



OCTG

Oil Country Tubular Goods



JFE
OCTG

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Preface

JFE Steel Corporation has been manufacturing Oil Country Tubular Goods (OCTG) since 1971, during that time we have accumulated extensive expertise and experience giving their customers great confidence and satisfaction when purchasing JFE Steel OCTG.

In the past the well conditions in Oil and Gas drilling were relatively mild and development was straight-forward. Today's Oil and Gas Industry has become a much more complicated operation as Engineers continue to drill deeper wells in harsher environments, encountering higher well bore pressures and temperatures in addition to sweet and sour gas.

To meet these ever increasing industry demands, JFE has developed its JFE series OCTG which has higher collapse resistance, yield strength, toughness and corrosion resistance, than standard API OCTG material. Especially, JFE's 13Cr OCTG has established an excellent reputation world-widely in terms of quality and manufacturing capability.

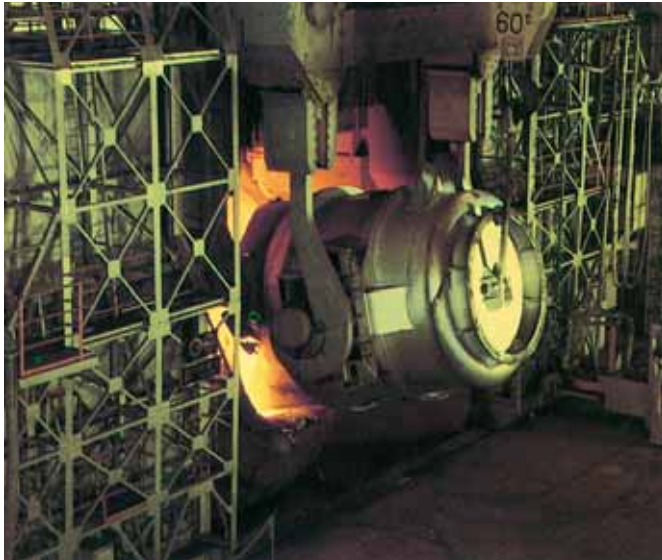
In the early 1980s, JFE developed the FOX™ premium connection which has now gained industry acceptance world wide. And the late 1990s, JFE has also developed a new premium connection called JFEBEAR™ designed to meet today's toughest well condition. With these two connections, JFE can offer customers a choice of products to suit their various applications.

This OCTG brochure provides you with our ardent desire to assist you in choosing the correct Oil Country Tubular Goods for your operation.

1. Features

Historical Advantage in Steel Making

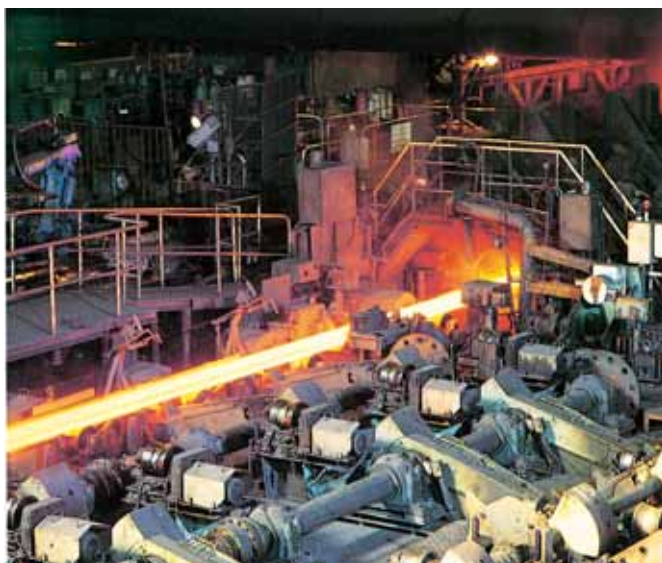
JFE Steel has been involved in the steel making business nearly one(1) hundred years and contributing to the industry with its technology. The Top and Bottom Gas Blowing system followed by Continuous Casting is a typical case, which was first introduced to the industry by JFE Steel.



▲ Basic Oxygen Furnace

Pipe Manufacturing

JFE Steel revealed their technical advancement in the pipe manufacturing process. Recently, the process to roll 13Cr steel by the Mannesman piercing mill was realized first in JFE Steel.



▲ Mandrel Mill



▲ High Frequency E. R. W. Machine

Quality System

All JFE OCTG's are inspected nondestructively for detection of internal and external imperfections by use of Eddy Current, Electromagnetic, Ultrasonic and/or Magnetic Particle method. These requirements play an important role in our rigid quality control and assurance system.



▲ 9-5/8" CNC Torque Process Control System

Research and Development

JFE Steel boasts a wide range of testing facilities and equipment to evaluate new and existing products. The benefits generated as a result of this R & D work contribute to our customers and the industry as well as to our daily production activities.



▲ *Magnetic Particle Inspection*



▲ *Collapse Test*



▲ *Electromagnetic Inspection*

Worldwide Service Network

JFE has established foreign offices and service centers throughout the world as listed on the back cover sheet.

2. Facilities and Location

OCTG is produced at Chita Works, which specializes in pipe and tubes under the company's well-known rigid quality control and assurance systems.

Equipped with complete mass production systems for all kinds of pipe and tubular products, Chita is one of the foremost tubular products centers in the world.

The location of Chita has the advantage of easy access to West Japan Works and East Japan Works which supplies Chita Works with steel materials for the production of their tubular products.

JFE Steel ensures consistently high quality for all its tubular products by way of production control at every stage from blast furnace to pipe mill, using inspection systems with advanced ultrasonic, electromagnetic and other non-destructive inspection equipment. Pipe production at JFE Steel is part of a fully integrated steelmaking facility. This means JFE tubular products are manufactured from beginning to end under single-maker responsibility for quality and performance.

▼ Chita Works located in the center of the Kinu-ura coastal industrial zone



3. OCTG Line Up

1) Line Up

Type of String	Size	Mill	Works	Note
Tubing	2-3/8" – 7"	Small-Diameter Seamless	Chita Works	Thread and Coupling End Upset Capability
Casing	4-1/2" – 7"	Small-Diameter Seamless	Chita Works	Thread and Coupling
	7" – 16"	Medium-Diameter Seamless		
	7-5/8" – 26"	ERW	Chita Works East Japan Works	Plain End
Conductor Casing	16"	Medium-Diameter Seamless	Chita Works	Plain End without welded-on Connector
	16" – 26"	ERW		
	20" and Over	UOE	West Japan Works	

2) Connections

a. API Connections

Casing and tubing of API Specification and JFE-Series are furnished with threads and coupling conforming to API Spec. 5CT and 5B. API Round and Buttress thread with resilient sealing ring is also available. Plain End, API thread without coupling, and special end finish (special bevel, special clearance) are available according to customers' requirement.

b. Premium Connections

b-1. FOX™

FOX™ is a thread and coupling type premium connection jointly developed by JFE Steel Corporation and Hunting Energy Services U.K. LTD. Please see page 31 for further information.

b-2. JFEBEAR™

JFEBEAR™ is a thread and coupling type premium connection developed by JFE Steel Corporation. Please see page 32 for further information.

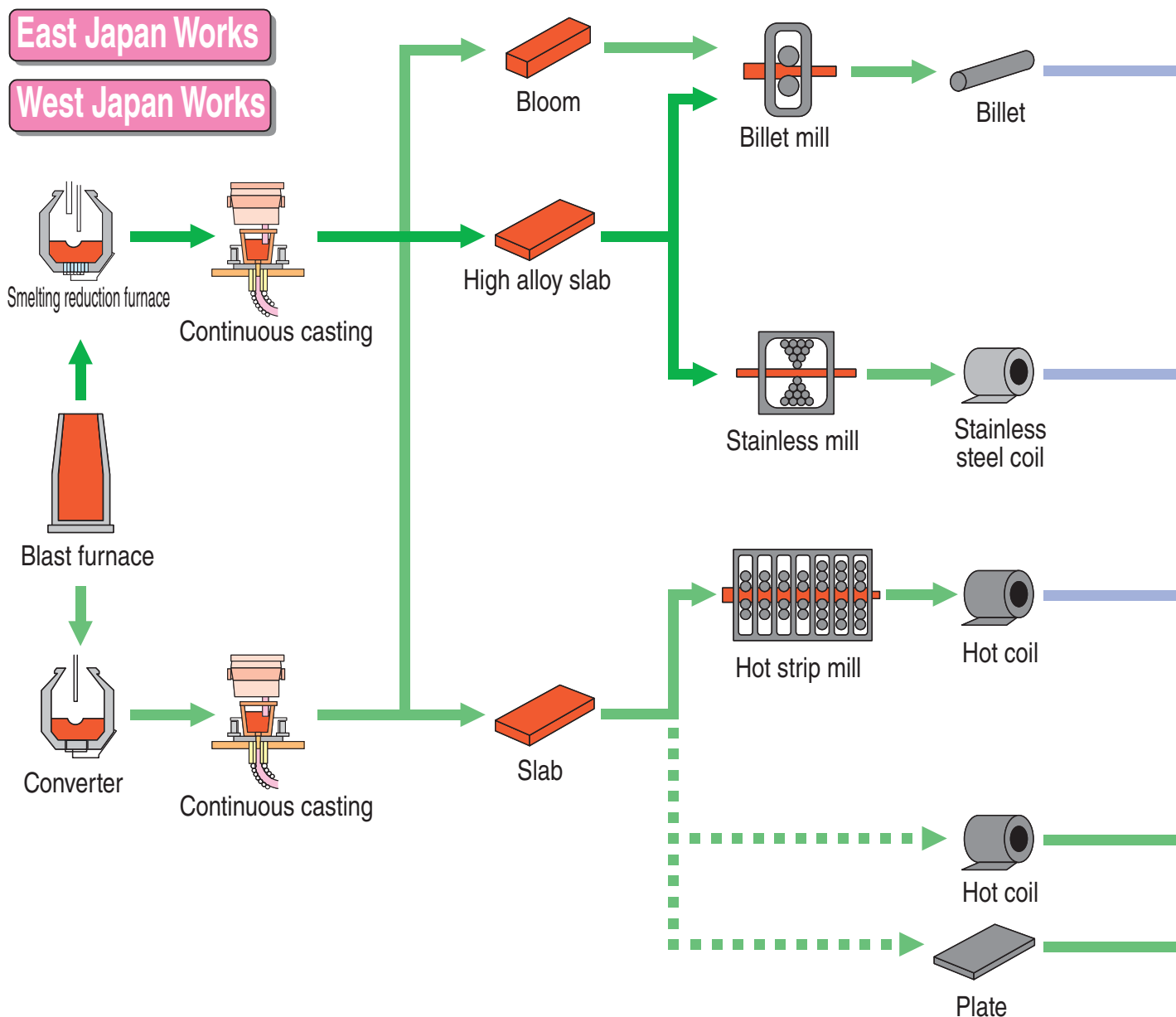
4. Manufacturing Process

Seamless Mill

Seamless pipes and tubes are produced either by the mandrel mill or the plug rolling mill process. The former process is used for producing small-diameter pipes up to 7" and the latter for medium-diameter pipes over 7". On either type of mill, each heated billet is pierced through its center on a piercing mill. The pierced billet then moves on to a mandrel or plug rolling mill where it is rolled with a mandrel bar or plug inserted in it. After withdrawal of the mandrel or the plug, the rolled shell is reheated before being processed on stretch reducing mill or sizing mill where the desired OD and wall thickness are obtained. To ensure consistently high quality, the company conducts thorough testing and inspection, using advanced equipment including eddy current, ultrasonic, electro- magnetic and magna flux devices.

Electric Resistance Weld (ERW) Mill

Electric Resistance Weld pipes are made from strip in coil form. 12-3/4" and above Mill in Chita Works and 8" and above Mill in East Japan Works produce ERW OCTG pipes. These mills are equipped with high frequency electric resistance welder to provide improved seam quality. And seam heat treatment system after welding helps to get better metallurgical structure.



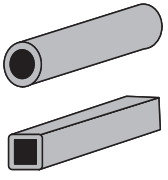
Chita Works

[Seamless pipes]

Hot process Cold process

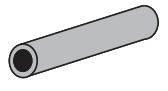
Medium diameter
seamless pipe mill

Medium diameter
seamless pipe
Seamless square
column



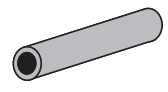
Small diameter
seamless pipe mill

Small diameter
seamless pipe



Special
Tube mill

Special Tube

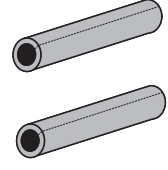


[Welded pipes]

Small diameter
ERW pipe mill

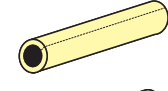
3, 6 mill
4 mill

Small diameter
ERW pipe
HISTORY™ pipe



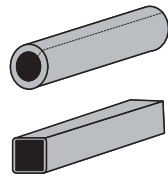
Galvanized
pipe mill

Galvanized pipe



Medium diameter
ERW pipe mill

Medium diameter
ERW pipe
Square column



Butt welded pipe mill

(East Japan Works)

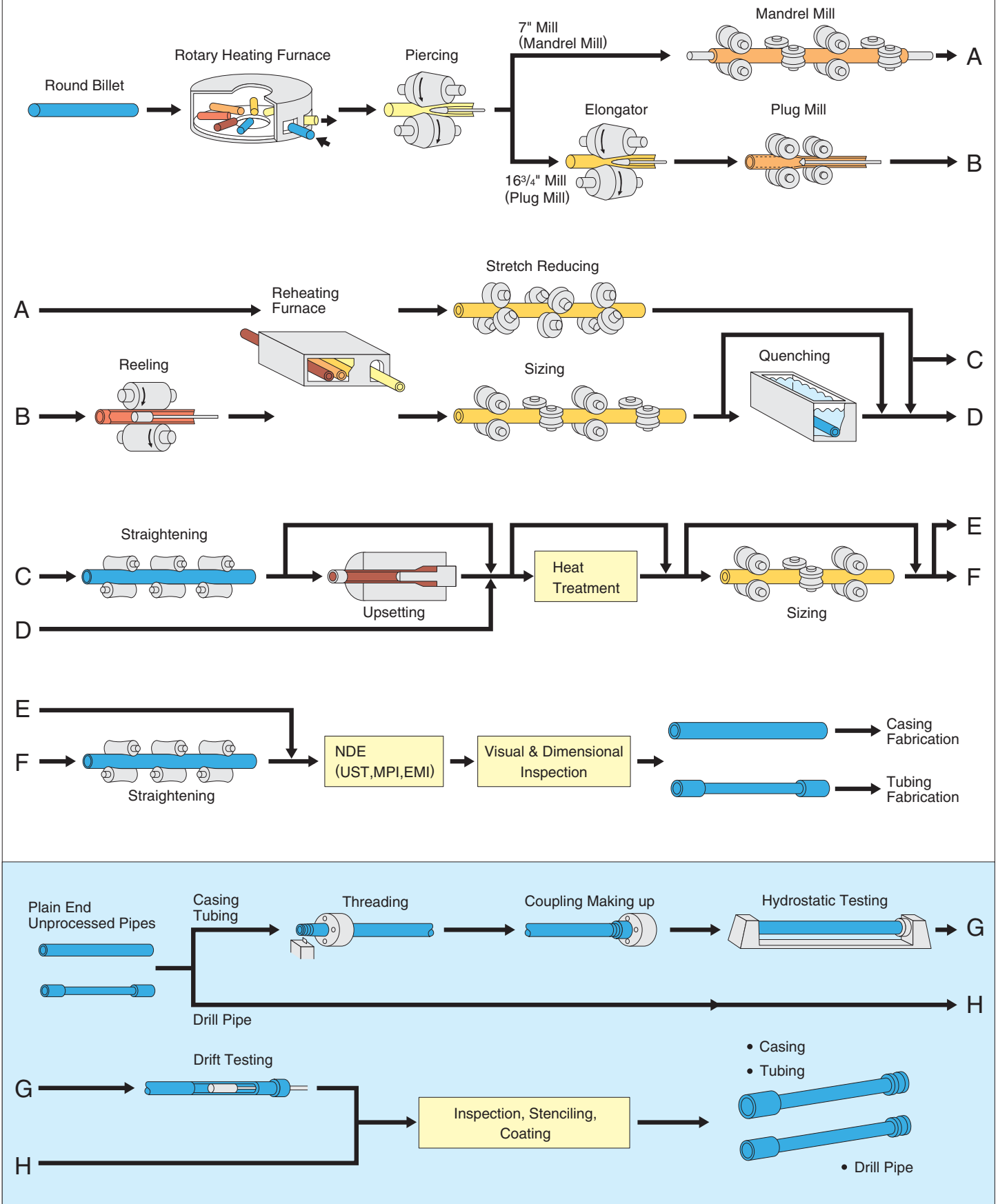
Spiral tube mill

(East Japan Works)

UOE pipe mill

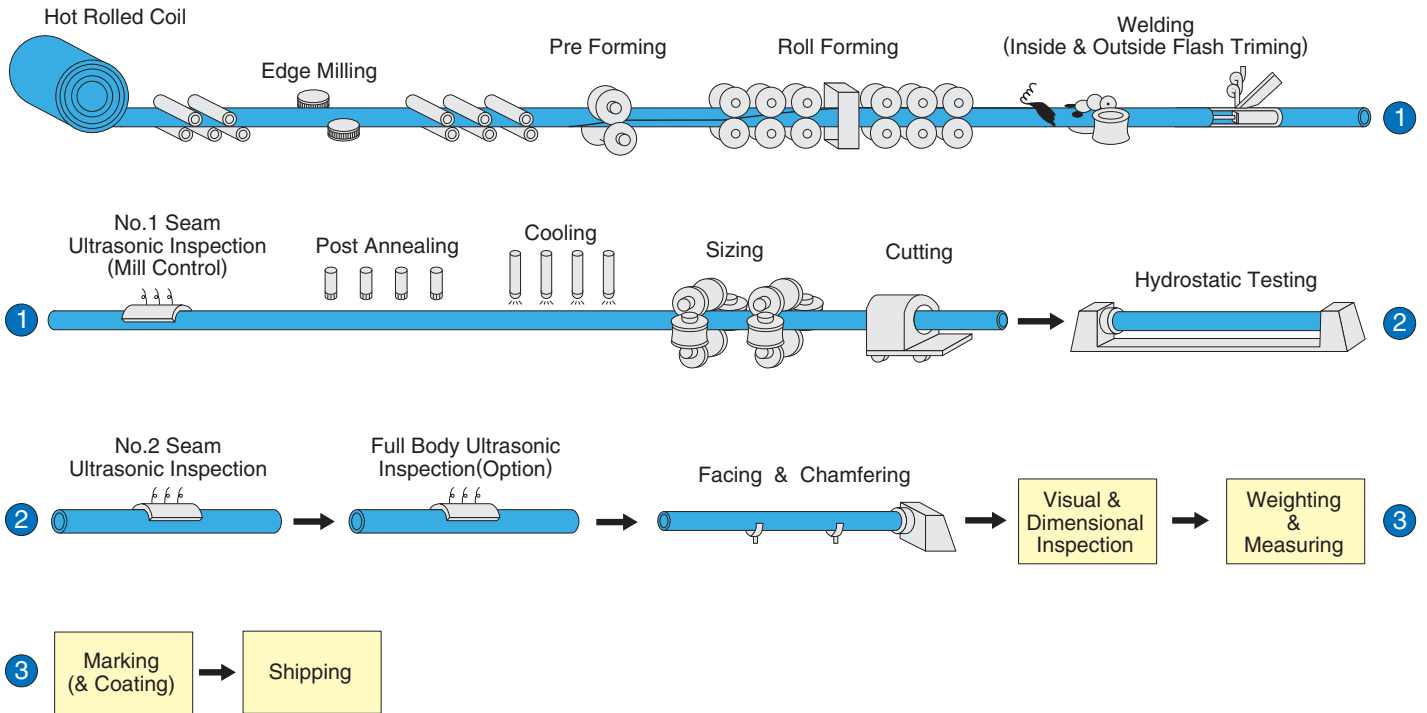
(West Japan Works)

SEAMLESS MILL

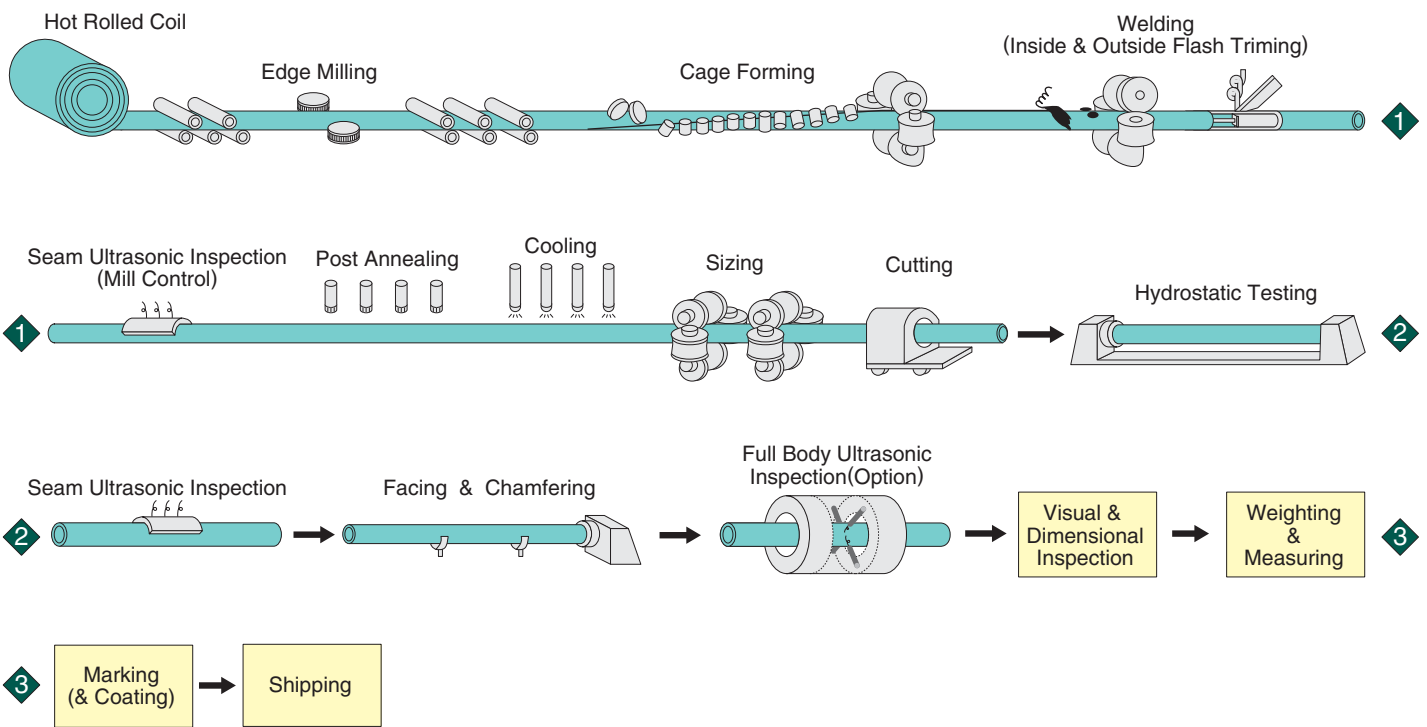


Electric Resistance Weld (ERW) Mill

24-in. ERW Mill



26-in. ERW Mill



5. Available Grades and Sizes

1) Available Grades

Yield Strength Minimum psi (MPa)	API 5CT						Deep Well Service	High Collapse Strength
	Seamless				ERW			
	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2		
40,000 (276)	H40				H40			
55,000 (379)	J55 K55				J55 K55			
65,000 (448)		M65						
80,000 (552)	N80/Type1 N80/TypeQ	L80/Type1 L80/13Cr			N80/Type1	L80/Type1		JFE-80T
85,000 (586)								
90,000 (621)		C90/Type1						
95,000 (655)	R95	T95/Type1			R95			JFE-95T
110,000 (758)		C110	P110					JFE-110T
125,000 (862)				Q125/Type1			JFE-125V	
140,000 (965)							JFE-140V	

JFE Special OCTG : JFE-Series								
Seamless							ERW	
Sour Service			Arctic Service	Wet CO ₂ Service			General Service	High Collapse Strength
General	Special	High Collapse		General	High Temperature	High Strength High Temperature		
							JFE-40E	
							JFE-55E	
JFE-80S		JFE-80TS	JFE-80L	JFE-13CR-80			JFE-80E	JFE-80ET
JFE-85S	JFE-85SS			JFE-13CR-85				
JFE-90S	JFE-90SS							
JFE-95S	JFE-95SS	JFE-95TS	JFE-95L	JFE-13CR-95	JFE-HP1-13CR-95 JFE-HP2-13CR-95			
JFE-110S	JFE-110SS		JFE-110L		JFE-HP1-13CR-110 JFE-HP2-13CR-110			
			JFE-125L			JFE-UHP™-15CR-125		



5. Available Grades and Sizes

2) Physical Properties of API and JFE-Series

Series	Application	Grade	Type	Yield Strength		Tensile Strength
				Minimum psi (MPa)	Maximum psi (MPa)	Minimum psi (MPa)
API	Group 1	H40		40,000 (276)	80,000 (552)	60,000 (414)
		J55		55,000 (379)	80,000 (552)	75,000 (517)
		K55		55,000 (379)	80,000 (552)	95,000 (655)
		N80	1	80,000 (552)	110,000 (758)	100,000 (689)
			Q	80,000 (552)	110,000 (758)	100,000 (689)
	R95		95,000 (655)	110,000 (758)	105,000 (724)	
	Group 2	M65		65,000 (448)	85,000 (586)	85,000 (586)
		L80	1	80,000 (552)	95,000 (655)	95,000 (655)
			13Cr	80,000 (552)	95,000 (655)	95,000 (655)
		C90	1	90,000 (621)	105,000 (724)	100,000 (689)
		T95	1	95,000 (655)	110,000 (758)	105,000 (724)
	C110		110,000 (758)	120,000 (828)	115,000 (793)	
	Group 3	P110		110,000 (758)	140,000 (965)	125,000 (862)
Group 4	Q125	1	125,000 (862)	150,000 (1,034)	135,000 (931)	
JFE-Series	High Collapse Strength	JFE-80T		80,000 (552)	110,000 (758)	100,000 (689)
		JFE-95T		95,000 (655)	125,000 (862)	110,000 (758)
		JFE-110T		110,000 (758)	140,000 (965)	125,000 (862)
	Sour Service	JFE-80S		80,000 (552)	95,000 (655)	95,000 (655)
		JFE-85S		85,000 (586)	100,000 (689)	95,000 (655)
		JFE-90S		90,000 (621)	105,000 (724)	100,000 (689)
		JFE-95S		95,000 (655)	110,000 (758)	105,000 (724)
		JFE-110S		110,000 (758)	125,000 (862)	120,000 (828)
		JFE-110SS		110,000 (758)	125,000 (862)	120,000 (828)
	Special Sour Service	JFE-85SS		85,000 (586)	100,000 (689)	95,000 (655)
		JFE-90SS		90,000 (621)	105,000 (724)	100,000 (689)
		JFE-95SS		95,000 (655)	110,000 (758)	105,000 (724)
		JFE-110SS		110,000 (758)	125,000 (862)	120,000 (828)
	Sour Service & High Collapse	JFE-80TS		80,000 (552)	95,000 (655)	100,000 (689)
		JFE-95TS		95,000 (655)	110,000 (758)	105,000 (724)
	Arctic Service	JFE-80L		80,000 (552)	95,000 (655)	95,000 (655)
		JFE-95L		95,000 (655)	125,000 (862)	110,000 (758)
		JFE-110L		110,000 (758)	140,000 (965)	125,000 (862)
		JFE-125L		125,000 (862)	150,000 (1,034)	135,000 (931)
	Deep Well Service	JFE-125V		125,000 (862)	150,000 (1,034)	135,000 (931)
		JFE-140V		140,000 (965)	170,000 (1,172)	150,000 (1,034)
	Wet CO ₂ Service	JFE-13CR-80		80,000 (552)	95,000 (655)	95,000 (655)
		JFE-13CR-85		85,000 (586)	100,000 (689)	100,000 (689)
		JFE-13CR-95		95,000 (655)	110,000 (758)	105,000 (724)
	High Temperature Wet CO ₂ Service	JFE-HP1-13CR-95		95,000 (655)	110,000 (758)	105,000 (724)
		JFE-HP1-13CR-110		110,000 (758)	130,000 (896)	120,000 (828)
		JFE-HP2-13CR-95		95,000 (655)	110,000 (758)	105,000 (724)
	High Temperature Wet CO ₂ Service	JFE-HP2-13CR-110		110,000 (758)	130,000 (896)	120,000 (828)
		JFE-UHP™-15CR-125		125,000 (862)	150,000 (1034)	135,000 (931)
	General Service	JFE-40E		40,000 (276)	80,000 (552)	60,000 (414)
		JFE-55E		55,000 (379)	80,000 (552)	75,000 (517)
		JFE-80E		80,000 (552)	110,000 (758)	100,000 (689)
	High Collapse Strength	JFE-80ET		80,000 (552)	110,000 (758)	100,000 (689)

Manufacturing Process		Hardness (HRC)		Collapse Value	Charpy V-notch Test			Other Specified Items
Seamless	ERW	Maximum	Variation		°F (°C)	Minimum Average	Minimum single	
				ft-lbs (J)				
●	●							
●	●							
●	●							
●	●							
●	●							
●		22						
●	●	23						
●		23						
●		25.4	3.0-6.0*				Grain Size & SSC Test	
●		25.4	3.0-6.0*				Grain Size & SSC Test	
●		30	3.0-6.0*				Grain Size & SSC Test	
●								
●			3.0-5.0*					
●				Guaranteed				
●				Guaranteed				
●				Guaranteed				
●		22						
●		23						
●		24						
●		25						
●		31						
●		23	3.0-5.0*				Grain Size & SSC Test	
●		24	3.0-5.0*				Grain Size & SSC Test	
●		25	3.0-5.0*				Grain Size & SSC Test	
●		31	3.0-5.0*				Grain Size & SSC Test	
●		22						
●		25						
●					-50 (-46)	25 (34)	19 (26)	
●					-50 (-46)	25 (34)	19 (26)	
●					-50 (-46)	25 (34)	19 (26)	
●			3.0-5.0*		-50 (-46)	25 (34)	19 (26)	
●			3.0-5.0*		-4 (-20)	20 (27)	15 (20)	
●			3.0-5.0*		-4 (-20)	20 (27)	15 (20)	
●		23						
●		24						
●		27						
●		28						
●		32						
●		30						
●		32						
●		37						
	●							
	●							
	●							
	●			Guaranteed				

*Depends on specified wall thickness. 13

5. Available Grades and Sizes

3) API and JFE-Series Tubing List

Outside Diameter		Nominal weight			Wall Thickness		Inside Diameter	Drift
		Threads & Coupling		Plain End				
		NUE	EUE					
inch	(mm)	lb/ft	lb/ft	lb/ft	inch	(mm)	inch	inch
2-3/8	(60.32)	4.00	—	3.94	0.167	(4.24)	2.041	1.947
		4.60	4.70	4.44	0.190	(4.83)	1.995	1.901
		5.80	5.95	5.76	0.254	(6.45)	1.867	1.773
		6.60	—	6.56	0.295	(7.49)	1.785	1.691
		7.35	7.45	7.32	0.336	(8.53)	1.703	1.609
2-7/8	(73.02)	6.40	6.50	6.17	0.217	(5.51)	2.441	2.347
		7.80	7.90	7.67	0.276	(7.01)	2.323	2.229
		8.60	8.70	8.45	0.308	(7.82)	2.259	2.165
		9.35	9.45	9.21	0.340	(8.64)	2.195	2.101
		10.50	—	10.40	0.392	(9.96)	2.091	1.997
		11.50	—	11.45	0.440	(11.18)	1.995	1.901
3-1/2	(88.90)	7.70	—	7.58	0.216	(5.49)	3.068	2.943
		9.20	9.30	8.81	0.254	(6.45)	2.992	2.867
		10.20	—	9.92	0.289	(7.34)	2.922	2.797
		12.70	12.95	12.53	0.375	(9.52)	2.750	2.625
		14.30	—	14.11	0.430	(10.92)	2.640	2.515
		15.50	—	15.39	0.476	(12.09)	2.548	2.423
		17.00	—	16.83	0.530	(13.46)	2.440	2.315
4	(101.60)	9.50	—	9.12	0.226	(5.74)	3.548	3.423
		10.70	11.00	10.47	0.262	(6.65)	3.476	3.351
		13.20	—	12.95	0.330	(8.38)	3.340	3.215
		16.10	—	15.90	0.415	(10.54)	3.170	3.045
		18.90	—	18.71	0.500	(12.70)	3.000	2.875
		22.20	—	22.11	0.610	(15.49)	2.780	2.655
4-1/2	(114.30)	12.60	12.75	12.25	0.271	(6.88)	3.958	3.833
		15.20	—	15.00	0.337	(8.56)	3.826	3.701
		17.00	—	16.77	0.380	(9.65)	3.740	3.615
		18.90	—	18.71	0.430	(10.92)	3.640	3.515
		21.50	—	21.38	0.500	(12.70)	3.500	3.375
		23.70	—	23.59	0.560	(14.22)	3.380	3.255
		26.10	—	26.06	0.630	(16.00)	3.240	3.115

5. Available Grades and Sizes

4) API and JFE-Series Casing List

Outside Diameter		Nominal weight		Wall Thickness	Inside Diameter	Drift	Special Drift
		Threads & Coupling	Plain End				
inch	(mm)	lb/ft	lb/ft	inch	(mm)	inch	inch
4-1/2	(114.30)	9.50	9.41	0.205 (5.21)	4.090	3.965	
		10.50	10.24	0.224 (5.69)	4.052	3.927	
		11.60	11.36	0.250 (6.35)	4.000	3.875	
		13.50	13.05	0.290 (7.37)	3.920	3.795	
		15.10	15.00	0.337 (8.56)	3.826	3.701	
5	(127.00)	11.50	11.24	0.220 (5.59)	4.560	4.435	
		13.00	12.84	0.253 (6.43)	4.494	4.369	
		15.00	14.88	0.296 (7.52)	4.408	4.283	
		18.00	17.95	0.362 (9.19)	4.276	4.151	
		21.40	21.32	0.437 (11.10)	4.126	4.001	
		23.20	23.11	0.478 (12.14)	4.044	3.919	
5-1/2	(139.70)	24.10	24.05	0.500 (12.70)	4.000	3.875	
		14.00	13.71	0.244 (6.20)	5.012	4.887	
		15.50	15.36	0.275 (6.98)	4.950	4.825	
		17.00	16.89	0.304 (7.72)	4.892	4.767	
		20.00	19.83	0.361 (9.17)	4.778	4.653	
		23.00	22.56	0.415 (10.54)	4.670	4.545	
		26.80	26.72	0.500 (12.70)	4.500	4.375	
		29.70	29.67	0.562 (14.27)	4.376	4.251	
		32.60	32.57	0.625 (15.88)	4.250	4.125	
		35.30	35.35	0.687 (17.45)	4.126	4.001	
		38.00	38.08	0.750 (19.05)	4.000	3.875	
6-5/8	(168.28)	40.50	40.69	0.812 (20.62)	3.876	3.751	
		43.10	43.26	0.875 (22.22)	3.750	3.625	
		20.00	19.51	0.288 (7.32)	6.049	5.924	
		24.00	23.60	0.352 (8.94)	5.921	5.796	
7	(177.80)	28.00	27.67	0.417 (10.59)	5.791	5.666	
		32.00	31.23	0.475 (12.06)	5.675	5.550	
		17.00	16.72	0.231 (5.87)	6.538	6.413	
		20.00	19.56	0.272 (6.91)	6.456	6.331	
7	(177.80)	23.00	22.65	0.317 (8.05)	6.366	6.241	6.250
		26.00	25.69	0.362 (9.19)	6.276	6.151	
		29.00	28.75	0.408 (10.36)	6.184	6.059	
		32.00	31.70	0.453 (11.51)	6.094	5.969	6.000

5. Available Grades and Sizes

Outside Diameter		Nominal weight		Wall Thickness		Inside Diameter	Drift	Special Drift
		Threads & Coupling	Plain End					
inch	(mm)	lb/ft	lb/ft	inch	(mm)	inch	inch	inch
7	(177.80)	35.00	34.61	0.498	(12.65)	6.004	5.879	
		38.00	37.29	0.540	(13.72)	5.920	5.795	
		42.70	42.59	0.625	(15.88)	5.750	5.625	
		46.40	46.36	0.687	(17.45)	5.626	5.501	
		50.10	50.11	0.750	(19.05)	5.500	5.375	
		53.60	53.71	0.812	(20.62)	5.376	5.251	
		57.10	57.29	0.875	(22.22)	5.250	5.125	
7-5/8	(193.68)	24.00	23.49	0.300	(7.62)	7.025	6.900	
		26.40	25.59	0.328	(8.33)	6.969	6.844	
		29.70	29.06	0.375	(9.52)	6.875	6.750	
		33.70	33.07	0.430	(10.92)	6.765	6.640	
		39.00	38.08	0.500	(12.70)	6.625	6.500	
		42.80	42.43	0.562	(14.27)	6.501	6.376	
		45.30	44.71	0.595	(15.11)	6.435	6.310	
		47.10	46.77	0.625	(15.88)	6.375	6.250	
		51.20	50.95	0.687	(17.45)	6.251	6.126	
55.30	55.12	0.750	(19.05)	6.125	6.000			
7-3/4	(196.85)	46.10	45.51	0.595	(15.11)	6.560	6.435	6.500
8-5/8	(219.08)	24.00	23.60	0.264	(6.71)	8.097	7.972	
		28.00	27.04	0.304	(7.72)	8.017	7.892	
		32.00	31.13	0.352	(8.94)	7.921	7.796	7.875
		36.00	35.17	0.400	(10.16)	7.825	7.700	
		40.00	39.33	0.450	(11.43)	7.725	7.600	7.625
		44.00	43.43	0.500	(12.70)	7.625	7.500	
49.00	48.04	0.557	(14.15)	7.511	7.386			
9-5/8	(244.48)	32.30	31.06	0.312	(7.92)	9.001	8.845	
		36.00	34.89	0.352	(8.94)	8.921	8.765	
		40.00	38.97	0.395	(10.03)	8.835	8.679	8.750
		43.50	42.73	0.435	(11.05)	8.755	8.599	
		47.00	46.18	0.472	(11.99)	8.681	8.525	
		53.50	52.90	0.545	(13.84)	8.535	8.379	8.500
58.40	57.44	0.595	(15.11)	8.435	8.279	8.375		

5. Available Grades and Sizes

Outside Diameter		Nominal weight		Wall Thickness		Inside Diameter	Drift	Special Drift
		Threads & Coupling	Plain End					
inch	(mm)	lb/ft	lb/ft	inch	(mm)	inch	inch	inch
9-5/8	(244.48)	59.40	58.70	0.609	(15.47)	8.407	8.251	
		64.90	64.32	0.672	(17.07)	8.281	8.125	
		70.30	69.76	0.734	(18.64)	8.157	8.001	
		75.60	75.21	0.797	(20.24)	8.031	7.875	
10-3/4	(273.05)	32.75	31.23	0.279	(7.09)	10.192	10.036	
		40.50	38.91	0.350	(8.89)	10.050	9.894	
		45.50	44.26	0.400	(10.16)	9.950	9.794	9.875
		51.00	49.55	0.450	(11.43)	9.850	9.694	
		55.50	54.26	0.495	(12.57)	9.760	9.604	9.625
		60.70	59.45	0.545	(13.84)	9.660	9.504	
		65.70	64.59	0.595	(15.11)	9.560	9.404	
		73.20	72.40	0.672	(17.07)	9.406	9.250	
79.20	78.59	0.734	(18.64)	9.282	9.126			
85.30	84.80	0.797	(20.24)	9.156	9.000			
11-3/4	(298.45)	42.00	40.64	0.333	(8.46)	11.084	10.928	11.000
		47.00	45.60	0.375	(9.52)	11.000	10.844	
		54.00	52.62	0.435	(11.05)	10.880	10.724	
		60.00	58.87	0.489	(12.42)	10.772	10.616	10.625
		65.00	64.03	0.534	(13.56)	10.682	10.526	10.625
71.00	69.48	0.582	(14.78)	10.586	10.430			
13-3/8	(339.72)	48.00	46.02	0.330	(8.38)	12.715	12.559	
		54.50	52.79	0.380	(9.65)	12.615	12.459	
		61.00	59.50	0.430	(10.92)	12.515	12.359	
		68.00	66.17	0.480	(12.19)	12.415	12.259	
72.00	70.67	0.514	(13.06)	12.347	12.191	12.250		
16	(406.40)	65.00	62.64	0.375	(9.53)	15.250	15.062	
		75.00	72.86	0.438	(11.13)	15.124	14.936	
		84.00	82.05	0.495	(12.57)	15.010	14.822	
109.00	107.60	0.656	(16.66)	14.688	14.500			
18-5/8	(473.08)	87.50	84.59	0.435	(11.05)	17.755	17.567	
20	(508.00)	94.00	91.59	0.438	(11.13)	19.124	18.936	
		106.50	104.23	0.500	(12.70)	19.000	18.812	
		133.00	131.45	0.635	(16.13)	18.730	18.542	

6. Specification of JFE-Series

— JFE Special OCTG

1) High Collapse Casing

JFE-95T -110T

With a recent increase in deep well drilling, there is a growing need for high collapse casing in a minimum yield strength of 95 ksi (655 MPa) grade. Collapse resistance is affected by yield strength, deviation of wall thickness, roundness, residual stress and D/t (D for outside diameter and t for wall thickness).

Reducing the deviation of wall thickness at hot rolling, controlling yield strength by closely regulating heat treatment conditions, and minimizing the deterioration of roundness and straightness during cooling are performed. This process is governed by our special techniques and knowhow.

a. Specifications

(a) Process of Manufacture and Heat Treatment

Seamless, quenched and tempered

(b) Chemical Requirements

(wt %)

Grade	C, max.	Si, max.	Mn, max.	P, max.	S, max.
JFE-95T JFE-110T	0.35	0.35	1.60	0.030	0.030

(c) Physical Properties

Grade	Tensile Requirement			Collapse Resistance
	Yield Strength ksi (MPa)	Tensile Strength min. ksi (MPa)	Elongation	
JFE-95T	95~125 (655~862)	110 (758)	As Per API 5CT	Please ask JFE representative
JFE-110T	110~140 (758~965)	125 (862)		



2) Deep Well Service

JFE-125V -140V

Drilling of deep wells in excess of 15,000 feet and high-pressure gas wells is on the increase. P-110's burst pressure, collapse resistance and tension are not always sufficient for these applications. Therefore, JFE-125V casing and tubing and JFE-140V casing have been developed. Cr-Mo-Nb steel with excellent hardenability and high temperature resistance are used to make OCTG which have superb strength, toughness, and restricted variation of HRC.

a. Specifications

(a) Process of Manufacture and Heat Treatment

Seamless, quenched and tempered

(b) Chemical Requirements

(wt %)

Grade	C	Si max.	Mn max.	P max.	S max.	Cu max.	Ni max.	Cr	Mo	Nb max.
JFE-125V JFE-140V	0.15~0.35	0.35	1.00	0.030	0.015	0.30	0.10	0.80~1.60	0.15~1.10	0.050

(c) Physical Properties

Grade	Tensile Requirements			2mm V Charpy Impact Requirements (casing only)			
	Yield Strength ksi (MPa)	Tensile Strength min. ksi (MPa)	Elongation	Test Temperature	Specimen	Minimum Average Absorbed Energy ft-lb (J)	Minimum Individual Absorbed Energy ft-lb (J)
JFE-125V	125~150 (862~1034)	135 (931)	As Per API 5CT	-4°F (-20°C)	10 × 10	20 (27)	15 (20)
JFE-140V	140~170 (965~1171)	150 (1034)					

(d) Hardness Test on Casing and Coupling Stock

Variation of HRC among three locations (O.D., Mid wall, I.D.) of one quadrant of a ring shall be as below.

Wall thickness (inch)	Maximum Variation
	JFE-125V, JFE-140V
0.500 or less	3.0
0.501 to 0.749	4.0
0.750 and above	5.0

6. Specification of JFE-Series

3) Sour and Special Sour Service

JFE-80S
 -85S, 85SS
 -90S, 90SS
 -95S, 95SS
 -110S, 110SS



Sour services

JFE-80S, -85S, -90S, -95S and -110S for continuous operating temperature above 149°F (65°C)

Special sour services

OCTG for sour wells must above all have improved resistance to sulfide stress cracking (SSC) in fluids containing H₂S. Intensive research has led to a modified Cr-Mo-Nb steel for OCTG for sour wells. This steel features both excellent hardenability and good temper resistance. Consequently, fine and homogeneous tempered martensite with lower HRC25 for 95 ksi grade is obtained after tempering at higher tempering temperature. As a result, OCTG of these grades possess excellent resistance to SSC for its strength grades. These OCTG are subjected to more stringent quality control.

SSC-resistant steel of these grades thoroughly tested by major oil companies enjoys high ratings and is now widely used for sour gas and oil wells all over the world.

a. Specification

(a) Process of Manufacture and Heat Treatment

Seamless, quenched and tempered

(b) Chemical Requirements

(wt %)

Grade	C	Si max.	Mn max.	P max.	S max.	Cu max.	Ni max.	Cr	Mo	Nb max.	B max.
JFE-80S, -85S JFE-90S, -95S	0.15~0.35	0.35	1.35	0.020	0.010	0.30	0.10	max. 1.60	0.05~1.10	0.050	0.0040
JFE-85SS, -90SS JFE-95SS,			1.00					0.80~1.60	0.15~1.10		
JFE-110S, -110SS	max. 0.50						0.20	max. 1.60	max. 1.10		

(c) Physical Properties

Item Grade	Tensile Requirement			Hardness Requirements		
	Yield Strength ksi (MPa)	Minimum Tensile Strength ksi (MPa)	Elongation	As-Quenched	Hardness (HRC) Maximum	
JFE-80S	80~ 95 (552~655)	95 (655)	As Per API 5CT	—	22	
JFE-85S	85~100 (586~689)	95 (655)		—	23	
JFE-90S	90~105 (621~724)	100 (689)		—	24	
JFE-95S	95~110 (655~758)	105 (724)		—	25	
JFE-110S	110~125 (758~862)	120 (827)		—	31	
JFE-85SS	85~100 (586~689)	95 (655)		Minimum equivalent to 90% martensitic Structure		23
JFE-90SS	90~105 (621~724)	100 (689)				24
JFE-95SS	95~110 (655~758)	105 (724)				25
JFE-110SS	110~125 (758~862)	120 (827)				31

b. Examples of Physical Tests on JFE-90SS Casing

HRC test results show relatively low and stable values indispensable for increasing sulfide stress cracking (SSC) resistance for its yield strength. SSC test results show excellent SSC-resistant properties.

(a) Hardness Test Result of Products

Pipe Dimensions O.D. × W.T.	Location	Rockwell C Hardness Values					Maximum Variation
		Quadrant No.					
		1	2	3	4		
5 1/2" × 0.415"	O.D.	20.9	20.1	20.6	20.9	0.1	
	I.D.	20.8	20.1	20.6	20.8		
5 1/2" × 0.725"	O.D.	19.8	20.0	20.4	20.5	1.2	
	Mid Wall	19.7	19.4	20.0	20.1		
	I.D.	19.4	18.8	19.6	19.8		
7" × 1.200"	O.D.	19.4	18.9	19.3	18.6	1.4	
	Mid Wall	19.1	19.4	19.2	19.1		
	I.D.	18.6	18.0	18.5	18.7		



(b) SSC Test Results (NACE Standard TM0177)

Wall Thickness	Location	Applied Stress, ksi (MPa)					Threshold Stress	σ_c/σ_y
		71.1 (490)	80.1 (552)	85.5 (590)	90.0 (621)	99.0 (683)	σ_c ksi	
0.415"	Mid Wall	—	NF	NF	546.8	31.0	85.5	0.95
0.725"	Mid Wall	—	NF	NF	301.4	3.2	85.5	0.95
1.200"	Mid Wall	NF	NF	NF	284.0	—	85.5	0.95
	Inside	NF	NF	NF	499.0	—	85.5	0.95

Note: (Time to failure Hr)

NF = No failure during 30 days (720 hours)

— = No test

σ_c = Maximum applied stress resulted in no failure

σ_y = Specified Minimum Yield Strength

Hardness Requirements			Prior Austenitic Grain Size	Threshold Stress Requirements for SSC Test according to NACE TM0177 Minimum % of SMYS
Variation (Wall Thickness, inch)				
Less than 0.750	0.750 to 0.999	1.000 and over		
—	—	—	—	—
—	—	—	—	—
—	—	—	—	—
—	—	—	—	—
—	—	—	—	—
3.0	4.0	5.0	ASTM 5 and finer	80
3.0	4.0	5.0		80
3.0	4.0	5.0		80
3.0	4.0	5.0		80

6. Specification of JFE-Series

4) Low-Temperature Service

JFE-80L
-95L
-110L
-125L

Representing the casing and tubing to be used in frigid zones, this series is designed with increased resistance for low-temperature impact in order to withstand shock during delivery, handling, storage, make up, and running in frigid zones. Quenching and tempering is performed to ensure both high yield strength and good low-temperature toughness. Note that the Charpy impact test data of JFE-125L with heavy wall of 0.725 in. below show good results at – 50°F. Tensile test results and variation of HRC also show good properties.

a. Specification

(a) Process of Manufacture and Heat Treatment

Seamless, quenched and tempered

(b) Physical Properties

Grade	Tensile Requirements			2mm V Charpy Impact Requirement (casing only)			
	Yield Strength ksi (MPa)	Tensile Strength min. ksi (MPa)	Elongation	Test Temperature	Specimen	Minimum Average Absorbed Energy ft-lb (J)	Minimum Individual Absorbed Energy ft-lb (J)
JFE-80L	80~95 (552~655)	95 (655)	As Per API 5CT	-50°F (-46°C)	10 × 10	25 (34)	19 (26)
JFE-95L	95~125 (655~862)	110 (758)			10 × 7.5	20 (27)	15 (20)
JFE-110L	110~140 (758~965)	125 (862)			10 × 5	14 (19)	10 (14)
JFE-125L	125~150 (862~1034)	135 (931)					

(c) Hardness Tests (HRC) on JFE-125L Casing and Coupling Stock

Variation of HRC among three locations (O.D., Mid wall, I.D.) of one quadrant of a ring from JFE-125L shall be as below.

Wall Thickness (inch)	Maximum Variation
0.500 or less	3.0
0.501 to 0.749	4.0
0.750 and above	5.0

b. Example of Physical Properties of JFE-125L Casing O.D. 5-1/2" × 0.725" (139.7φ × 18.42mm)

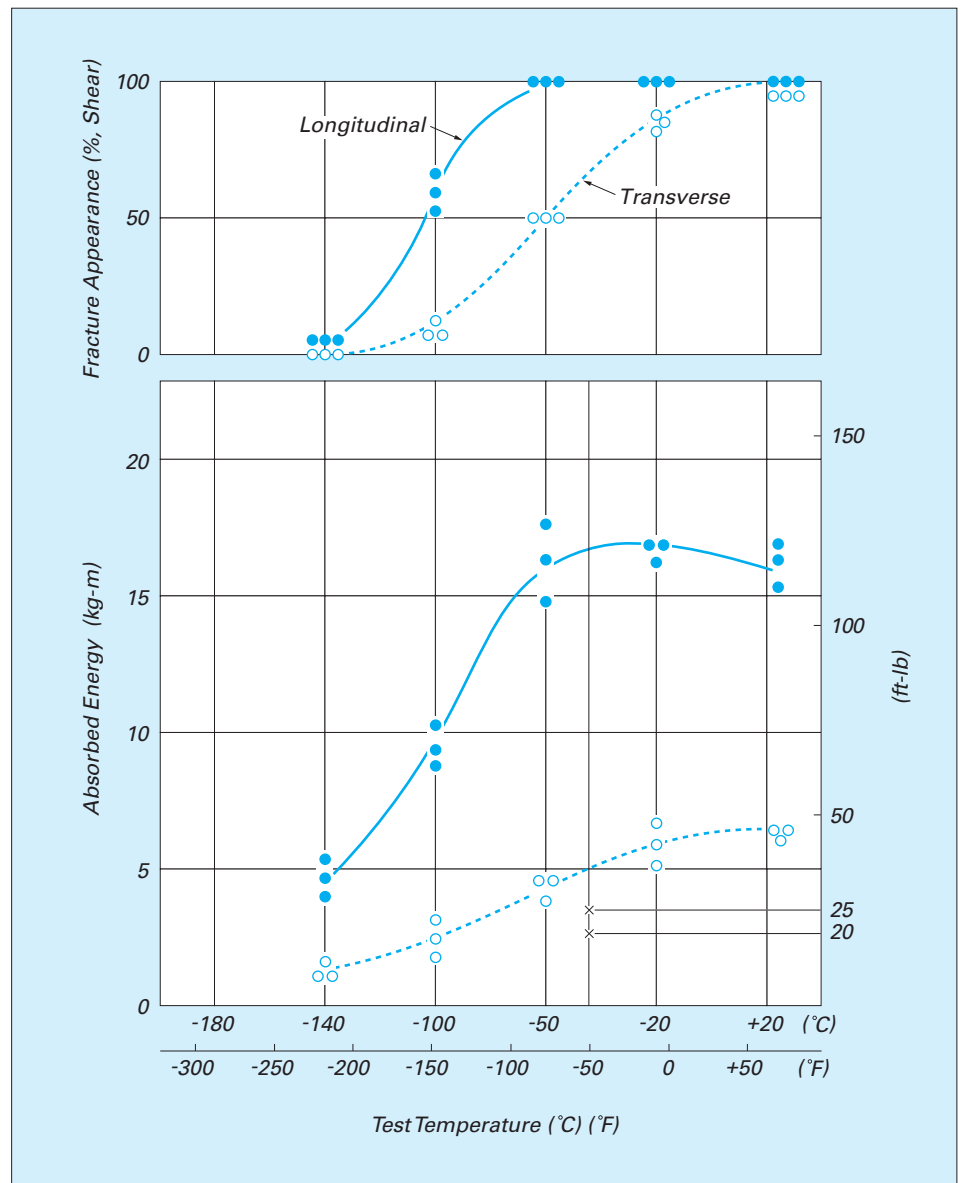
(a) HRC Variation

Measurements were made on four quadrants of one test ring.

Quadrant	1	2	3	4
Location				
Outside	31.3	30.5	30.7	30.8
Mid Wall	31.2	31.3	31.2	31.5
Inside	31.6	31.6	31.7	31.5
Variation	0.3	1.1	1.0	0.7

(b) 2 mm Charpy Test Result

Specimen : full size (10 × 10)



6. Specification of JFE-Series

5) Corrosive Wet CO₂ Service

JFE-13CR-80

-13CR-85

-13CR-95

JFE-HP1-13CR-95

-HP1-13CR-110

JFE-HP2-13CR-95

-HP2-13CR-110

In oil and gas fields being looked to for future development, gas which includes CO₂ is an increasingly common occurrence. Corrosion has become the major problem for production strings used in environments including CO₂, and there is a great demand for a tubing that has strong resistance to CO₂ corrosion. JFE Steel's JFE-13CR is a martensitic stainless steel which combines high performance in such kind of corrosive condition with low cost.

For fields with more severe conditions such as high temperature and containing not only CO₂ but small amounts of H₂S, JFE Steel developed JFE-HP-13CR (HP1 and HP2) material which has higher strength and outstanding anti-corrosion property. It also shows excellent low-temperature toughness.

a. Specifications

(a) Process of Manufacture

Process : Seamless

Heat Treatment : Quenched and Tempered/Ausformed Tempered

(b) Chemical Composition

(wt %)

Grade	C	Si, max.	Mn	P, max.	S, max.	Cr	Ni	Mo	Cu, max.
JFE-13CR	0.15~0.22	1.00	0.25~1.00	0.020	0.010	12.0~14.0	max. 0.50	—	0.25
JFE-HP1-13CR	max. 0.04	0.50	max. 0.60	0.020	0.010	12.0~14.0	3.50~4.50	0.80~1.50	—
JFE-HP2-13CR	max. 0.04	0.50	max. 0.60	0.020	0.005	12.0~14.0	4.50~5.50	1.80~2.50	—

(c) Specified Physical Properties (at Ambient Temperature)

Grade	Yield Strength		Tensile Strength	Elongation %	Hardness max. HRC
	min. psi (MPa)	max. psi (MPa)	min. psi (MPa)		
JFE-13CR-80	80,000 (552)	95,000 (655)	95,000 (655)	API Formula	23
JFE-13CR-85	85,000 (586)	100,000 (689)	100,000 (689)	API Formula	24
JFE-13CR-95	95,000 (655)	110,000 (758)	105,000 (724)	API Formula	27
JFE-HP1-13CR-95	95,000 (655)	110,000 (758)	105,000 (724)	API Formula	28
JFE-HP2-13CR-95					30
JFE-HP1-13CR-110	110,000 (758)	130,000 (896)	120,000 (827)	API Formula	32
JFE-HP2-13CR-110					32

Notes:

-The corrosion testing data in this brochure were obtained from laboratory testing results. Care should always be taken when selecting materials, as operating conditions may change during the period of usage.

-Regarding completion/packer fluid

Care should be taken in the selection of well fluids such as completion/packer fluids used in connection with this material in order to minimize the risk of stress corrosion cracking. JFE recommends that you consult with a person knowledgeable about fluid compatibility with this material in making a selection.

-Cr tubulars have shown a tendency toward localized pitting corrosion when stored in moist environments.

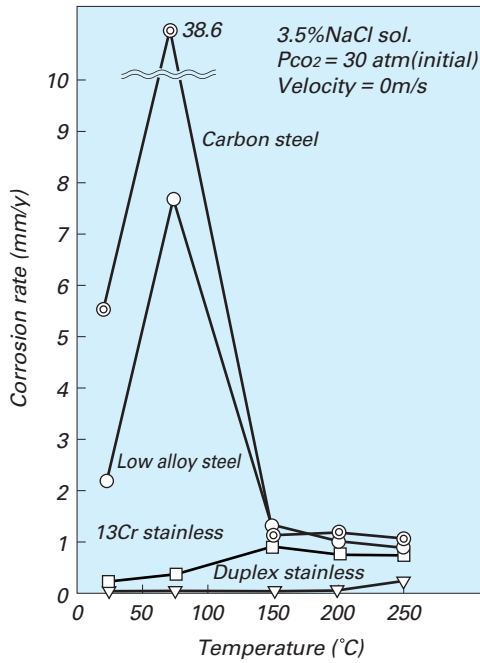
Special precautions during coating, shipping and storage are required.

-Anti-galling connection

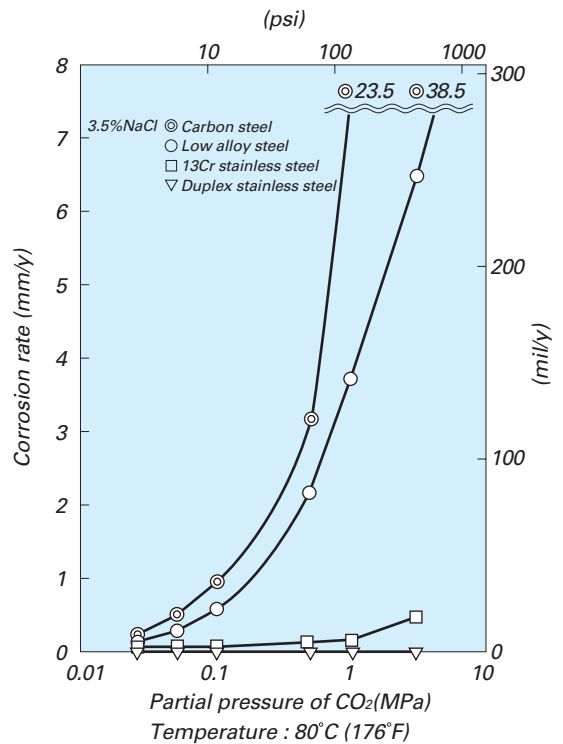
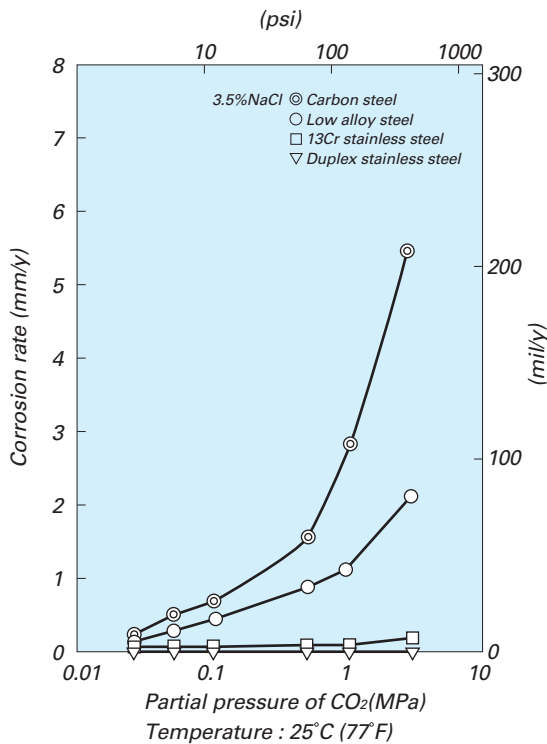
Cr tubulars have been categorized as prone to thread galling, JFE Steel recommends to use FOX™ & JFEBEAR™ premium connection which overcomes this concern by its special design criteria. (Please see page 31, 32)

b. Test Data

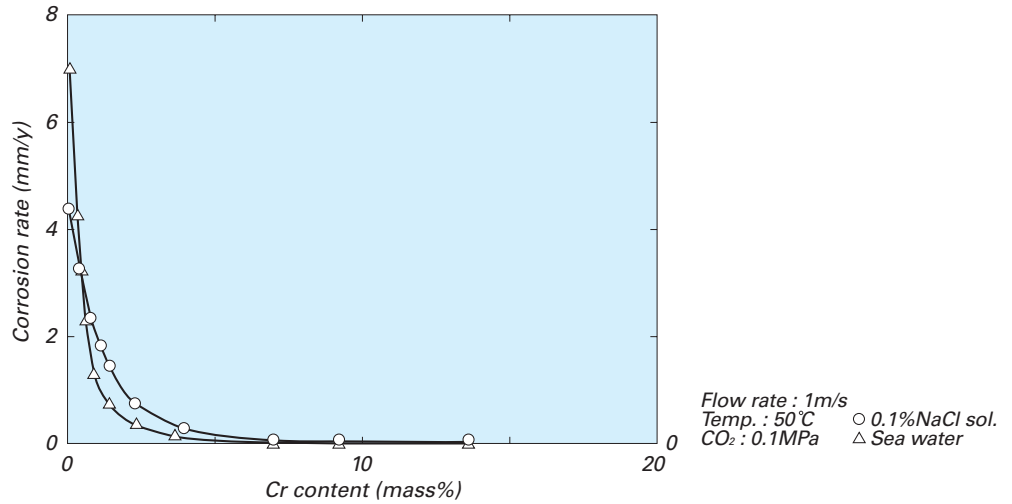
(a-1) Effect of Temperature on Corrosion Rate



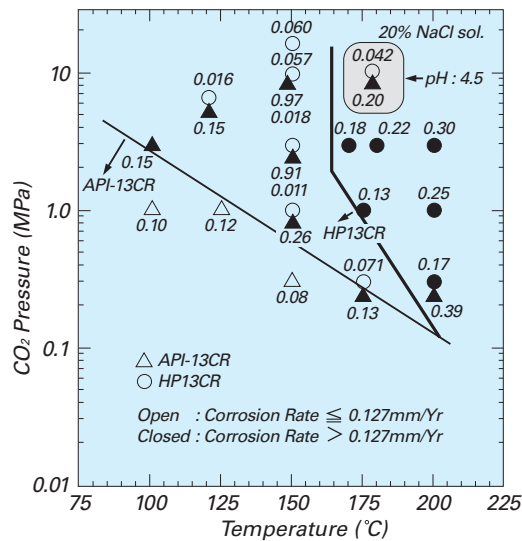
(a-2) Effect of CO₂ Partial Pressure on Corrosion Rate



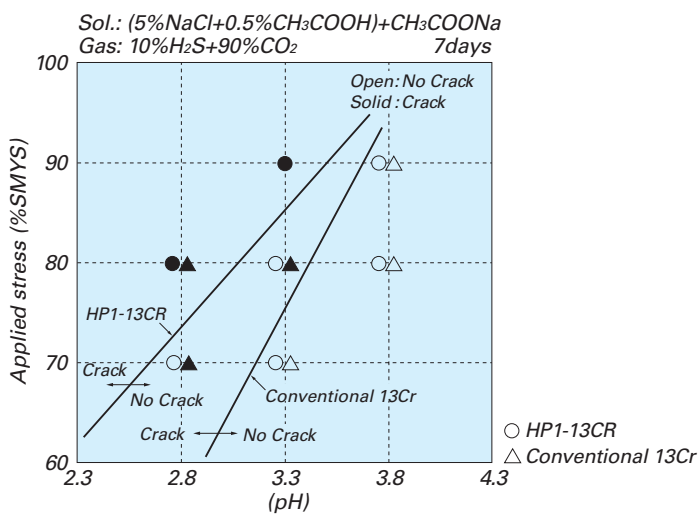
(a-3) Effect of Cr Content on CO₂ Corrosion Rate



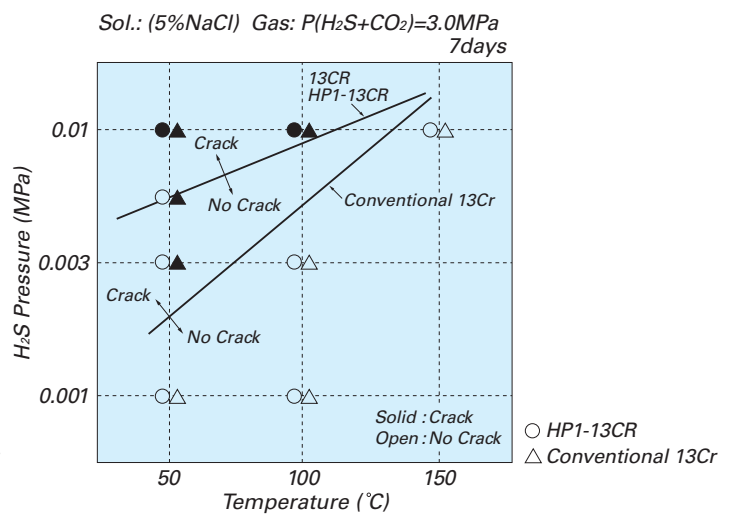
(a-4) CO₂ Corrosion Test Results of HP1-13CR and conventional 13Cr



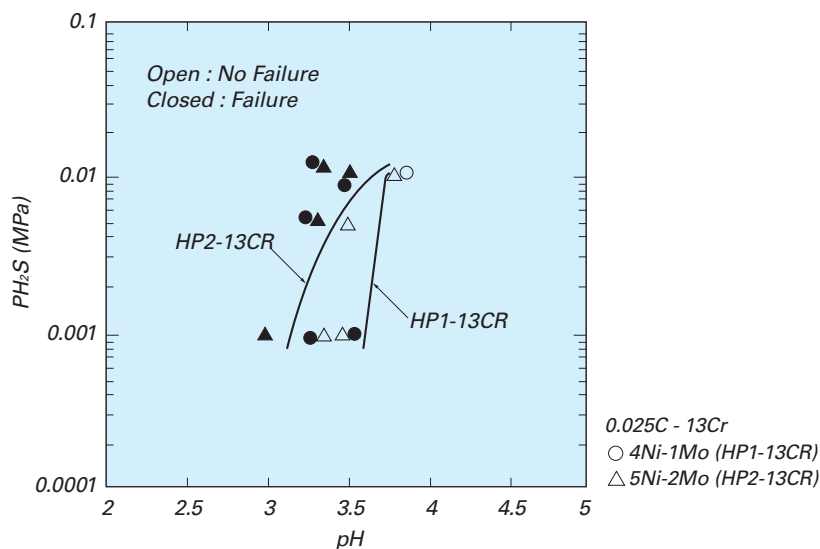
(b-1) C-Ring SSC Test Results of HP1-13CR and conventional 13Cr steels



(b-2) U-Bend SSC Test Results of HP1-13CR and conventional 13Cr steels



(b-3) Effect of Mo content on the resistance to SSC



(C) Physical and Thermal Properties (Information Purpose Only)

Grade			Minimum Value Temperature			
			50°C (122°F)	100°C (212°F)	150°C (302°F)	200°C (392°F)
JFE-13CR-80	Yield Strength	psi (MPa)	80,000 (550)	78,000 (540)	75,000 (520)	72,000 (500)
	Tensile Strength	psi (MPa)	98,000 (680)	95,000 (660)	91,000 (630)	90,000 (620)
JFE-13CR-95	Yield Strength	psi (MPa)	92,000 (630)	89,000 (610)	88,000 (610)	85,000 (590)
	Tensile Strength	psi (MPa)	106,000 (730)	101,000 (700)	98,000 (680)	95,000 (660)
JFE-HP1-13CR-95	Yield Strength	psi (MPa)	98,000 (680)	97,000 (670)	96,000 (660)	94,000 (650)
	Tensile Strength	psi (MPa)	117,000 (810)	112,000 (770)	108,000 (740)	106,000 (730)
JFE-HP1-13CR-110	Yield Strength	psi (MPa)	115,000 (790)	110,000 (760)	106,000 (730)	104,000 (720)
	Tensile Strength	psi (MPa)	126,000 (870)	119,000 (820)	115,000 (790)	114,000 (780)
JFE-HP2-13CR-95	Yield Strength	psi (MPa)	100,000 (690)	98,000 (680)	96,000 (670)	95,000 (660)
	Tensile Strength	psi (MPa)	125,000 (860)	120,000 (830)	115,000 (790)	113,000 (780)
JFE-HP2-13CR-110	Yield Strength	psi (MPa)	109,000 (750)	106,000 (730)	103,000 (710)	101,000 (700)
	Tensile Strength	psi (MPa)	129,000 (890)	123,000 (850)	117,000 (810)	114,000 (790)

	Young Modulus	Poisson's Ratio	Thermal Expansion
JFE-13CR-80	31,290 ksi (215,700 MPa)	0.30	0.0000099/°C for 21.1°C up to 100°C 0.0000115/°C for 21.1°C up to 538°C

6. Specification of JFE-Series

5) High Strength High Temperature Wet CO₂ Service

JFE-UHP™-15CR-125

High demand for natural gas, deep water drilling and an increasing number of high pressure, high temperature (HPHT) wells has generated the need for a high strength OCTG material which can provide superior corrosion resistance at high temperatures. JFE-UHP™-15CR-125 is that material. A tempered Martensitic microstructure provides high strength at ambient and elevated temperatures with excellent corrosion resistance properties in both productive and non-productive environments.

a. Specifications

(a) Process of Manufacture

Process : Seamless

Heat Treatment : Quenched and Tempered/Ausformed Tempered

(b) Chemical Composition

(wt %)

Grade	C, max.	Si, max.	Mn, max.	P, max.	S, max.	Cr	Ni	Mo	Cu, max.
JFE-UHP™-15CR-125	0.04	0.50	0.60	0.020	0.005	14.0~16.0	6.00~7.00	1.8~2.5	1.5

(c) Specified Physical Properties (at Ambient Temperature)

Grade	Yield Strength		Tensile Strength	Elongation %	Hardness max. HRC
	min.	max.	min.		
	ksi (MPa)	ksi (MPa)	ksi (MPa)		
JFE-UHP™-15CR-125	125 (862)	150 (1034)	135 (931)	API Formula	37

Notes:

-The corrosion testing data in this brochure were obtained from laboratory testing results. Care should always be taken when selecting materials, as operating conditions may change during the period of usage.

-Regarding completion/packer fluid

Care should be taken in the selection of well fluids such as completion/packer fluids used in connection with this material in order to minimize the risk of stress corrosion cracking. JFE recommends that you consult with a person knowledgeable about fluid compatibility with this material in making a selection.

-Cr tubulars have shown a tendency toward localized pitting corrosion when stored in moist environments.

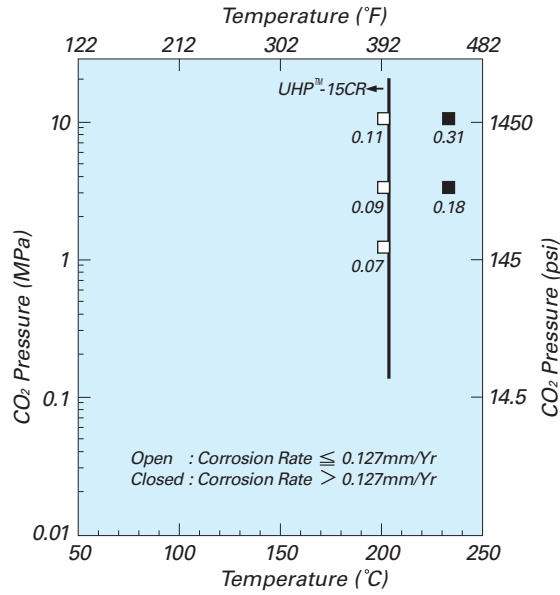
Special precautions during coating, shipping and storage are required.

-Anti-galling connection

Cr tubulars have been categorized as prone to thread galling, JFE Steel recommends to use FOX™ & JFEBEAR™ premium connection which overcomes this concern by its special design criteria. (Please see page 31, 32)

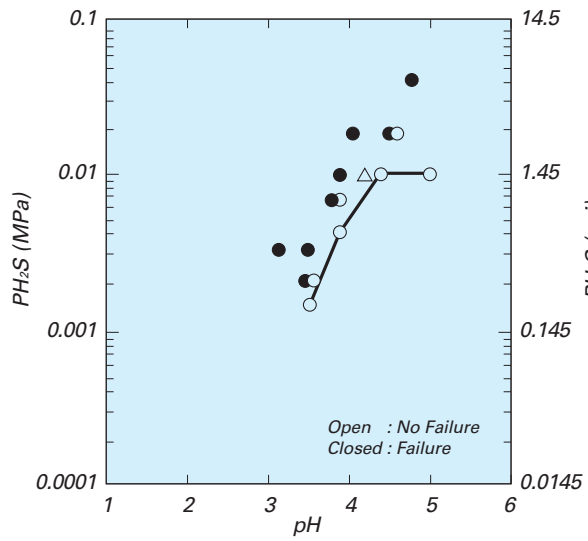
b. Test Data

(1) CO₂ Corrosion Test Results of UHP™-15CR-125



20% NaCl sol.

(2) SSC Test Results of UHP™-15CR-125

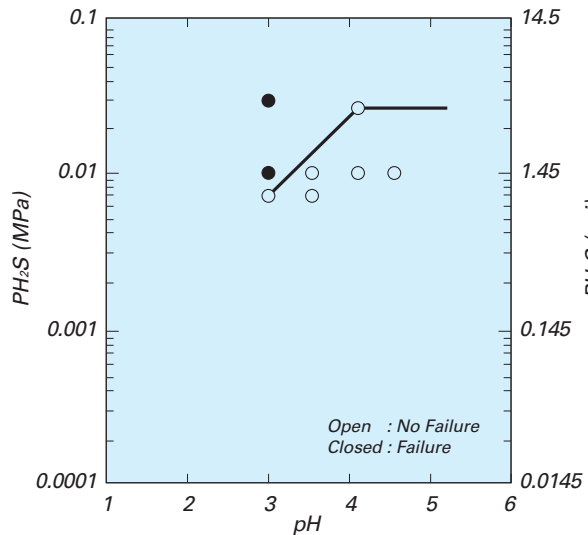


20% NaCl sol.
 (Cl⁻ 121,200ppm)

0.5%CH₃COOH
 +CH₃COONa

100%SMYS(125ksi)
 720h

○ NACE-TM0177-Method A
 △ NACE-TM0177-Method C



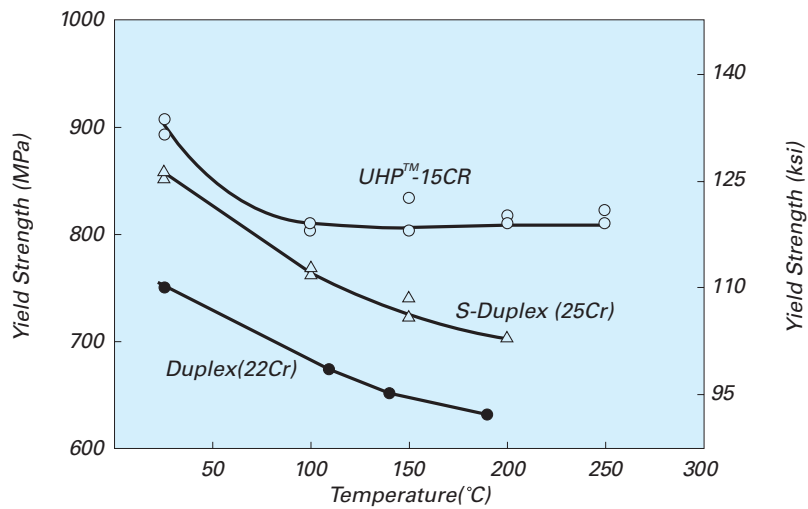
0.165% NaCl sol.
 (Cl⁻ 1,000ppm)

0.5%CH₃COOH
 +CH₃COONa

100%SMYS(125ksi)
 720h

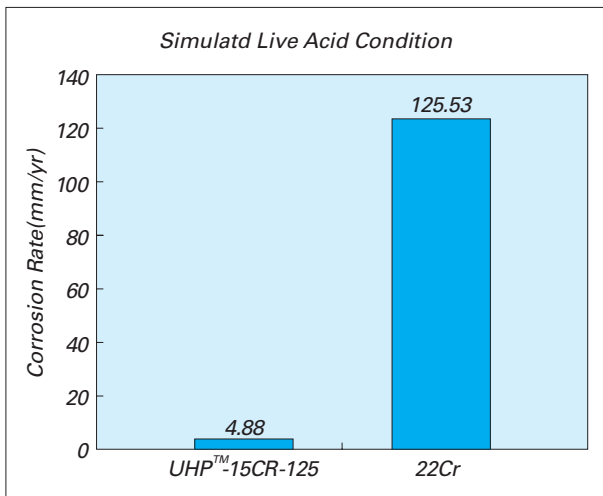
○ NACE-TM0177-Method A

(3) Tensile test results of UHP™-15CR-125 at elevated temperature

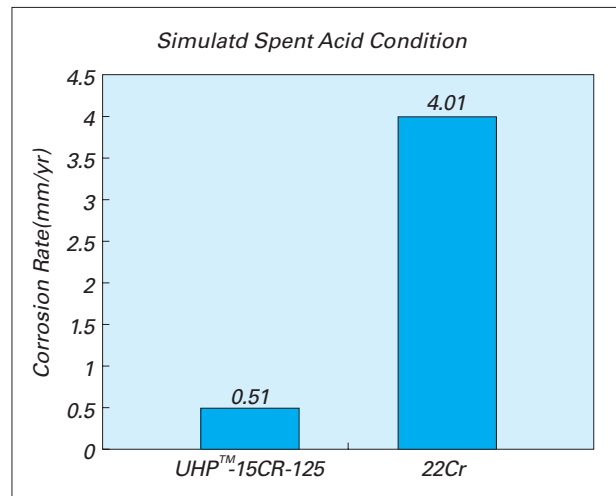


※ JFE-UHP™-15CR-125 provides better tensile properties at elevated temperature than Duplex stainless steel, which requires cold drawn.

(4) Corrosion test results in acidizing condition



1.5%HF + 13.5%HCl + Inhibitor
80C(176F) 24Hrs



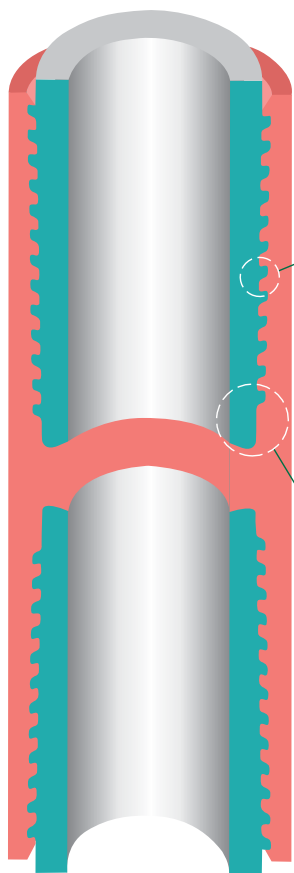
5%CH₃COOH + 7%HCOOH + 1%HF
+ Inhibitor ,80C(176F) 168Hrs

※ JFE-UHP™-15CR-125 provides better corrosion resistance than Duplex stainless steel during acidizing operations.

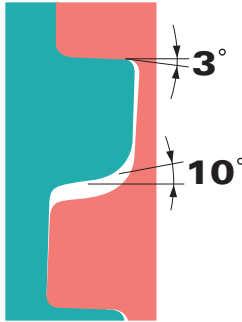
7. Premium Threaded Connections

1) FOX™

FOX™ is an advanced premium threaded connection jointly developed by JFE Steel Corporation, and Hunting Oilfield Services, in early 1980s. The connection was created using an advanced thread geometry and unique seal design to reduce thread galling and enhance sealing performance. FOX™ is a field proven connection with over 50 million ft sold world wide.



THREAD FORM



Modified Buttress Thread

2 3/8", 2-7/8" :8TPI,
 3 1/2", 4" :6TPI,
 4 1/2" to 13 3/8" :5TPI

SEAL GEOMETRY

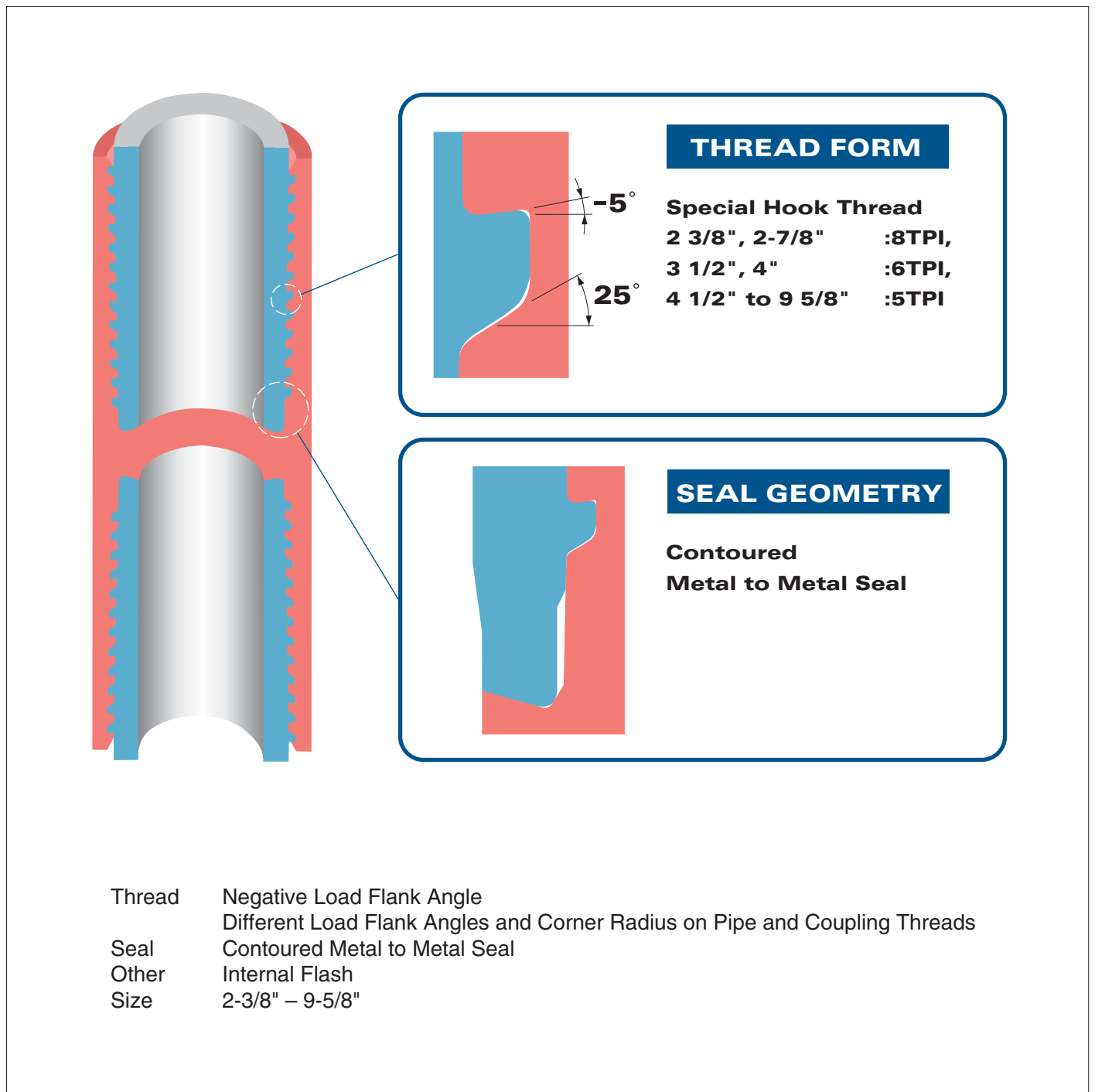


**Contoured
Metal to Metal Seal**

Thread	Buttress Modified Type
	Pitch Change on Coupling thread
Seal	Contoured Metal to Metal Seal
Other	Internal Flash
Size	2-3/8" – 13-3/8"

2) JFEBEAR™

In today's oil & gas industry, companies are drilling deeper high-deviation wells into high pressure reservoirs using the latest generation of drilling rigs and tools. As a result, the loads placed on OCTG connections in certain well conditions exceed those of an API class-1 qualified connection. JFEBEAR™ has been designed and tested to withstand today's toughest well conditions.



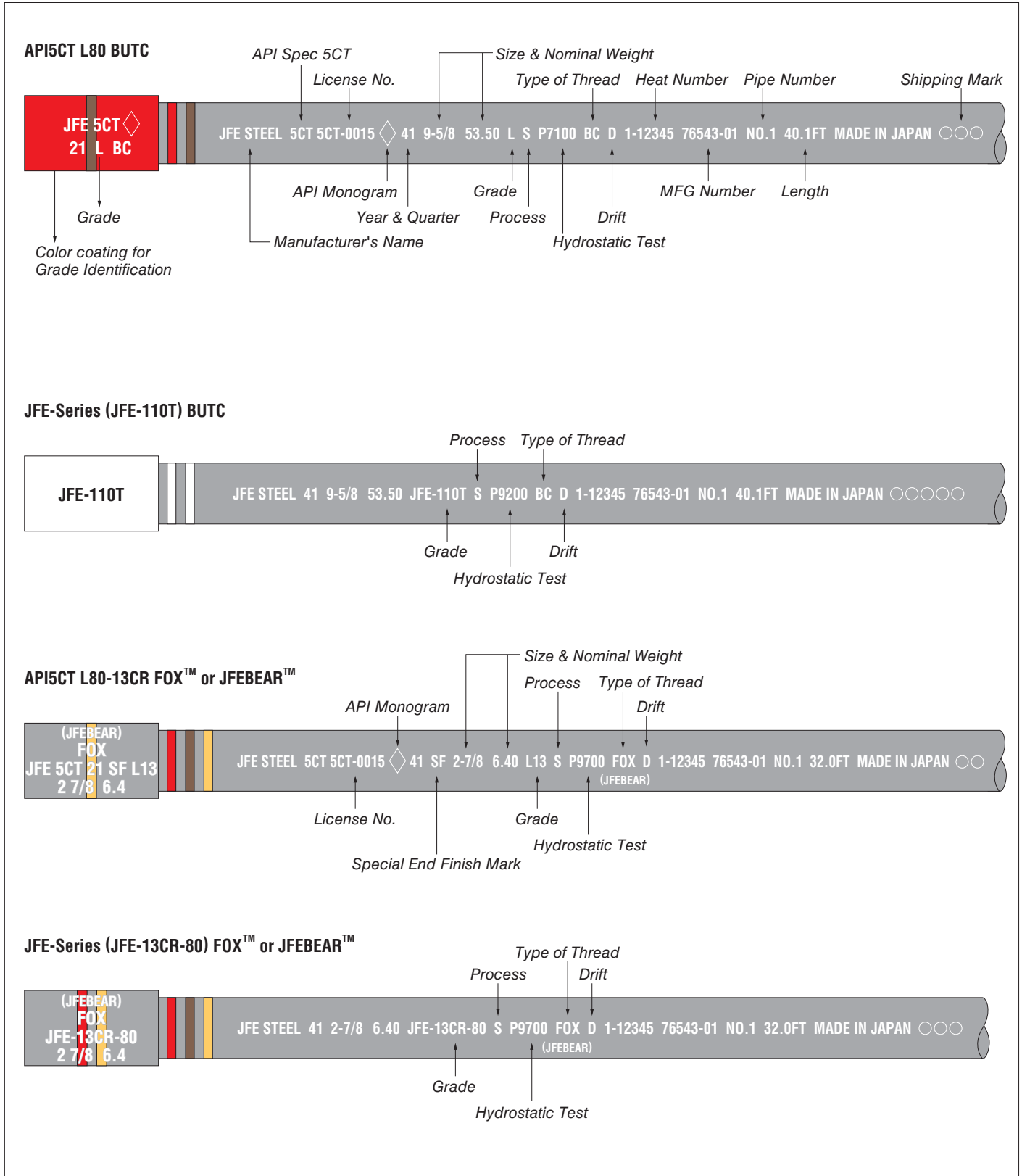
* Detailed information on connections can be found in the FOX™, and JFEBEAR™ brochures.

8. Marking

Tubing and casing are paint-stenciled as shown below.

The color identification table for JFE-series tubing and casing are shown next page.

Marking Example



9. Color Identification of JFE OCTG (JFE-Series)

Type	Grade	Coupling	Pipe Body
General Service (ERW)	JFE-40E		
	JFE-55E		
	JFE-80E		
High Collapse Casing(ERW)	JFE-80ET		
High Collapse Casing (Seamless)	JFE-80T		
	JFE-95T		
	JFE-110T		
Sour Service	JFE-80S		
	JFE-85S		
	JFE-90S		
	JFE-95S		
	JFE-110S		
Special Sour Service	JFE-85SS		
	JFE-90SS		
	JFE-95SS		
	JFE-110SS		
Sour Service & High Collapse	JFE-80TS		
	JFE-95TS		

Type	Grade	Coupling	Pipe Body
Arctic Service	JFE-80L		
	JFE-95L		
	JFE-110L		
	JFE-125L		
Deep Well Service	JFE-125V		
	JFE-140V		
Wet CO ₂ Service	JFE-13CR-80		
	JFE-13CR-85		
	JFE-13CR-95		
High Temperature Wet CO ₂ Service	JFE-HP1-13CR-95		
	JFE-HP1-13CR-110		
	JFE-HP2-13CR-95		
	JFE-HP2-13CR-110		
High Strength High Temperature Wet CO ₂ Service	JFE-UHP™ 15CR-125		

The special clearance coupling is painted with a black band adjacent to a color identification band on the coupling.

10. Thread Protectors and Packaging

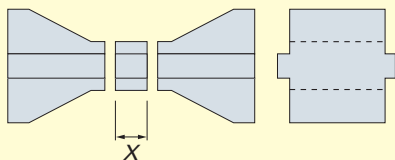
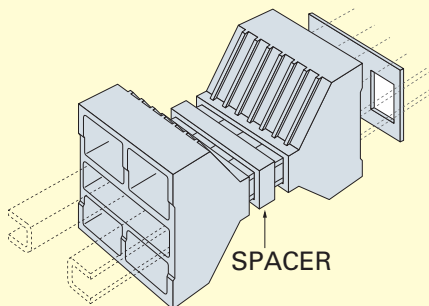
1) Thread Protectors

Various types of protector including composite type are available according to customer's requests.

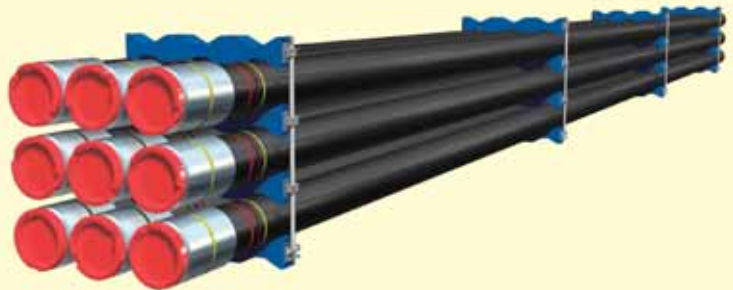
2) Packaging

Bare in bundle or bare in loose is the standard packaging method for carbon OCTG. Other than the standard packaging, customer can choose special packaging such as rack pack (in wooden or plastic), spacer rings or JFE-PACK all of which avoid metal to metal contact during transport and storage.

1. JFE-PACK can be used for all pipe sizes ranging from 2-3/8" to 10-3/4" by changing the spacers.

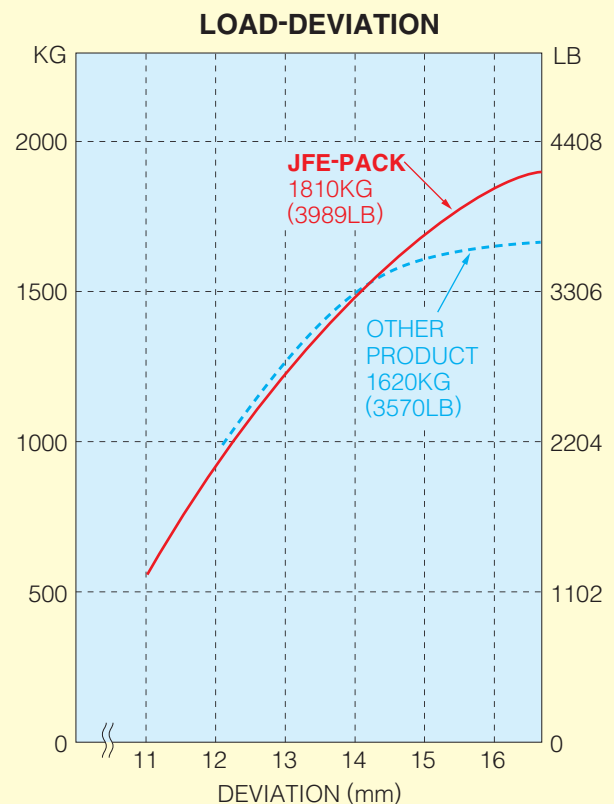


2. JFE-PACK is composite-type packing unit fit for repetitive re-bundling.



3. JFE-PACK can pack different number of pipes by changing the number of parts.

4. JFE-PACK has drainage function, anti-slip function at the contact portion with pipes.



11. Inquiries and Orders

The following information if available should be specified in your order or inquiry.

1. Specification, Grade and Type

2. Quantity (feet, meters, or number of joints, delivery allowance)

3. Seamless, Electric Welded (ERW) or UOE

4. Casing or Tubing

/Threaded or Plain End

/Thread Type (API, FOX™ or other premium connection)

/With or Without Couplings

/Special Clearance Couplings

/Special Bevel Couplings

5. Size (Outside Diameter)

6. Nominal Weight with Specified Unit or Wall Thickness

7. Range Length

8. Marking and Packaging (if specification is outside that presented in this brochure)

9. Delivery Date and Shipping Instructions

10. Third Party Inspection

11. Any Other Special Requirements such as;

/Hydrostatic Test Pressure

/Non Destructive Inspection

/Thread Protectors

/Thread Compound

/Coupling Make Up Other Than Power Tight

/Special Drift

/Internal Descaling (In case of 13Cr material)

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