TECHNICAL INFORMATION

ASTM A106 Grade B Tensile Strength and Yield Strength

Mechanical Properties						
Grade	Grade A		Grade B		Grade C	
Tensile stength, min, psi	48000 [330]		60 000 [415]		70 000 [485]	
Yield strength, min, psi [MPa]	30 000 [205]		35 000 [240]		40 000 [275]	
Direction	Longitudinal	Transverse	Longitudinal	Transverse	Longitudinal	Transverse
Elongation in 2 in. [50mm], min, %						
Basic minimum elongation transverse strip tests, and for small sizes tested in full section	35	25	30	16.5	30	16.5
When standard round 2-in. [50-mm] gage length test specimen is used	28	20	22	12	20	12
For longitudinal strip tests	*A*		*A*		*A*	
For transverse strip tests, a deduction for each 1/32-in. [0.8-mm] decrease in wall thickness below 5/16 in. [7.9 mm] from the basic minimum elongation of the following percentage shall be made		1.25		1.00		1.00

ASTM A106 Grade B and A pipe chemical composition

Chemical Composition			
Grade	Grade A	Grade B	Grade C
	%		
Carbon (C) Mx.	0.25	0.30	0.35
Manganese (Mn)	0.27-0.93	0.29-1.06	0.29-1.06
Phosphorus (P) Mx.	0.035	0.035	0.035
Sulfur (S) Mx.	0.035	0.035	0.035
Silicon (Si) Mx.	0.10	0.10	0.10
Chromium (Cr) Mx.	0.40	0.40	0.40
Copper (Cu) Mx.	0.40	0.40	0.40
Molybdenum (Mo) Mx.	0.15	0.15	0.15
Nickel (Ni) Mx.	0.40	0.40	0.40
Vandadium (V) Mx.	0.08	0.08	0.08

Grade :	E355
Number:	1.0580
Classification:	Non-alloy quality steel
Standard:	EN 10296-1: 2003 Welded circular steel tubes for mechanical and general engineering purposes. Non-alloy and alloy steel tubes. Technical delivery conditions EN 10305-1: 2010 Steel tubes for precision applications. Seamless cold drawn tubes. Technical delivery conditions EN 10305-2: 2002 Steel tubes for precision applications. Welded cold drawn tubes. Technical delivery conditions EN 10305-3: 2002 Steel tubes for precision applications. Welded cold sized tubes. Technical delivery conditions EN 10305-4: 2003 Steel tubes for precision applications. Seamless cold drawn tubes for hydraulic and pneumatic power systems. Technical delivery conditions EN 10305-5: 2003 Steel tubes for precision applications. Welded and cold sized square and rectangular tubes. Technical delivery conditions EN 10297-1: 2003 Seamless circular steel tubes for mechanical and general engineering purposes. Non-alloy and alloy steel tubes. Technical delivery conditions
Equivalent grades:	Go here

Chemical composition % of steel E355 (1.0580): EN 10296-1-2003

P max =0.025%; S max =0.025%; Al min =0.02% (EN 10305-1:2010)				
C	**Si**	**Mn**	**P**	**S**
max 0.22	**max 0.55**	**max 1.6**	**max 0.045**	**max 0.045**

Mechanical properties of steel E355 (1.0580)

Rm - Tensile strength (MPa) (+U)	**540**

Rm - Tensile strength (MPa) (+A)	**450-490**			
Rm - Tensile strength (MPa) (+N)	**490-630**			
Nominal thickness (mm):	**to 16**	**16 - 40**	**40 - 65**	**65 - 100**
Rm - Tensile strength (MPa) (+AR)	**490**	**490**	**490**	**470**
Rm - Tensile strength (MPa) (+C)	**640**			
Rm - Tensile strength (MPa) (+LC)	**580-590**			
Rm - Tensile strength (MPa) (+SR)	**580-590**			

ReH - Minimum yield strength (MPa) (+U)	**400**				
ReH - Minimum yield strength (MPa) (+N)	**355**				
Nominal thickness (mm):	**to 16**	**16 - 40**	**40 - 65**	**65 - 80**	**80 - 100**
ReH - Minimum yield strength (MPa) (+AR)	**355**	**345**	**335**	**315**	**295**
ReH - Minimum yield strength (MPa) (+SR)	**435-450**				

A - Min. elongation at fracture (%) (+A) or (+N)	**22**
A - Min. elongation at fracture (%) (+U)	**5**
A - Min. elongation at fracture (%) longitud., (+AR)	**20**
A - Min. elongation at fracture (%) (+C)	**4**
A - Min. elongation at fracture (%) (+SR)	**10**

A - Min. elongation at fracture (%) (+A)	**22**
A - Min. elongation at fracture (%) (+LC)	**6-7**

Equivalent grades of steel E355 (1.0580)

EU EN	USA -	Germany DIN,WNr	France AFNOR	England BS	Italy UNI	Sweden SS	Poland PN	Czechia CSN	Austria ONORM	Russia GOST	Inter ISO
E355	Gr.65	1.0060 E355 St52 St52-3	E335 ES355 TS-47a TU526	CEW5 CFS5 E335 ERW5NKM ERW5NZF	E335 Fe510	1650	MSt6	11600	St60F	St6sp	Fe590

Delivery Conditions for Each API 5L Grade

Table 1 — Pipe grades, steel grades and acceptable delivery conditions

PSL	Delivery condition	Pipe grade/steel grade [a,b]
PSL 1	As-rolled, normalizing rolled, normalized or normalizing formed	L175 or A25
		L175P or A25P
		L210 or A
	As-rolled, normalizing rolled, thermomechanical rolled, thermomechanical formed, normalizing formed, normalized, normalized and tempered; or, if agreed, quenched and tempered for SMLS pipe only	L245 or B
	As-rolled, normalizing rolled, thermomechanical rolled, thermomechanical formed, normalizing formed, normalized, normalized and tempered or quenched and tempered	L290 or X42
		L320 or X46
		L360 or X52
		L390 or X56
		L415 or X60
		L450 or X65
		L485 or X70
PSL 2	As-rolled	L245R or BR
		L290R or X42R
	Normalizing rolled, normalizing formed, normalized or normalized and tempered	L245N or BN
		L290N or X42N
		L320N or X46N
		L360N or X52N
		L390N or X56N
		L415N or X60N
	Quenched and tempered	L245Q or BQ
		L290Q or X42Q
		L320Q or X46Q
		L360Q or X52Q
		L390Q or X56Q
		L415Q or X60Q
		L450Q or X65Q
		L485Q or X70Q
		L555Q or X80Q
		L625Q or X90Q [c]
		L690Q or X100Q [c]

Table 1 — Pipe grades, steel grades and acceptable delivery conditions *(continued)*

PSL	Delivery condition	Pipe grade/steel grade [a,b]
PSL 2	Thermomechanical rolled or thermomechanical formed	L245M or BM
		L290M or X42M
		L320M or X46M
		L360M or X52M
		L390M or X56M
		L415M or X60M
		L450M or X65M
		L485M or X70M
		L555M or X80M
	Thermomechanical rolled	L625M or X90M
		L690M or X100M
		L830M or X120M

[a] For intermediate grades, the steel grade shall be in one of the following formats: (1) The letter L followed by the specified minimum yield strength in MPa and, for PSL 2 pipe, the letter describing the delivery condition (R, N, Q or M) consistent with the above formats. (2) The letter X followed by a two or three digit number equal to the specified minimum yield strength in 1000 psi rounded down to the nearest integer and, for PSL 2 pipe, the letter describing the delivery condition (R, N, Q or M) consistent with the above formats.

[b] The suffix (R, N, Q or M) for PSL 2 grades belongs to the steel grade.

[c] Seamless only.

Chemical composition for API 5L PSL1 pipe
Wall thickness ≤ 25.0 mm (0.984 in)

Chemical composition								
Steel Grade (Steel Name)	Wall Thickness ≤ 25.0 mm (0.984 in)							
	Mass fraction, based upon heat and product analyses							
	%							
	C	Mn	P		S	V	Nb	Ti
	max	max	min.	max	max	max	max	max
Seamless pipe								
L175 or A25	0.21	0.60	—	0.030	0.030	—	—	—
L175P or A25P	0.21	0.60	0.045	0.080	0.030	—	—	—
L210 or A	0.22	0.90	—	0.030	0.030	—	—	—
L245 or B	0.28	1.20	—	0.030	0.030	c,d	c,d	d
L290 or X42	0.28	1.30	—	0.030	0.030	d	d	d
L320 or X46	0.28	1.40	—	0.030	0.030	d	d	d
L360 or X52	0.28	1.40	—	0.030	0.030	d	d	d
L390 or X56	0.28	1.40	—	0.030	0.030	d	d	d
L415 or X60	0.28	1.40	—	0.030	0.030	f	f	f
L450 or X65	0.28	1.40	—	0.030	0.030	f	f	f
L485 or X70	0.28	1.40	—	0.030	0.030	f	f	f
Welded (ERW, LSAW, SSAW) pipe								
L175 or A25	0.21	0.6	—	0.030	0.030	—	—	—
L175P or A25P	0.21	0.6	0.045	0.080	0.030	—	—	—
L210 or A	0.22	0.9	—	0.030	0.030	—	—	—
L245 or B	0.26	1.2	—	0.030	0.030	c,d	c,d	d
L290 or X42	0.26	1.3	—	0.030	0.030	d	d	d
L320 or X46	0.26	1.4	—	0.030	0.030	d	d	d
L360 or X52	0.26	1.4	—	0.030	0.030	d	d	d
L390 or X56	0.26	1.4	—	0.030	0.030	d	d	d
L415 or X56	0.26	1.4	—	0.030	0.030	f	f	f
L450 or X65	0.26	1.45	—	0.030	0.030	f	f	f
L485 or X70	0.26	1.65	—	0.030	0.030	f	f	f

a. Cu ≤ 0,50 %; Ni ≤ 0,50 %; Cr ≤ 0,50 % and Mo ≤ 0.15%

b. For each reduce of 0.01% Carbon Max, an increase of 0.05% of maximum Mn is permited, up to a maximum of 1.65 for grade ≥ B or L245, but ≤ X52 or L360; Up to max 1.75% for grades above L360 or X52, but below L485 or X70; And up to 2.00% max for grade X70 or L485.

c. Unless otherwise agreed, Nb + V ≤ 0.06%.

d. Nb + V + Ti ≤ 0.15%.

e. Unless otherwise agreed.

f. Unless otherwise agreed, Nb + V + Ti ≤ 0.15%.

g. B shall be not added in on purpose, and maximum B is 0.001%.

Chemical composition for API 5L Sour Service Pipe with wall thickness ≤ 25.0 mm (0.984 in)											
Steel Grade (Steel Name)	Mass fraction, based upon heat and product analyses % maximum									Carbon equivalent % maximum	
	C [b]	Si	Mn [b]	P	S	V	Nb	Ti	other [c,d]	CE_{IIW}	CE_{Pcm}
Seamless and welded pipes											
L245NS or BNS	0.14	0.40	1.35	0.020	0.003 [e]			0.04	g	0.36	0.19 [h]
L290NS or X42NS	0.14	0.40	1.35	0.020	0.003 [e]	0.05	0.05	0.04	-	0.36	0.19 [h]
L320NS or X46NS	0.14	0.40	1.40	0.020	0.003 [e]	0.07	0.05	0.04	g	0.38	0.20 [h]
L360NS or X52NS	0.16	0.45	1.65	0.020	0.003 [e]	0.10	0.05	0.04	g	0.43	0.22 [h]
L245QS or XQBS	0.14	0.40	1.35	0.020	0.003 [e]	0.04	0.04	0.04	-	0.34	0.19 [h]
L290QS or X42QS	0.14	0.40	1.35	0.020	0.003 [e]	0.04	0.04	0.04	-	0.34	0.19 [h]
L320QS or X46QS	0.15	0.45	1.40	0.020	0.003 [e]	0.05	0.05	0.04	-	0.36	0.20 [h]
L360QS or X52QS	0.16	0.45	1.65	0.020	0.003 [e]	0.07	0.05	0.04	g	0.39	0.20 [h]
L390QS or X56QS	0.16	0.45	1.65	0.020	0.003 [e]	0.07	0.05	0.04	g	0.40	0.21 [h]
L415QS or X60QS	0.16	0.45	1.65	0.020	0.003 [e]	0.08	0.05	0.04	g,i,k	0.41	0.22 [h]
L450QS or X65QS	0.16	0.45	1.65	0.020	0.003 [e]	0.09	0.05	0.06	g,i,k	0.42	0.22 [h]
L485QS or X70QS	0.16	0.45	1.65	0.020	0.003 [e]	0.09	0.05	0.06	g,i,k	0.42	0.22 [h]
Welded pipe											
L245MS or BMS	0.10	0.40	1.25	0.020	0.002 [e]	0.04	0.04	0.04	-	-	0.19
L290MS or X42MS	0.10	0.40	1.25	0.020	0.002 [e]	0.04	0.04	0.04	-	-	0.19
L320MS or X46MS	0.10	0.45	1.35	0.020	0.002 [e]	0.05	0.05	0.04	-	-	0.20
L360MS or X52MS	0.10	0.45	1.45	0.020	0.002 [e]	0.05	0.06	0.04	-	-	0.20
L390MS or X56MS	0.10	0.45	1.45	0.020	0.002 [e]	0.06	0.08	0.04	g	-	0.21
L415MS or X60MS	0.10	0.45	1.45	0.020	0.002 [e]	0.08	0.08	0.06	g,i	-	0.21
L450MS or X65MS	0.10	0.45	1.60	0.020	0.002 [e]	0.10	0.08	0.06	g,i,k	-	0.22
L485MS or X70MS	0.10	0.45	1.60	0.020	0.002 [e]	0.10	0.08	0.06	g,i,k	-	0.22

a. If C > 0.12%, CEIIW limits shall be applied; If C ≤ 0.12%, CEPCM shall be applied.

b. For each reduce of 0.01% for maximum C, an increase of 0.05% maximum Mn is permissible, up to a maximum of 0.20%.

c. Al ≤ 0.060%; N ≤ 0.012%; Al/N ≥ 2:1 (titanium-killed or titanium-treated steel not applicable); Cu ≤ 0.35% (Cu ≤ 0.10% if agreed); Ni ≤ 0.30%; Cr ≤ 0.30%; Mo ≤ 0.15%; B ≤ 0.0005%.

d. For seamless and welded pipes, Ca ≤ 0.006%; For welded pipe if Ca is added by intention, unless agreed, Ca/S ≥ 1.5 in case S > 0.0015%.

e. For SMLS pipe maximum limit for S could be increased to ≤ 0.008%, and in case welded if agreed to ≤ 0.006%. For higher S conent in welded pipe, lower Ca/S ratios maybe agreed.

f. Nb + V ≤ 0.06%, unless otherwise agreed.

g. Nb + V + Ti ≤ 0.15%.

h. In case seamless pipe, listed CEPCM value could be increased by 0.03.

i. Mo ≤ 0.35% in case agreed.

j. Cr ≤ 0.45% in case agreed.

k. Cr ≤ 0.45% and Ni ≤ 0.50% in case agreed.

API 5L PSL 1 pipe Mechanical properties
Tensile strength, Yeild strength, Elongation

Pipe grade	Pipe body of seamless pipes			Weld seam of EW, LSAW, SSAW and COW pipes
	Yield strength	Tensile strength	Elongation (on 50mm or 2 in)	Tensile strength
	Rt0.5	Rm	Af	Rm
	MPa (psi), min	MPa (psi), min	% minimum	MPa (psi), min
L175 or A25	175 (25 400)	310 (45 000)	c	310 (45 000)
L175P or A25P	175 (25 400)	310 (45 000)	c	310 (45 000)
L210 or A	210 (30 500)	335 (48 600)	c	335 (48 600)
L245 or B	245 (35 500)	415 (60 200)	c	415 (60 200)
L290 or X42	290 (42 100)	415 (60 200)	c	415 (60 200)
L320 or X46	320 (46 400)	435 (63 100)	c	435 (63 100)
L360 or X52	360 (52 200)	460 (66 700)	c	460 (66 700)
L390 or X56	390(56 600)	490 (71 100)	c	490 (71 100)
L415 or X60	415 (60 200)	520 (75 400)	c	520 (75 400)
L450 or X65	450 (65 300)	535 (77 600)	c	535 (77 600)
L485 or X70	485 (70 300)	570 (82 700)	c	570 (82 700)

c.For the specified minimum elongation, Af shall be using below equation:

$$A_f = C\frac{A_{xc}^{0,2}}{U^{0,9}}$$

Where

C is 1940 for calculations using IS units and 625000 for calculations using USC units;

Axc is the applicable tensile test piece cross-section area, expressed in square mm or square inch, as follows:

- for circular cross-section test pieces,130mm^2 for 12.7 mm and 8.9 mm diameter test pieces; and 65 mm^2 (0.10 in^2) for 6,4 mm (0.250 in) diameter test pieces;
- for full-section test pieces, the lesser of a) 485 mm^2 (0.75 in^2) and b) the cross-sectional area of the test piece, derived using the specified outside diameter and the specified wall thickness of the pipe, rounded to the nearest 10 mm^2 (0.01 in^2);
- for strip test pieces, the lesser of a) 485 mm2 (0.75 in2) and b) the cross-sectional area of the test piece, derived using the specified width of the test piece and the specified wall thickness of the pipe, rounded to the nearest 10 mm2 (0.01 in^2);

U is the specified minimum tensile strength, expressed in megapascals (pounds per square inch).

Grade :	P355NL1
Number:	1.0566
Classification:	Non-alloy low temperature quality steel
Standard:	EN 10028-3: 2009 Flat products made of steels for pressure purposes. Weldable fine grain steels, normalized EN 10216-3: 2014 Seamless steel tubes for pressure purposes. Technical delivery conditions. Alloy fine grain steel tubes EN 10217-3: 2002 Welded steel tubes for pressure purposes. Alloy fine grain steel tubes EN 10253-2: 2007 Butt-welding pipe fittings. Non alloy and ferritic alloy steels with specific inspection requirements
Equivalent grades:	Go here

Chemical composition % of steel P355NL1 (1.0566): EN 10028-3-2009

According EN 10216-3:2014: 0.9=< Mn=<1.7; S=<0.008; N=<0.02; Ti=<0.04;

C	Si	Mn	Ni	P	S	Cr	Mo	V	N	Nb	Ti	Al	Cu	-
max 0.18	max 0.5	1.1 - 1.7	max 0.5	max 0.025	max 0.015	max 0.3	max 0.08	max 0.1	max 0.012	max 0.05	max 0.03	max 0.02	max 0.3	Nb+Ti+V < 0.12

Mechanical properties of steel P355NL1 (1.0566)

Nominal thickness (mm):	to 60	60 - 100	100 - 150	150 - 250
Rm - Tensile strength (MPa) (+N)	490-630	470-610	460-600	450-590

Nominal thickness (mm):	to 16	16 - 40	40 - 60	60 - 100	100 - 150	150 - 250
ReH - Minimum yield strength (MPa) (+N)	**355**	**345**	**335**	**315**	**305**	**295**

KV - Impact energy (J) transverse, (+N)	**-40°** **27**	**-20°** **35**	**0°** **43-50**	**+20°** **47-60**

KV - Impact energy (J) longitud., (+N)	**-50°** **30**	**-40°** **40**	**-20°** **50-53**	**0°** **65-70**	**+20°** **70-80**

Nominal thickness (mm):	to 60	60 - 250
A - Min. elongation at fracture (%) (+N)	**22**	**21**

Equivalent grades of steel P355NL1 (1.0566)

Warning! Only for reference

EU EN	USA -	Germany DIN,WNr	France AFNOR	England BS	Italy UNI	Sweden SS	Finland SFS	Inter ISO
P355NL1	A737Gr.B	TStE355	A510AP A510FP1 A530AP E355FP	224Gr.490 50EE	FeE355-3	2107	Fe355EP	E355E

Composition Standard of S355J2H steel Pipe

Steel Grade	C Maximum	Mn Maximum	P Maximum	Si Maximum	S Maximum	N Maximum
S235JRH	0.17	0.040	1.40	-	0.040	0.009
S355J0H	0.22	0.035	1.60	0.55	0.035	0.009
S275J2H	0.20	0.030	1.50	-	0.030	–
S355J2H	0.22	0.030	1.60	0.55	0.030	–
S275J0H	0.20	0.035	1.50	-	0.035	0.009
S355K2H	0.22	0.030	1.60	0.55	0.030	–

Check online Price list, dimension and weight, stockist and distributor of EN 10210 S355J2H steel pipe in various sizes.

S355J2H Pipe Mechanical Properties Database

View S355J2h ASTM equivalent and 1.0576 material properties, KNPC and Saudi Aramco approved

EN 10210 S355J2H	Mechanical Strength			Impact Energy		
	Yield Strength	Elongation (%))	Tensile Strength	Test Temperature in celsius		
				-20	0	20
S355J2H	355	22	510-680	27	–	–
S275J0H	275	23	410-560	–	27	–
S275J2H	275	23	410-560	27	–	–
S235JRH	235	26	360-510	–	–	27
S355J0H	355	22	510-680	–	27	–
S355K2H	355	22	510-680	40	–	–

S355J2H EN 10210 Carbon Steel Pipes

Specification	Grade	Chemical Composition [%]										Mechanical Properties		
		C	Mn	P	S	Si	Cr	Mo	Cu	Ni	V	Yield Strength	Tensile Strength	% Elongation (G.L.
												Min.	Min.	

		Min	Max.	Min	Max.	Max.	Max.	Min.	Max	Min.	Max	Min.	Max	Max	Max	Max	PSI	MPa	PSI	MPa	50 mm WT 8 mm) e (min.)
HYDROCARBON PROCESS INDUSTRY/STRUCTURAL/PRESSURE VESSEL TUBES																					
ASTM A-53	A B	--	0.25 0.30	--	0.95 1.20	0.050 0.050	0.045 0.045	--	--	--	0.40 0.40	--	0.15 0.15	0.40 for S 0.40 for S	0.40 0.40	0.08 0.08	30,000 35,000	205 240	48,000 60,000	330 415	e=625000 A02/U09
ASTM A-106	A B c	-- --	0.25 0.30 0.35	0.27 0.29	0.93 1.06 1.06	0.035 0.035 0.035	0.035 0.035 0.035	0.10 0.10 0.10	-- --	-- --	0.40 0.40 0.40	-- --	0.15 0.15 0.15	0.40 0.40 0.40	0.40 -	0.08 0.08 0.08	30,000 35,000 40,000	205 240 275	48,000 60,000 70,000	330 415 485	35L / 25T 30L / 16.5T 30L / 16.5T
ASTM A333 & A 334	1 6	--	0.30 0.30	0.40 0.29	1.06 1.06	0.025 0.025	0.025 0.025	-0.10	--	--	--	--	--	--	--	--	30,000 35,000	205 240	55,000 60,000	380 415	35 30
SEAMLESS COLD DRAWN PRECISION STEEL TUBES FOR MECHANICAL APPLICATIONS/HYDRAULIC/PNEUMATIC POWER SYSTEMS																					
EN 10305-1/ EN10305-4	E 235 E 355		0.17 0.22		1.2 1.6	0.025 0.025	0.025 0.025		0.35 0.55							0.02 0.02		235 355		340 490	25 22
EN 10216-1	P195 TR1 P235 TR1		0.13 0.16		0.7 1.2	0.025 0.025	0.02 0.02		0.35 0.35		0.3 0.3		0.08 0.08	0.3 0.3	0.3 0.3			195 235		320 360	27 25
EN 10216-2	P235 GH		0.16		1.2	0.025	0.02		0.35		0.3		0.08	0.3	0.3	0.02					

DIN 2391	St - 45 St - 45 St - 52	- - -	0. 17 0. 21 0. 22	0. 40 0. 40 -	- - 1. 60	0.0 25 0.0 25 0.0 25	0.0 25 0.0 25 0.0 25	- - -	0. 35 0. 35 0. 55	- - -	- - -	- - -	- - -	- - -	- - -	- - -	NBK : 215 / GBK : - NBK : 255 / GBK : - NBK : 355 / GBK : -	NBK : 340 / GBK : 315 NBK : 440 / GBK : 390 NBK : 490 / GBK : 490	NBK : 470 NBK : 570 NBK : 630
ASTM A-519	SA E 101 0 SA E 101 8 SA E 102 6 SA E 103 5 SA E 104 0 SA E 151 8 SA E 154 1 SA E 413 0	0. 08 0. 15 0. 22 0. 32 0. 37 0. 15 0. 36 0. 28	0. 13 0. 20 0. 28 0. 38 0. 44 0. 21 0. 44 0. 33	0. 30 0. 60 0. 60 0. 60 0. 60 1. 10 1. 35 0. 40	0. 60 0. 90 0. 90 0. 90 0. 90 1. 40 1. 65 0. 60	0.0 40 0.0 40 0.0 40 0.0 40 0.0 40 0.0 40 0.0 40 0.0 40	0.0 50 0.0 50 0.0 50 0.0 50 0.0 50 0.0 50 0.0 50 0.0 50	- - - - - - - - - - 0. 15	- - - - - - - - - - 0. 35	- - - - - - - - - - 0. 80	- - - - - - - - - - 1. 10	- - - - - - - - - - 0. 15	- - - - - - - - - - 0. 25	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	As per Customer requirements		
BOILER/HEAT EXCHANGER/SUPERHEATER & CONDENSER TUBES																				
ASTM A179	-	0. 06	0. 18	0. 27	0. 63	0.0 35	0.0 35	-	-	-	-	-	-	-	-	-	26, 000	18 0	47, 000	32 5	35

ASTM A192		0.06	0.18	0.27	0.63	0.035	0.035	-	0.25	-	-	-	-	-	-	-	26,000	180	47,000	325	35
ASTM A 210	A-1 C	--	0.27 0.35	-0.29	0.93 1.06	0.035 0.035	0.035 0.035	0.10 0.10	--	--	--	--	--	--	--	--	37,000 40,000	255 275	60,000 70,000	415 485	30 30
ASTM A 213	T-11 T-12 T-22	0.05 0.05 0.05	0.15 0.15 0.15	0.30 0.30 0.30	0.60 0.61 0.60	0.025 0.025 0.025	0.025 0.025 0.025	0.50 --	1.00 0.50 0.50	1.00 0.80 1.90	1.50 1.25 2.60	0.44 0.44 0.87	0.65 0.65 1.13	---	---	---	30,000 32,000 30,000	205 220 205	60,000 60,000 60,000	415 415 415	30 30 30
ASTM A335	P-11 P-12 P-22	0.05 0.05 0.05	0.15 0.15 0.15	0.30 0.30 0.30	0.60 0.61 0.60	0.025 0.025 0.025	0.025 0.025 0.025	0.50 --	1.00 0.50 0.50	1.00 0.80 1.90	1.50 1.25 2.60	0.44 0.44 0.87	0.65 0.65 1.13	---	---	---	30,000 32,000 30,000	205 220 205	60,000 60,000 60,000	415 415 415	30 30 30
BS 3059 Pt I	320	-	0.16	0.30	0.70	0.040	0.040	0.10	0.35	-	-	-	-	-	-	-	28,000	195	46,000	320	69,500
BS 3059 Pt II	622-490	0.08	0.15	0.40	0.70	0.030	0.030	-	0.50	2.00	2.50	0.90	1.20	-	-	-	40,000	275	71,000	490	93,000
DIN 1629	St-37.0 St-52	--	0.17 0.22	--	--	0.040 0.040	0.040 0.035	--	--	--	--	--	--	--	--	--	WT 16mm = 235 / WT>16 mm = 225 WT 16mm = 355 / WT>16 mm = 345		350 -		- Long 21 / Trans 19
DIN 17175	St-35.8 St-45.8	--	0.17 0.21	0.40 0.40	0.80 1.20	0.040 0.040	0.040 0.040	0.10 0.10	0.35 0.35	--	--	--	--	--	--	--	WT 16mm = 235 / WT>16 mm = 225 WT 16mm = 255 / WT>16		360 410		480 530

																mm = 245					
RAILWAYS																					
IS:1239 Pt I	-	-	-	-	-	0.050	0.050	-	-	-	-	-	-	-	-	-	-	-	46,500	320	-
IS:1161	YST-210 YST-240 YST-310	---	0.120.160.25	---	0.601.201.30	0.040 0.040 0.040	0.040 0.040 0.040	---	---	---	---	---	---	---	---	---	30,500 35,000 45,000	210 240 310	48,000 59,500 64,500	330 410 445	---