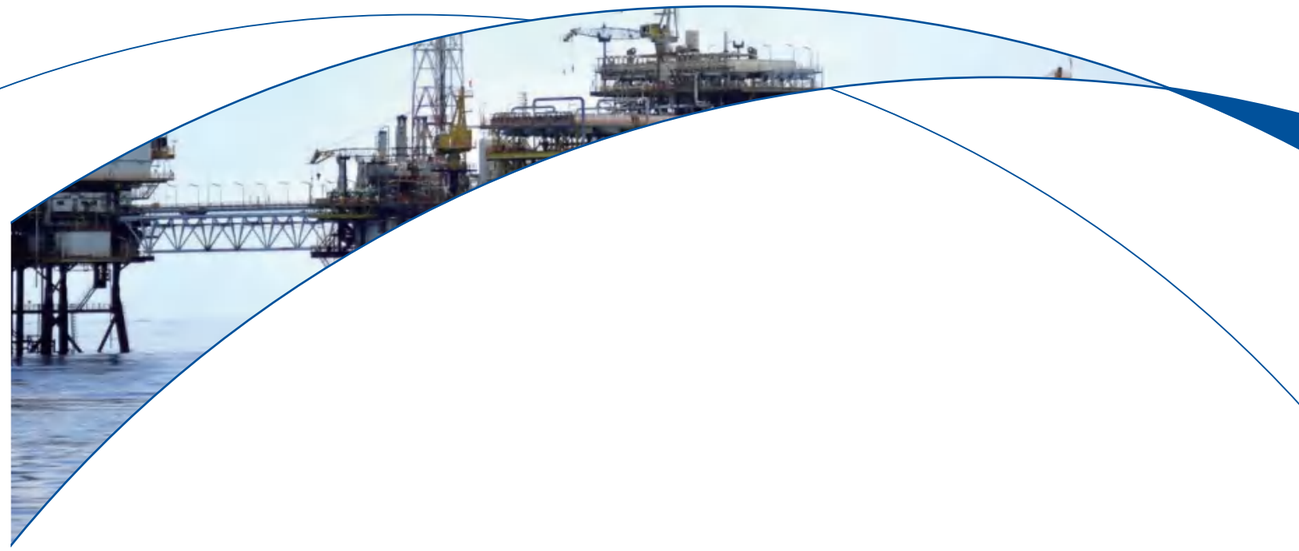
Tianjin Pipe Corporation

Seamless pipe for

Offshore Structure



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2022 Version 01

Tianjin Pipe Corporation

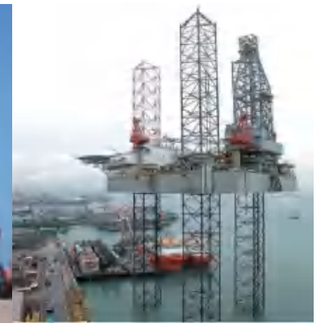
TPCO

Offshore Structural Pipe

Choke & Kill, Boost Pipe

Offshore Structural Pipe



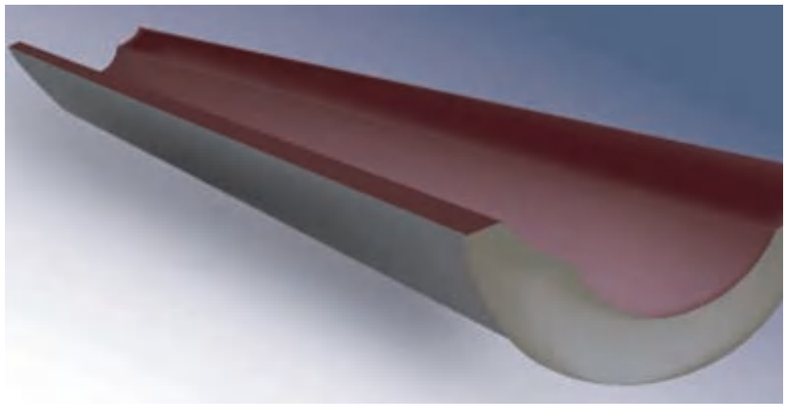


Offshore platform is the equipment to drill and extract oil from the sea. Based on different functions, offshore platform can be classified as drilling platform, production platform, service platform, oil storage, etc. There are bottom-supported, gravity, jack-up, semi-submersible, tension leg type, etc. According to different function, Pile foundation type, bottom-supported and gravity platform are used in shallow waters. Jack-up, semi-submersible, tension leg type, such as vertical cylinder type of offshore platform become the hotspot in the field of ocean engineering.

TPCO has developed the offshore structural pipes for offshore platform, supplied in normalized or quenched and tempered condition for yield strength 355~690 MPa.

- Bracing pipe
- Chord pipe

Jack-up drilling platform leg chord pipe is manufactured as with semicircle.
Its advantage is low cost and high efficiency that producing semicircle pipe with seamless pipe through longitudinal cutting process.



Characteristics of TPCO products

- Steel design with low carbon and micro alloyed
- Low carbon equivalent
- Excellent weldability
- Excellent low temperature toughness
- Lower ductile brittle transition
- Higher surface quality

Reference Standards

API SPEC 5L Specification for Line Pipe
EN 10210-1 Hot finished structural hollow sections of non-alloy and fine grain steels - Part 1: Technical delivery conditions.
EN 10210-2 Hot finished structural hollow sections of non-alloy and fine grain steels - Part 2: Tolerances, dimensions and sectional properties.
EN 10225 Weldable structural steels for fixed offshore structures - Technical delivery conditions
ABS RULES Material and Welding 2015 Part 2
ABS RULES Building and Classing Mobile Offshore Drilling units 2015 Part 3
DNV-OS-B101

The Grade of Offshore Structural Pipe of TPCO

Specification	API SPEC 5L	EN 10210	EN10225	ABS Rules	DNV Rules
Grade	X52Q	S355NH S355NLH	S355G1+N S355G14 +N S355G14 +QT S355G15 +N S355G15 +QT	AH36~FH36	NV A36~NV E36
	X60Q	S420NH S420NLH	S420G6+QT	AQ43~FQ43	NV A420~NV E420/ NV AO420~NV EO420
	X65Q	S460NH S460NLH	S460G6+QT	AQ47~FQ47	NV A460~NV E460/ NV AO460~NV EO460
	X70Q			AQ51~FQ51	NV A500~NE E500/ NV AO500~NE EO500
	X80Q			AQ56~FQ56	NV A550~NV E550/ NV AO550~NV OE550
	X90Q			AQ63~FQ63	NV A620~NV E620/ NV AO620~NV EO620
	X100Q			AQ70~FQ70	NV A690~NV E690/ NV AO690~NV EO690

Offshore Structural Pipe

Size range

Grade	Outside Diameter(mm)	Maximum Wall Thickness(mm)
B~X100	168.3	38
	219.1	35
	273.1	40
	323.9	64
	355.6	60
	406.4	60
	457	50
	508	50

Platform Type and Corresponding Pipe Sizes and Grades

Platform Type	O.D. (mm)	W.T. (mm)	ABS/DNV Grade	API SPEC 5L Grade
JU2000E	273.1	21.41	ABS EQ56	X80Q
	323.9	28.58	ABS EQ56	X80Q
	168.3	10.97	ABS EH36	X52Q
CJ46	273.1	14.00	ABS EQ70	X100Q
	273.1	17.50	ABS EQ70	X100Q
	141.3	9.38	ABS EH36	X52Q
CJ50	298.5	25	ABS EQ70	X100Q
	298.5	35	ABS EQ70	X100Q
	152.4	10	ABS EQ47	X70Q
CJ70	355.6	28.0	NV E690	X100Q
	355.6	35.0	NV E690	X100Q
	171.0	12.5	NV D460	X65Q
CJ80	368	28.0	NV E690	X100Q
	368	35.0	NV E690	X100Q
	202	25.0	NV D690	X100Q
R-550D	324	64	X100Q	X100Q
	273	19	X100Q	X100Q
	219	8.2	X52Q	X52Q

Mechanical Properties

Performance Data as per EN 10225

Grade	YS（MPa）		TS (MPa)	min. $5.65\sqrt{S_0}$(%)	Impact Energy of VL, Full Size （J）		
	t≤25mm	25mm<t≤65mm			W.T.(mm)	Temp.(℃)	min.(J)
S355G1+N S355G14 +N S355G14 +QT S355G15 +N S355G15 +QT	360~530	345~530	470~620	22	t≤40	-40	100
					40<t≤65	-40	80
S420G6+QT	420~565	400~565	500~690	22	t≤40	-40	100
					40<t≤65	-40	80
S460G6+QT	460~600	440~600	550~700	19	t≤40	-40	100
					40<t≤65	-40	80

note:t = wall thickness

Performance Data as per API SPEC 5L

Grade	YS(MPa)		TS (MPa)	min. A50(%)	Impact Energy of VL, Full Size (J)		
	t≤40mm	40mm<t≤65mm			W.T.(mm)	Temp.(℃)	min.(J)
X52Q	360~530	345~530	470~760	22	t≤40	-40	100
					40<t≤65	-40	80
X65Q	450~600	440~600	535~760	19	t≤40	-40	100
					40<t≤65	-40	80
X70Q	485~635	465~635	570~760	18	t≤40	-40	100
					40<t≤65	-40	80
X80Q	550~705	520~705	625~825	18	t≤40	-40	80
					40<t≤65	-40	60
X100Q	690~840	650~840	760~990	16	t≤40	-40	80
					40<t≤65	-40	60

note:t = wall thickness

Offshore Structural Pipe

Chemical Composition (%, API Spec 5L)

Grade	C	Si	Mn	P	S	Cu+Cr+Ni+Mo*	V+Nb+Ti	Ceq	Pcm
X52Q	≤0.18	≤0.45	≤1.50	≤0.020	≤0.015	≤0.50	≤0.15	≤0.43	≤0.25
X60Q	≤0.18	≤0.45	≤1.70	≤0.020	≤0.015	≤0.80	≤0.15	≤0.43	≤0.25
X65Q	≤0.18	≤0.45	≤1.70	≤0.020	≤0.010	≤1.00	≤0.15	≤0.43	≤0.25
X70Q	≤0.18	≤0.45	≤1.70	≤0.020	≤0.010	≤1.20	≤0.15	≤0.43	≤0.25
X80Q	≤0.18	≤0.45	≤1.70	≤0.015	≤0.008	≤1.20	≤0.15	≤0.48	≤0.28
X100Q	≤0.16	≤0.35	≤1.70	≤0.015	≤0.006	≤1.50	≤0.15	≤0.62	≤0.33

* other technical requirement as per API SPEC 5L and Customer's requirement.

Customer Weldability

X80Q Weldability test

Welding Specification	AWS D1.1/D1.1M:2010、ABS MODU RULES
Company	SWS
Welding Process	SMAW
Size	323.85 x 28.58mm
Grade	PSL2 X80Q
Position	6GR
Root	LB52U
Filling/Cap	TENACITO 65R

Serial Number	Test Item	Quantity	Result					Status
1	Tensile	2	654 MPa，Fracturein Base metal 657 MPa，Fracturein Base metal					Qualified
2	Side bend	4	No crack					Qualified
3	-40℃ impact(J)	5×3	Center of weld	82	78	93	84	Qualified
			FL	89	172	164	142	
			FL+1mm	70	210	44	108	
			FL+3mm	54	240	162	152	
			FL+5mm	110	260	268	213	
4	Metallography	3	No imperfection					Qualified
5	Hardness	1	≤325 HV10					Qualified

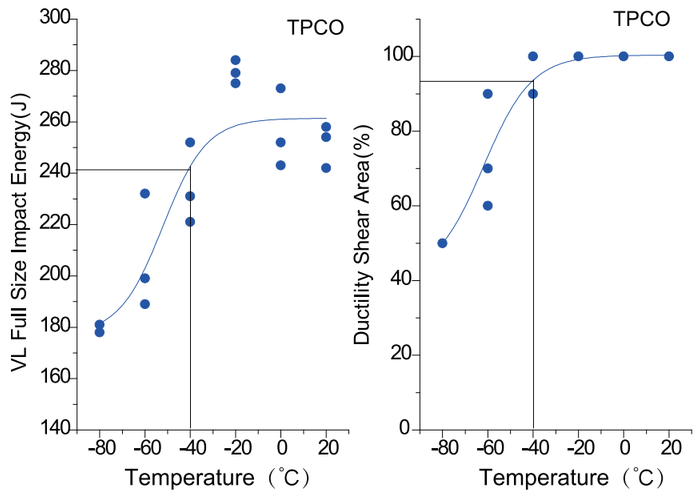
X100Q Weldability

Welding Specification	AWS D1.1/D1.1M:2010、ABS MODU RULES
Company	China Petroleum Pipeline Bureau,CNPC
Welding Process	SMAW
Size	356 x 35mm
Grade	PSL2 x 100Q
Position	6GR
Root	LB-62U
Filling/Cap	TENACITO 80CL

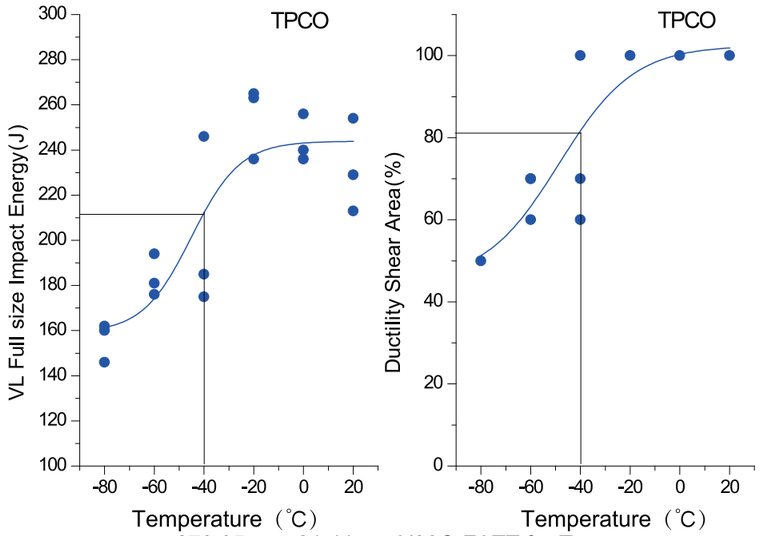
Serial Number	Test Ltem	Quantity	Result					Wheather Qualified
1	Tensile	2	Tensile Strength: 844MPa Tensile Strength: 840MPa					Qualified
2	Side bend	4	180°with 63.5mm, No crack					Qualified
3	-40℃ impact(J)	5×3	Center of weld	77	58	76.5	70.5	Qualified
			FL at bevel	68.5	70	60.5	66.5	
			FL at straight	66.5	76.5	53	65	
			FL+1mm	196	190.5	190.5	192.5	
			FL+2mm	180	179.5	172.5	177.5	
			FL+5mm	202.5	205	212	206.5	
4	Metallography	2	No imperfection					Qualified
5	Hardness	1	≤325 HV10					Qualified

At present TPCO's products from X70Q to X100Q had passed weldability evaluation by Singapore keppel corporation.

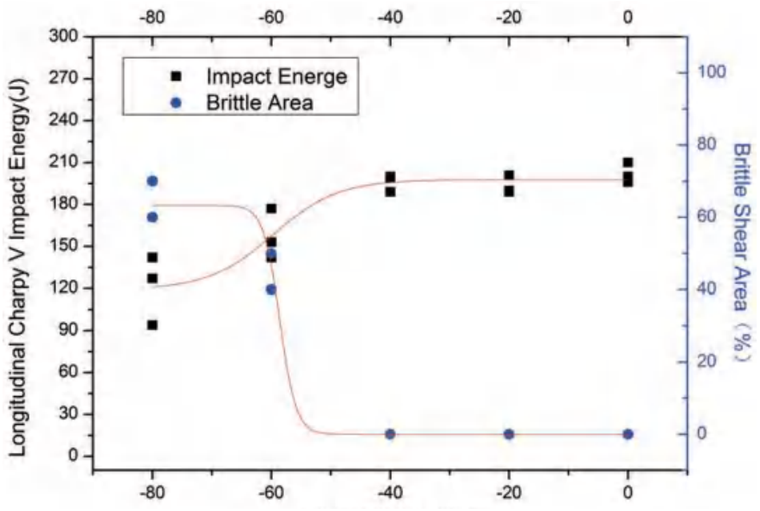
Ductile Brittle Transition



323.85mm×28.58mm X80Q FATT for Longitudinal



273.05mm×21.41mm X80Q FATT for Transverse

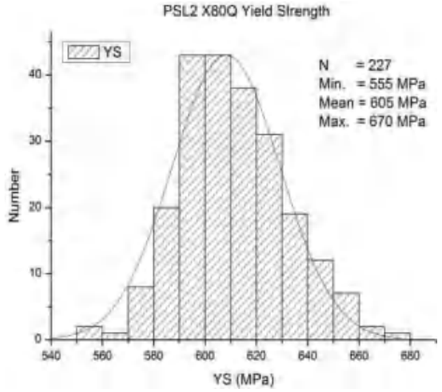


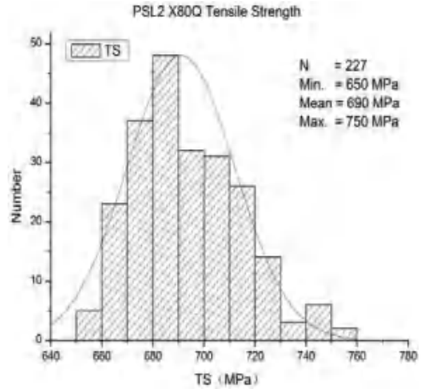
356mm×35mm X100Q FATT for Transverse

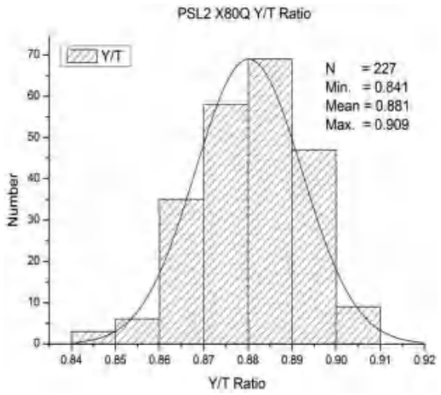
Conclusion: Impact toughness of TPCO products is better. The temperature of ductile brittle transition is lower than minus 40˚C for X100Q , minus 80˚C for X80Q. So it is safer when TPCO's products are used in low temperature environment.

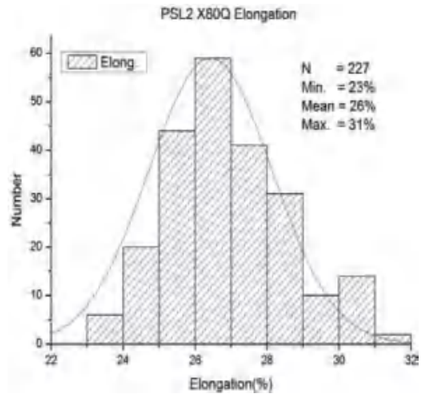
Manufacturing Statistics X80Q - X100Q

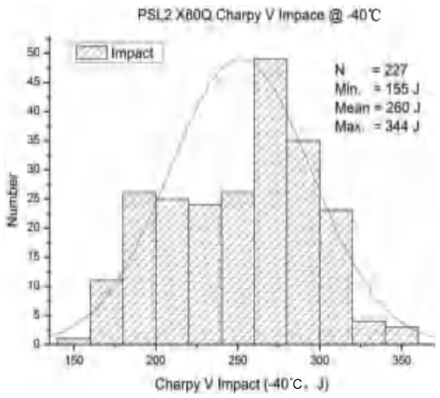
Manufacturing Statistics X80Q of TPCO



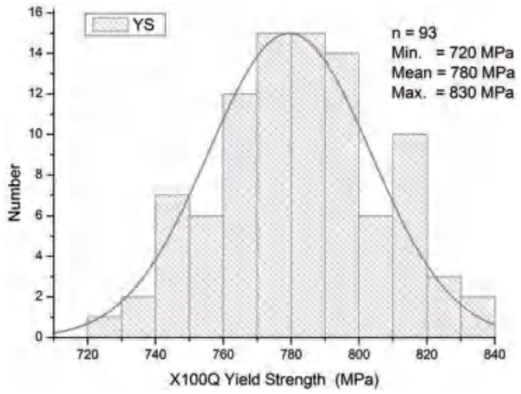


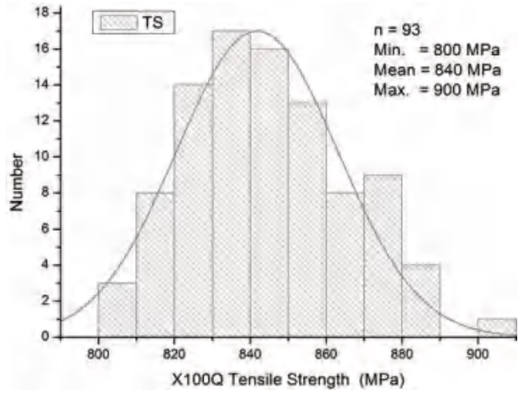


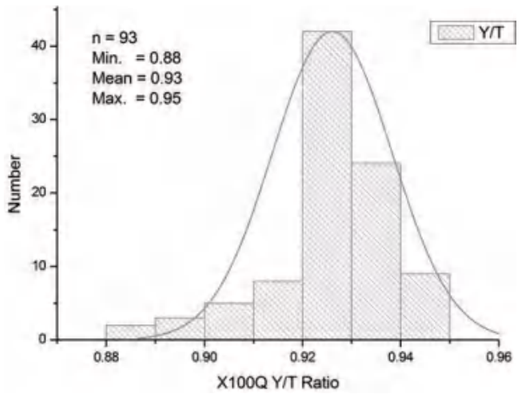


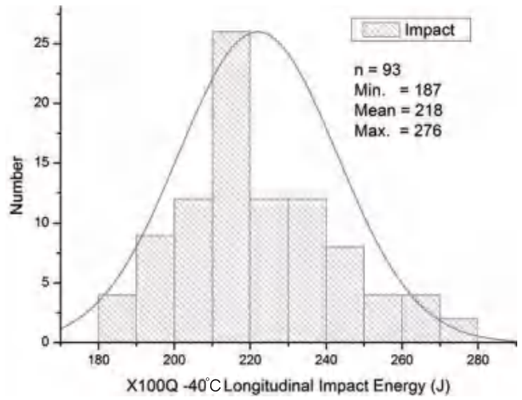


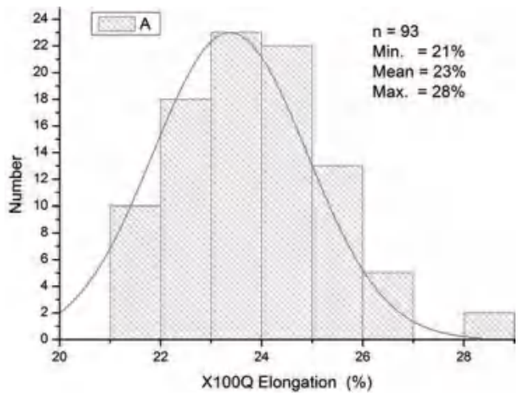
Manufacturing Statistics X100Q of TPCO











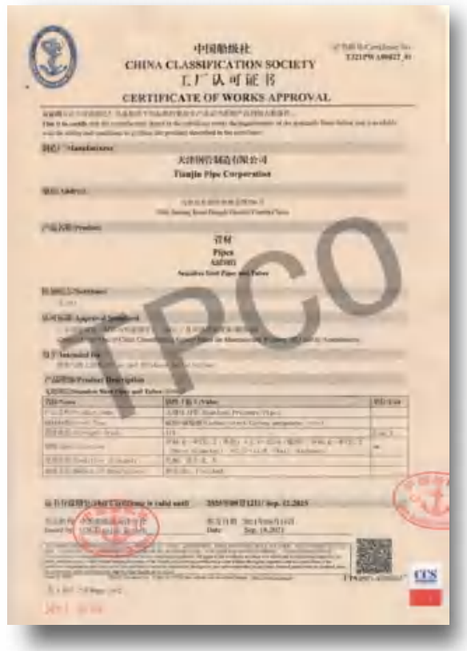
Certification of Offshore Structural Pipe


ABS

CERTIFICATE OF
Manufacturing Assessment

Tianjin Pipe Corporation
Tianjin, P.R.China

Seamless Steel Pipe and Tubes


中国船级社
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工厂认可证书
CERTIFICATE OF WORKS APPROVAL
天津钢管制造有限公司
Tianjin Pipe Corporation
管材
Pipes
seamless
Seamless Steel Pipes and Tubes

Construction Site Pictures

JU2000E Platform Before Sailing(By SWS)

JU2000E Platform After Penetrating Legs (By SWS)

Supply Record of Jack-up Drilling Platform Pipe

O.D. (mm)	W.T. (mm)	Grade/Standard	Ship Survey	Platform Type	Delivery
323.85	28.58	PSL2 X80Q /API 5L	ABS	JU2000E	4 platforms Total 5400 tons
273.05	21.41	PSL2 X80Q /API 5L			
323.85	28.58	PSL2 X80Q /API 5L	ABS	JU2000E	4 platforms Total 5400 tons
273.05	21.41	PSL2 X80Q /API 5L			
323.85	28.58	PSL2 X80Q /API 5L	CCS	CP400	1 platform Total 1350 tons
273.05	21.41	PSL2 X80Q /API 5L			
219.1	18.3	PSL2 X52Q /API 5L	CCS	DSJ300	1 platform Total 700 tons
219.1	22.2	PSL2 X52Q /API 5L			
355.5	35.7/27.8	PSL2 X52Q /API 5L	ABS	CP-101	1 platform Total 950 tons
219.1	23/15	PSL2 X52Q /API 5L			
356 168.3	25/30/35 20/28	PSL2 X100Q/API 5L	ABS		2 platforms Total 935 tons
298.5 152.4	25/35 10	PSL2 X100Q/API 5L PSL2 X70Q/API 5L	ABS	CJ50	2 platforms Total 2400 tons

Note:2010-2015 year.

Choke & Kill, Boost pipe should be produced in accordance with ASTM A519 and A370, latest editions. API 16C and API spec 5L shall be used as a reference only. Material shall comply with NACE MR-01-75(ISO 15156-2).

Chemical Composition as per 4130 of ASTM A 519

(%)	C	Si	Mn	P	S	Ni	Cr	Mo	Cu
TPCO	0.30	0.21	0.48	0.008	0.001	0.030	1.04	0.19	0.040
Other	0.30	0.24	0.52	0.012	0.0014	0.058	0.98	0.20	0.155
(%)	V	Nb	Ti	Ca	N	Sn	As	Al	Ceq
TPCO	/	/	/	0.0006	0.0080	0.0040	0.0040	0.022	0.629
Other	0.018	/	0.015	0.0018	0.0060	0.0113	0.0041	0.021	0.641

Mechanical Property

	Impact 0℃, Full Size, VT (J)			Hardness (HRC)		
	min.	max.	aver.	inner	mid.	outer
TPCO	177	239	207.6	20.29	20.36	20.36
Other	160	205	187.5	18.11	19.44	19.13

Manufacturing Statistics