PetroMaterials

Profile

PetroMaterials (Cangzhou) Co., Ltd is wholly owned by the Japan PetroMaterials Corporation with a total investment of 49.8 million US dollars, of which registered capital is 29.8 million US dollars. The company has nearly 34 acres of land, with buildings area being 56,500 square meters. Rated as a key project in Hebei Province, the company has a drill pipe plant, a drill collar plant, a Metal material test centre and other relevant facilities. It mainly supplies high premium quality OCTG to meet the increasing demand in China, especially some products that the internal market can not satisfy.

The company has two friction weld lines for drill pipe, and the welders of which are Japan-made. There are another two production lines, one for making tool joint, and the other one for processing drill collar. The company has full ability to conduct full length heat treatment on drill collar, heat treatment on weld zone and tool joint, and are able to perform friction welding, ID boring, OD turning, threading, cold rolling on thread roots, make and break, thread anti-galling and more. Our metal material test center is equipped with spectrum analysis instrument made in Germany, metallographic microscope, tensile testing machines, impact and hardness testing machines, heat treatment, magnetic particle detection equipment, ultrasonic detection equipment and more. The company strictly manufactures goods as per API Specifications; it utilizes Japanese techniques and skills, and buys high quality steels from world-renowned mills globally. It has been granted with API certificates, ISO9001 and HSE certificates.

Our primary products are drill pipes, drill collars (spiral, nonmagnetic), heavy weight dill pipes, tool joints, Kelly, pup joints and more. The company can yearly produce 20,000MT of drill pipe, 10,000 pieces of drill collar, and 100,000 sets of tool joint. It can supply premium connections such as PAC, AOH, H90, DSHT and products in accordance with DS-1.

About 120 miles away from Beijing, and just 80 kilometers away from sea port of Xingang, Tianjin, the company is located in a historical town (Qing County) with thousands of years' history. It is easily accessible either through interstate highway or through railway networks. Now Qing is one of the biggest manufacturing bases of OCTG in China.

The company's core principle is "Customer Satisfaction" and "To be deeply involved in the development of oil and gas industry", making every effort to supply our customers with the best products and the best service.

Introduction of PetroMaterials Corporation, investor of our company

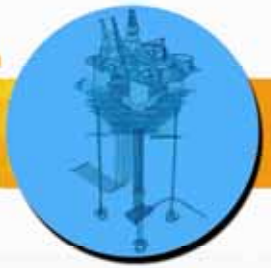
PetroMaterials Corporation (PMC) is headquartered in Tokyo, Japan. It is specialized in manufacturing and trading of drilling products for oil and gas industry. It has a subordinate manufacturing plant in Japan-PMC Wakayama Works which is the only manufacturer in Japan that is able to produce products covering DP, DC, HWDP, Tubing, Casing and Line pipe. Another subordinate manufacturing plant is in Qing County, China-PetroMaterials(Cangzhou)Co., Ltd which is engaged in manufacturing products of DP, Sour-Service DP, Tool Joint, DC, NMDC, HWDP, Tubing & Casing, Kelly, Lifting Sub, Pup Joint, Stabilizer and many other accessories. Further, the corporation has established many joint ventures with local petroleum companies in China and Egypt.

In order to provide the best service and quick response to the needs of customers, PMC has established subsidiary sales companies in Beijing, Tokyo and Houston, USA.

- PetroMaterials (Cangzhou) Co., Ltd.
- PetroMaterials Corporation
- PMC Wakayama works

Our primary products

- Drill Pipe
- UDP
- Drill Collar
- Stabilizer
- Tubing
- Casing



PetroMaterials(Cangzhou)Co., Ltd

Advanced Equipment

Three sets of Japan-made heat treatment lines for tool joint, drill pipe and drill collar.
Two sets of friction welders made in Japan.
CNC Threading Lathes made in Japan .
Precise Instruments for experiment and inspection.

Skilled Management

5S and TPM on-site management system from Japan.
ERP assistant management system.

High Efficiency

Intelligent production and customer management system enables the best delivery of goods.

Fine-selected raw materials

Raw steel materials are sourced from world-renowned mills around the world.

Sophisticated Techniques and Skills

Work team joined by some experienced Japanese experts of drilling products.
World-leading manufacturing technology in drilling products.

High Quality Products

Special Rotary Shoulder Products

Double Shoulder High Torque(DSHT)
PAC
AOH
H90

Quality Control System

- ★ Strict Procedure of Quality Management
- ★ 100% Inspection on incoming raw materials
- ★ Self Check, Mutual Check and Special Check("3 Checks") in whole process of production.
- ★ Strict control on production techniques and procedures.
- ★ The production process and inspection are strictly recorded by both ERP system and manual so as to ensure the correctness of the data.

- ★ Accurate inspection results benefit from precise experiment instruments.
- ★ 100% Non-destructive Test on finished product
- ★ Quality management system ensures 100% qualified products to be delivered to customers. Quality and uniformity of finished products are guaranteed.
- ★ API Quality system, ISO9001 Quality control system and HSE management system are fully carried out in our plants.

API SPEC7

API SPEC 5CT

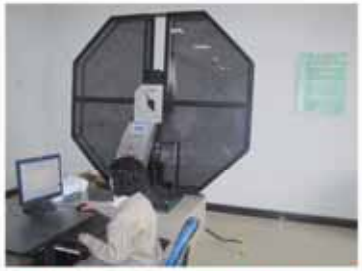
Certificate of ISO9001 Quality Management System granted by DNV

Inspection Instruments

The company has Metal Material Test Center, consisting of Gauge lab, Mechanical property lab, Metallographic lab, Spectrum Lab and Sampling lab.

1、Chemical, Mechanical and Metallographic Inspection

2、 Product Quality Research



ZBC2452 Computerized Automatic Metal Hammer Impact Value Testing Machine

- Max Impact Value：450 J，Pound Speed：5.24 m/s
- Angle of Hammer：150°

600DX Hydraulic pressure servo testing machine

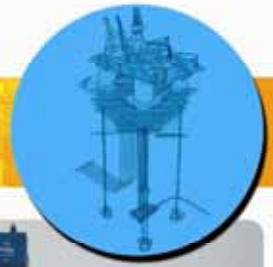
- Loading Capacity：600KN；Max test speed：380mm/min；600KN Max：76mm/min；Returning Speed：380mm/min；
- Max space of tensile test：77－914mm；Compress test space：32－565mm
- measure accuracy of loading：accuracy rate to readable numerical value: ±0.5%
- Measure accuracy：±0.5% of readable numerical value；

LC-200R Full-automatic Rockwell Hardness Tester

- Measure principle and method：sensor feedback electronic loading method/ linearly measure
- preloading：Newton：29.42、98.07
- Main loading：Newton：147.1、294.2、441.3、588.4、980.7、1471
- Time of Hold：0-999秒
- digital display, touchable LCD, sensor feedback electronic loading, accuracy up to 1.01HR

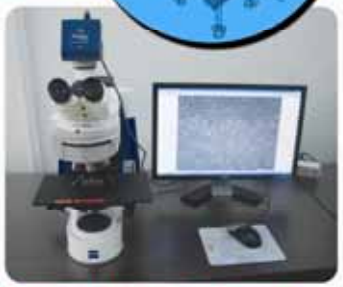
XHB-3000 Digital Brinell Hardness Tester

- Range of Measuring：（8－650）HBW
- Power of Test:612.9N(62.5kgf－ 29400N(3000kgf)
- Accurate mechanical structure and PC control closed cycle system, combining of light, machine and electricity. It is the world most advanced Brinell hardness testing machine. Counterweights are removed from the tester and replaced by automatic electrical loading/unloading testing power. To be feed-backed by pressure sensor with accuracy rate of 0.5‰, lost testing power can be automatically compensated by CPU control system. Pressure Mark can be measured directly on tester through eyepiece micrometer.



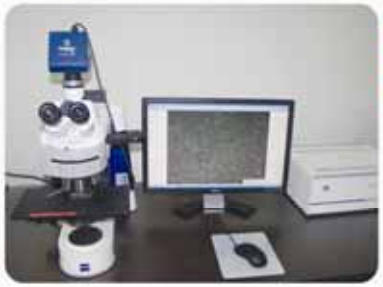
Zeiss Stemi DV4 Microscope

- Times of Enlargement：8 X-64X
- Camera：1.3 Mega Pixels



Axio Imager. A1m Intelligent Microscope

- Times of Enlargement：50-1000X，under brightness
- Camera：3 Mega Pixels

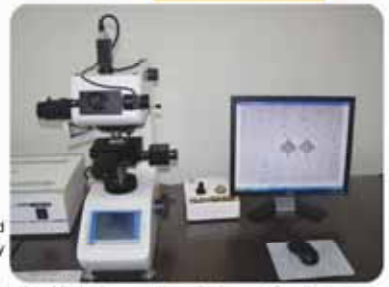


Axio Imager.A1mIntelligent Microscope

- Times of Enlargement：25-1500X，bright field, ADF dark field, and be disturbed
- Camera：5 Mega pixels
- Image Quality：Provide the most contrast , the most lining degree, and the keenest high resolution image

Optical System：up-to-date international standard ICCS optical micro observation

High-grade darkness technology , round polarized technology.

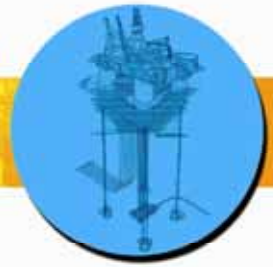


FM-700 Full-automatic Micro hardness Tester

- Max Height of Sample：95mm
- Max Depth of Sample：115mm
- Loading Speed：micron meter per second
- Loading Type：Auto loading/unloading
- FM-700 Full-automatic micro-hardness tester was invented by Japan Future-Tech company in 1995. It has been broadly utilized in many fields such as metallurgy, aviation, electron, machinery, automobile, shipbuilding and more due to its international first-class quality and advanced functions.

ARL4460 Metal Analyzer

- ARL 4460 Metal Analysis instrument is world most advanced, it adopts both patented technologies of CCS and TRS, and combines with unique curve adjustment and self diagnose function. This instrument not only can carry out routine analysis but also can satisfy the special needs of metal variability analysts. The durable physical design and reliable manufacturing engineering ensure this instrument can be working properly under any severe circumstances.



Drill Pipe

The company has imported two integral production lines of friction welding for drill pipe from Japan. Sizes range from 2-3/8" to 6-5/8". Our production capacity of drill pipe with API Standard, Non API Standard and special connections is about 20,000 MT a year.

Green Pipe

The company heat treats and upsets green pipe sourced from Sumitomo Metal Industries Japan at our manufacturing plant in Wakayama, Japan. Seamless green pipe is made from high grade chrome-molybdenum steel. Ends of pipe are upset twice with smooth upset zone to reduce damage to property of pipe body. Our drill pipe product has good fatigue endurance performance and long working life.

The company can provide different grades of drill pipe by controlling mechanical properties during the process of heat treatment.

Chemistry of Green Pipe Body (only applied for G105 and S135)

	C	Si	Mn	P (≤)	S (≤)	Ni (≤)	Cr	Mo	Cu (≤)	S-aL
G	0.25 / 0.3	0.15/0.35	0.7/ 0.9	0.015	0.005	0.2	1.00/ 1.2	0.4/ 0.5	0.2	0.015/0.035
S	0.25/0.31	0.15/0.35	0.7/ 0.9	0.015	0.005	0.2	1.0/ 1.2	0.4/ 0.5	0.2	0.015/0.05

Mechanical Properties

Grade	Yield Strength MPa	Tensile Strength MPa	Elongation %
S135	≥931	≥1000	≥11.5
G105	≥724	≥793	≥13

The company has long and smooth upset zone to achieve high performance of anti-fatigue, anticorrosion and high stability of quality.

Key process control

Friction Welding

The company has two sets of heavy duty friction welders made in Japan. These two welders can optimize parameter of welding by automatic memory of previous parameters to improve the quality of welding lines.

Heat treatment

Induction machine is made in Japan by utilizing middle frequency coil. This machine can automatically adjust temperature, heating time, wind cooling time in order to have a better mechanical property and stable metallography in weld zone.

Quality Inspection

All the data of procedure inspection and final inspection are recorded by ERP online to ensure the traceability. 100% of samples are tested through visual inspection, hardness testing, magnetic particle inspection and ultrasonic inspection to ensure the quality of each batch of drill pipe.

Double Shoulder High Torque (DSHT) Drill Pipe

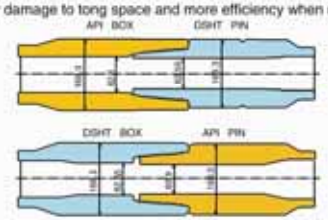
DSHT adopts the design of both inside and outside shoulders, namely one main shoulder on outside, one subsidiary shoulder on inside. So its yield strength is much higher than API Spec 7 connections. Refer to drawing below for details.

DSHT is interchangeable with API Spec 7, and can be directly connected with drill pipe, HWDP, drill collar, stabilizer if they have API Standard connection.

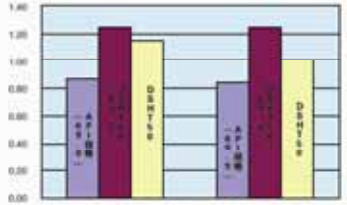
Yield strength of DSHT is much higher than pipe body. Thread stress of DSHT is much lower than API connection. DSHT greatly reduce possibility of cracking and improve the resistance to corrosion and bending. DSHT is much better than API connection in both yield strength and tensile strength. ID of drill pipe can be bigger than API standards if having DSHT connection and bigger ID can reduce pressure of pumping and improve drilling speed.

Key features of DSHT DP:

A. Yield strength on DSHT Pin is increased by 33% than API standard tool joint. Increasing yield strength on Pin can prevent the expansion stress on box.
B. ID of DSHT tool joint can be bigger without reducing tensile strength. Bigger ID increases the flow volume of mud and increase the well depth of drilling.
C. More wear and tear to DSHT tool joint is allowed before replacement compared with API tool joint.
D. Internal flush structure is able to reduce turbulence.
E. To scatter the stress when make-up the tool joint.
F. DSTH is designed to be perfectly interchangeable with API Standard NC connections. Refer to the drawing below for details.
G. Lower damage to tong space and more efficiency when repairing



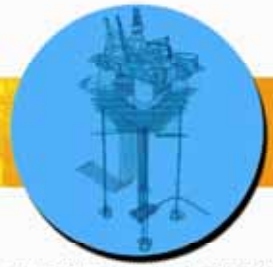
Main reference data (Based on NC50)



T J/tube Tensile Ratio (Ty/Tp)

Item		Dutside Dia of Tool Joint	Inside Dia of Pin Tool Joint	Box Tool Joint	Pin Tool Joint	Tube	Box Tool Joint/Tube	Pin Tool Joint/Tube	Make-up Torque
				Yield Strength	Yield Strength	Yield Strength	Strength Ratio	Strength Ratio	
Symbols		OD	ID	Tyb	Typ	Tp	Tyb/Tp	Typ/Tp	
Unit		mm	mm	ft-lb	ft-lb	ft-lb			ft-lb
S135	API Standard	168	69.9	63,979	62,918	74,100	0.86	0.85	37,751
	DSHT50 API ID	168	69.9	92,537	91,477	74,100	1.25	1.23	54,886
	DSHT50[1]	168	80	85,646	75,348	74,100	1.16	1.02	45,209
	DSHT50[2]	168	82.55	83,700	70,884	74100	1.12	0.96	42,530

Tool joints are made from forgings from Daido Special Steel Japan and Riken Forge Co., Ltd. The company buys high quality steel bars/tubes for drill collar from Daido Special Steel, Japan, Sumitomo Metal Industries, Japan and Timken, USA.



Sour-service Drill Pipe

Along with the increasing of well depth of drilling, the more complex stratum will emerge, especially of the emerging of sulfur stratum which will harmfully impact the safety of well drilling operation. Once hydrogen sulfur emerges, drilling tools would break suddenly in a very short time period and it will be very harmful to well drilling operation. The company uses sour-service steel pipe from Sumitomo Metal Industry Japan to produce sour-service drill pipe and drill collar. From the Table below it can unveil that: Pipe body, tool joint and welding line must be tested against hydrogen sulfur. Yield strength of pipe body, tool joint and welding line is strictly limited between 724MPa-827MPa. Sour-service performance of pipe body and tool joint must be at least of 85% SMYS, and at least 80% SMYS for welding line as per NACE 0177 Spec A.

	Yield Strength	Tensile strength	Impact Value	Anti-Sulfur
	MPa	MPa	J	performance
Pipe Body	724 ~ 827	≥793	≥90	85%SMYS
Tool joint	724 ~ 827	≥793	≥90	85%SMYS
Welding line	724 ~ 827	≥793	≥80	80%SMYS

Drill pipe as per NS-1

The company has researched and developed drill pipe as per NS-1 for international market. So far the company is preparing certification. European standards primarily require the length of drill pipe to be range 3 and longer upset zone than API requirements. European standards requires low temperature impact value for pipe body, tool joint and welding zone, and also have more strict technical requirements on hardbanding and internal plastic coating for drill pipe. All these special requirements are designed for the well drilling operation under arctic-alpine environment and complex geographic stratum in Europe.

Trenchless (API) Drill Pipe

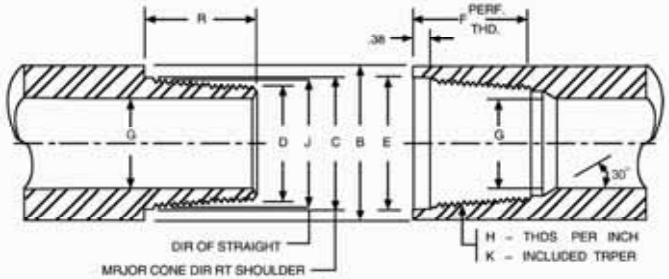
The trenchless drill pipe has higher yield strength and higher tensile strength than normal API drill pipe, but has smaller radius of curvature.

DSHT drill pipe has good performance in directional well drilling. The DSHT drill pipes have been successfully used under many different harsh environmental conditions.

P.A.C.

PAC is the abbreviation of Pacific Asia Connection. It is a special connection for drill pipe with smaller OD, shorter thread teeth and longer connection. PAC has significant advantage on drilling, repairing and fishing in smaller well holes.

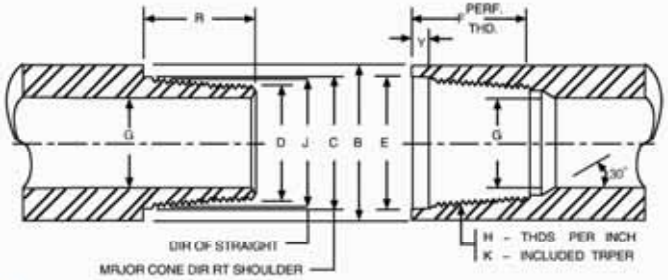
	A	B	C	D	E	F	G	H	J	K
SIZE	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in.)	TPI	(in.)	TPF
2-3/8	2-3/8	2-7/8	2-23/64	2-1/16	2-27/64	2-1/2	1-3/8	4	2-5/16	1-1/2
2-7/8	2-3/8	3-1/8	2-17/32	2-15/64	2-19/32	2-1/2	1-1/2	4	2-31/64	1-1/2
3-1/2	3-1/4	3-3/4	3-3/64	2-41/64	3-7/64	3-3/8	2	4	3	1-1/2



A.O.H

AOH is the abbreviation of American Open Hole, which is similar with PAC connection and has been widely used in Europe and America.

SIZE	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	F (in.)	G (in.)	H TPI	J (in.)	K TPF	Y (in.)
2-3/8	2-3/8	3-1/4	2-3/4	2-29/64	2-13/16	2-1/2	1-13/16	4	2-45/64	1-1/2	3/8
2-7/8	2-7/8	3-7/8	3-9/64	2-25/32	3-7/32	3	2.151	4	3-7/64	1-1/2	3/8
3-1/2	3-1/4	4-3/4	3-57/64	3-31/64	3-61/64	3-3/8	2-11/16	4	3-27/32	1-1/2	5/8
4	4	5-1/2	4-37/64	4-5/64	4-41/64	4-1/8	3-1/4	4	4-17/32	1-1/2	5/8



Hardbanding

The company highly recommends Japanese HB9000 series hardbanding products, which can provide effective protection to tool joint and magnificently reduce the damage to casing. It can also hardband ARNCO 100XT, ARNCO 200XT and ARNCO 300XT, Tungsten and TCS8000 as well.

Tool joint plant

Tool joint is an important tool to connect up drill pipes; however, it is one of the weakest part of a drill stem because it has to bear alternating tensile stress and alternating torque during the whole process of well drilling. Thus requirements of best wear resistance, best welding and best mechanical properties are highly important to tool joints. Our tool joint possesses high accuracy of machining and smooth surface in addition to the features above.

Key Processes

Heat Treatment: A key process to control mechanical properties of materials. In order to achieve best mechanical properties we installed roller-type heating furnace made in Japan to quench and temper blank tool joints. Quenching medium we use is the high quality quenching liquid from Germany.

Threading: Japanese CNC lathe delivers better accuracy and efficiency on process of threading. Cutting tools source from world-renowned brands such as Sandvik, Kenna, Toshiba and STeck. Experienced Japanese experts of threading provide supervision and guidance on threading to ensure threading quality.

Raw materials: Sourced from good quality billets with stable chemistry and mechanical properties made in Daido Special Steel Japan, Sumitomo Metal Industries Japan and Timken USA.

Inspection Instruments: Full sets of gauges for NC, REG, FH, PAC, AOH, H90 and more.

High precise gauge made in Japan to measure in order to ensure every single value of thread.

The company has automatic testing machines and hardness device. Experienced Japanese experts in heat treatment work all the year round to ensure the quality of products.

Charpy Impact Value (21C)

Dimension of sample	Single (J)	Average (J)
10 x 10	≥70	≥80

Special Features:

The company has full sets of equipments to produce premium connections such as PAC, AOH and more in addition to API connections.
Our self-designed DSHT tool joint has significant leading advantages than similar products of others.

The company can phosphate-coat or copper-coat on tool joint at option of customer.

Mechanical property of tool joint

Standard	Tensile strength	Yield strength	Elongation	Brinell hardness
API Spec7	≥965.3	≥827.4	≥13	≥285
SY/T 5290-2000	≥965	≥827	≥13	≥285

HWDP, Kelly, Drill Collar and Accessories

- ★ Annual production capacity of drill collar (slick, spiral, nonmagnetic), HWDP and Kelly is up to 10,000 pieces.
- ★ Deep hole opening with 1-1/4" ID ~ 6" ID.
- ★ The company has ability to produce PAC, AOH, DSTH connections in addition to API connections such as NC, REG, IF, FH. It is able to process stress relief groove, cold rolling on threads roots, spirals, phosphate-coating or copper coating, hardbanding and more.
- ★ Raw materials are sourced from Sumitomo Metal Industries Japan, Daido Special Steel Japan and Timken USA according to our technical requirements. All raw materials are processed by advanced heat treatment facilities for quenching and tempering with stable and uniform chemistry and mechanical properties.

Key process control

Full length heat treatment on drill collar

- Steel bar/tube are quenched and tempered by barrel-shaped furnace made in Japan. Bars/tubes keep rolling during the whole process of heat treat with perfect uniformity of temperature. Water cooling can have a good uniformity on hardness and a high intensity.
- Full length heat treatment can greatly improve tensile and impact value and uniform mechanical properties.
- Full length Non-destructive Detection.
- Impact value of 80J is guaranteed through full length heat treatment.

Equipments for Drill Collar

Trepanning with high efficiency and precision by utilizing Japanese techniques and skills.

High precision CNC lathe can precisely manufacture thread and stress relief groove for pin and box tool joint.

Raw materials

The company uses AISI 4145H or AISI 4145M alloy steel sourced from Sumitomo Metals Japan, Daido Special Steel Japan and Timken USA as per our technical requirements. All the materials are heat treated in full length with best material quality.

Manufacturer	Grade	C	Si	Mn	P	S	Ni	Cr	Mo	Cu
AISI	4145	0.43/0.48	0.15/0.35	0.75/1.0	0.05	0.04	0.8/1.1	0.15/0.25	0.2	
SAE	4145	0.43/0.48	0.15/0.35	0.75/1.0	0.035	0.04	0.8/1.1	0.15/0.25	0.2	
AS TM	4145	0.43/0.48	0.15/0.35	0.75/1.0	0.035	0.04	0.8/1.1	0.15/0.25	0.2	
AS TM	4145H	0.42.0.49	0.15/0.35	0.65/1.1				0.75/1.2	0.15/0.25	
TIMKEN	4145M	0.44/0.47	0.15/0.35	1.05/1.15	0.02	0.015	0.25	1.1/1.2	0.22/0.35	0.3

Primary Products: Refer to attached sheet for sizes

Slick Drill Collar The company can produce from 2-7/8" OD to 14" OD drill collar with API, Non API, or special connections such as AOH, PAC, DSHT and more.

Spiral Drill Collar The company can produce three right-hand spiral grooves on drill collar. Spiral grooves decrease the volume of contact between well side and pipe, and it leads to reduce the occurrence of differential pressure sticking. The weight of spiral drill collar is 4% less than slick drill collar if same size. Spiral drill collar can be divided into Type Ⅰ and Type Ⅱ according to spiral grooves.

Nonmagnetic drill collar The company has the ability to process nonmagnetic drill collar, and raw materials are from Daido Special Steel Japan or other mills. Our nonmagnetic drill collars have low permeability and great mechanical properties. Its hardness, tensile strength, impact value, and anti-corrosion are strictly satisfied with relevant standards.

Permeability(Magnetic strength= $1 \times 10^5/4\pi$ A/m)

Maximum: 1.010

Deviation from magnetic field:

Maximum: $B_t \leq \pm 0.05\mu T$

Heavy Weight Drill Pipe

HWDP is similar to drill pipe, but with bigger wall thickness and much longer tool joints. Its wall thickness is less than drill collar. HWDP is primarily used to connect drill pipe and drill collar to reduce the fatigue of drill pipe. HWDP can increase the drilling speed under the condition of low torque, and reduce the damage and abrasion to drill stem. HWDP also reduces the contact volume between pipe and well side and decreases the occurrence of different pressure sticking. HWDP includes welded HWDP and Integral HWDP.

The company produces customized HWDP by using steel from renowned mills all over the world.

The company can produce API standard or Non-API standard HWDP range from 2-7/8" OD to 6-5/8" OD.

Mechanical Property of Integral HWDP

Yield Strength Mpa	Tensile Strength Mpa	Elongation (%)	Hardness	Charpy Impact Value
≥758	≥964	≥13	285 - 341	≥54

Mechanical Property of Welded HWDP

Yield Strength Mpa	Tensile Strength Mpa	Elongation (%)
≥379	≥655	≥18

Spiral Heavy Weight Drill Pipe

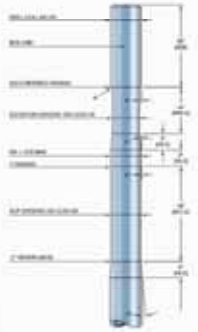
Spiral HWDP is primarily used in directional drilling. Its spiral grooves reduce the contact volume between pipe and well side and decrease the occurrence of different pressure sticking. Spiral HWDP can deliver more torque to drill stem. It can greatly reduce the cost of well drilling and increase drilling efficiency.

(1) Slip and Elevator recesses

The company can process slip and elevator recesses on drill collar.

Slip and Elevator recesses can improve handling efficiency and safety without using lifter and clipper.Refer to drawing for Slip and Elevator Recesses:

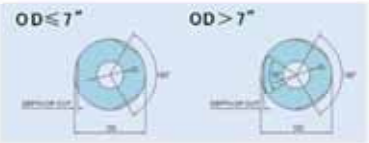
Drill Collar OD
BOX
Cold processing radius
Slip recess, OD less than 2A
OD+1/16inch Max
1 inch radius
Elevator recess, OD less than 2B
2inch radius(5.8mm)



(2)Spiral groove

Spiral grooves reduce the contact volume between drill collar and well side and decrease the occurrence of different pressure sticking.

The space of approximately 20 inch (508mm) are not be grooved starting from the shoulder of both box and pin.



(3) Thread

Stress-release groove

The company can produce customized stress relief groove as per API Spec 7, which can improve resistance to fatigue during well drilling operation. Thus we highly recommend it to our customers.

Stress release groove can greatly reduce the concentration of stress on box, and effectively reduce the damage to box.

Cold rolling on thread roots

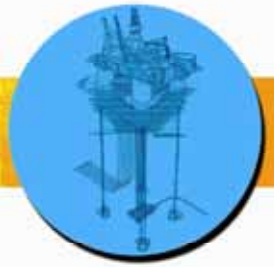
The company can provide cold rolling on thread roots, which can minimize the residue stress and reduce fatigue.

Anti-galling treatment

All connections are phosphate-coated to improve resistance to corrosion during well operation.

(4) Hardbanding

Hardbanding can increase the usage life of drill collar. The company can perform hardbanding with ARNCO 100XT, ARNCO 200XT, ARNCO 300XT, HB9000 and TCS8000 at customer's option.



Kelly

The company can produce Square Kelly of 2-1/2" OD- 5-1/4" OD, and Hexagonal Kelly of 3" OD-6" OD.

Accessories of drill stem

The company can produce accessories at quantity of different size and length.

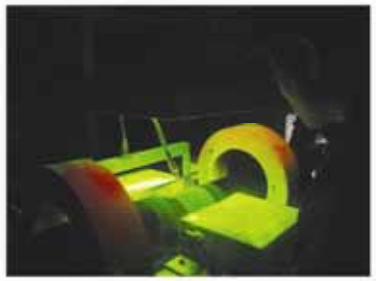
Short Drill pipe Short drill pipe can be produced by using the steel for drill pipe or drill collar.

Pup joint Pup joint is made from AISI 4145 same as the steel for drill collar. All too joints are phosphated to improve the resistance to corrosion. The company can produce customized length in addition to normal length of 5ft, 10ft, 15ft and 20ft according to the specifications of API standards.

Cross-over sub Cross-over sub is made from AISI 4145 same as the steel for drill collar and strictly processed as per API Spec 7. It has four types: same diameter, different diameter, left-hand thread, and right-hand thread.

Lifting Sub Lifting Sub is made from AISI 4145 same as the steel for drill collar.

Good combination performance (Good balance between higher hardness and higher tensile strength)
Good hardenability (metallography and mechanical property is good and uniform on entire cross section.
Good tempering stability (Higher tempering temperature can greatly reduce internal stress and improve tensile strength.)
Smaller brittleness tendency of tempering (Tensile strength will not be lowered during slow tempering).
Smaller tendency of cold brittleness (Tensile strength will not be lowered at room temperature or even below 0 temperature).



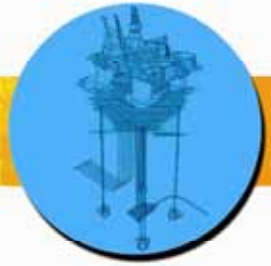
Drill Pipe

Range of Size	2-3/8" - 6-5/8"
Grade	E75、X95、G105、S135、
Type of Upset	IU、EU、IEU、

Available Sizes and Grades

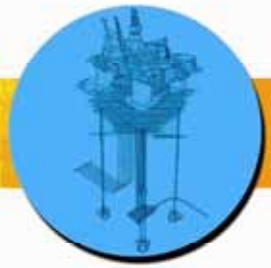
Size	Weight Designation	Calculated Plain-End Weight		Outside Diameter		Wall Thickness		Grade	Type of Opset		
									Int.Upset	Ext.Upset	Int.-Ext.Upset
in	lb/ft	lb/ft	kg/m	in	mm	in	mm		IU	EU	IEU
2 3/8	6.65	6.27	9.33	2.375	60.3	0.280	7.11	E, X, G, S	-	○	-
2 7/8	10.40	9.72	14.47	2.875	73.0	0.362	9.19	E, X, G, S	○	○	-
3 1/2	9.50	8.81	13.12	3.500	88.9	0.254	6.45	E	○	○	-
	13.30	12.32	18.34	3.500	88.9	0.368	9.35	E, X, G, S	○	○	-
	15.50	14.64	21.79	3.500	88.9	0.449	11.40	E	○	○	-
	15.50	14.64	21.79	3.500	88.9	0.449	11.40	X, G, S	-	○	▲
4	14.00	12.95	19.27	4.000	101.6	0.330	8.38	E, X, G, S	○	○	-
4 1/2	13.75	12.25	18.23	4.500	114.3	0.271	6.88	E	○	○	-
	16.60	15.00	22.32	4.500	114.3	0.337	8.56	E, X, G, S	-	○	○
	20.00	18.71	27.84	4.500	114.3	0.430	10.92	E, X, G, S	-	○	○
5	16.25	14.88	22.16	5.000	127.0	0.296	7.52	X, G, S	○	-	-
	19.50	17.95	26.70	5.000	127.0	0.362	9.19	E	-	-	○
	19.50	17.95	26.70	5.000	127.0	0.362	9.19	X, G, S	-	▲	○
	25.60	24.05	35.80	5.000	127.0	0.500	12.70	E	-	-	○
	25.60	24.05	35.80	5.000	127.0	0.500	12.70	X, G, S	-	▲	○
5 1/2	21.90	19.83	29.52	5.500	139.7	0.361	9.17	E, X, G, S	-	-	○
	24.70	22.56	33.57	5.500	139.7	0.415	10.54	E, X, G, S	-	-	○
6 5/8	25.20	22.21	33.04	6.625	168.3	0.330	8.38	E, X, G, S	-	-	○
	27.72	24.24	36.06	6.625	168.3	0.362	9.19	E, X, G, S	-	-	○

○: For All Grades ▲: For Grades X, G, S



Size of Tool Joint

Drill Pipe				Tool Joint								
Tool Joint Designations	Size and Style	Nom Wt.b kg/m	Grade	Outside Dia of Pin and Box ± 0.8	Inside Dia of Pin and Pin ± 0.4–0.8	Bevel Dia of Pin and Box Shoulder ± 0.4	Total Length Tool Joint Pin ± 6.4–9.5	Pin Tong Space ± 6.4	Box Tong Space ± 6.4	Combined Length of Pin and Box ± 12.7	Dia of Pin at Elevator Upset	Torsional Ratio Pin to Drill Pipe
NC26	23/8 EU	9.9	E75	85.7	44.45	82.95	254	177.8	203.2	381	65.09	1.1
				85.7	45.45	82.95	254	177.8	203.2	381	65.09	0.87
				85.7	45.45	82.95	254	177.8	203.2	381	65.09	0.79
NC31	27/8 EU	15.49	E75	104.8	53.98	100.41	266.7	177.8	228.6	406.4	80.96	1.03
			X95	104.8	50.8	100.41	266.7	177.8	228.6	406.4	80.96	0.9
			G105	104.8	50.8	100.41	266.7	177.8	228.6	406.4	80.96	0.82
			S135	111.1	41.28	100.41	266.7	177.8	228.6	406.4	80.96	0.82
NC38	31/2 EU	14.15	E75	120.7	68.26	116.28	292.1	203.2	266.7	469.9	98.43	0.91
NC38	31/2 EU	19.81	E75	120.7	68.26	116.28	304.8	203.2	266.7	469.9	98.43	0.98
			X95	127	65.09	116.28	304.8	203.2	266.7	469.9	98.43	0.87
			G105	127	61.91	116.28	304.8	203.2	266.7	469.9	98.43	0.86
			S135	127	53.98	116.28	304.8	203.2	266.7	469.9	98.43	0.8
NC38			E75	127	65.09	116.28	304.8	203.2	266.7	469.9	98.43	0.97
			X95	127	61.91	116.28	304.8	203.2	266.7	469.9	98.43	0.83
			G105	127	53.98	116.28	304.8	203.2	266.7	469.9	98.43	0.9
NC40	31/2 EU	23.09	S135	139.7	57.15	127.4	292.1	177.8	254	431.8	98.43	0.87
	4 IU	20.85	E75	133.4	71.44	127.4	292.1	177.8	254	431.8	106.36	1.01
			X95	133.4	68.26	127.4	292.1	177.8	254	431.8	106.36	0.86
			G105	139.7	61.91	127.4	292.1	177.8	254	431.8	106.36	0.93
			S135	139.7	50.8	127.4	292.1	177.8	254	431.8	106.36	0.87
NC46	4 EU	20.85	E75	152.4	82.55	145.26	292.1	177.8	254	431.8	114.3	1.43
			X95	152.4	82.55	145.26	292.1	177.8	254	431.8	114.3	1.13
			G105	152.4	82.55	145.26	292.1	177.8	254	431.8	114.3	1.02
			S135	152.4	76.2	145.26	292.1	177.8	254	431.8	114.3	0.94
	41/2 IU	20.48	E75	152.4	85.73	145.26	292.1	177.8	254	431.8	119.06	1.2
	41/2 IEU	24.73	E75	158.8	82.55	145.26	292.1	177.8	254	431.8	119.06	1.09
			X95	158.8	76.2	145.26	292.1	177.8	254	431.8	119.06	1.01
			G105	158.8	76.2	145.26	292.1	177.8	254	431.8	119.06	0.91
			S135	158.8	69.85	145.26	292.1	177.8	254	431.8	119.06	0.81
	41/2 IEU	29.79	E75	158.75	76.2	145.3	292.1	177.8	254	431.8	119.07	1.07
			X95	158.75	69.85	145.3	292.1	177.8	254	431.8	119.07	0.96
NC46	41/2 IEU	29.79	G105	158.75	63.5	145.3	292.1	177.8	254	431.8	119.07	0.96
			S135	158.75	57.15	145.3	292.1	177.8	254	431.8	119.07	0.81
NC50	41/2 EU	20.48	E75	168.28	95.25	154	292.1	177.8	254	431.8	127	1.32
	41/2 EU	24.73	E75	168.28	95.25	154	292.1	177.8	254	431.8	127	1.23
			X95	168.28	95.25	154	292.1	177.8	254	431.8	127	0.97
			G105	168.28	95.25	154	292.1	177.8	254	431.8	127	0.88
			S135	168.28	88.9	154	292.1	177.8	254	431.8	127	0.81
	41/2 FU	29.79	E75	168.28	92.08	154	292.1	177.8	254	431.8	127	1.02
			X95	168.28	88.9	154	292.1	177.8	254	431.8	127	0.96
			G105	168.28	88.9	154	292.1	177.8	254	431.8	127	0.86
			S135	168.28	76.2	154	292.1	177.8	254	431.8	127	0.87
	5 IEU	29.05	E75	168.28	95.25	154	292.1	177.8	254	431.8	130.18	0.92
			X95	168.28	88.90	154	292.1	177.8	254	431.8	130.18	0.86
			G105	168.28	82.55	154	292.1	177.8	254	431.8	130.18	0.89
			S135	168.28	69.85	154	292.1	177.8	254	431.8	130.18	0.86
	5 IEU	38.13	E75	168.28	88.90	154	292.1	177.8	254	431.8	130.18	0.86
			X95	168.28	76.20	154	292.1	177.8	254	431.8	130.18	0.86
			G105	168.28	69.85	154	292.1	177.8	254	431.8	130.18	0.87
51/2 FH	5 IEU	29.05	E75	177.8	95.25	170.7	330.2	203.2	254	457.2	130.18	1.53
			X95	177.8	95.25	170.7	330.2	203.2	254	457.2	130.18	1.21
			G105	177.8	95.25	170.7	330.2	203.2	254	457.2	130.18	1.09
			S135	184.15	88.9	180.2	330.2	203.2	254	457.2	130.18	0.98
	5 IEU	38.13	E75	177.8	88.9	170.7	330.2	203.2	254	457.2	130.18	1.21
			X95	177.8	88.9	170.7	330.2	203.2	254	457.2	130.18	0.95
			G105	184.15	88.9	170.7	330.2	203.2	254	457.2	130.18	0.99
			S135	184.15	82.55	170.7	330.2	203.2	254	457.2	130.18	0.83
	51/2 IEU	32.62	E75	177.8	101.6	170.7	330.2	203.2	254	457.2	144.46	1.11
			X95	177.8	95.25	170.7	330.2	203.2	254	457.2	144.46	0.98
			G105	184.15	88.9	170.7	330.2	203.2	254	457.2	144.46	1.02
			S135	190.5	76.2	170.7	330.2	203.2	254	457.2	144.46	0.96
	51/2 IEU	36.79	E75	177.8	101.6	170.7	330.2	203.2	254	457.2	144.46	0.99
			X95	184.15	88.9	170.7	330.2	203.2	254	457.2	144.46	1.01
			G105	184.15	88.9	170.7	330.2	203.2	254	457.2	144.46	0.92
			S135	190.5	76.2	180.2	330.2	203.2	254	457.2	144.46	0.86



Drill Collar

Available Sizes and Grades

Drill Collar Number	Outside Diameter D inch (mm)	Bore Diameter d inch (mm)	B.S.R Round Number	Lehgth,ft ±6in	Tensile Strength Yield Strength (0.25% offset)	Tensile Strength	Elongation	Impact Value Charpy V	Hardness Brinnell
				ft					
NC23-31	31/8 (79.4)	11/4 (31.8)	2.57 : 1	30					
NC26-35 (2-3/8 IF)	31/2 (88.9)	11/2 (38.1)	2.42 : 1	30					
NC31-41 (2 7/8 IF)	41/4 (104.8)	2 (50.8)	2.43 : 1	30 or 31					
NC35-47	43/4 (120.7)	2 (50.8)	2.58 : 1	30 or 31					
NC38-50 (3 1/2 IF)	5 (127.0)	21/4 (57.2)	2.38 : 1	30 or 31					
NC44-60	6 (152.4)	21/4 (57.2)	2.49 : 1	30 or 31	min. 110000 psi (≥77.3kgf/mm²) (≥758Mpa)	min. 140000 psi (≥98.4kgf/mm²) (≥965Mpa)	min. 13%	min.59 ft·lb (≥8.1 kg·m)	285 ~ 341
NC44-60	6 (152.4)	213/16 (71.4)	2.84 : 1	30 or 31					
NC44-62	61/4 (158.8)	21/4 (57.2)	2.91 : 1	30 or 31					
NC46-62 (4 IF)	61/4 (158.8)	213/16 (71.4)	2.63 : 1	30 or 31					
NC46-65 (4 IF)	61/2 (165.1)	21/4 (57.2)	2.76 : 1	30 or 31					
NC46-65 (4 IF)	61/2 (165.1)	213/16 (71.4)	3.05 : 1	30 or 31					
NC46-67 (4 IF)	63/4 (171.5)	21/4 (57.2)	3.18 : 1	30 or 31					
NC50-67 (4 1/2 IF)	63/4 (171.5)	213/16 (71.4)	2.37 : 1	30 or 31					
NC50-70 (4 1/2 IF)	7 (177.8)	21/4 (57.2)	2.54 : 1	30 or 31					
NC50-70 (4 1/2 IF)	7 (177.8)	213/16 (71.4)	2.27 : 1	30 or 31					
NC50-72 (4 1/2 IF)	71/4 (184.2)	213/16 (71.4)	3.12 : 1	30 or 31					
NC56-77	73/4 (196.9)	213/16 (71.4)	2.70 : 1	30 or 31					
NC56-80	8 (203.2)	213/16 (71.4)	3.02 : 1	30 or 31	min. 100,000 psi (≥70.3kgf/mm²) (≥689Mpa)	min. 135,000 psi (≥94.9kgf/mm²) (≥931Mpa)	min. 13%	min.59 ft·lb (≥8.1 kg·m)	285 ~ 341
65/8REG	81/4 (209.6)	213/16 (71.4)	2.93 : 1	30 or 31					
NC61-90	9 (228.6)	213/16 (71.4)	3.17 : 1	30 or 31					
75/8REG	91/2 (241.3)	3 (76.2)	2.81 : 1	30 or 31					
NC70-97	93/4 (247.7)	3 (76.2)	2.57 : 1	30 or 31					
NC70-100	10 (254.0)	3 (76.2)	2.81 : 1	30 or 31					
85/8 REG	11 (279.4)	3 (76.2)	2.84 : 1	30 or 31					

Heavy Weight Drill Pipe

Range of Size	2-7/8" - 6-5/8"
Material	AISI 4145H, AISI 1340
Finished Type	Integral Type, Welded Type

Available Sizes and Grades

Nominal OD	Approx. Weight	Body ID	Upset OD	Upset Length	Elevator Upset OD	Connection Conn. Type	Connection ID	Connection OD	Connection Length Pin Box	Yield Strength Body	Yield Strength Tool Joint	Body Data Tens. Yield	Body Data Tors. Yield	Tool Joint Data Tens. Yield	Tool Joint Data Tors. Yield	Recom.MUT
A		B	C	D	E		F	G	I/H							
in	lb/ft	in	in	in	in		in	in	in	Ksi	Ksi	Lbs	Ft-lbs	Lbs	Ft-lbs	Ft-lbs
27/8	17.4	13/4	31/4	25	33/16	NC31	13/4	41/8	27 / 21	65	120	265,600	12,600	572,200	14,200	8,500
31/2	25.0	21/16	4	25	35/8	NC38	21/16	43/4	27 / 21	65	120	408,200	23,100	764,000	19,200	11,500
31/2	23.4	21/4	4	25	35/8	NC38	21/4	43/4	27 / 21	65	120	366,900	21,800	687,700	19,200	11,500
4	30.4	21/2	41/2	25	41/8	NC40	21/2	51/4	27 / 21	65	120	497,700	33,300	758,500	25,600	15,400
41/2	39.8	213/16	5	25	45/8	NC46	213/16	61/4	27 / 21	65	120	548,100	47,400	1,024,500	39,700	23,800
5	49.5	3	51/2	25	51/8	NC50	3	65/8	27 / 21	65	120	816,800	66,800	1,278,200	52,900	31,700
51/2	47.5	37/8	6	25	55/8	51/2 FH	37/8	7	27 / 21	65	120	777,700	76,900	1,182,500	53,100	31,900
57/8	58.2	37/8	63/8	25	6	51/2 FH	4	7	27 / 21	65	120	995,500	100,900	1,265,800	76,200	45,700
65/8	58.2	5	71/8	25	63/4	65/8 FH	5	8	27 / 21	65	120	946,400	120,500	1,233,900	63,800	38,300

Kelly

PMC can produce customized square or hexagonal Kellys with normal range of 12.19 meter made from AISI 4145H alloy steel. Kellys are strictly produced according to API standards. The company conducts full length heat treatment on Kellys. Brinell hardness can reach to 285–341HBS and Charpy Impact value can be 54J min after full length heat treatment.

Square Kellys

Kelly Size mm in	Length of Drive section feet Standard	Length of Drive section feet Optional	Length Overall feet Standard	Length Overall feet Optional	Drive section Across Flats	Drive section Across Corners	Drive section Across Corners	Drive section Radius	Drive section Radius	Drive section Min Wall Bore	Upper Box Connection Size and Style LH Standard	Upper Box Connection Size and Style LH Optional	Upper Box Connection OD Standard	Upper Box Connection OD Optional	Upper Box Connection Bevel Diametex Length	Upper Box Connection Bevel Diametex Standard	Upper Box Connection Bevel Diametex Optional	Lower Pin Conection Size and Style	Lower Pin Conection Outside Diameter	Lower Pin Conection Length	Lower Pin Conection Bevel Diameter	Inside Diameter
	Ld	Ld	L	L	Dfl	Dc	Dcc	Rc	Rcc	t			Dc	Du	Lu	Df	Df		Du	Lj	Dr	D
63.5	11280		12190		63.5	83.3	82.55	7.9	41.3	11.43	-65/8 REG	-41/2 REG	196.9	146.1	406.4	186.1	134.5	NC26 (2 3/8IF)	85.7	508	82.9	31.8
76.2 -3	11280		12190		76.2	100	96.43	9.5	49.2	11.43	-65/8 REG	-41/2 REG	196.9	146.1	406.4	186.1	134.5	NC31 (2 7/8IF)	104.8	508	100.4	44.5
88.9 -31/2	11280		12190		88.9	115.1	112.7	12.7	56.4	11.43	-65/8 REG	-41/2 REG	196.9	146.1	406.4	186.1	134.5	NC38 (3 1/2IF)	120.7	508	116.3	57.2
108 -41/4	11280	15540	12190	16460	108	141.3	139.7	12.7	69.9	12.07	-65/8 REG	-41/2 REG	196.9	146.1	406.4	186.1	134.5	NC46 (4IF)	158.8	508	145.3	71.4
108 -41/4	11280	15540	12190	16460	108	141.3	139.7	12.7	69.9	12.07	-65/8 REG	-41/2 REG	196.9	146.1	406.4	186.1	134.5	NC50 (4 1/2IF)	161.9	508	154	71.4
133.4 -51/4	11280	15540	12190	16460	133.4	175.4	171.45	15.9	85.7	15.88	-65/8 REG		196.9		406.4	186.1		51/2FH	177.8	508	170.7	82.6
133.4 -51/4	11280	15540	12190	16460	133.4	175.4	171.45	15.9	85.7	15.88	-65/8 REG		196.9		406.4	186.1		NC56	177.8	508	171.1	82.6

Hexagonal Kellys

Kelly Size mm in	Length of Drive section feet Standard	Length of Drive section feet Optional	Length Overall feet Standard	Length Overall feet Optional	Drive section Across Flats	Drive section Across Corners	Drive section Across Corners	Drive section Radius	Drive section Radius	Drive section Min Wall Bore	Upper Box Connection Size and Style LH Standard	Upper Box Connection Size and Style LH Optional	Upper Box Connection OD Standard	Upper Box Connection OD Optional	Upper Box Connection Bevel Diametex Length	Upper Box Connection Bevel Diametex Standard	Upper Box Connection Bevel Diametex Optional	Lower Pin Conection Size and Style	Lower Pin Conection Outside Diameter	Lower Pin Conection Length	Lower Pin Conection Bevel Diameter	Inside Diameter
	Ld	Ld	L	L	Dfl	Dc	Dcc	Rc	Rcc	t			Dc	Du	Lu	Df	Df		Du	Lj	Dr	D
76.2 -3	11280		12190		76.2	85.7	85.73	6.4	42.9	12.1	-65/8 REG	-41/2 REG	196.9	146.1	406.4	186.1	134.5	NC26 (2 3/8IF)	85.7	508	82.9	31.8
88.9 -3 1/2	11280		12190		88.9	100.8	100	6.4	50	13.3	-65/8 REG	-41/2 REG	196.9	146.1	406.4	186.1	134.5	NC31 (2 7/8IF)	104.8	508	100.4	44.5
108 -4 1/4	11280		12190	16460	108	122.2	121.44	9.9	60.7	15.9	-65/8 REG	-41/2 REG	196.9	146.1	406.4	186.1	134.5	NC38 (3 1/2IF)	120.7	508	116.3	57.2
133.4 -5 1/4	11280	15540	12190	16460	133.4	151.6	149.86	9.5	75	15.9	-65/8 REG		196.9		406.4	186.1		NC46 (4IF)	158.8	508	145.3	76.2
133.4 -5 1/4	11280	15540	12190	16460	133.4	151.6	149.86	9.5	75	15.9	-65/8 REG		196.9		406.4	186.1		NC50 (4 1/2IF)	161.9	508	154	82.6
152.4 -6	11280	15540	12190	16460	152.4	173	173.02	9.5	86.5	15.9	-65/8 REG		196.9		406.4	186.1		51/2FH	177.8	508	170.7	88.9
152.4 -6	11280	15540	12190	16460	152.4	173	173.02	9.5	86.5	15.9	-65/8 REG		196.9		406.4	186.1		NC56	177.8	508	171.1	88.9