7d (29 ≤ d ≤ 36 mm)		
				90°	9d (d > 36 mm)		
BjTS 520	Min. 520 Maks. 645	Min. 650	7 (d ≤ 25 mm)	180°	5d (d ≤ 25 mm)	Min. 1,25	
			6 (d ≥ 29 mm)	180°	7d (29 ≤ d ≤ 36 mm)		
				90°	9d (d > 36 mm)		
BjTS 550	Min. 550 Maks. 675	Min. 687,5	7 (d ≤ 25 mm)	180°	5d (d ≤ 25 mm)	Min. 1,25	
			6 (d ≥ 29 mm)	180°	7d (29 ≤ d ≤ 36 mm)		
				90°	9d (d > 36 mm)		
BjTS 700	Min. 700 Maks. 825	Min. 805	7 (d ≤ 25 mm)	180°	5d (d ≤ 25 mm)	Min. 1,15	
			6 (d ≥ 29 mm)	180°	7d (29 ≤ d ≤ 36 mm)		
				90°	9d (d > 36 mm)		

### Dimension

According to SNI 2052-2017

Designation	Nominal Diameter (d)	Nominal Area (A)	Height of Knot (H)		Max. Spacing (P)	Max. Gap (T)	Nominal Weight
	(mm)	(mm <sup>2</sup> )	Min	Max	Max.	Max.	
			(mm)	(mm)	(mm)	(mm)	(kg/m)
S 6	6	28	0,3	0,6	4,2	4,7	0,222
S 8	8	50	0,4	0,8	5,6	6,3	0,395
S 10	10	79	0,5	1,0	7,0	7,9	0,617
S 13	13	133	0,7	1,3	9,1	10,2	1,042
S 16	16	201	0,8	1,6	11,2	12,6	1,578
S 19	19	284	1,0	1,9	13,3	14,9	2,226
S 22	22	380	1,1	2,2	15,4	17,3	2,984
S 25	25	491	1,3	2,5	17,5	19,7	3,853
S 29	29	661	1,5	2,9	20,3	22,8	5,185
S 32	32	804	1,6	3,2	22,4	25,1	6,313
S 36	36	1018	1,8	3,6	25,2	28,3	7,990
S 40	40	1257	2,0	4,0	28,0	31,4	9,865
S 50	50	1964	2,5	5,0	35,0	39,3	15,413
S 54	54	2290	2,7	5,4	37,8	42,3	17,978
S 57	57	2552	2,9	5,7	39,9	44,6	20,031



Regular Product

## PLAIN BAR

### Mechanical Properties

According to SNI 2052-2017

Steel Class	Tensile Test			Bend Test		TS/YS Ratio	Color Marking
	Yield TS/YS Strength (YS)	Tensile Strength (TS)	Min Elongation (Min)	Bending Angle	Inside Radius		
	MPa	MPa	%		mm		
BjTP 280	Min. 280	Min. 350	11 (d ≤ 10 mm)	180°	3,5d (d ≤ 16 mm)	-	
	Maks. 405		12 (d ≥ 13 mm)	180°	5d (d ≥ 19 mm)		

### Dimension

According to SNI 2052-2017

Designation	Nominal Diameter (d)	Nominal Area (A)	Nominal Weight
	(mm <sup>2</sup> )	(kg/m)	kg/m
P 6	6	28	0,222
P 8	8	50	0,395
P 10	10	79	0,617
P 12	12	113	0,888
P 14	14	154	1,208
P 16	16	201	1,578
P 19	19	284	2,226
P 22	22	380	2,984
P 25	25	491	3,853
P 28	28	616	4,834
P 32	32	804	6,313
P 36	36	1018	7,990
P 40	40	1257	9,865
P 50	50	1964	15,413



Regular Product



## STEEL SECTIONS

### Chemical Composition

According to SNI

Steel Class	Chemical Composition (%)			
	C	Mn	P	S
Bj P 34	-	-	0.05 max	0.05 max
Bj P 41	-	-	0.05 max	0.05 max
Bj P 50	-	-	0.05 max	0.05 max
Bj P 55	0.30 max	1.60 max	0.04 max	0.04 max

### Mechanical Properties

According to SNI

Steel Class	Tensile Test					Bend Test	
	Minimum Yield Strength kgf/mm <sup>2</sup> (MPa)		Tensile Strength kgf/mm <sup>2</sup> (MPa)	Thickness (mm)	Minimum Elongation (%)	Bending Angle	Inside Radius
	t < 16	16 < t < 16					
Bj P 34 (SS 34)	21 (205)	20 (195)	34 - 44 (330 - 430)	t < 5	26	180°	0.5 x t
				5 < t < 16	21		
				16 < t < 20	26		
Bj P 41 (SS 41)	25 (245)	24 (235)	41 - 52 (400 - 510)	t < 5	21	180°	1.5 x t
				5 < t < 16	17		
				16 < t < 20	21		
Bj P 50 (SS 50)	29 (285)	28 (275)	50 - 62 (490 - 610)	t < 5	19	180°	2 x t
				5 < t < 16	15		
				16 < t < 20	19		
Bj P 55 (SS 55)	41 (400)	40 (390)	55 min (540 min)	t < 5	16	180°	2 x t
				5 < t < 16	13		
				16 < t < 20	17		

SNI 07-2054-2006 : Baja Profil Siku Sama Kaki Proses Canai Panas (Bj P Siku Sama Kaki)

SNI 07-7178-2006 : Baja Profil WF - Beam Proses Canai Panas (Bj P WF - Beam)

SNI 07-0052-2006 : Baja Profil Kanal U Proses Canai Panas (Bj P Kanal U)

SNI 07-0329-2005 : Baja Profil I - Beam Proses Canai Panas (Bj P I - Beam)

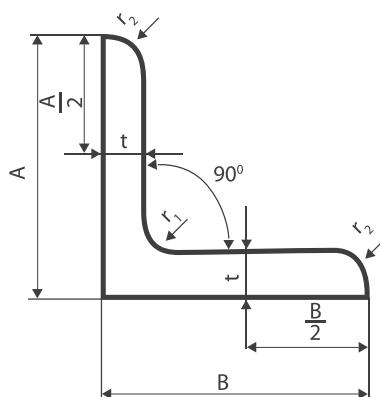
SNI 2610-2011 : Baja Profil H - Beam Proses Canai Panas (Bj P H - Beam)

## EQUAL ANGLE

Steel Class	Dimension (mm)				Sectional Area (cm <sup>2</sup> )	Weight (kg/m)	Geometrical Moment Inertia (cm <sup>4</sup> )		Radius Gyration of Area (cm)		Modulus of Section (cm <sup>3</sup> )	
	A x B	t	r1	r2			I <sub>x</sub>	I <sub>y</sub>	I <sub>x</sub>	I <sub>y</sub>	Z <sub>x</sub>	Z <sub>y</sub>
40 x 40 x 4	40	4	4.5	3.0	3.05	2.39	4.48	4.48	1.21	1.21	1.15	1.15
50 x 50 x 5	50	5	6.5	3.0	4.80	3.77	11.10	11.10	1.52	1.52	3.08	3.08
60 x 60 x 6	6.5	6	6.5	3.0	6.89	5.41	25.50	25.50	1.82	1.82	5.29	5.29
65 x 65 x 6	6.5	6	8.5	4.0	7.52	5.91	29.40	29.40	1.98	1.98	6.26	6.26
70 x 70 x 7	7.0	7	8.5	4.0	9.37	7.40	42.40	42.40	2.12	2.12	8.43	8.43
75 x 75 x 7	7.5	7	8.5	4.0	10.11	7.94	52.40	52.40	2.28	2.28	9.69	9.69
75 x 75 x 8	7.5	8	8.5	4.0	11.47	9.00	58.90	58.90	2.27	2.27	10.97	10.97
80 x 80 x 8	8.0	8	9.0	4.5	12.25	9.61	72.30	72.30	2.43	2.43	12.60	12.60
90 x 90 x 9	9.0	9	10.0	5.0	15.50	12.17	116.00	116.00	2.74	2.74	17.96	17.96
100 x 100 x 8	10.0	8	10.0	7.0	15.36	12.06	129.00	129.00	2.90	2.90	17.70	17.70
100 x 100 x 10	10.0	10	10.0	7.0	19.00	14.90	175.00	175.00	3.04	3.04	24.40	24.40
120 x 120 x 11	12.0	11	13.0	6.5	25.40	19.90	341.00	341.00	3.66	3.66	39.50	39.50
120 x 120 x 12	12.0	12	13.0	6.5	27.50	21.61	368.00	368.00	3.65	3.65	42.70	42.70
130 x 130 x 12	13.0	12	12.1	8.5	29.76	23.40	467.00	467.00	3.96	3.96	49.90	49.90
150 x 150 x 12	15.0	12	14.1	7.0	34.77	27.30	740.00	740.00	4.61	4.61	68.10	68.10
150 x 150 x 15	15.0	15	14.0	10.0	42.74	33.60	888.00	888.00	4.56	4.56	82.60	82.60
200 x 200 x 20	20.	15	17.0	12.0	57.75	45.30	2,180.00	2,180.00	6.14	6.14	150.00	150.00



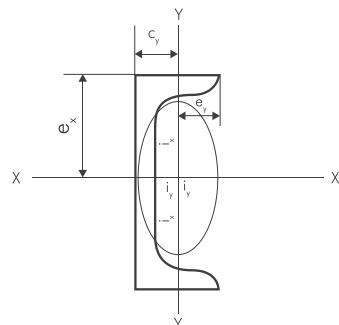
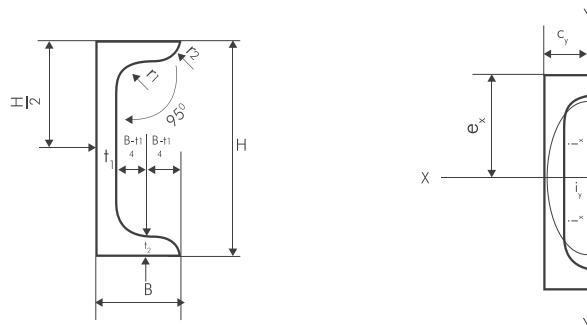
Regular Product



## CHANNEL

According to SNI 0052-2017

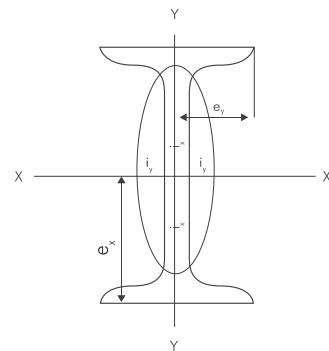
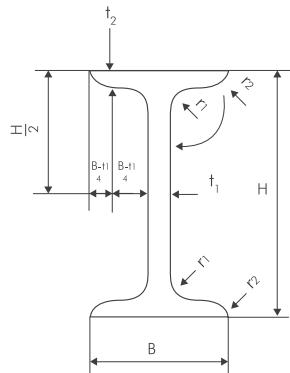
Steel Class	Dimension (mm)						Sectional Area (cm <sup>2</sup> )	Weight (kg/m)	Geometrical Moment Inertia (cm <sup>4</sup> )		Radius Gyration of Area (cm)		Modulus of Section (cm <sup>3</sup> )	
	H	B	t <sub>1</sub>	t <sub>2</sub>	r <sub>1</sub>	r <sub>2</sub>			I <sub>x</sub>	I <sub>y</sub>	I <sub>x</sub>	I <sub>y</sub>	Z <sub>x</sub>	Z <sub>y</sub>
100 x 50 x 5	100	50	5.0	7.5	8.0	4.0	11.92	9.36	188	26.0	3.97	1.48	37.60	7.52
120 x 55 x 7	120	55	7.0	9.0	9.0	4.5	17.00	13.40	364	43.2	4.62	1.59	60.70	11.12
150 x 75 x 6.5	150	75	6.5	10.0	10.0	5.0	23.71	18.60	861	117	6.03	2.22	115.00	22.40
180 x 75 x 7	180	75	7.0	10.5	11.0	5.5	27.20	21.40	1,380	131	7.12	2.19	153.00	24.30
200 x 80 x 7.5	200	80	7.5	11.0	12.0	6.0	31.33	24.60	1,950	168	7.88	2.32	195.00	29.10
250 x 90 x 9	250	90	9.0	13.0	14.0	7.0	44.07	34.60	4,180	294	9.74	2.58	334.00	44.50



## I Beam

According to SNI 07-0329-2005

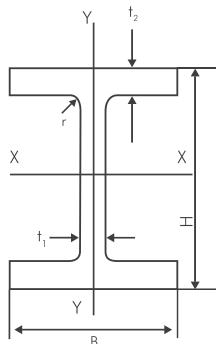
Steel Class	Dimension (mm)						Sectional Area (cm <sup>2</sup> )	Weight (kg/m)	Geometrical Moment Inertia (cm <sup>4</sup> )		Radius Gyration of Area (cm)		Modulus of Section (cm <sup>3</sup> )	
	H	B	t <sub>1</sub>	t <sub>2</sub>	r <sub>1</sub>	r <sub>2</sub>			I <sub>x</sub>	I <sub>y</sub>	I <sub>x</sub>	I <sub>y</sub>	Z <sub>x</sub>	Z <sub>y</sub>
100 x 50 x 4.5	100	50	4.5	6.8	4.5	2.7	10.60	8.34	171.0	12.2	4.01	1.07	34.20	4.88
125 x 75 x 5	125	75	5	9.5	9.0	4.5	20.50	16.10	538.0	57.5	5.13	1.68	86.00	15.30
150 x 75 x 5.5	150	75	5.5	9.5	9	4.5	21.83	17.10	819.0	57.5	6.12	1.62	109.00	18.30
180 x 100 x 6	180	100	6	10	10	5	30.06	23.60	1,670.0	138.0	7.45	2.114	186.00	27.50
200 x 90 x 7.5	200	90	7.5	11.3	7.5	4.5	33.40	26.20	2,140.0	117.0	8.00	1.87	210.00	26.00



## WF BEAM

According to SNI 07-7178-2006

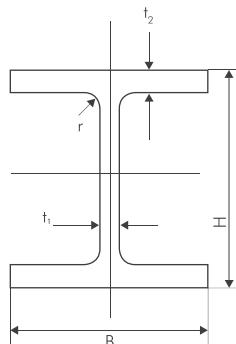
Steel Class	Dimension (mm)					Sectional Area (cm <sup>2</sup> )	Weight (kg/m)	Geometrical Moment Inertia (cm <sup>4</sup> )		Radius Gyration of Area (cm)		Modulus of Section (cm <sup>3</sup> )	
	H	B	t <sub>1</sub>	t <sub>2</sub>	r			I <sub>x</sub>	I <sub>y</sub>	I <sub>x</sub>	I <sub>y</sub>	Z <sub>x</sub>	Z <sub>y</sub>
Nominal													
100 x 50 x 5	100	50	5.0	7.0	8.0	11.84	9.30	187	14.8	3.93	1.12	37.50	5.91
125 x 60 x 6	125	60	6.0	8.0	9.0	16.84	13.20	413	29.2	4.95	1.13	66.10	9.73
150 x 75 x 5	150	75	5.0	7.0	8.0	17.85	14.00	666	49.5	6.11	1.66	88.80	13.20
150 x 75 x 6	150	75	6.0	9.0	11.0	26.80	21.10	1,020.0	151	6.20	2.40	138.00	30.10
200 x 100 x 4.5	200	100	4.5	7.0	11.0	23.18	18.20	1,580	114	8.26	2.21	160.00	23.00
200 x 100 x 5.5	200	100	5.5	8.0	11.0	27.16	21.23	1,840	134	8.24	2.22	184.00	26.80
200 x 150 x 6	200	150	6.0	9.0	13.0	39.01	30.60	2,690	507	8.30	3.61	277.00	67.60
250 x 125 x 5	250	125	5.0	9.0	12.0	32.68	25.70	3,540	255	10.40	2.70	285.00	41.10
250 x 125 x 6	250	125	6.0	9.0	12.0	37.66	29.60	4,050	294	10.40	2.79	324.00	47.00
350 x 175 x 7	350	175	7.0	11.0	14.0	63.14	49.60	13,600	984	14.70	3.95	775.00	112.00
400 x 200 x 8	400	200	8.0	13.0	16.0	84.10	66.00	23,700	1,740	16.80	4.51	1,190.00	174.00



## H Beam

According to SNI 2610-2011

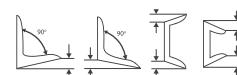
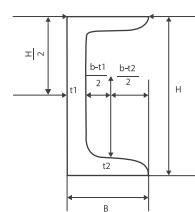
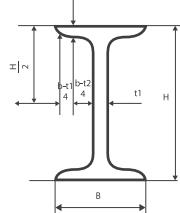
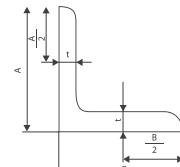
Steel Class	Dimension (mm)					Sectional Area (cm <sup>2</sup> )	Weight (kg/m)	Geometrical Moment Inertia (cm <sup>4</sup> )		Radius Gyration of Area (cm)		Modulus of Section (cm <sup>3</sup> )	
	H	B	t <sub>1</sub>	t <sub>2</sub>	r			I <sub>x</sub>	I <sub>y</sub>	I <sub>x</sub>	I <sub>y</sub>	Z <sub>x</sub>	Z <sub>y</sub>
Nominal													
100 x 100 x 6	100	100	6.0	8.0	8.0	21.59	16.90	378	134	4.18	2.49	75.6	26.7
125 x 125 x 6.5	125	125	6.5	9.0	8.0	30.00	23.60	839	293	5.29	3.13	134.0	46.9
150 x 150 x 7	150	150	7.0	10.0	8.0	39.65	31.10	1,620	563	6.40	3.77	216.0	75.1
175 x 175 x 7.5	175	175	7.5	11.0	13.0	51.43	40.40	2,900	984	7.50	4.37	331.0	112.0
200 x 200 x 8	200	200	8.0	12.0	13.0	63.53	49.90	4,720	1,600	8.62	5.02	472.0	160.0



## TOLERANCE OF EQUAL ANGLE, U CHANNEL, AND I BEAM

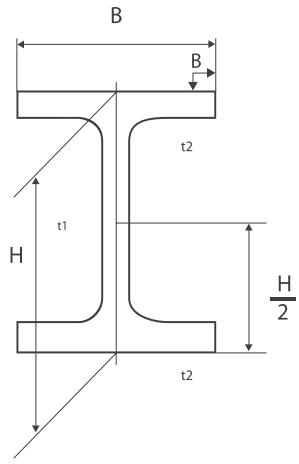
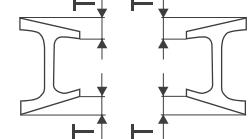
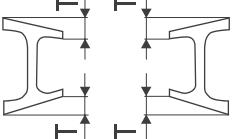
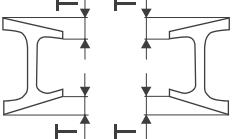
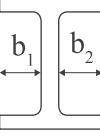
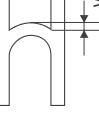
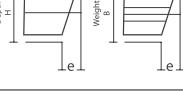
Unit : mm

Dimension		Tolerance	Remarks
Leg Length (A or B)	A < 50	+ 1.5	
	50 < A < 100	+ 2.0	
	100 < A < 200	+ 3.0	
	A > 200	+ 4.0	
Depth (H)	H < 100	+ 1.5	
	100 < H < 200	+ 2.0	
	200 < H < 400	+ 3.0	
	H > 400	+ 4.0	
Thickness (t, t1, t2)	For leg length A or under 130 in depth	t < 6.3	+ 0.6
		6.3 < t < 10	+ 0.7
		10 < t < 16	+ 0.8
		t > 16	+ 1.0
	For leg length A or 130 or over in depth	t < 6.3	+ 0.7
		6.3 < t < 10	+ 0.8
		10 < t < 16	+ 1.0
		16 < t < 25	+ 1.2
		t > 25	+ 1.5
Length	7 m or under	+ 40, - 0	
	Over 7 m	Add 5 mm to the plus side tolerance given in the above column for every 1 m increase in lengths or its fraction. The minus side tolerance shall be 0 mm.	
Out of Square (T)	I Section	2.0 % or under of width B	
	Section excluding I	2.5 % or under of width B	
Bend	I Section	0.20 % or under of length	To be applied to bend such as sweep and camber
	Section excluding I	0.30 % or under of length	



## TOLERANCE OF WIDE FLANGE AND H BEAM

Unit : mm

Dimension		Tolerance	Remarks
Width (B)	B < 100	+ 2.0	
	100 < B < 200	+ 2.5	
	B > 200	+ 3.0	
Depth (H)	H < 400	+ 2.0	
	400 < H < 600	+ 3.0	
	H > 600	+ 4.0	
Thickness	Web (t1)	t < 16	+ 0.7
		16 < t < 25	+ 1.0
		25 < t < 40	+ 1.5
		t > 40	+ 2.0
	Flange (t2)	t < 16	+ 1.0
		16 < t < 25	+ 1.5
		25 < t < 40	+ 1.7
		t > 40	+ 2.0
Length	7 m or under	+ 40, - 0	
	Over 7 m	Add 5 mm to the plus side tolerance given in the above column for every 1 m increase in lengths or its fraction. The minus side tolerance shall be 0 mm.	
Out of Square (T)	300 or under in nominal depth	1.0 % or under of width B, provided that 1.5 mm is the maximum	
	Over 300 in nominal depth	1.2 % or under of width B, provided that 1.5 m	
Bend	300 or under in nominal depth	0.15 % or under of length	
	Over 300 in nominal depth	0.10 % or under of length	
Eccentricity (S)	300 or under in nominal depth and 200 or under in nominal width	$\pm 2.5$	$S = \frac{b_1 - b_2}{2}$ 
	300 or under in nominal depth and 200 or under in nominal width	$\pm 3.5$	
Concavity of Web (W)	Under 400 in nominal depth	2	
	400 or over to and excluding 600	2.5	
	600 or over	3	
Sectional Squareness (e.)		1.6 % or under of width B or of depth H, provided that 3.0 mm is the minimum	



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