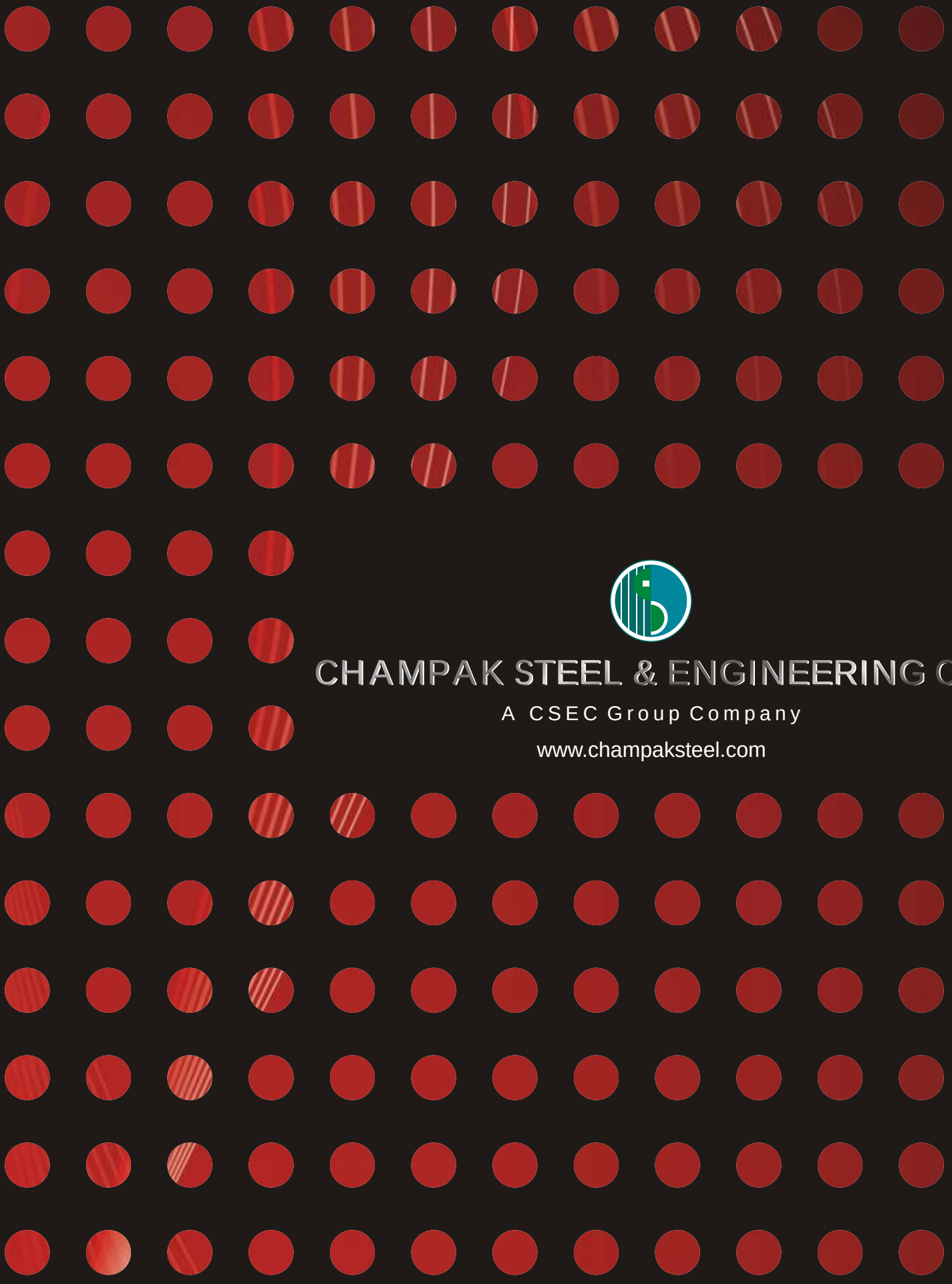


CHAMPAK STEEL & ENGINEERING CO .

A CSEC Group Company

www.champaksteel.com

Index

Company Profile	1
Product Range	2
Quality Policy	3
Nickel Alloy	4
Exotic grades /Nickel Alloy	5
Pipes & Tubes	6
S.S, C.S., A.S., Seamless Pipe Dimension	7
Chemical Comp. Pipes & Tubes	8
Mechanical Properties of S.S.Pipes	9
Tolarance: ASTM Spec. for Tubing & Piping	10
C.S., A.S., low temp., Pipe& Tube Spec.	11
Dimensional Wight of Black Steel Tube	12
Square & Rectangular Tube	13
S.S Hollow Section, Square, Rectangular, Tube	14-15-16
Plates	17
S.S Plates Chemical & Mechanical Properties	18
S.S., Duplex& Super Duplex Plates	19
Steel Plates for Boilers	20
NACE HIC Steel	21
Hot Rolled low, Medium & High Tensil Struc. Steel	22
Abrasion Resistant Plates	23-24
Quenched & Tempered Steel	25
Alloy steel Chrome Moly Plates to ASTM & En	26-27
Hadfield Manganese Steel Plates	28
Weather Resistant Steels	29
S.S., A.S., EN Series Rods	30
EN Series Steel	31
S.S., Round Bar Physical & Chemical Prop.	32
Round Bar	33
Hexagonal Bar / Square Bar	34
Angles	35
Mild Steel Channels, Beams, Angles Steel	36
S.S., Buttweld Fittings	37-38
Chemical Composition/Mechanical Prop.	39-40-41
Tolarance ASME-B-16.9/B-16.28	42
Chemical Physical Prop., C.S., S.S., A.S.,	43
Socket weld Fitting	44
Socket weld Pipe fitting	45
Swaged Nippolets	46
Forged Flange Dimension	47-48
ANSI Flange Weights	49
Dimensional Tolerance of Forged Fittings	50
Formulae	51

Established in the year 1978, by Mr. C. J. Jain Champak Steel & Engineering Co. is now a very well established name in the tubular and flat products industry. In less than 34 years of existence we have made our mark in stocking & supplying all kinds of Stainless steel, Carbon Steel & Alloy Steel Pipes, Sheets, Plates, Rods, Pipe Fittings & Flanges to various core industries like Power, Petrochemicals, Agrochemicals, offshore, defence, paper & pulp industries, OEM supplies and Mining Industry.

We cater to all type of clients irrespective of their size of requirements. We always put the customer first, their requirements, understand them technically & further suggest, source & supply the material at the right price & right time in almost all of the world specifications. We specialize in supply of hard to find materials.

“Project 3S” This is not just an acronym but is our corporate philosophy of "source, supply, service" which is whole heartedly believed and practiced not only by the management but also by all the other staff members.

No wonder many of our clients are there with us for the last 34 years for the quality of our products , our service & prices.

PRODUCT RANGE

Pipes & Tubes

STAINLESS STEEL: ASTM A-213, A-269, A-312, A-358, A-249, A-240, A-479, TP-304, 304L, 304H, 316, 316L, 316H, 316TI, 317, 317L, 312, 347, 309, 310, 310S, 409, 410 etc. in all required size & specifications.
CARBON STEEL: ASTM A-106 GR. A, B&C, A-333, GR.I & 6, A-53 GR. A&B, ASTM A-210 GR, A-1,BS 3059, PART I&II, SA 179, IS 1233,PART I IS 3589 GR 3301 410, etc. in shapes & sizes.
ALLOY STEEL :
SA/A 213 T11, T12, T22, T5, T9, T91
SA /A-335-P11,P22,P5,P9,P91
SA 691 ½ CR, 1CR, 1$_{1/4}$CR, 2$_{1/4}$CR, 5CR, 9CR, 91CR.
15CDV6 & AISI 4130 Tubes.

Sheets & Plates

CARBON & ALLOY STEEL:
Normalized, Normalized & Tempered, Water Quenched
ASTM A-516 Gr. 60 & 70, ASTM A-387 Gr.11, 12, 22, 5, 9, 91
Corten A & Corten B.
400BHN & 500BHN Abrasion Resistant Plates
High Yield Steel S690 QL & S700MC
High Manganese Steel Plates.
Stainless, Duplex, Super Duplex Steels.
Nickel Alloys.
Aluminium Alloys, Copper & Cupro Nickel Sheets.

Buttweld Fittings

PIPE FITTINGS: BW/SW/SRD/Forged & Compression type with ferrules such as ELBOW , TEES, REDUCERS, STUBENDS FLANGES, UNIONS, CAPS, NIPPLES, COUPLING, ELBOWLETS, WELDOLETS, NUTS, BOLTS, STUDS, WASHERS, VALVES & GASKETS etc. A182,A-194, A-234, WPB, A - 350 LF, A - 403 WP, A - 120, WPL as per dimension ANSI B- 36.10, B36.90, B16.5, B - 16.9, B- 16.11 & B- 16.18 etc.

Flanges

FLANGES: C S. S S. A S. Forged Flanges
Size: ½" to 24" SORF, BLRF, WNRF from ready stock
Grade: ASTM A-105 & ASTM A-182 F304, F316

FERRULE FITTINGS: In Single ferrule, double ferrule in the shape of CONNECTER UNION, RED UNION, UNION TEE, UNION ELBOW, BULK HEAD UNION CROSS ETC.

QUALITY ASSURANCE PLAN

Quality Assurance plans are prepared in accordance with specific requirements stated by the customer and respective ASTM specifications, Mandatory and supplimentary requirements are translated to special instructions and audits performed during manufacture and inspection.

Inspection stages and check hold points are decided to carry out in process inspection and record important stages of inspection and tests.

ORGANISATION:
A separate Quality Assurance/Control Department functions under the control of management, independent of production. The Quality Assurance Department oversees all important quality functions and performs the following activities.

MATERIAL CONTROL SYSTEM:
This system controls the quality of all incoming material. The incoming material specifications are co-related with Raw Material test certificates of the material. These checks and tests are documented. The material is given internal control No. and same is recorded for future reference.

PROCESS CONTROL SYSTEMS:
During forming, Forging and Heat treatment, process control system outlines inprocess checks and controls to be followed during heat treatment and testing. Forging and interim heat treatment in the process control reduces the chances of introduction of variables in the process.

Each lot of fittings as defined in ASTM specifications are subjected to heat treatment and testing. Testing is performed in accordance with specification requirements. Test data is evaluated by QA department and recorded in appropriate format, supplementary test like radiography, ultrasonic, corrosion testing etc. is done as per code guide lines.

MACHINING AND DIMENSIONAL CONTROL:
Suitable fixtures and templates are used to maintain dimensional accuracy. Necessary gauges and callipers are calibrated periodically to maintain their accuracy.

FINISHING PAINTING & MARKING:
Carbon and alloy steel fitting are shot balasted or pickled and painted. Stainless steel fittings are pickled and passivated. All fittings are marked with size, schedule, specification and manufacturer stamp. Equipment calibration and audits are done as per quality plans.

CERTIFICATION & SUPPLEMENTARY TEST:
Materials are supplied to the QAP with Manufactrer test certificate. Test certificate incorporates, Chemical, Mechanical and other properties as per purchase order and specification in various International standards. Any Additional Testing requirements of customers are met with extra tests at NABL accredited laboratories under scrutiny of reputed third party inspection agencies with verified additional certificates for each point of test.

NICKEL ALLOY / Additional Services

NICKEL 200 / 201
Commercial pure nickel with good mechanical properties and excellent resistance to to may corrosive media. Important characteristic are its magnetic and magnetostrictive properties, the high thermal and electrical conductivity at low gas content.

MONEL 400 (ALLOY 400)
Alloy 400 is especially resistant to salino and other acids in ventilated condition. It is successfully employed in the salt winning process. Alloy 400 is especially suited for employment in sea breakage water at high speed, where resistance against cavitation and erosion is of great importance. This alloy is very resistant to solvents, glass etching agents. sulphuric and other acids and virtually to all alkalis. This grade is not sensitive to stress corrosion cracking in oxidizing media. Alloy 400 can be employed at temperatures up to 550^{0} Celsius.

MONEL K-500 (ALLOY K-500)
An age-hardening alloy with the same corrosion resistance as Alloy 400, though with increased tensile strenght and hardness. Alloy K-500 retains its strength up to temperature of about 650^{o} Celsius.

INCONEL 600 (ALLOY 600)
Alloy 600 has excellent resistance to oxidation at temperatures upto 1175^{o} Celsius and is also resistant to a variaty of corrosive media. It retains its high strength up to about 650^{0} Celsius. Even at lowest temperature, alloy 600 is employed in components of power plants. This grade can be welded without thermal retreatment.

INCONEL 625 (ALLOY 625)
Excellent corrosion resistance with high strength and ductility at temperature upto 700^{o} Celsius applicable upto 1100^{o} Celsius. Alloy 625 is weldable without thermal retreatment.

INCOLLOY 800 (H) (ALLOY 800 (H)
This Alloy is resistant to corrosion resulting form hydrogen sulphide as well as to stress corrosion cracking. It is highly heat resistant and insensitive to the separation of sigma phase. Alloy 800 H with controlled carbon content improves furthermore the creep strength depending on time solution annealed condition.

INCOLLOY 825 (ALLOY 825)
Resistance to sulphuric acid, phosphoric acid solvents and sea water as well as to many oxidising chemicals. Alloy 825 has good resistance to reducing acid. It can be employed without thermal treatment after the welding process.

HASTALLOY C-276 (ALLOY C-276)
Today probably one of the best and manifold alloys on the market, when employed in extremely corrosive reducing and oxidising applications. Alloy C-276 has excellent resistance to strong oxidising media contaminated chloride, dry chloride acid formate acid. acetic hydride solutions, sea water solutions and saline solutions. The alloy is resistance to the corrosive infuence of the hydrochloride acid, hydrochloride chlorine diexide solutions.

HASTALLOY C-4 (ALLOY C-4)
Excellent resistance against strong oxidising agents, hot contaminated miniral acid, solvent, chlorine and media contaminated by chlorine (organic and inorganic), dry chloric acid, formic acid, acetic hydride solutions, sea water solution and saline solution. This alloy has high ductility and corrosive resistance even in temperature range of 650-1040^{0} celsius. Alloy C-4 is resistant against the formation of grain boundary carbides and can thus used in most cases without heat - treatment after welding.

INCOLLY DS (ALLOY DS)
Alloy Ds is a heat resistant Ni-Cr-Fe alloy with Si addition for the employment at temperatures where sufficient strength and corrosive resistance are required. Alloy Ds is heat-resistant upto 1100^{0} Celsius when in air. This alloy is especially resistant against changing oxidising / reducing conditions as well as the formation of sigma phase in the critical temperature range of 590-870^{0} Celsius. Furthermore it is green rot. Due to high strength and heat resistance to alloy DS, smaller sections than usual can be manufactured from this material.

ALLOY20
Alloy 20 is a high-alloyed stainless steel. Its corrosion properties surpass those of usual stainless qualities. For example. alloy 20 has excellent stress corrosion to boiling 20-40% sulphuric acid. Although alloy 20 was originally developed for usage in sulphuric environment, its range of application has been steadily extended and today also includes machining of artificial rubber, plastic, synthetic fiber etc. In pharmaceutical and food producing application, where purity has to be guaranteed, Alloy 20 is employed to prevent metalic contamination. The most important advantages of this grade are its excellent mechanical properties as well as its comparatively easy machine ability.

Exotic Grades

EXOTIC	UNS No	W.NR	C(Max)	Mn(Max)	S(Max)	Sl(Max)	Cr	NI	Mo	Cu	Fe	Ti	Al	Other
					005	0.180	-	99.5+	-	-	–	-	-	-
ALLOY 201	N02201	2.4068	0.010	0.80	0.005	0.180	-	99.5+	-	0.130	0.200	-	-	-
ALLOY 400	N04400	2.4360	0.300	1.000	0.024	0.200	-	63.0mim	-	28-34	2.5max	-	-	-
ALLOY K-500	N05500	2.4375	0.250	1.500	0.010	0.050	-	63.0min	-	27-33	2-0max	0.35-0.85	2.3-3.14	
ALLOY 800	N08800	1.4876	0.0100	1.500	0.015	1.000	19.0-23.0	30.0-35.0	-	0.75max	39.5min	0.15-0.60	0.15-0.60	-
ALLOY 800H	N08810	1.4958	0.0500	1.500	0.015	1.000	19.0-23.0	30.0-35.0	-	0.75max	39.5min	0.15-0.60	0.15-0.60	AL-TI-0.30-1.20
ALLOY 800HT	N08811	1.4959	0.0600	1.500	0.015	1.000	19.0-23.0	30.0-35.0	-	0.75max	39.5min	0.25-0.60	0.25-0.60	AL+TI-0.85-1.20
ALLOY 330	N08330	-	0.080	2.000	0.030	0.75-1.50	17.0-20.0	34.0-37.0	-	-	Sal	-	-	P-0.030max
ALLOY DS	-	1.4862	0.100	0.8-1.5	0.030	1.9-2.6	17.0-19.0	34.5-41.0	-	0.5max	Sal	0.2max	-	-
ALLOY 600	N06600	2.4816	0.150	1.000	0.015	0.050	14.0-17.0	72.0min	-	0.5max	6.0-10.0	-	-	-
ALLOY601	N06601	2.4851	0.100	1.000	0.015	0.500	21.0-25.0	58.0-63.0	-	1.0max	Sal	-	1.0-1.7	-
ALLOY 825	N08825	2.4858	0.025	0.100	0.030	0.500	19.5-23.5	38.0-46.0	2.5-3.0	1.5-3.0	Sal	0.6-1.2	0.200	-
ALLOY 625	N06625	2.4856	0.100	0.500	0.015	0.500	20.0-23.0	58.0min	8.0-10.0	-	5.0maX	0.400	0.400	P-0.015,Nb-3.15-4.15,Co-1.0max
ALLOY X-750	N07750	2.4669	0.080	1.000	0.010	0.500	14.0-17.0	70.0min	-	0.50max	5.0-9.0	2.25-2.75	0.40-1.00	Co-1.00 max, N-0.70-1.20
ALLOY 718	N07718	2.4668	0.02-0.08	0.350	0.015	0.350	17..0-21.0	50.0-55.0	2.80-3.30	0.20maX	Sal	0.70-1.15	0.30-0.70	P-0.01max, B 0.006max, Nb-0.75-5.50 Co-1.0max
ALLOY 617	N06617	2.4663	0.05-015	1.000	0.015	1.000	20.0-24.0	44.5min	8.0-10.0	0.5max	3.0maX	-0.6max	0.8-1.5	80.006 max. Co-10.0-15.0
ALLOY C4	N06455	2.4610	0.010	1.000	0.010	0.050	14.5-17.5	Bal	14.0-17.0	-	3.0max	0.70max	-	P-0.025max, Co-2.5
ALLOY C22	N06022	2.4602	0.015	0.500	0.02	0.080	20.0-22.5	-	12.5-14.5	-	2.0-6.0	-	-	P-0.020max, Co-2.5max, V-0.35max W-2.5-3.5
ALLOY C276	N010276	2.4819	0.010	1.000	0.03	0.080	14.5-16.5	Bal	15-.0-17.0	-	4.0-7.0	-	-	P-0.040maX, W-3.0-4.5, Co-2.5max, V-0.35max
ALLOY B2	N010665	2.4617	0.010	1.000	-	0.008	0.4-1.0	Bal	26.0-30.0	-	2.0maX	-	-	P-0.020max, Co-1.0maX, W-3.0-4.5, V-.35max
ALLOY B3	N010675	2.4600	0.00	3.000	-	0.100	1.0-3.0	65.0min	27.0-32.0	0.20maX	1.5maX	0.2maX	0.50maX	Co-3.0maX,W-3.0max
ALLOY 75	N06075	2.4630-2.495	10.08-0.15	1.000	-	1.000	18.0-21.0	Bal	-	0.5maX	5.0maX	0.2-0.6	-	-
ALLOY 80A	N07080	2.4631-2.4952	0.100	1.000	0.015	1.000	18.0-21.0	Bal	-	0.2maX	3.0max	1.8-2.7	1.0-1.8	Co-2.0max,B-008Max, Zi-0.15Max
ALLOY 901	N09901	2.4662	0.100	0.500	0.030	0.400	11.0-14.0	40.0-45.0	5.0-6.5	0.5max	Sal	2.8-3.1	0.35max	Co-1.0max
ALLOY 90	N07090	2.4632	0.130	1.000	0.015	1.000	18.0-21.0	Bal	-	0.2maX	1.5max	2.0-3.0	1.0-2.0	Co-15.0-21.0, B-0.02max, Zi-0.15max
ALLOY 105	-	2.4634	0.120	1.000	0.010	1.000	14.0-5.7	Bal	4.5-5.5	0.2max	1.0maX	0.9-1.5	4.5-4.9	Co-18-22, B-0.003-0.010, Zi-0,15
ALLOY 115	-	2.4636	0.2-0.2	1.000	0.015	1.000	14.0-16.0	Bal	3.0-5.0	0.2max	1.0max	3.5-4.5	4.5-5.5	Co-13-155, 8-0.01-0.025, Zi-0.15max
ALLOY 263	N07263	2.4650	0.04-0.08	0.600	0.007	0.400	19.0-21.0	Bal	5.6-6.1	0.2max	0.7max	1.9-2.4	0.60max	B-0.005max,Co-19-21,Al+Ti-2.4-2.8
ALLOY 690	N06690	2.4642	0.020	0.300	0.015	0.300	27.0-31.0	58.0min	-	0.50maX	8.0-10.0	0.300	0.300	-
ALLOY 20	N08020	-	0.070	2.000	0.035	1.000	19.0-21.0	32.0-38.0	2.0-3.0	3.0-4.0	Bal	-	-	P-0.045max, Nb+Ti-8x C-1.0
ALLOY 904L	N08904	1.4539	0.020	2.000	0.035	1.000	19.00-23.00	23.00-28.00	4.00-5.00	1.00-2.00	Bal	-	-	P-0.045max
ALLOY 6XM	N08367	NIL	0.030	2.000	0.030	1.000	20.00-22.00	23.50-25-50	6.00-7.00	0.75max	Bal	-	-	P-0.040max, N-0.15-0.25
ALLOY SMO-254	S31254	1.4547	0.020	1.000	0.010	0.800	19.5-20.5	17.5-18.5	6.0-6.5	0.50-1.00	Bal	-	-	P-0.030max, N-0.18-0.22
ALLOY SMO 654	S32654	1.4562	0.020	2.00-4.00	0.005	0.500	24.0-25.0	21.0-23.0	7.0-8.0	0.30-0.60	Bal	-	-	P-0.03max, N-0.45-0.55

Age Hardening Martensitic Steels

Common Grade	-	UNS	c	Mn	P	S	Si	Cr	Ni	Mo	N	Other
NITRONIC-40	-	S 21900	0.03maX	8.0- 0.0	0.04max	0.03max	00max	19.0-21.5	5.5-7.5	-	0.5-0.0	-
NITRONIC-50	XM-19	S 21910	0.06max	4.0-6.0	0.040max	0.030max	0.75max	20.5-23.5	11.5-13.5	1.50-3.0	0.20-0.40	Cb-0.10-0.30,V-0.10-0.30
NITRONIC-60	22-13-5	S 21800	0.10max	7.0-9.0	0.060max	0.030max	3.5-4.5	16.0-18.0	8.0-9.0	-	0.080-0.18	-
13 - 8 MO	-	S 13800	0.05max	0.10max	0.01max	0.008max	0.10max	12.25-13.25	7.50-8.5	2-2.5	-	N-0.01max, Al-0.9-1.35
15 - 7 MO	-	S 15700	0.09max	1.0max	0.04max	0.03max	1.0max	14.0-16.0	6.5-7.75	2.0-3.0	-	Al-0.75-1.50
17 - 4PH	-	S 17400	0.07max	1.0maX	0.04max	0.03max	1.0max	15.00-17.5	3.0-5.0	-	3.0-5.0	Nb+Ta - 0.15-0.45
17 - 7PH	630	S 17780	0.09max	1.0max	0.04max	0.04max	1.0max	16.0-18.0	6.5-7.75	-	-	Al-0.75-1.50
A - 286	1.4980	S 66286	0.08max	2.0max	-	-	1.0max	13.5-16.00	24.0-27.0	1.0-1.5	-	Ti-1.9-2.3, Al-0.35 MAX,
												V-0.1-0.5,8-M03-0.010

PIPES & TUBES

Stainless,Carbon & Alloy Steel Seamless Pipe, Schedule Dimension

Nominal pipe size	O, D mm	10	20	30	STD	40	60	XS	80	100	120	140	160	XXS	Nominal pipe size	FIGURES BASED ON AUSTENITIC STEEL 5S	10S	40S	80S	SHIPPING Vol/m m³
1/8	10,30				1,73 0,37	1,73 0,37		2,41 0,47	2,41 0,47						1/8		1,24 0,28	1,73 0,36	2.41 0.48	0,0001
1/4	13,70				2,24 0,63	2,24 0,63		3,02 0,80	3,02 0,80						1/4		1,65 0,51	2,24 0,64	3.02 0.82	0,0002
3/8	17,10				2,31 0,84	2,31 0,84		3,20 1,10	3,20 1,10						3/8		1,65 0,64	2,31 0,86	3.20 1.12	0,0003
1/2	21,30				2,77 1,27	2,77 1,27		3,73 1,62	3,73 1,62				4,78 1,95	7,47 2,55	1/2	1,65 0,82	2,11 1,01	2,77 1,30	3.73 1.65	0,0004
3/4	26,70				2,87 1,69	2,87 1,69		3,91 2,20	3,91 2,20				5,56 2,90	7,82 3,64	3/4	1,65 1,04	2,11 1,31	2,87 1,71	3.91 2.24	0,0007
1	33,40				3,38 2,50	3,38 2,50		4,55 3,24	4,55 3,24				6,35 4,24	9,09 5,45	1	1,65 1,33	2,77 2,13	3,38 2,55	4.55 3.29	0,0011
1 1/4	42,20				3,56 3,39	3,56 3,39		4,85 4,47	4,85 4,47				6,35 5,61	9,70 7,77	1 1/4	1,65 1,68	2,77 2,76	3,56 3,46	4.85 4.56	0,0018
1 1/2	48,30				3,68 4,05	3,68 4,05		5,08 5,41	5,08 5,41				7,14 7,25	10,15 9,56	1 1/2	1,65 1,95	2,77 3,17	3,68 4,13	5.08 5.51	0,0023
2	60,30				3,91 5,44	3,91 5,44		5,54 7,48	5,54 7,48				8,74 11,11	11,07 13,44	2	1,65 2,24	2,77 4,01	3,91 5,54	5.54 7.63	0,0036
2 1/2	73,00				5,16 8,63	5,16 8,63		7,01 11,41	7,01 11,41				9,53 14,92	14,02 20,39	2 1/2	2,11 3,77	3,05 5,36	5,16 8,81	7.01 11.64	0,0053
3	88,90				5,49 11,29	5,49 11,29		7,62 15,27	7,62 15,27				11,13 21,35	15,24 27,68	3	2,11 4,60	3,05 6,59	5,49 11,52	7.62 15.59	0,0079
3 1/2	101,60				5,74 13,57	5,74 13,57		8,08 18,63	8,08 18,63				- -	- -	3 1/2	2,11 5,29	3,05 7,55	5,74 13,84	8.08 19.01	0,0103
4	114,30				6,02 16,07	6,02 16,07		8,56 22,32	8,56 22,32		11,13 28,32		13,49 33,54	17,12 41,03	4	2,11 5,96	3,05 8,52	6,02 16,40	8.56 22.77	0,0130
5	141,30				6,55 21,77	6,55 21,77		9,53 30,97	9,53 30,97		12,70 40,28		15,88 49,11	19,05 57,43	5	2,77 9,67	3,40 11,82	6,55 22,20	9.53 31.59	0,0199
6	168,30				7,11 28,26	7,11 28,26		10,97 42,56	10,97 42,56		14,27 54,20		18,26 67,56	21,95 79,22	6	2,77 11,55	3,40 14,13	7,11 28,83	10.97 43.42	0,028
8	219,10		6,35 33,31	7,04 36,81	8,18 42,55	8,18 42,55	10.30 53.10	12,70 64,64	12,70 64,64	15,09 75,92	18,26 90,44	20,62 100,92	23,01 111,27	22,23 107,92	8	2,77 15,09	3,76 20,37	8,18 43,39	12.70 65.95	0,048
10	273,10		6,35 41,77	7,80 51,03	9,27 60,31	9,27 60,31	12.70 81.50	12,70 81,55	15,09 96,01	18,26 114,75	21,44 133,06	25,40 155,15	28,58 172,33	25,40 155,15	10	3,40 23,08	4,19 28,34	9,27 61,52	12.70 83.19	0,074
12	323,90		6,35 49,73	8,38 65,20	9,53 73,88	10,31 79,73	14.30 109.00	12,70 97,46	17,48 132,08	21,44 159,91	25,40 186,97	28,58 208,14	33,32 238,76	25,40 186,97	12	3,96 31,89	4,57 36,73	9,53 75,32	12.70 99.43	0,104
14	355,60	6,35 54,69	7,92 67,90	9,53 81,33	9,53 81,33	11,13 94,55	15.10 126.40	12,70 107,39	19,05 158,10	23,83 194,96	27,79 224,65	31,75 253,56	35,71 281,70		14	3,96 35,06	4,78 42,14			0,126
16	406,40	6,35 62,64	7,92 77,83	9,53 93,27	9,53 93,27	12,70 123,30	16.70 160.00	12,70 123,30	21,44 203,53	26,19 245,56	30,96 286,64	363,53 333,19	40,49 365,35		16	4,19 42,41	4,78 48,26			0,165
18	457,00	6,35 70,57	7,92 87,71	11,13 122,38	9,53 105,16	14,27 155,80	19.00 206.00	12,70 139,15	23,83 254,55	29,36 309,62	34,93 363,56	39,67 408,26	45,24 459,37		18	4,19 47,77	4,78 54,36			0,208
20	508,00	6,35 78,55	9,53 117,15	12,70 155,12	9,53 117,15	15,09 183,42	20.60 248.5	12,70 155,12	26,19 311,17	32,54 381,53	38,10 441,49	44,45 508,11	50.01 564,81		20	4,78 60,46	5,54 70,00			0,258
22	559,00	6,35 86,54	9,53 129,13	12,70 171,09	9,53 129,13	- -	22.20 294.00	12,70 171,09	28,58 373,83	34,93 451,42	41,28 527,02	47,63 600,63	53,98 672,26		22	4,78 66,57	5,54 77,06			0,312
24	610,00	6,35 94,53	9,53 141,12	14,27 209,64	9,53 141,12	17,48 255,41	24.60 355.00	12,70 187,06	30,96 442,08	38,89 547,71	46,02 640,03	52,37 720,15	59,54 808,22		24	5,54 84,16	6,35 96,37			0,372
26	660,00	7,92 127,36	12,70 202,72	- -	9,53 152,87	- -		12,70 202,72							26					0,435
28	711,00	7,92 137,32	12,70 218,69	15,88 271,21	9,53 164,85	- -		12,70 218,69							28					0,505
30	762,00	7,92 147,28	12,70 234,67	15,88 292,18	9,53 176,84	- -		12,70 234,67							30	6,35 120,72	7,92 150,36			0,580
32	813,00	7,92 157,24	12,70 250,64	15,88 312,15	9,53 188,82	17,48 342,91		12,70 250,64							32					0,660
34	864,00	7,92 167,20	12,70 266,61	15,88 332,12	9,53 200,31	17,48 364,90		12,70 266,61							34					0,746
36	914,00	7,92 176,96	12,70 282,27	15,88 351,70	9,53 212,56	19,05 420,42		12,70 282,27							36					0,835
38	965,00				9,53 224,54			12,70 298,24							38					0,931
40	1016,00				9,53 236,53			12,70 314,22							40					1,032
42	1067,00				9,53 248,52			12,70 330,19							42					1,138
44	1118,00				9,53 260,50			12,70 346,16							44					1,249
46	1168,00				9,53 272,25			12,70 351,82							46					1,364
48	1219,00				9,53 284,24			12,70 377,79							48					1,485

Notes : 1) NPS (Normal Piper Size) is a dimensionless designator that has been substituted in the customary units section for the previous term inch Nominal Size.
2) Black- Thickness of Pipe RED - Pipe weight in kg per meter.
3) STD = Standard, XS = Extra Strong, XXS = Double Extra Strong.

CHEMICAL COMPOSITION OF S. S. PIPES & TUBES

Grade	UNS Designation	Composition %															
		Carbon max	Manganese max	Sulphur max	Phosphorus max	Silicon	Nickel	Chromium	Molybdenum	Titanium	Columblum plus Tantalum	Tantalum max	Nitrogen[C]	Vanadium	Copper	Cerlum	Bom
TP304	S30400	0.08	2.00	0.040	0.030	0.75 max	8.00-11.0	18.0-20.0	--	--	--	--	--	--	--	--	--
TP304H	S30409	0.04-0.10	2.00	0.040	0.030	0.75 max	8.00-11.0	18.0-20.0	---	---	---	---	---	---	---	---	
TP304L	S30403	0.035	2.00	0.040	0.030	0.75 max	8.00-13.0	18.0-20.0	---	---	---	---	---	---	---	---	
TP304N	S30451	0.08	2.00	0.040	0.030	0.75 max	8.00-11.0	18.0-20.0	---	---	---	---	0.10-0.16	---	---	---	
TP304LN	S30453	0.035	2.00	0.040	0.030	0.75 max	8.00-11.0	18.0-20.0	---	---	---	---	0.10-0.18	---	---	---	
TP309Cb	S30940	0.08	2.00	0.045	0.030	0.75 max	12.0-16.0	22.0-24.0	0.75 max	---	10 x C min 1.10 max	---	---	---	---	---	
TP309H	S30909	0.04-0.10	2.00	0.040	0.030	0.75 max	12.0-15.0	22.0-24.0	---	---	---	---	---	---	---	---	
TP309HCb	S3041	0.04-0.10	2.00	0.045	0.030	0.75 max	12.0-16.0	22.0-24.0	0.75 max	---	10 x C min 1.10 max	---	---	---	---	---	
TP309S	S30908	0.08	2.00	0.045	0.030	0.75 max	12.0-15.0	22.0-24.0	0.75 max	---	---	---	---	---	---	---	
TP310Cb	S31040	0.08	2.00	0.045	0.030	0.75 max	19.0-22.0	24.0-26.0	0.75 max	---	10 x C min 1.10 max	---	---	---	---	---	
TP310H	S31009	0.04-0.10	2.00	0.040	0.030	0.75 max	19.0-22.0	24.0-26.0	---	---	---	---	---	---	---	---	
TP310HCb	S31041	0.04-0.10	2.00	0.045	0.030	0.75 max	19.0-22.0	24.0-26.0	0.75 max	---	10 x C min 1.10 max	---	---	---			
TP310S	S31008	0.08	2.00	0.045	0.030	0.75 max	19.0-22.0	24.0-26.0	0.75 max	---	---	---	---	---		---	
	S31272	0.08-0.12	1.5 2.00	0.030	0.015	0.3-0.7	14.0-16.0	14.0-16.0	1.0-1.4	0.3-0.6							0.04 0.00
TP316	S31600	0.08	2.00	0.040	0.030	0.75 max	11.0-14.0	16.0-18.0	2.00-3.00	---	---	---	---	---	---	---	
TP316H	S31609	0.04-0.10	2.00	0.040	0.030	0.75 max	11.0-14.0	16.0-18.0	2.00-3.00	---	---	---	---	---	---	---	
TP316L	S31603	0.035	2.00	0.040	0.030	0.75 max	10.0-15.0	16.0-18.0	2.00-3.00	---	---	---	---	---	---	---	
TP316N	S31651	0.08	2.00	0.040	0.030	0.75 max	11.0-14.0	16.0-18.0	2.00-3.00				0.10-0.16	--	---	---	
TP316LN	S31653	0.035	2.00	0.040	0.030	0.75 max	11.0-14.0	16.0-18.0	2.00-3.00	---	---	---	0.10-0.18	---	----	---	
TP317	S31700	0.08	2.00	0.040	0.030	0.75 max	11.0-14.0	18.0-20.0	3.00-4.00	---	---	---	---	---	---	---	
TP317L	S31703	0.035	2.00	0.040	0.030	0.75 max	11.0-15.0	18.0-20.0	3.00-4.00	---	---	---	---	---	---	---	
TP321	S32100	0.08	2.00	0.040	0.030	0.75 max	9.00-13.0	17.0-20.0	---	[F]	---	---	---	---	---	---	
TP321H	S32109	0.04-0.10	2.00	0.040	0.030	0.75 max	9.00-13.0	17.0-20.0	---	[G]	---	---	---	---	---	---	
TP347	S34700	0.08	2.00	0.040	0.030	0.75 max	9.00-13.0	17.0-20.0	--	---	[H]	---	---	---	---	---	
TP347H	S34709	0.04-0.10	2.00	0.040	0.030	0.75 max	9.00-13.0	17.0-20.0	--	---	[I]	---	---	---	---	---	---
TP347LN	S34751	0.005-0.020	2.00	0.040	0.030	0.75 max	9.00-13.0	17.0-20.0	---	---	0.2-0.5[H]	---	0.06-0.10	---	---	---	
TP348	S34800	0.08	2.00	0.040	0.030	0.75 max	9.00-13.0	17.0-20.0	---	---	[H]	0.10	---	--	---	---	
TP348H	S34809	0.04-0.10	2.00	0.040	0.030	0.75 max	9.00-13.0	17.0-20.0	---	---	[I]	0.10	---	--	---	---	
TPXM 10	S21900	0.08-1000	8.00-10.00	0.040	0.030	1.00 max	5.50-7.50	19.0-21.5	---	---	---	---	0.15-0.40	---	---	---	
TPXM 11	S21904	0.04-10.00	8.00-10.00	0.040	0.030	1.00 max	5.50-7.50	19.0-21.5	---	---	---	---	0.15-0.40	---	---	---	
TPXM-15	S38100	0.08	2.00	0.030	0.030	1.50-2.50	17.5-18-5	17.0-19.0	---	---	---	---	---	---	---	---	
TPXM-19	S20910	0.060	4.00-6.00	0.040	0.030	1.00 max	11.5-13.5	20.5-3.00	1.50-3.00	---	0.10-0.30	---	0.20-0.40	0.10-0.30	---	---	
TPXM-29	S24000	0.080	11.5-14.5	0.060	0.030	1.00 max	2.25-3.75	17.0-19.0	---	---	--	---	0.20-0.40	---	---	---	
---	S31254	0.020	1.00	0.030	0.010	0.80 max	17.5-18.5	19.5-20.5	6.00-6.50	---	---	---	0.18-0.22	---	0.50-1.00		
---	S30615	0.16-0.24	2.00	0.030	0.030	3.2-4.0	13.5-16.0	17.0-19.5	---	---	---	---	---	---	---	---	
---	S30815	0.05-0.10	0.80	0.040	0.030	1.40-2.00	10.0-12.0	20.0-22.0	---	---	---	---	0.14-0.20	---	---	0.03-0.08	
---	S31050	0.025	2.00	0.020	0.015	0.4	20.5-23.5	24.0-26.0	1.6-2.6	---	---	---	0.09-0.15	---	---	---	
---	S30600	0.018	2.00	0.020	0.020	3.7-4.3	14.0-15.5	17.0-18.5	0.20 max	---	---	---	---	---	0.50 max	---	
---	S31725	0.03	2.00	0.040[J]	0.030	0.75	13.5-17.5	18.0-20.0	4.0-5.0	---	---	---	0.10 max	---	0.75 max	---	
---	S31726	0.03	2.00	0.040[J]	0.030	0.75	13.5-17.5	17.0-20.0	4.0-5.0	---	---	---	0.10-0.20	---	0.75 max	---	
---	S32615	0.07	2.00	0.045	0.030	4.8-6.0	19.0-22.0	16.5-19.5	0.3-1.5	---	---	---	---	---	1.5-2.5	---	
---	S33228	0.04-0.08	1.00	0.020	0.015	0.30 max	31.0-33.0	26.0-28.0	---	---	0.6-1.0	---	---	---	---	0.05-0.10	---
---	S24565	0.03	5.0-7.0	0.030	0.010	1.00max	16.0-18.0	23.0-25.0	4.0-5.0	---	0.1 max		0.04-0.6	---	---	---	---
---	S30415	0.4-0.06	0.80	0.045	0.030	1.00-2.00	9.00-10.0	18.0-19.0	---	---	---	---	0.12-0.16	---	---	0.03-0.08	
---	S32654	0.020	2.00-4.00	0.030	0.005	0.50 max	21.0-23.0	24.0-25.0	7.00-8.00	---	---	---	0.45-0.55	---	0.030-0.60	---	
---	S35315	0.04-0.08	2.00	0.045	0.030	0.75	34.0-36.0	24.0-26.0	---	---	---	---	0.12-0.18	---	---	0.03-0.08	
---	N08367	0.030	2.00	0.030	0.030	1.00 max	23.50-25.50	20.00-22.00	6.00-7.00	---	---	---	0.18-0.25	---	0.75 max	---	---
---	N08904	0.020	2.00	0.045	0.035	1.00	23.0-28.0	19.0-23.0	4.0-5.0	---	---	---	0.10 max	---	1.0-2.0	---	---

New designation established in accordance with Practice E 527 and SAE J 1086.
Maximum, unless otherwise indicated.The method of analysis for nitrogen shall be a matter of agreement between the purchaser and manufacturer.
For welded TP316, TP316N, TP316LN, and TP316H pipe, the nickel range shall be 10.0-14.0 %. For small diameter or thin walls or both, where many drawing passes are required, a carbon maximum of 0.040 % is necessary in grades TP304L and TP316L. Small diameter tubes are defined as those less 0.500 in (12.7mm) in outside diameter and light wall tubes as those less than 0.049 in (1.20 mm) in average wall thickness (1.10 mm) in minimum wall thickness
The titanium content shall be not less than five times the carbon content and not more than 0.70 %. The titanium content shall be not be less than four times the carbon content and not more than 0.60 %. The Columblum plus titanium content shall be not less than ten times carbon content and not more than 1.00 %.
The Columblum plus titanium content shall be not less than eight times carbon content and not more than 1.00 %.
For welded pipe, the phosphorus maximum shall be 0.045 %. Grade S34751 shall have a columblum (Nioblum) plus tantalum content of not less than 15 times the carbon content.

MECHANICAL PROPERTIES OF S.S.PIPES

Table-2 Annealing Requirements — A312/A312M

Grade or UNS Designation	Solution Treating Temperature	Cooling Requirements
All Grades not individually listed below	1900°F(1040°C)	rapid[c]
TP321H, TP347H, TP348H		
Cold Rolled	2000°F (1100°C)	
Hot Rolled only	1925°F (1050°C)	
TP304H, TP316H		
Cold Rolled	1900°F (1040°C)	
Hot rolled only	1900°F (1040°C)	
TP309H, TP309HCb, TP310H	1900°F (1040°C)	
TP310HCb		
S30815	1920°F (1050°C)	rapid
S31272	1920°F (1050°C)	rapid
S31254	2100°F (1150°C)	rapid
S24565	2050-2140°F (1120-1170°C)	rapid
S35315	2010°F (1100°C)	rapid
N08367	2010°F (1100°C)	rapid
N08904	2010°F (1100°C)	rapid

Table-3 Tensile Requirements

Grade	UNS Designation	Tensile Strength, min Ksi (MPa)	Yield Strength, Min Ksi (MPa)
TP304L	S30403	70 (485)	25 (170)
TP316L	S31603	70 (485)	25 (170)
TP304	S30400	75 (515)	30 (205)
TP304H	S30409	75 (515)	30 (205)
TP309Cb	S30940	75 (515)	30 (205)
TP309H	S30909	75 (515)	30 (205)
TP309HCb	S30941	75 (515)	30 (205)
TP309S	S30908	75 (515)	30 (205)
TP310Cb	S31040	75 (515)	30 (205)
TP310H	S31009	75 (515)	30 (205)
TP310HCb	S31041	75 (515)	30 (205)
TP310S	S31008	75 (515)	30 (205)
	S31272	65 (450)	29 (200)
TP316	S31600	75 (515)	30 (2050
TP316H	S31609	75 (515)	30 (205)
TP317	S31700	75 (515)	30 (205)
TP317L	S31703	75 (515)	30 (205)
TP321	S32100		
Welded		75 (515)	30 (205)
Seamless			
≤ 3/8 in.		75 (515)	30 (205)
> 3/8 in.		70 (485)	25 (170)
TP321H	S32109		
Welded		75 (515)	30 (205)
Seamless			
< 3/8 in.		75 (515)	30 (205)
> 3/8 in.		70 (485)	25 (170)
TP347	s34700	75 (515)	30 (205)
TP347H	S3470	75 (515)	30 (205)
TP347LN	S34751	75 (515)	30 (205)
TP348	S34800	75 (515)	30 (205)
TP348H	S34809	75 (515)	30 (205)
TPXM-10	S21900	90 (620)	50 (345)
TPXM-11	S21904	90 (620)	50 (345)
TPXM-15	S38100	75 (515)	30 (205)
TPXM-29	S24000	100 (690)	55 (380)
TPXM-19	S20910	100 (690)	55 (380)
TP304N	S30451	80 (550)	35(240)
TP316N	S31651	80 (550)	35 (240)
TP304LN	S31653	75 (515)	30 (205)
---	S31254	94 (650)	44 (300)
---	S30615	90 (620)	40 (275)
---	S30815	87 (600)	45 (310)
---	S30600	78 (540)	35 (240)
---	S31725	75 (515)	30 (205)
---	S31726	80 (550)	35 (240)
---	S31050		
T<0.25 IN.		84 (580)	39 (270)
T>0.25 in.		78 (540)	37 (255)
---	S32615	80 (550)	32 (220)
---	S33228	73 (500)	27 (185)
---	S24565	115 (795)	60 (415)
---	S30415	87 (600)	42 (290)
---	S32654	109 (750)	62 (430)
---	S35315	94 (650)	39 (270)
---	N08367:		
t<0.187		100 (690)	45 (310)
t>0.187		95 (655	45 (310)
---	N08904	71(490)	31(215)

Elongation in 2 in or 50 mm (or 4D), min,% Longitudinal Transverse
All Grades except S 31050 and S 32615 35 25 S32615, S31050 25 --NO8367
Prior to the issuance of A 312/A 312 M- 88a, the tensile and yield strength values were 76 (515) and 30 (205) respectively, for nominal wall greater than 3/8 in. (9.5 mm).

TOLERANCE: ASTM SPECIFICATION FOR TUBING & PIPING

Specification	Allowable Outside Diameter Variation in mm			Allowable Wall Thickness Variation		Exact Length Testing Tolerance in mm		
	Nominal Diameter	Over	Under	%Over	%Under	Over	Under	
ASTM-A213 Seamless Boiler Superheater and Heat Exchanger Tubes	Under 25.4	.1016	.1016	+20	-0	3.175	0	Tension Test
	25.4-38.1 incl	.1524	.1524	+22	-0	3.175	0	Flattening Test
	38.1-50.8 excl	.2032	.2032	+22	-0	3.176	0	Flare Test
	50.8-63.5 excl	.254	.254	+2	-0	4.46	0	Hardness Test
	63.5-76.2 excl	.3048	.3048	+22	-0	4.76	0	100% Hydrostatic test
	76.2-101.6 incl	.381	.381	+22	-0	4.76	0	Refer to ASTM A-450
ASTM-A249 Welded Boiler Superheater, Heat Exchanger And Condenser Tubes	Under 25.4	.1016	.1016	+10	-10	3.175	0	Tension Test
	25.4-38.1 incl	.1524	.1524	+10	-10	3.175	0	Flattening Test
	38.1-50.8 Excl	.2032	.2032	+10	-10	3.175	0	Flare Test
	50.0-63.5 excl	.254	.254	+10	-10	4.76	0	Reverse Bend Test
	63.5-76.2 excl	.3848	.3048	+10	-10	4.76	0	Hardness Test
	76.2-101.6 incl	.381	.381	+10	-10	4.76	0	100% Hydrostastic Test
				Minimum Wall tubes + 18% 0 available On request				*Reverse flattening Test Refer to ASTM A-450 *Wherever applicable
ASTM-A269 Seamless & Welded Tubing for General Service	Untp 12.7	.13	.13	+15	-15	3.2	0	Flare Test
	12.7-38.1 excl	.13	.13	+10	-10	3.2	0	Flance Test (Welded Only)
	38.1-88.9 excl	.25	.25	+10	-10	4.8	0	Hardness Test
	88.9-139.7 excl	.38	.38	+10	-10	4.8	0	Reverse Flattening Test (Welded only)
	139.7-203.2 excl	.76	.76	+10	-10	4.8	0	100% Hydrostatic Test Refer to ASTM-A269
ASTM-A270 Seamless & Welded Sanitary Tubing	25.4	.05	.20	+12.5	-12.5	3.2	0	Reverse flattening Test
	38.1	.05	.20	+12.5	-12.5	3.2	0	100% Hydrostastic Test
	50.8	.05	.28	+12.5	-12.5	3.2	0	External polish on all tubes
	60.5	.05	.28	+12.5	-12.5	3.2	0	
	76.2	.08	.30	+12.5	-12.5	3.2	0	Refer to ASTM A-270
	101.6	.08	.38	+12.5	-12.5	3.2	0	
ASTM-A312 Seamless & Welded pipe	3.175-38.1 incl	.79	.79	12.5% under Minimum Wall nominal wall Specified		6.4	0	Tension Test Flattening Test 100% Hydrostatic Test Refer to ASTM A-530
	38.1-1016 incl	.4	.79			6.4	0	
	101.6-203.2 imcl	1.59	.79			6.4	0	
		+0.5%		-0.3		(Normally Random Lengths ordered 6.0		
ASTM A-358 Welded pipe	219.08-750mm or 0.01 inch							Refer to ASTM A-530

CARBON STEEL, ALLOY STEEL LOW TEM, PIPE AND TUBE SPECIFICATION

CHEMICAL									MECHANICAL PROPERTIES			SPECIFIC REQUIREMENT
									TENSILE STRENGTH	YIELD STRESS	ELONGATION	
SPECIFICATION	WT	C%	Mn %	P % MAX	S% MAX	Si%	Cr%	Mo%	Mpa	Mpa	50mm MIN Longitudinal	
ASTM A53/A	AW	0.25MAX	0.95MAX	0.050	0.045	-	-	-	330MIN	205MIN	36	
ASTM A53/B	AW	0.30MAX	1.20MAX	0.050	0.045	-	-	-	415MIN	240MIIN	29/5	Cr Mo Cu Ni Va
ASTM /A 106/A	AW	0.25MAX	0.27-0.93	0.035	0.025	0.10MIN	0.40MAX	0.15MAX	330MIN	205MIN	35/2	40 15 40 40 08
ASTM A 106/B	AW	0.35MAX	0.29-1.06	0.035	0.035	0.10MIN	0.40MAX	0.15MAX	415 MIN	240MIN	30/22	Five elements not to exceed 1%
ASTM A 106/C	AW	0.35MAX	0.29-1.06	0.035	0.035	0.10MIN	0.40MAX	0.15MAX	485MIN	275MIN	30/22	
ASTM A179	MW	0.06~018	0.27-0.63	0.035	0.035	-	-	-	325MIN	180MIN	35.0	Hardness 72 HRB Max
ASTMA214	MW	0.18MAX	0.27-0.63	0.035	0.035	-	-	-	385MIN	180MIN	35.0	Hardness 72 HRB Max
ASTM A192	MW	0.06-0.18	0.27-0.63	0.035	0.035	0.25MAX	-	-	325MIN	180MIN	35.0	Hardness 77 HRB Max
ASTM a209/T1	MW	0.10-0.20	0.30-0.80	0.025	0.025	0.10-0.50	-	0.44-0.65	380MIN	205MIN	30/22	Hardness 80 HRB Max
ASTM A209/T1a	MW	0.15-0.25	0.30-0.80	0.025	0.025	0.10-0.50	-	0.44-0.65	365MIN	195MIN	30/22	Hardness 81 HRB Max
ASTM A209/T1b	MW	0.14MAX	0.30-0.80	0.025	0.025	0.10MIN	-	0.44-0.65	415MIN	220MIN	30/22	Hardness 77 HRB Max
ASTM A210/A-1	MW	0.27max	0.93max	0.035	0.035	0.10min	-	-	415MIN	255MIN	30/22	Hardness 79 HRB Max
ASTMA210/C	MW	0.35MAX	0.23-1.06	0.035	0.035	0.10MIN	-	-	485MIN	275MIN	30/22	Hardness 89 HRB Max
ASTM A213/T2	MW	0.10/0.20	0.30-0.61	0.025	0.025	0.10-0.30	0.50-0.81	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A213/T5	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	4.00-6.00	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A213/T11	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	1.00-1.50	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A213/T12	0.05	0.15MAX	0.30-0.61	0.025	0.025	0.50MAX	0.80-1.25	0.44-0.65	415MIN	220MIN	30/22	Hardness 85 HRB Max
ASTM A213/T22	0.05	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	1.90-2.60	0.87-1.13	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A333/3	AW	0.19MAX	0.31-0.64	0.025	0.025	0.18-0.37	Ni	3.18-3.82	380MIN	205MIN	35/25	
ASTM A333/6	AW	0.30MAX	0.29-1.06	0.025	0.025	0.10MIN	--	-	415MIN	240MIN	30/22	IMPACT AS -50f
ASTM A334/3	AW	0.19MAX	0.31-0.64	0.025	0.025	0.18-0.37	Ni	3.18-3.82	380MIN	205MIN	35/28	FOR 40X10/18/1490 HRB MAX
ASTM A334/6	MW	0.30MAX	0.9-1.06	0.025	0.025	0.10MIN	-	-	415MIN	240MIN	30/22	50 f 40X10/18/14
ASTM A335/P1	AW	0.10-0.20	0.30-0.80	0.025	0.025	0.10-0.50-	-	0.40-0.65	380MIN	205MIN	30/22	
ASTM A335/P2	AW	0.10-0.20	0.30-0.61	0.025	0.025	0.10-0.30	0.50-0.81	0.40-0.65	380MIN	205MIN	30/22	
ASTM A335/P5	AW	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	4.00-6.00	0.40-0.65	415MIN	205MIN	30/22	
ASTM A335/P11	0.05	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	0.400-65	415MIN	205MIN	30/22	
ASTM A335/P12	0.05	0.15MAX	0.30-0.61	0.025	0.025	0.50MAX	0.80-1.25	0.40-0.65	415MIN	205MIN	50/22	
ASTM A335/P22	0.05	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	1.90-2.60	0.87.1.13	415MIN	205MIN	30/22	
BS/3059/1/33		0.15Max	0.30-0.70	0.050	0.050	-	-	-	324-441	186MIN	25	
BS/3059/2/33		0.15MAX	0.400.70	0.050	0.050	0.10-0.35	-	-	324-441	186MIN	21	
BS/3059/245		0.120.18	0.90-1.20	0.035	0.035	0.10-0.35	-	-	441-560	245MIN	22	
BS/3059/2/620		0.10-0.15	0.40-0.70	0.040	0.040	0.10-0.35	0.70-1.10	0.45-0.65	441-618	235MIN	22	
DIN/17175/ST35.8		0.17MAX	0.40MIN	0.040	0.040	0.35MAX	-	-	340-441	235MIN	25	
DIN/17175/ST45.8		0.22MAX	0.45MIN	0.040	0.040	0.10-0.35	-	-	441-540	255 MIN	25	
DIN/17175/15MO3		0.12-0.20	0.50-0.80	0.040	0.040	0.10-0.35	-	0.250-0.35	441-540	284MIN	21	
DIN/17175/13CrMo44		0.10-0.18	0.40-0.60	0.040	0.040	0.15-0.35	0.70-1.60	0.40-0.50	441-570	294MIN	22	
DIN/17175/10CrM910		0.15MAX	0.40-0.60	0.040	0.040	0.15-0.50	2.0-2.5	0.9-1.10	441-570	249MIN	22	
ASTM A199/T5	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	4.00-6.00	0.45-0.65	415MIN	170MIN	30/22	
ASTM A199/T11	MW	0.05-0.15	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	0.44-0.65	415MIN	170MIN	30/22	
ASTM A199/T22	MW	0.05-0.15	0.30-0.60	0.025	0.025	0.50MAX	1.90-2.60	0.87-1.13	415MIN	170MIN	30/22	
ASTM A199/T4	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	2.15-2.85	0.44-0.65	415MIN	170MIN	30/22	
ASTM A199/T7	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	6.00-8.00	0.45-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A199/T5	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	4.00-6.00	0.45-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A199/T11	MW	0.05-0.15	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	0.44-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTMA199/T22	MW	0.05-0.15	0.30-0.60	0.025	0.025	0.50MAX	1.90-2.60	0.87-1.13	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A199/T4	MW	0.05-0.15	0.30-0.60	0.025	0.025	0.50-1.00	2.15-2.852	0.44-0.85	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A199/T7	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	6.00-8.00	0.45-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A199/T9	MW	0.15MAX	0.30-0.60	0.025	0.025	0.25-1.00	8.00-10.00	0.90-1.10	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A199/T9	MW	0.15MAX	0.30-0.60	0.025	0.025	0.25-1.00	8.00-10.00	0.90-1.10	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A199/T9	MW	0.15MAX	0.30-0.60	0.025	0.025	0.25-1.00	8.00-10.00	0.90-1.10	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A335/P9	MW	0.15MAX	0.30-0.60	0.025	0.025	0.25-1.00	8.00-10.00	0.09-1.10	415MIN	172MIN	30/22	HARDNESS 85 HRB MAX
ASTM A178A	MW	0.06-0.18	0.30-0.60	0.035	0.035	-	-	-	325MIN	180MIN	35	HARDNESS 89 HRB MAX
ASTM A178C	MW	0.35 MAX	0.27-0.63	0.035	0.035	-	-	-	415MIN	170MIN	30	HARDNESS 89 HRB MAX
ASTM A178B	MW	0.27MAX	0.80 MAX	0.030	0.015	0.10MIN	-	-	485MIN	275MIN	30	HARDNESS 89 HRB MAX

DIMENSIONS AND NOMINAL WEIGHTS OF BLACK STEEL TUBES IN ACCORDANCE WITH IS: 1239 (PART 1) - 1979

Outside diameter					Thickness						Weight of black tube						Dimension of sockets	
Nominal	Light		Medium & Heavy		Light		Medium		Heavy		Light		Medium		Heavy		Outside	
											Plain	Screwed	Plain	Screwed	Plain	Screwed	Diameter	Length
Bore mm	Max mm	Min mm	Max mm	Min mm	mm	swg	mm	swg	mm	swg	End kg/m	Socketed kg/m	End kg/m	Socketed kg/m	End kg/m	Socketed kg/m	Min mm	Min mm
6	10.1	9.7	10.6	9.8	1.8	15	2.0	14	2.65	12	0.361	0.364	0.407	0.410	0.496	0.496	15	19
8	13.6	13.2	14.0	13.2	1.8	15	2.35	13	2.9	11	0.517	0.521	0.650	0.654	0.769	0.773	18.5	27
10	17.1	16.7	17.5	16.7	1.8	15	2.35	13	2.9	11	0.674	0.680	0.852	0.858	1.02	1.03	22	28
15	21.4	21.0	21.8	21.0	2.0	14	2.65	12	3.25	10	0.952	0.951	1.22	1.23	1.45	1.46	27	37
20	26.9	26.4	27.3	26.5	2.35	13	2.65	12	3.25	10	1.41	1.42	1.58	1.59	1.90	1.91	32.5	39
25	33.8	33.2	34.2	33.3	2.65	12	3.25	10	4.05	8	2.01	2.03	2.44	2.46	2.97	2.99	39.5	46
32	42.5	41.9	42.9	42.0	2.65	12	3.25	10	4.05	8	2.58	2.61	3.14	3.17	3.84	3.87	49	51
40	48.4	47.8	48.8	47.9	2.9	11	3.25	10	4.05	8	3.25	3.29	3.61	3.65	4.43	4.47	56	51
50	60.2	59.6	60.8	59.7	2.9	11	3.65	9	4.5	7	4.11	4.18	5.10	5.17	6.17	6.24	68	60
65	76.0	75.2	76.6	75.3	3.25	10	3.65	9	4.5	7	5.80	5.92	6.51	6.63	7.90	8.02	84	69
80	88.7	87.9	89.5	88.0	3.25	10	4.05	8	4.85	6	6.81	6.98	8.47	8.64	10.1	10.3	98	75
100	113.9	113.0	115.0	113.1	3.65	9	4.5	7	5.4	5	9.89	10.2	12.1	12.4	14.4	14.7	124	87
125	-	-	140.8	138.5	-	-	4.85	6	5.4	5	-	-	16.2	16.7	17.8	18.3	151	96
150	-	-	166.5	163.9	-	-	4.85	6	5.4	5	-	-	19.2	19.8	21.2	21.8	178	96

BIG DIAMETER ERW PIPES CONFIRMING TO IS 3589

Wall Thickness in mm	Nominal Bore 7" NB 193.7 mm OD	Nominal Bore 8" NB 219.1 mm OD	Nominal Bore 10" NB 273 mm OD	Nominal Bore 12" NB 323.7 mm OD	Nominal Bore 14" NB 355.6 mm OD	Nominal Bore 16" NB 406.4 mm OD	Nominal Bore 18" NB 457 mm OD	Nominal Bore 20" NB 508 mm OD
kg/mtr	kg/mtr	kg/mtr	kg/mtr	kg/mtr	kg/mtr	kg/mtr	kg/mtr	kg/mtr
4.85	22.59	25.62	32.07	38.13	-	-	-	-
5.2	24.17	27.43	34.34	40.85	-	-	-	-
5.6	26	29.28	36.93	43.93	48.11	-	-	-
6	27.88	31.53	39.5	47.02	51.49	61	69	-
6.35	29.34	33.28	41.73	49.67	54.43	62.35	70.5	78.5
7.01	32.27	36.76	46.43	55.45	61.82	69.04	-	-
7.94	-	41	50.95	61.85	67.98	77.92	87.8	-
8.18	-	42.56	53.42	65.12	-	-	-	-
9.53	-	51.5	60.24	73.75	81.21	93.13	105	117
12.7	-	-	-	-	107.28	123.3	139	155

Tolerance on Thickness and Weight

The following manufacturing tolerance shall be permitted on the tubes and sockets.

(a) Thickness

(1) Butt welded Light tubes

Medium and Heavy tubes

+ Not limited
- 8 percent

(2) Seamless tubes

+ Not Limited
- 10 percent

(b) Weight :

+ Not Limited
- 12.5 percent

(1) Single tube (light series)

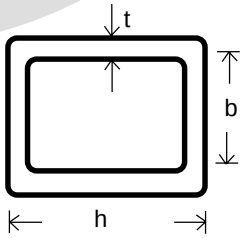
+ 10 percent
- 8 percent

(2) Single tube (medium and heavy series)

+ 10 percent

SQUARE & RECTANGULAR TUBE

STAINLESS STEEL & CARBON STEEL HOLLOW SECTION, SQUARE & RECTANGULAR TUBE WT. / MTR

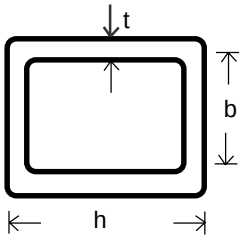


h mm	b mm	t mm	Weight kg/m	A mm^2	I_y 10^4 mm^4	W_y 10^3 mm^3	i_y mm	I_z 10^4 mm^4	W_z 10^3 mm^3	i_z mm	I_v 10^4 mm^4	W_v 10^3 mm^3
30	20	1,00	0776	94	1,15	0,77	11,06	0,6135	0,61	8,08	1,29	1,01
30	20	1,20	0,925	110	1,33	0,89	11,00	0,7052	0,71	8,01	1,52	1,18
30	20	1,50	1,146	135	1,58	1,05	10,82	0,837	0,84	7,87	1,83	1,40
30	20	2,00	1,495	173	1.93	1,28	10,55	1,011	1.01	7.64	2,29	1,71
40	10	1,50	1,146	135	2,15	1,07	12,61	0,213	0,42	3,97	0,70	0,81
40	10	2,00	1,495	173	2,59	1,29	12,23	0,245	0,49	3,76	0,83	0,94
40	20	1,00	0,950	113	2,33	1,16	14,37	0,794	0.79	8,38	1,93	1,38
40	20	1,20	1,106	134	2,72	1,36	14,25	0,921	0,92	8,29	2,27	1,60
40	20	1,50	1,371	165	3,26	1,63	14,05	1,094	1,09	8,14	2,74	1,91
40	20	2,00	1,840	213	4,03	2,01	13,76	1,337	1,33	7,92	3,45	2,36
40	30	1,20	1,310	158	3,63	1,81	15,15	2,328	1,55	12,14	4,52	250
40	30	1,50	1,620	195	4,37	2,18	14,97	2,801	1,86	11,99	5,52	3,02
40	30	2,00	2,150	253	5,48	2,74	14,72	3,497	2,33	11,76	7,07	3,79
40	30	3,00	3,280	347	7,03	3,51	14,23	4,455	2,97	11,33	9,41	4,89
40	20	2,00	1,903	233	5,48	2,43	15,33	1,499	2,49	8,02	4,05	2,68
50	10	1,50	1,371	165	4,00	1,60	15,56	0,268	0,54	4,03	0,92	1,03
50	10	2,00	1,840	215	4.91	1,96	15,10	0,31	0,62	3,80	1,09	1,20
50	20	1,20	1,310	158	4,78	1,91	17,40	1,133	1,13	8,47	3,05	2,03
50	20	1,50	1,620	195	5,76	2,30	17,19	1,351	1,35	8,32	3,69	2,42
50	20	2,00	2,150	253	7,21	2,88	16,88	1,662	1,66	8,11	4,66	3,00
50	25	1,20	1,415	170	5,50	2,20	17,98	1,873	1,50	10,50	4,54	2,59
50	25	1,50	1,758	210	6,64	2,66	17,79	2,249	1,80	10,35	5,54	3,13
50	25	2,00	2,319	273	8,36	3,35	17,50	2,801	2,22	10,13	7,06	3,92
50	25	3,00	3,456	376	10,81	4,32	16,95	3,552	2,84	9,72	9,34	5,04
50	30	1,20	1,496	182	6,21	2,48	18,47	2,826	1,88	12,46	6,22	3,17
50	30	2,00	2,454	293	9,52	3,81	18,02	4,282	2,86	12,09	9,77	4,84
50	30	3,00	3,756	405	12,40	4,96	17,50	5,52	3,68	11,67	13,08	6,30
50	30	4,00	4,808	515	14,76	5,91	16,93	6,49	4,32	11,23	16,07	7,53
50	40	1,50	2,122	255	9,29	3,72	19,09	6,595	3,30	16,08	12,26	5,24
50	40	2,00	2,804	333	11,82	4,73	18,84	8,37	4,19	15,85	15,86	6,67
50	40	3,00	4,131	462	15,59	6,24	18,37	10,994	5,50	15,43	21,55	8,83
60	10	1,50	1,620	195	6,67	2,22	18,50	0,323	0,65	4,07	1,13	1,25
60	10	2,00	2,150	253	8,29	2,76	18,10	0,375	0,75	3,85	1,35	1,46
60	20	1,20	1,496	182	7,64	2,55	20,48	1,346	1,35	8,60	3,85	2,45
60	20	1,50	1,859	225	9,24	3,08	20,26	1,609	1,61	8,46	4,66	2,94
60	20	2,00	2,454	293	11,66	3,89	19,94	1,087	1,99	8,24	5,89	3,65
60	30	1,50	2,122	255	11,81	3,94	21,25	4,02	2,68	12,56	9,77	4,64
60	30	2,00	2,804	333	15,02	5,01	21,24	5,067	3,38	12,34	12,57	5,88
60	30	3,00	4,131	462	19,80	6,60	20,70	6,58	4,38	11,93	16,89	7,71
60	40	1,50	2,329	285	14,37	4,79	22,46	7,71	3,85	16,44	15,97	6,35
60	40	2,00	3,080	373	18,39	6,13	22,20	9,82	4,91	16,22	20,70	8,12
60	40	3,00	4,650	520	24,49	8,16	21,70	12,98	6,49	15,80	28,24	10,81
60	40	4,00	5,960	668	29,92	9,98	21,17	15,74	7,87	15,35	35,50	13,27
80	10	1,50	2,122	255	15,10	3,78	24,34	0,43	0,87	4,12	1,57	1,69
80	10	2,00	2,804	333	19,06	4,77	23,92	0,51	1,01	3,90	1,87	1,99
80	20	2,00	3,080	373	25,15	6,29	25,97	2,64	2,64	8,41	8,40	4,96
80	40	1,50	2,802	345	28,97	7,24	28,98	9,93	4,97	16,97	23,77	8,57
80	40	2,00	3,711	453	37,32	9,33	28,70	12,71	6,35	16,75	30,88	11,00
80	40	3,00	5,491	634	50,35	12,59	28,18	16,94	8,47	16,35	42,28	14,77
80	40	4,00	7,222	820	62,49	15,62	27,61	20,76	10,38	15,91	53,43	18,29
80	40	5,00	8,902	996	72,64	18,16	27,01	23,83	11,91	15,47	62,97	21,16
80	50	2,00	4,060	493	43,40	10,85	29,67	21,04	8,42	20,66	45,31	14,04
80	50	3,00	5,928	691	58,89	14,72	29,19	28,36	11,34	20,26	62,55	19,02
80	60	2,00	4,380	533	49,49	12,37	30,47	31,85	10,62	24,44	61,22	17,08
80	60	3,00	6,530	749	67,43	16,86	30,00	43,24	14,41	24,03	84,95	23,28
80	60	4,00	8,450	973	84,68	21,17	29,50	54,08	18,03	23,58	109,08	29,33
80	60	5,00	10,629	1188	99,73	24,93	28,57	63,44	21,15	23,11	130,81	34,56
100	20	2,00	3,711	453	46,11	9,22	31,90	3,29	3,29	8,52	10,94	6,26
100	40	2,00	4,380	533	65,32	13,06	35,01	15,60	7,80	17,11	41,47	13,89
100	40	3,00	6,530	749	88,91	17,78	34,45	20,91	10,45	16,71	56,88	18,73
100	40	4,00	8,450	973	111,46	22,29	33,85	25,78	12,89	16,28	72,04	23,31

STAINLESS STEEL & CARBON STEEL HOLLOW SECTION, SQUARE & RECTANGULAR TUBE WT. / MTR

h mm	b mm	t mm	Weight kg/m	A mm^2	I_y 10^4 mm^4	W_y 10^3 mm^3	i_y mm	I_z 10^4 mm^4	W_z 10^3 mm^3	i_z mm	I_v 10^4 mm^4	W_v 10^3 mm^3
100	40	500	10,629	1187	131,00	26,20	33,22	20,79	14,89	15,84	85,15	27,11
100	50	2.00	4,680	573	74,93	14,99	36,16	25,65	10,26	21,16	61,59	17,73
100	50	3,00	6,950	807	102,45	20,49	35,63	34,74	13,90	20,75	85,20	24,12
100	50	4,00	9,9090	1050	129,14	25,83	35,07	43,34	17,34	20,32	109,02	30,34
100	50	500	11,240	1283	152.69	30,54	34,500	50,72	20,29	19,88	130,28	35,68
100	50	6,00	13,490	1504	172,90	34,58	33,900	56,85	22,74	19,44	149,42	40,31
100	60	2,00	4,988	613	84,53	16,91	37,13	38,58	12,86	25,09	84,08	21,56
100	60	3,00	7,530	864	115,98	23,20	36,64	52,61	17,54	24,68	116,95	29,52
100	60	4,00	9,816	1126	146,82	29,36	36,11	66,16	22,05	24,24	150,60	37,38
100	60	5,00	12,395	1379	174,37	34,87	35,56	78,05	26,02	23,79	181,17	44,28
100	60	6,00	14,600	1619	198,43	36,69	35,01	88,25	29,42	23,35	209,30	50,40
100	80	2,00	5,625	693	103,74	20,75	38,69	73,83	18,46	32,64	134,59	29,24
100	80	3,00	8,388	978	143,07	28,61	38,25	101,60	25,40	32,23	188,34	40,33
100	80	4,00	11,050	1281	182,57	36,51	37,75	129,33	32,33	31,77	244,29	51,51
100	80	5,00	13,750	1569	217,75	43,55	37,25	153,89	38,47	31,32	296,06	61,54
100	80	6,00	16,220	1848	249,90	49,90	36,74	175,92	43,98	30,85	344,80	70,67
120	40	2,00	4,988	613	104,00	17,33	41,19	18,49	9,24	17,37	52,32	16,78
120	40	3,00	7,530	864	142,44	23,74	40,60	24,87	12,44	16,97	71,82	22,69
120	40	4,00	9,816	1128	180,27	30,05	39,98	30,85	15,43	16,54	91,07	28,33
120	60	2,00	5,624	693	131,85	21,97	43,62	45,31	15,10	25,57	107,88	26,05
120	60	3,00	8,388	979	181,83	30,30	43,10	61,99	20,66	25,16	150,24	35,76
120	60	4,00	11,050	1279	231,48	38,58	42,54	78,23	26,08	24,73	193,77	45,44
120	60	5,00	13,750	1570	276,60	46,10	41,97	92,67	30,89	24,30	233,50	54,00
120	60	6,00	16,220	1849	316,78	52,79	41,39	105,21	35,07	23,85	270,29	61,68
120	80	2,00	6,400	773	159,70	26,62	45,45	86,00	21,50	33,35	175,00	35,32
120	80	3,00	9,530	1094	221,21	36,87	44,97	118,68	29,67	32,94	245,28	48,87
120	80	4,00	12,400	1432	283,06	47,18	44,46	151,24	37,81	32,50	318,69	62,62
120	80	5,00	15,380	1761	340,09	56,68	43,95	180,97	45,24	32,06	387,05	75,05
120	80	6,00	17,500	2078	391,77	65,29	43,42	207,63	51,91	31,61	451,77	86,49
140	80	3,00	10,080	1208	321,22	45,89	51,57	135,76	33,94	33,52	304,37	57,40
140	80	4,00	13,312	1588	413,51	59,07	51,03	173,81	43,45	33,06	395,92	73,73
140	80	5,00	16,320	1952	497,66	71,09	50,49	208,06	52,01	32,65	481,43	88,57
150	50	3,00	9,530	1093	286,94	32,26	51,24	50,70	20,28	21,54	144,47	36,88
150	50	4,00	12,400	1435	367,37	48,98	50,60	63,88	25,55	21,10	185,30	46,69
150	50	5,00	15,580	1761	439,58	58,61	49,96	75,24	50,10	20,67	222,05	55,27
150	100	3,00	11,664	1381	442,28	58,97	56,59	237,87	47,57	41,50	486,59	78,22
150	100	4,00	15,424	1814	570,68	76,09	56,09	305,92	61,18	41,07	635,89	101,06
150	100	5,00	18,800	2239	691,68	92,22	55,58	369,57	73,91	40,63	776,96	122,14
150	100	6.00	22,560	2652	804,08	107,21	55,06	428,21	85,64	40,18	912,74	141,96
160	80	3,00	11,800	1323	445,39	55,67	58,02	152,84	38,21	33,99	365,07	65,94
160	80	4,00	15,030	1741	575,10	71,89	57,47	196,05	49,01	33,56	475,22	84,84
160	80	5,00	18,660	2143	694,27	86,78	56,92	235,14	58,78	33,12	578,31	102,10
160	80	6,00	21,200	2537	805,62	100,70	56,35	271,06	67,77	32,69	676,50	118,15
200	100	3,00	14,064	1667	886,97	88,70	72,94	305,58	61,12	42,81	723,49	105,29
200	100	4,00	18,624	2201	1153,24	115,32	72,39	395,22	79,04	42,37	946,81	136,48
200	100	5,00	22,400	2717	1402,13	140,21	71,84	478,01	95,60	41,94	1158,57	165,48
200	100	6,00	27,360	3226	1639,16	163,92	71,28	555,87	11,17	41,51	1363,22	192,96

Dimension	Tolerance	
External dimensions	<100mm 100 mm < 200 mm	+1% +0,8%
Thickness	t < 5mm t>5mm	+10% 0.5 mm
Squareness	90=1	
Side convexity x 1		max. 0.8%
Side convexity x 2		min. 0,5 mm
External corner radius R		(1,8 x 2,1)t
Straightness	max 0,15%	
Twist V		2 mm+0,5 mm/m
Lenght I	< 5000 mm	+5mm/ - 0mm
Lenght I	< 5000 mm	+15mm/ - 0mm



STAINLESS STEEL HOLLOW SECTION,

Grade:

EN 1,4301 / AISI 304

EN 1,4571 / AISI 316 Ti

EN 1,4404 / AISI 316L

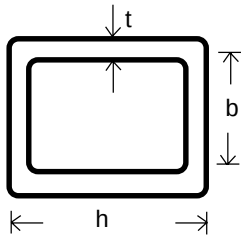
Also Duplex steel and high-alloy austenitic steel grades available to order

Carbon steel & High Tensile Hollow Section

IS:4923 YST310, EN10210-1 S275J2H, S355J2H

25 X 25mm upto 450 X450mm

30 X 20mm upto 500 X 400mm



W.T. upto 20mm thk

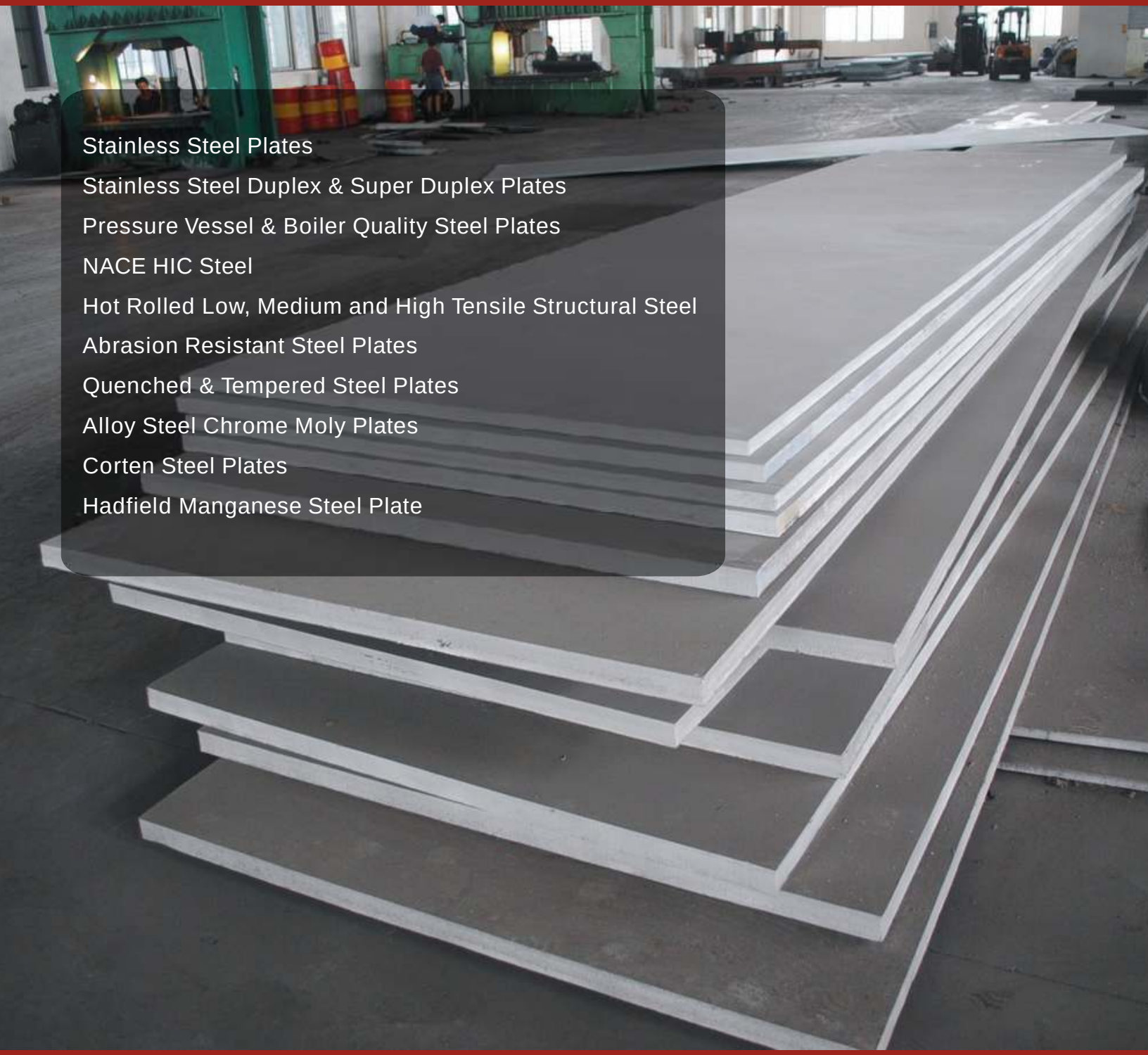
- Supply Condition :

a Normalised cold formed

b Hot formed

h = b mm	t mm	Weight kg/m	A mm^2	I_y 10^4 mm^4	W_y 10^3 mm^3	i_y mm	I_z 10^4 mm^4	W_z 10^3 mm^3
25	1,00	0,776	93	0,88	0,71	9,74	1,41	1,06
25	1,20	0,925	110	1,02	0,82	9,64	1,66	1,24
25	1,50	1,146	135	1,21	0,97	9,48	2,01	1,47
25	2,00	1.495	173	1,48	1,18	9,23	2,53	1,80
25	3,00	2,216	233	1,79	1,43	8,76	3,24	2,23
30	1,00	0,950	113	1,57	1,41	11,78	2,49	1,57
30	1,20	1,106	134	1,83	1,22	11,69	2,93	1,84
30	1,50	1,371	165	2,19	1,46	11,52	3,57	2,21
30	2,00	1,840	233	2,71	1,43	10,79	4,54	2,75
30	3,00	2,720	290	3,39	2,26	10,81	5,97	3,49
32	1,20	1,200	144	2,25	1,40	12,49	3,58	2,11
32	1,50	1,472	177	2,70	1,69	12,34	4,37	2,54
34	1,20	1,310	153	2,72	1,60	13,33	4,32	2,41
34	1,50	1,620	189	3,27	1,93	13,16	5,28	2,90
35	1,20	1,310	158	2,98	1,70	13,73	4,73	2,56
35	1,50	1,620	195	3,59	2,05	13,57	5,78	3,09
35	2,00	2,150	253	4,50	2,57	13,33	7,41	3,89
35	3,00	3,280	347	5,75	3,29	12,87	9,89	5,03
38	1,20	1,415	172	3,86	2,03	14,97	6,09	3,05
38	1,50	1,758	213	4,66	2,45	14,79	7,46	3,70
38	2,00	2,319	277	5,87	3,09	14,56	9,60	4,67
40	1,20	1,496	182	4,53	2,26	15,77	7,13	3,40
40	1,50	1,859	225	5,48	2,74	15,61	8,75	4,13
40	2,00	2,454	293	6,93	3,46	15,37	11,28	5,23
40	3,00	3,756	405	9,01	4,50	14,92	15,22	6,86
40	4,00	4,808	515	10,38	5,36	14,19	18,87	8,27
50	1,50	2,329	285	10,72	5,36	19,39	17,42	6,65
50	2,00	3,080	373	11,05	4,42	17,21	22,63	8,51
50	3,00	4,650	520	18,78	7,51	19,00	30,97	11,38
50	4,00	5,960	668	22,93	9,17	18,53	39,10	14,02
50	5,00	7,410	805	26,19	10,48	18,04	46,02	16,14
50	6,00	8,832	930	28,58	11,43	17,53	46,02	16,14
60	1,50	2,802	345	19,51	6,50	23,78	30,48	9,77
60	2,00	3,711	453	25,12	8,37	23,55	39,79	12,59
60	3,00	5,491	634	33,86	11,29	23,11	54,94	17,04
60	4,00	7,222	820	42,01	14,00	22,63	70,12	21,29
60	5,00	8,902	996	48.83	16,28	22,14	83,55	24,87
70	2,00	4,380	533	40,69	11,63	27,63	63,96	17,48
70	3,00	6,530	749	55,39	15,83	27,19	88,86	23,85
70	4,00	8,450	973	69,48	19,85	26,72	114.25	30,09
70	5,00	10,629	1188	81,73	23,35	26,23	137,21	35,50
80	2,00	4,988	613	61,66	15,41	31,72	96,34	23,16
80	3,00	7,530	864	84,51	21,13	31,27	134,44	31,80
80	4,00	9,816	1126	106,87	26,72	30,81	173,77	40,41
80	5,00	12,395	1379	126,81	31,72	30,32	209,87	48,04
80	6,00	14,600	1619	144,20	36,05	29,84	209,87	48,04
100	2,00	6,400	773	122,95	24,59	39,88	190,54	36,92
100	3,00	9,530	1094	170,16	34,02	39,44	267,49	51,15
100	4,00	12,400	1432	217,53	43,52	38,98	348,18	65,66
100	5,00	15,380	1761	261,13	52,23	38,51	423,66	78,83
100	6,00	17,500	2078	300,56	60,11	38,03	495,48	91,01
120	3,00	11,800	1323	299,97	50,00	47,62	467,87	75,09
120	4,00	15,030	1737	386,22	64,37	47,15	611,76	97,03
120	5,00	18,660	2144	467,08	77,85	46,67	747,87	117,27
120	6,00	21,200	2538	541,77	90,30	46,20	879,04	136,30
150	3,00	14,064	1668	597,61	79,68	59,86	924,81	119,61
150	4,00	18,624	2196	774,80	103,31	59,40	12115,26	1551,99
150	5,00	22,400	2717	943,78	125,80	58,94	14913,96	1892,47
150	6,00	27,360	3226	1102,87	147,00	58,47	17613,05	2214,37

PLATES



- Stainless Steel Plates
- Stainless Steel Duplex & Super Duplex Plates
- Pressure Vessel & Boiler Quality Steel Plates
- NACE HIC Steel
- Hot Rolled Low, Medium and High Tensile Structural Steel
- Abrasion Resistant Steel Plates
- Quenched & Tempered Steel Plates
- Alloy Steel Chrome Moly Plates
- Corten Steel Plates
- Hadfield Manganese Steel Plate

STAINLESS STEEL PLATES CHEMICAL COMPOSITIONS (%)

Type	C*	Mn*	P*	S*	Si*	Cr	Ni	Others
304	0.08	2.00	0.045	0.030	0.75	18.0-20.0	8.0-10.5	NO.25
304L	0.03	2.00	0.045	0.030	0.75	18.0-20.0	8.0-12.0	NO.25
309S	0.08	2.00	0.045	0.030	0.75	22.0-24.0	12.0-15.0	
310S	0.08	2.00	0.045	0.030	1.50	24.0-26.0	19.0-22.0	
314	0.15	1.5	0.045	0.030	1.5-2.5	23-27	19-23	
316	0.08	2.00	0.045	0.030	0.75	16.0-18.0	10.0-14.0	Mo 2.0-3.0, NO.10
316L	0.03	2.00	0.045	0.030	0.75	16.0-18.0	10.0-14.0	Mo 2.0-3.0, -0.10
316Ti	0.08	2.00	0.045	0.030	0.75	16.0-18.0	10.0-14.0	NO.10Ti5(C+N)Min0.70Max
317L	0.03	2.00	0.045	0.030	0.75	18.0-20.0	11.0-15.0	Mo 3.0-4.0, NO-10
321	0.08	2.00	0.045	0.030	0.75	17.0-19.0	9.0-12.0	Ti5 (C+N)Min, 0.70 Max
330	0.08	2.00	0.030	0.030	0.75-1.5	17.0-20.0	34.0-37.0	GUI
347	0.08	2.00	0.045	0.030	0.75	17.0-19.0	9.0-13.0	Cb 10XC Min,1.0 Max
409	0.03	1.00	0.030	0.040	1.00	10.5-11.75	0.5Max	Ti 6(C) Min-0.75 Max
410	0.15	1.00	0.030	0.030	1.00	11.5-13.5	0.75	
420	0.15Min	1.00	0.030	0.040	1.00	12.0-14.0		
430	0.12	1.00	0.030	0.040	1.00	16.0-18.0		
431	0.2	1.00	0.04	0.030	1.00	15.0-17.0	1.25-2.50	EN 57
440C	0.95-1.0	1.00	0.04	0.03	1.00	16.0-18.0		
446	0.2	1.5	0.04	0.03	1.00	23.0-27.0	0.60Max	
17-4PH	0.07	1.0	0.04	0.03	1.0	15-17.50	3.0-5.0	CU 3.0-5.0
904L	0.02	2.00	0.030	0.045	1.00	19.0-23.0	23.0-28.0	MO 4.0-5.0, CUL,0-2.0
* = Max.								

STAINLESS STEEL PLATES - MECHANICAL PROPERTIES

Mechanical Properties of wrought Stainless Steel
(All properties minimum specified as per code)

Type	UNS Designation	Condition	Tensile Strength Mpa	0.2% Proof Strength Map	Elongation % in 50mm	Hardness Brinell	ASTM Specification
301	S30100	Annealed	515	205	40	201	A167
302	S30200	Annealed	515	205	40	201	A167
304	S30400	Annealed	515	205	40	201	A240
304L	S30403	Annealed	485	170	40	202	A240
309S	S30908	Annealed	515	205	40	217	A167
310S	S31008	Annealed	515	205	40	217	A167
316	S31600	Annealed	515	205	40	217	A240
316L	S31603	Annealed	485	205	40	217	A240
316TI	S31635	Annealed	515	205	30	217	A167
317L	S31703	Annealed	515	205	40	217	A240
321	S32100	Annealed	515	205	40	217	A240
330	No8330	Annealed	480	210	30	75	B536
347	S34700	Annealed	515	205	40	201	A240
409	S40900	Annealed	380	205	22	179	A176
410	S41000	Annealed	450	205	20	217	A176
420	S42000	Annealed	860*	-	-	-	A580
430	S43000	Annealed	450	205	22	183	A176
431	S43100	Annealed	965*	-	-	-	A580
440C	S44004	Annealed	760	450	14	223	A276
446	S44600	Annealed	515	275	20	217	A176
17-4PH	S17400	H1025	1070	1000	12	331	-
904L	-	Annealed	490	220	35	90	-

Duplex & Super Duplex STEEL PLATES - CHEMICAL COMPOSITION

UNS Designation [B]	Type[C]	Carbon [D]	Manganese	Phos Phorus	Sulphur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements[E,F]
S31200	...	0.030	2.00	0.045	0.030	1.00	24.0-26.0	5.5-6.5	1.20-2.00	0.14-0.20	...	...
S31260	...	0.030	1.00	0.030	0.030	0.75	24.0-26.0	5.5-7.5	2.5-3.50	0.10-0.300	0.20-0.80	W 0.10-0.50
S31803	...	0.030	2.00	0.030	0.020	1.00	21.0-23.0	4.5-6.5	2.5-3.5	0.08-0.20	...	...
S32001	...	0.030	4.0-6.0	0.040	0.030	1.00	19.5-21.5	1.00-3.00	0.60	0.05-0.17	1.00	...
S32205	2205[G]	0.030	2.00	0.030	0.020	1.00	22.0-23.0	04.5-6.5	3.0-3.5	0.14-0.20	...	...
S32304	2304[G]	0.030	2.50	0.040	0.030	1.00	21.5-24.5	3.0-5.5	0.05-0.60	0.05-0.60	0.05-0.60	...
S32520	...	0.030	1.50	0.035	0.020	0.80	24.0-26.0	5.5-8.0	3.0-4.0	0.20-0.35	0.50-2.00	...
S32550	255[G]	0.040	1.50	0.040	0.030	1.00	24.0-27.0	4.5-6.5	2.9-3.9	0.10-0.25	1.50-2.50	...
S32750	2507[G]	0.030	1.20	0.035	0.020	0.80	24.0-26.0	6.0-8.0	3.0-5.0	0.24-0.32	0.50	...
S32760	...	0.030	1.00	0.030	0.010	1.00	24.0-26.0	6.0-8.0	3.0-4.0	0.20-0.30	0.50-1.00	W 0.50-1.00
S32900	329	0.080	1.00	0.040	0.030	0.75	23.0-28.0	2.0-5.00	1.00-2.00	...	...	...
S32950	...	0.030	2.00	0.035	0.010	0.60	26.0-29.0	3.5-5.2	1.00-2.50	0.15-0.35	...	...

Mechanical Test Requirements

UNS Designation [B]	Type[A]	Tensile Strength, min		Yield Strength, [B] min		Elongation in 2 in. or 50 mm, min,%	Hardness, max[C]		Cold Bend[OD]
		Ksi	MPa	Ksi	MPa		Brinell	Rockwell B	
S31200	...	100	690	65	450	25.0	293	31[J]	not required
S31260	...	100	690	70	485	20.0	290	...	...
S31803	...	90	620	65	450	25.0	293	31[J]	not required
S32001	...	90	620	65	450	25.0	...	25[G]	not required
S32205	2205[F]	90	620	65	450	25.0	293	31[J]	not required
S32304	2304[F]	87	600	58	400	25.0	290	32[J]	not required
S32520	...	112	760	80	550	25.0	310	...	not required
S32550	255[F]	110	760	80	550	15.0	302	32[J]	not required
S32750	2507[F]	116	795	80	550	15.0	310	32[J]	not required
S32760	...	108	750	80	550	25.0	270	...	not required
S32900	329	90	620	70	485	15.0	269	28	not required
S32950[M]	...	100	690	70	485	15.0	293	32	not required

Pressure Vessel & Boiler Quality Steel Plates

IS - 2002 - 62 STEEL PLATES FOR BOILERS

Designation			Chemical Composition			Tensile test			Elongation	
	C max	mn	si max	P max	S max	Tensile Strength Kf/mm²	Yield Strength Kf/mm²min		Test	% min piece
IS 2002-1	0.18	0.5 1.2	0.15-0.35	0.035	0.040	36.7-49	24	23	5.65/Sc	24
IS 2002-2	0.20	0.5 1.2	0.15-0.35	0.035	0.40	41.7-54	27	26	5.65/Sc	22
IS 2002-3	0.22	0.5 1.2	0.15-0.35	0.035	0.040	46.8-59	29.5	29	5.65/Sc	21

ASTM A 537 - 35 PRESSURE VESSEL PLATES, HEAT TREATED, CARBON MANGANESES-SILICON STEEL

Designation	%Chemical Composition										Heat Treat-ment	Tensile Strength			Elongation % min	
	C Max		Min. thickness in mm		P max	S max	Cu max	Ni max	Cr max	Mo max		Thickness in mm	Tensile Strength Ksi (MPa)	Yield Strength Ksi (MPa) min	GL= 8 in or 200 mm	GL = 2 in or 50 mm
			t<1-1/2(38)	t>-1-1/2												
A 537 -1	0.24	0.15-0.50	0.70-1.35	1.0-1.60	0.035	0.040	0.035	0.25	0.25	0.08	Normalised	t<2-1 (64) 2-1/2<t <4 (100)	70-90 (485-620) 65-85 (450-585)	50 (345) 45 (310)	18	22
A 537 -2	0.24	0.15-0.50	0.70-1.35	1.0-1.60	0.035	0.040	0.035	0.25	0.25	0.08	Quenched & Tempered	T<2-1/2(64) 2-1/2<t (4(100)	80-100 (550-690) 75-95 (515-655)	60 (415) 55 (380)	-	22

ASME SA / ASTM A516 PRESSURE VESSEL PLATES, CARBON STEEL, FOR INTERMEDIATE AND LOWER TEMP. SERVICE

Designation	Chemical Composition, %						Tensile Test			
	Thickness in (mm)	C max	Si	Mn max	P max	S max	Tensile Strength Ksi (MPa)	Yield Strength Ksi (MPa), min or 200 mm	Elongation,% min GI=8 in. *2 or 50 mm	Elongation,% min GI=2 in
A 516-55	T<1/2 (13)	0.18	0.15~0.30	0.60~0.90	0.035	0.04	55-75 (380-515)	30(205)	23	27
	1<t<2(50) 2<t<4(100) 4<t<8 (200) t>8	0.20 0.22 0.24 0.26	0.15-0.30	0.60~1.20	0.035	0.04				
A 516-60	T<1/2 (13)	0.21	0.15~0.30	0.60~0.90	0.035	0.04	60-80 (415-550)	32(220)	21	25
	1<t<2 (50) 2<t<4 (100) 4<t<8 (200) t<8	0.23 0.25 0.27 0.27	0.15-0.30	0.85~1.20	0.035	0.04				
A 516-65	t<1/2(13) 1<t<2 (50) 2<t<4 (100) 4<t<8(200) t<8	0.24 0.26 0.28 0.29 0.29	0.15-0.30	0.85~1.20	0.035	0.04	65-85 (450-585)	35(240)	19	23
A 516-70	t<1/2 (13) 1<t<2 (50) 2<t<4< (100) 4<t8 (200) t>8	0.27 0.28 0.30 0.31 0.31	0.15-0.30	0.85~1.20	0.035	0.04	70-90 (485-620)	38(260)	17	21

NACE HIC Steel

Champak Steel & Engg. Co. provides a complete range of plate tested for its resistance to hydrogen induced cracking (HIC) in wet H2S (sour service) environments. The plate is manufactured by Industeel (part of the Arcelor Mittal Group) & by ISD HUTA, Poland and is guaranteed by them to have the following minimum properties:

Crack Length Ratio (CLR) less than 5 %
Crack Thickness Ratio (CTR) less than 1.5%
Crack Sensitivity Ratio (CSR) less than 0.5%

The plate is tested to NACE TM 0284-03 Solution A and certified to EN 10204 3.2 (Lloyds). It is compatible with many of the world's most stringent proprietary specifications including Petrobras N1706, Saudi Aramco 01-SAMSS-016, EEMUA 179, Axens IN-43, Shell MESC 74/125, and Shell DEP 31.22.10.32.

We are able to offer plates to ASME / ASTM SA / A 516 Grades 60/65/70.
Plates are supplied from our stock / warehousing facilities at Taloja & Kalamboli, Navi Mumbai.

Specifications :

ASME /ASTM SA/A516-60/65/70

Technical Specifications :

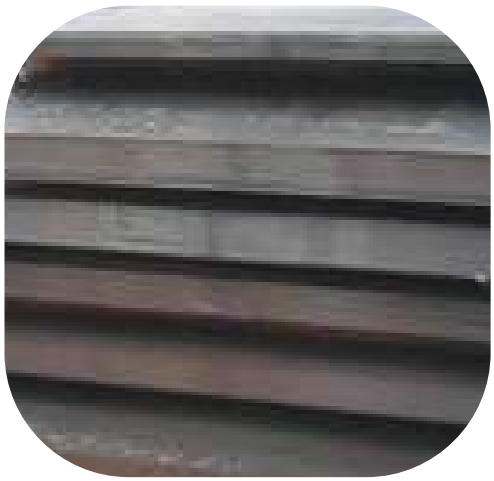
Chemical Analysis
Max Ceq 0.41% < = 50mm, 0.43% > 50mm
Max S 0.001%, P 0.008%, Nb 0.015%, V 0.005%, O 0.002%
All material is made with an Electric Arc Furnace, fully killed, vacuum degassed, with fine grain.

Mechanical Properties :

Mechanical and HIC tests after simulated PWHT at 610°C (2 min/mm).
Ambient tensile properties as per standard.
Charpy impact test longitudinal and transverse direction
At -51°C for thickness < = 25mm (20J average /16J individual)
At -46°C for thickness >25mm (41J average /34J individual

Applications :

- Condensers
- Dished ends
- Flanges
- Filters
- Heat exchangers
- Line pipe
- Pressure vessels
- Valves



HIC Steel Plate Size Range :
HIC Steel Plate Thicknesses: 6-105mm
HIC Steel Plate Widths: 2 metres, 2.5 metres, 3 metres
HIC Steel Plate Lengths: up to 12 metres

HOT ROLLED LOW, MEDIUM AND HIGH TENSILE STRUCTURAL STEEL AS PER IS 2062 : 2006

Table 1 Chemical Composition
(Clauses 5, 8.1 and 8.2)

Grade Designation	Quality	Ladle Anatysis, Percent, Max					Carbon Equivalent (CE), Max	Method of Deoxidation
		C	Mn	S	P	Si		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
E165 (Fe290)	-	0.25	1.25	0.045	0.045	-	-	Semi-killed or killed
E250 (Fe410w)	A	0.23	1.5	0.045	0.045	0.4	0.42	Semi-killed or killed
E250 (Fe410w)	B	0.22	1.5	0.045	0.045	0.4	0.41	Killed
E250 (Fe410w)	C	0.2	1.5	0.04	0.04	0.4	0.39	Killed
E300 (Fe440)	-	0.2	1.3	0.045	0.045	0.45	0.4	Semi-killed or killed
E350 (Fe490)	-	0.2	1.5	0.045	0.045	0.45	0.42	Semi-killed or killed
E410 (Fe540)	-	0.2	1.6	0.045	0.045	0.45	0.44	Semi-killed or killed
E450 (Fe570)	D	0.22	1.6	0.045	0.045	0.45	0.46	Semi-killed or killed
E450 (Fe590)	E	0.22	1.8	0.045	0.045	0.45	0.48	Semi-killed or killed

Table 2 Mechanical Properties
(Clauses 5, 10.3 and 10.3.1)

Grade Designation	Quality	Tensile Strength R Min Mpa	Yield Stress,R Min Mpa			Percentage Elongation,A at Gauge Length, L, 5.65 Is, Min	Internal Bend Diameter Min		Charpy V-Notch Impact Energy Min J	
			<20	20-40	>40		≤25	>25	Room Temp	-20°C
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
E165 (Fe290)	-	290	165			23	2t	-	-	-
E250 (Fe410w)	A	410	250	240	230	23	3t	2t	-	-
E250 (Fe410w)	B	410	250	240	230	23	2t	3t	27 (see Note3)	
.E250 (Fe410w)	C	410	250	240	230	23	2t	3t	27 (see Note3)	
E300 (Fe440)	-	440	300	290	280	22	2t	3t	50	30
E350 (Fe490)	-	490	350	330	320	22	2t	3t	50	25
E410 (Fe540)	-	540	410	390	380	20	2t	3t	50	25
E450 (Fe570)	D	570	450	430	420	20	2t	3t	45	20
E450 (Fe590)	E	590	450	430	420	20	2t	3t	45	20

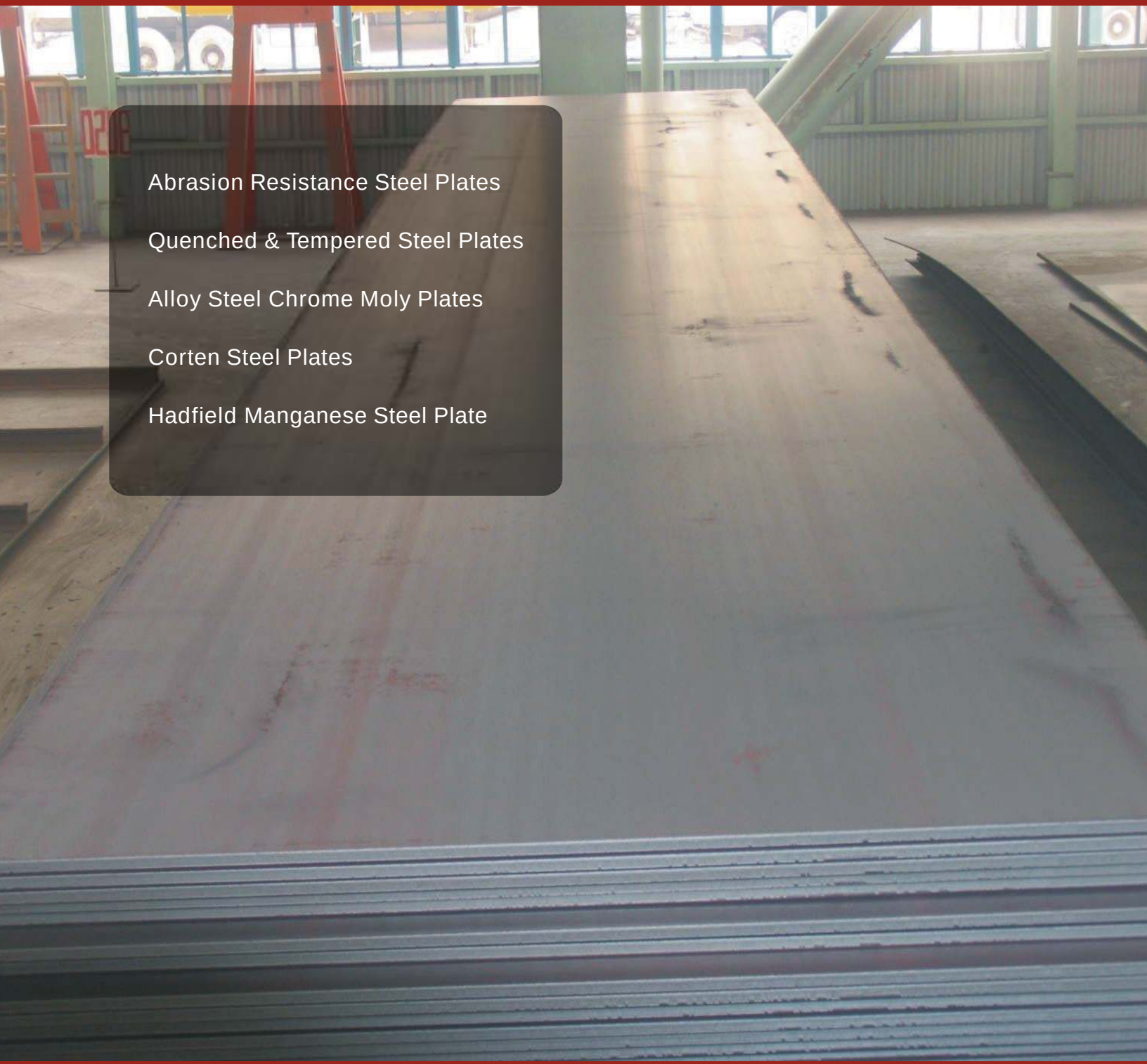
NOTE: MATERIALS OF SIMILAR QUALITY IN FOREIGN STANDARDS ARE ALSO AVAILABLE.

For Eg.

a. ASTM A 36 / SS 400 / S235JR / Q235

b. ASTM A 572 Gr. 50 / S355JR & J2/ Q345

ABRASION RESISTANT PLATES



- Abrasion Resistance Steel Plates
- Quenched & Tempered Steel Plates
- Alloy Steel Chrome Moly Plates
- Corten Steel Plates
- Hadfield Manganese Steel Plate

ABRASION RESISTANT PLATES

(AR Steel plate) with superior forming, welding and wear characteristic. This steel plate, with it's high Brinell Hardness (BHN) rating, is particularly suited to the mining equipments, earth moving equipment, are and aggregates processing, road target backstop and bullet trap application.

200 BRINEL WEAR RESISTANT STEELS

	CHEMICAL COMPOSITION						MECHANICAL PROPERTIES
GRADE	C% max	Mn% max	P% max	S% max	SI% max	CE max	
SAILHARD/ TISCRAL	0.23	1.6	0.050	0.050	0.50	–	HARDNESS - 200 BHN (MIN)
Al 0.10 max, Cr 0.65 max, Nb +V+Ti 0.15 max							

400 BRINEL WEAR RESISTANT STEELS

	Plate Thickness mm	CHEMICAL COMPOSITION IN % (Max)														Typical values		
		C	SI	P	S	Mn	Ni	Cr	Mo	B	Ai	Ti	CEV Typv.	CET Typv.	Hardness HB	Ys Mpa	UTS Mpa	E %
HARDOX 400	10 – 20	0,15	0,70	0,025	0,010	1,60	0,25	0,50	0,25	0,004	--	--	0,37	0,27	370-430	1000	1250	10
JFE EH360LE	6 - 32	0.17	0.55	0.020	0.010	1.60		0.40	0.35	0.004	-	0.020	0.40	0.43	361-440	1058	1308	23
ABREX 400	6 - 100	0.21	0.70	0.025	0.010	2.00	1.00	1.20	0.60	0.005					360-440	1075	1322	-
X AR 400		0.20	0.80	0.025	0.010	1.50	-	1.00	0.50	0.005					360-440	1050	1250	12
SR 400	12-20	0.16	0.70	0.025	0.010	1.60	0.25	0.50	0.25	0.0040		0.15	0.45		370-430	1000	1200	10
ABRAZO 400	8 - 19	0.20	0.50	0.025	0.010	1.60	0.70	0.25	0.20	0.004	0.06	0.04	0.43		360-400	1050	1200	14
Creusabro 4800		0.20		0,018	0,005	1,60	0,20	1.90	0.40			0,200			340-400	900	1200	12

500 BRINEL WEAR RESISTANT STEELS

	Plate Thickness mm	CHEMICAL COMPOSITION IN % (MAX)														Typical Values		
		C	SI	P	S	Mn	Ni	Cr	Mo	B	Ai	Ti	CEV Typv.	CET Typv.	Hardness HB	Ys Mpa	UTS Mpa	E %
HARDOX 500	4-13	0,27	0,70	0,025	0,010	1,60	0,25	1,00	0,25	0,004	--	--	0,49	0,34	470-530	-	-	-
ABREX 500	6 - 50	0.35	0.70	0.015	0.010	2.00	1.00	1.20	0.60	0.005					450-550	1373	1552	

QUENCHED & TEMPERED STEEL

QUENCHED & TEMPERED STEEL
NAXTRA-70/WELDOX-700E/DILIMAX690 E/S690QL.
High strength quenched & tempered steel with minimum yield strength of 690 mpa (100ksi)
Preferably used for welded structure. conveying plates, cranes, flood gates, bridges

HIGH STRENGTHED STEELS

		CHEMICAL COMPOSITION IN % (MAX)											Typical Values		
	Thickness mm	C	S	SI	P	Mn	Ni	Cr	Mo	B	Al	V	Ys Mpa	UTS Mpa	E %
DILLIMAX 690 E		0,18	0,010	0,50	0,020	1,60	1,80	1,50	0,60	0,004			690	770-940	14
NAXTRA M 700		0,20	0,010	0,08	0,020	1,60	-	1.5	0.6				700	770-940	14
RQT701	8 -30	0,20	0,010	0,50	0,025	1.60	0.70	0.25	0.20	0.004	0.006	0.008	690	790-930	18
WELDOX 700 E	4,0 - 50,1	0,20	0,010	0,60	0,020	1.60	2	0,70	0.70	0.005	0,015	0,09	700	780-930	14
HITEN 780 LE	6-19 19.1-32	0.20	0.015	0.40	0.025	1.40	-	0.20	0.15	0.005	-	0.08	685	780-930	16
WELTEN 780 E	6-50	0.22	0.015	0.55	0.025	2.00	0.30	1.20	-	0.005	-	0.05	685	780-930	16
S690QL		0.18	0.01	0.50	0.02	1.60	1.15	1.00	0.60	0.005	-	0.1	690	790-940	14

SAILMA PLATES
IT'S A HIGH STRENGTH MICRO ALLOY STRUCTURAL STEEL SEMI-KILLED
Hardness AVAILABLE IN 300/300HI/350/350HI/410/410HI/450/450HI

Grade	C% max	Mn% max	P% max	S% max	Si% max	CE max	Yield Strength MPa min	ultimate Tensile Strength MPa min	Elongation %min GL 5.65 S	Internal diameter of bend
300	0.25	1.5	0.055	0.055			300	440-560	20	3T
300 Hi	0.20	1.5	0.040	0.040			300	440-560	21	3T
350	0.25	1.5	0.055	0.055			350	490-610	20	3T
350 Hi	0.20	1.5	0.040	0.040			350	490-610	21	3T
410	0.25	1.5	0.055	0.055			410	540-660	19	3T
410 Hi	0.20	1.5	0.040	0.040			410	540-660	20	3T
450	0.25	1.5	0.055	0.055			450	570-720	18	3T
450 Hi	0.20	1.5	0.040	0.040			450	570-720	19	3T

Nb = V + Ti = 0.30 max

Charpy Impact energy : 40J at 0^0 C for 300HI, 40J at 0^0 C, 30j at -20^0 C for 350 HI, 35J at 0^0 C, 25J at -20^0 C for 410 HI, 3J at 0^0 C , 20J at -20^0 C for 450 HI. Impact will be given for any one temperature. For 450 HI impact is for >10 mm. For <12 mm impact to be given only if specified.

Alloy Steel Chrome Moly Plates to ASTM & EN STANDARDS.

ASME SA 387 / ASTM A 387	Chemical Composition, % Grade and UNS Number														
	Carbon: Heat analysis Product analysis	Manganese: Heat analysis Product analysis	Phosphorus, max: Heat analysis Product analysis	Sulfur, max: Heat analysis Product analysis	Silicon: Heat analysis Product analysis	Chromium: Heat analysis Product analysis	Molybdenum: Heat analysis Product analysis	Nickel, max: Heat analysis Product analysis	Vanadium: Heat analysis Product analysis	Columbium: Heat analysis Product analysis	Boron: Heat analysis Product analysis	Nitrogen: Heat analysis Product analysis	Aluminum, max: Heat analysis Product analysis	Titanium, max: Heat analysis Product analysis	Ziconium, max: Heat analysis Product analysis
Grade 2	0.50-0.21	0.55-0.80	0.035	0.035	0.15-0.40	0.50-0.80	0.45-0.60	--	--	--	--	--	--	--	--
S50460	0.04-0.21	0.50-0.88	0.035	0.035	0.13-0.45	0.46-0.85	0.40-0.65	--	--	--	--	--	--	--	–
Grade 11	0.05-0.17	0.40-0.65	0.035	0.035	0.50-0.80	1.00-1.50	0.45-0.65	--	--	--	--	--	--	--	--
K11757	0.04-0.17	0.35-0.73	0.035	0.035	0.44-0.86	0.94-1.56	0.40-0.70	--	--	--	--	--	--	--	–
Grade 12	0.05-0.17	0.40-0.65	0.035	0.035	0.15-0.40	0.80-1.15	0.45-0.60	--	--	--	--	--	--	--	--
K11789	0.04-0.17	0.35-0.73	0.035	0.035	0.13-0.45	0.74-1.21	0.40-0.65	--	--	--	--	--	--	--	–
Grade 22	0.50-0.15[A]	0.30-0.60	0.035	0.035	0.50 max	2.00-2.50	0.90-1.10	--	--	--	--	--	--	--	--
K21590	0.04-0.15[A]	0.25-0.66	0.035	0.035	0.50 max	1.88--2.62	0.85-1.15	--	--	--	--	--	--	--	–
Grade5	0.15 max	0.30-0.60	0.035	0.03	0.50 max	4.00-6.00	0.45-0.65	--	--	--	--	--	--	--	--
S50200	0.15max	0.25-0.66	0.035	0.03	0.50 max	3.90-6.10	0.40-0.70	--	--	--	--	--	--	--	–
Grade 9	0.15 max	0.30-0.60	0.03	0.03	1.00 max	8.00-10.00	0.90-1.10	--	0.04 max	--	--	--	--	--	--
K90941	0.15max	0.25-0.66	0.03	0.03	1.05 max	7.90-10.10	0.85-1.15	--	0.05 max	--	--	--	--	--	–
Grade 91	0.08-0.12	0.30-0.60	0.02	0.010	0.20-0.50	8.00-9.50	0.85-1.05	0.4	0.18-0.25	0.06-0.10	--	0.030-0.070	0.02	0.01	0.01
K91560	0.06-0.15	0.25-0.66	0.025	0.012	0.18-0.56	7.90-9.60	0.80-1.10	0.43	0.16-0.27	0.05-0.11	--	0.025-0.080	0.02	0.01	0.01

[A] The carbon content for plates over 5 in. (125 mm) in thickness is 0.17 max on product analysis.

TABLE 2 Tensile Requirements for Class 1 Plates

	Grades 2 and 12	Grade 11	Grades 22, 21, 5, 9, 21L, 22L
Tensile strength, ksi (Mpa)	55 to 80 (380 to 550)	60 to 85 (415 to 585)	60 to 85 (415 to 585)
Yield strength, min, ksi (Mpa)	33 (230)	35 (230)	30 (205)
Elongation in 8 in. (200 mm), Min, %A	18	19	---
Elongation in 2 in. (50 mm), Min, %A	22	22	18
Reduction of area, min, %	---	---	45[B]
			40[C]

TABLE 3 Tensile Requirements for Class 2 Plates[A]

	Grades 2	Grade 11	Grades 12	Grades 22, 21, 5,	Grades 91
Tensile strength, ksi (Mpa)	70 to 90 (485 to 620)	75 to 100 (515 to 690)	65 to 85 (450 to 585)	75 to 100 (515 to 690)	85 to 110 (585 to 760)
Yield strength, min, ksi (Mpa)/(0.2% offset)	45 (310)	45 (310)	40 (275)	40 (310)	60 (415)
Elongation in 8 in. (200 mm), Min, %B	18	18	19	--	--
Elongation in 2 in. (50 mm), Min, %B	22	22	22	18	18
Reduction of area, min, %	--	--	--	45[C]	--40[D]

Supplementary Requirements

Supplementary requirements shall not apply unless specified in order. A list of standardized supplementary requirements for use at the option of the purchaser is included in specification A 20/A 20M. Several of those considered suitable for use with this specification are listed below by title. Other tests may be performed by agreement between the supplier and the purchaser.

S1. Vaccum treatment
S2. Product analysis
S3. Simulated post-weld treatment of mechanical test coupons
S4.1 Additional tension test
S5. Charpy V-Notch impact test
S6. Drop weight test (for material 0,625 in. (16 mm) and over in thickness)
S8. Ultra sonic examination in accordance with specification A 435/A 435 M.
S9. Magnetic Particle examination
S11. Ultrasonic Examination in accordance with specification A 577/ A 577M
S12. Ultrasonic examination in accordance with specification A 578/A 578M and
S17. Vaccum Carbon-Deoxidized steel

Additional Supplementary requirements

In adddition, the following supplementary requirements are suitable for this application. S62 and S63 are applicable for Grades 22 and 21 only

S53.
When specified by the purchaser, the axis of the tensile and impact test specimens shall come from the mid-thickness of each plate tested, in lieu of midway between the center thickness and the top or bottom surface of the plate.
S60. Restricted Carbon
S60.1 The maximum of the steel, based on heat analysis, shall be restricted in accordance with the following equations:
S62. Temper Embrittlement Factor
S62.1 The Composition of the steel, based on heat analysis,
Shall be restricted in accordance with the following equations:
J = (Si + Mn) X (P + Sn) X 104 $\leq$ 150 (Si, Mn, P and Sn in wt %)
Cu $\leq$ 0.20%
Ni $\leq$ 0.30%

S62.1.1 Lower values of J, Cu, and NI can be specified by agreement between putween and the supplier.
S62.1.2 When so specified by the purchaser, the maximum vwlue of J shall not exceed 100.
S62.1.3 The values of J shall be reported.
S62.1.4 If the plates are repaired by welding, the composition of the weld deposit shall be restricted in accordance with the following equations:
X = (10P + 5Sb + 4Sn + As) 100 $\leq$ 15 (P, Sb, Sn and As in ppm)
Cu $\leq$ 0.20%
Ni $\leq$ 0.30%
S62.1.5 The values of X shall be reported.
S63. Impact Properties After Step Cooling
S63.1 The Charpy V- notch impact properties shall be determined as followes:

Chrome-Moly Plates as per EN specification 10028-2

Stahlsorte		Massenanteil in %														
Kurzname	Werk-stoff-nummer	C	Si	Mn	P max.	S max.	Al_{gesamt}	N	Cr	Cu[b]	Mo	Nb	Ni	Ti max.	V	Sonstige
16Mo3	1.5415	0,12 bis 0,20	$\leq$ 0,35	0,40 bis 0,90	0,025	0,010	e	$\leq$ 0,012	< 0,30	$\leq$ 0,30	0,25 bis 0,35	--	$\leq$ 0,30	--	--	--
13CrMo4-5	1.7335	0,08 bis 0,18	$\leq$ 0,35	0,40 bis 1,00	0,025	0,010	e	$\leq$ 0,012	0,70f bis 1,15	$\leq$ 0,30	0,40 bis 0,60	--	--	--	--	--
10CrMo9-10	1.7380	0,08 bis 0,14g	$\leq$ 0,50	0,40 bis 0,80	0,020	0,010	e	$\leq$ 0,012	2,00 bis 2,50	$\leq$ 0,30	0,90 bis 1,10	--	--	--	--	–

EN 10028-2 Mechanical

Stahlsorte Matl. Grade	Werk-stoff-nummer	Supply Condition	Thickness mm	Im Zugversuch bei Raumtemperatur bestimmte Elgenschaften			Impact J min. Test Temperatur In °C von		
				Y.S Mpa min.	U T S Mpa	EL% min.	-20	0	+20
16Mo3	1,5415	+N[e]	< 16	275	440 bis 590	22	t	t	31
			16 < t < 40	270					
			40 < t < 60	260					
			60 < t < 100	240	430 bis 560				
			100 < t < 150	220	420 bis 570				
			150 < t < 250	210	410 bis 570				
13CrMo4-5	1.7335	+NT	< 16	300	450 bis 600	19	t	t	31
			16 < t < 60	290					
			60 < t < 100	270	440 bis 590		t	t	27
		+NT oder +QT	100 < t < 150	255	430 bis 580				
		+QT	150 < t < 250	245	420 bis 570		t	t	t
10CrMo9-10	1.7380	+NT	< 16	310	480 bis 630	18	t	t	31
			16 < t < 40	300					
			40 < t < 60	290					
		+NT oder +QT	60 < t < 100	280	470 bis 620	17	t	t	27
		+QT	100 < t < 150	260	460 bis 610				
			150 < t < 250	250	450 bis 600				

Hadfield Manganese Steel Plate

Mn13 / Creusabro® M / Hadfeild® / CSEC Hi-Mn Brand is a high Manganese, fully austentic, quench annealed, non magnetic, work-hardening steel with an exceptionally high level of wear resistance when subjected to work-hardening by shock or high impact pressure in service.

The main characteristics is a superior wear resistance: Severe wear on the surface has a work-hardening effect on the austenitic structure of this steel. This, when combined with the level of carbon in accordance with the international standards, leads to an increase in hardness from 200BHN (in as delivered plates) up to an in-service hardness of at least 600BHN.

This work-hardening capability renews itself through out in-service life. The underlayers not work-hardened maintain an excellent resistance to shock and a very high ductility.

Typical Applications:

- Quarries and Constructions: Earth moving crusher jaw, grizzly, screen, stone chutes, chain guide and shredder plates, shovel buckets.

- Mines: Bucket blade of loader, chain conveyor parts, sprocket wheel, various armouring elements.
- Iron Industry, Foundry: Guiding and shifting plates, scraps container, liner of shot blasting unit, pedestal liner, flanged bolster cup, wear liner.

- Concrete and Brickworks: Core and dividing wall of parpen mould, grinding mill scraper, mixer paddle.
- Scraps – Recoveries: Wheel disk, striker and hammer mill.
- Automotive Industries: Shot blasting equipment.

It is also used for its low coefficient of friction in metal-to-metal applications, its non-magnetic properties in electrical transformer assemblies and for industrial lifting magnets.

A high manganese, fully austentic, quench annealed, non magnetic, work-hardening steel with an exceptionally high level of wear resistance when subjected to work-hardening by shock or high impact pressure in service.

The main characteristics is a superior wear resistance:

Severe wear on the surface has a work-hardening effect on the austenitic structure of this steel.

This, when combined with the level of carbon in accordance with the international standards, leads to an increase in hardness from 200BHN (in as delivered plate) up to an in-service hardness of at least 600BHN.

This work-hardening capability renews itself through out in-service life.The underlayers not work-hardened maintain an excellent resistance to shock and a very high ductility.

Chemical Analysis Typical values (% weight)

C	Si	Mn	S	P
1.13	0.40	13	0.003	<0.20

Mechanical Propoerties

	Hardness HB	Yield Strength Mpa	UTS Mpa	EI%	KCV 200C (600F)-J
Typical Values	200	380 (55 KSI)	940 (136 KSI)	40	≥ 112 J (≥ 83 ft.lbs)
Guaranted Values*	180/245	350 (51 KSI)	800 (116 KSI)	30	64 J (47 ft.lbs)

WEATHER RESISTANT STEELS (Corten Steel)

It is a steel resistant to bad weather. Because of its special chemical composition, it is self-protected creating a superficial coat which prevents rust from progressing both in urban and industrial environments.

This superficial rust coat provides it with an aspect suitable for decoration, facades or covers without coating.

Applications :

Widely used in bridge construction, any kind of structures, fences, urban furniture, sculptures, containers, etc.

Size Range :

Thicknesses : 1.2 mm - 50 mm

Widths : 1.25mm, 1.5m, 2.5m

Lengths : up to 12m

Chemial composition of steels with Improved atmospheric corrosion resistance

Grade	C % max.	Si % max.	Mn %	P %	S % max.	N % max.	Cr %	Cu %	V %	Ni %	Z %	Al %	Mo %	YS (Mpa)	UTS (Mpa)	El% (200mm)
According To EN Grades EN 10025-5 (Europeran Standards)														<16	> 3 < 100	> 3 < 40
S235J0W	0.13	0.4	0.20-0.60	0.04	0.04	0.01	0.40-0.80	0.25-0.55	-	0.65	-		-	235	360-510	26
S235J2W	0.13	0.4	0.20-0.60	0.04	0.03	-	0.40-0.80	0.25-0.55	-	0.65	-		-	235	360-510	24
S355J0W	0.12	0.75	1	0.06-0.15	0.04	0.01	0.30-1.25	0.25-0.55	-	0.65	-		-	355	470-630	22
S355J2WP	0.12	0.75	1	0.06-0.15	0.03	-	0.30-1.25	0.25-0.55	-	0.65	-		-	355	470-630	20
S355J0W	0.16	0.5	0.50-1.50	0.04	0.04	0.01	0.40-0.80	0.25-0.55	-	0.65	0.15		0.3	355	470-630	22
S355J2W	0.16	0.5	0.50-1.50	0.03	0.03	-	0.40-0.80	0.25-0.55	-	0.65	0.15		0.3	355	470-630	20
S355K2W	0.16	0.5	0.50-1.50	0.03	0.03	-	0.40-0.80	0.25-0.55	-	0.65	0.15		0.3	355	470-630	20
According To ASTM & ASME SEC-II PART A (American Standards)																
A 588 GR. A	0.19	0.3-0.65	0.80-1.25	0.04	0.05	-	0.40-0.65	0.25-0.40	0.02-0.10					345	485	18
A 588 GR. B	0.2	0.15-0.50	0.75-1.35	0.04	0.05	-	0.40-0.70	0.20-0.40	0.01-0.10					345	485	18
A 588 GR. C	0.15	0.15-0.40	0.80-1.35	0.04	0.05	-	0.30-0.50	0.20-0.50	0.01-0.10					345	485	18
A 588 GR. K	0.17	0.25-0.50	0.50-1.20	0.04	0.05	-	0.40-0.70	0.30-0.50	-		Cb-0.005-0.05			345	485	18
A 242 TYPE-1	0.15	-	1	0.15	0.05		-	0.20 min	-		-			345	480	18
A 242 TYPE-2	0.2	0.20-0.50	1.35	0.04	0.05		-	0.20 min	-		-			345	480	18
According To Indian Railways Specification. (Indian Standards)																
IRSM-41	0.1	0.30-0.50	0.25-0.45	0.75-0.14	0.03	-	0.35-0.49	0.30-0.60	0.05	0.28-0.49	-		0.05	360	500	21
According To Manufacturer Trademarks																
Cor-Ten A	0.12	0.25-0.75	0.20-0.50	0.07-0.15	0.03	-	0.50-1.25	0.25-055	-	0.65		>0.02%		355	470-630	20
Cor-Ten B	0.16	0.30-0.50	0.80-1.25	0.03	0.03	-	0.40-0.65	0.25-0.40	0.02-0.10	0.4		>0.02%		355	470-630	20

* Steel Properties mentioned are for reference only. For Exact properties please refer the Specification book of the country agencies.

STAINLESS STEEL, ALLOY STEEL & EN SERIES RODS

EN SERIES STEEL ROUND

E.N. No.	Type and Application	Chemical composition & max						Physical Properties min			Limiting Size (diameter or width) Across Plats)	Condition	Brinell No.
		C	Mn	Ni	Cr.	Mo.	Others	T.I t/sq	El %	Izod ft.lbs			
IA	Free cutting machining Steel for low duty bolts, nuts, studs etc	.07/.15	.80/1.20	-	-	-	s. .2/.3 P. .07 Si. .10	32 28 25 23 23	10 14 14 14 26	- - - - -	17/32" and less Over 17/32" to 1-1/2" Over 1-1/2" to 2 1/2" Over 2 1/2" to 4" 4" Other finishes	Cold rolled or Cold drawn	-
8	40CARBON STEEL without grain size con trol. For mother connecting rods, crankshafts, bolts and machine details in general.	.35/.45	.6/10				Si 06/.36 S & P .06	35 Q 40 H 45 35 Q 40 R 45	20 20 20 17 17 17	 10 10 - - -	6' 2 1/2" 7/8" 6" 2 1/2 7/8"	Normalized H & T H & T N & CD H & T & CD H & T & CD	152/207 179/229 201/255 152/207 169/229 201/255
19	1 percent chromium Molybdenum steel Suitable for tensile ranges of 45/80 tons according to the ruling section of the part	.35/.45	.50/.80	-	.90 1.50	.2/4	S & P .05 Si 0.10/.35	R. 45 S. 50 T. 55 U. 60 V. 65 W. 70 Y. 80	22 20 18 17 16 15 10	40 40 40 35 35 30 10	6" PS 32 4" - 36 2 1/2 - 41 2 1/2" - 46 1.1/8" - 50 1. 1/8 - 55 1" - 64	H & T H & T H & T H & T H & T H & T H & T	201/255 223/177 248/302 269/321 293/341 311/375 363/415
24	1 1/2 percent Nickel-Chromium Molybdenum steel. Suitable for tensile ranges of 50/100 tons according to the ruling section of the part.	.35/45	.45/.7	1.3/ 1.8	.9/1.4	.2/35	Si. 10/35 S. P 0.05	S. 50 T. 55 U. 60 V. 65 W. 70 X. 75 Y. 80 Z.100	20 18 17 16 15 14 14 8	40 40 35 35 30 25 25 8	6" PS 36 6" - 41 4" - 46 2 1/2 - 50 1.1/8" - 55 1.1/8" - 59 1.1/8" - 64 1.1/8" - 80	H & T H & T H & T H & T H & T H & T H & T H & T	223/277 248/302 269/321 293/341 311/375 341/388 363/415 444 Min
36A	3 percent Nickel- Chromium	.15	.3/.6	3/3.75	.6/1.1	-	Si .10/.35	55	15	35	-	-	-
36B	Case- hardening steel	.12/.18	.3/.6	3/3.75	.6/1.1	-	-	65	13	30	-	-	-
36C	3 percent Nickel Chromium. Molybdenum Case	.12/.18	.3/.6	3/3.75	.6/1.1	.1/.25	Si .10/.35	65	13	30	-	-	-
353	1.1/4 percent, Nickel Chromium Case Hard-	.20	.50/1.0	1.0/ 1.5	.75/ 1.25	.08/ .15	Si. .35 S. & P. .05	65	12	20	-	-	-

LOW TEMP. ROUND CHEMICAL & PHYSICAL PROP

ASTM Grade	C	Min	Si	S	P	Cr	Ni	Mo	Other	Tensile Ksi(MPa)	Yield Ksi(Mpa)	Elongation % Strip/Round	Impact Jules. Av. min	Redn. in Area
A350LF1	0.30 MAX	0.60 1.35	0.15 0.30	0.040 MAX	0.035 MAX	0.30 MAX	0.40 MAX	0.12 MAX	Cu-0.4 max Cb - 0.4 max Cb - 0.02 max	60.85 (415.585)	0(205)	28/35	18/14	38
LF2	0.30 MAX	0.90 MAX	0.15 0.30	0.040 MAX	0.035 MAX	0.30 MAX	0.40 MAX	0.12 MAX	Cb-0.02 max Va-0.3	0.95 (485.655)	36(250)	30/22	20/16	36
LF3	0.20 MAX	0.6 1.35	0.20 0.35	0.040 MAX	0035 MAX	0.30 MAX	3.25 3.75	0.12 MAX	Cu-0.4 max Cb -0.02max Va-0.3 max	0.95 (485.655)	37.5(250)	30/22	20/16	35
LF5	0.30 MAX	0.60 1.35	0.20 0.35	0.040 MAX	0.035 MAX	0.30 MAX	1.0 2.0	0.12 MAX	Cu-0.4max cb-0.02max Va-0.3max	Ci.1.60.85(415.585) CI. 2.70.95(485.655)	CI.1 30(205) CI.2 37.5(260)	CI. 1 28/25 CI.2 30/22	20/16	CI.1.38 CI.135
LF6	0.22 1.50	1.15 1.50	0.15 0.30	0.025 MAX	0.025 MAX	0.30 MAX	0.40 MAX	0.12 MAX	Cu-0.4 max Cb-0.02 max Va-0.04-0.11	CI1.66-91(455-495) CI.275-100(515-690)	52(360) 60(415)	CI.1 30/22 CI.2 28/20	2016	40
LF9	0.20 MAX	0.40 1.06	-	0.040 MAX	0.035 MAX	0.30 MAX	1.60 2.24	-	Cb-0.02 max Cu-0.75-1.25 vA-0.03	63-88 (435-605)	46(315)	28/25	18/14	38
A 420WPL-6	0.30 MAX	0.39 1.06	0.10 MIN	0.030 MAX	0.030 MAX	-	-	-	-	60-85 (415-585)	35(240)	30/22 Long 16.5/12 Trans	17.6/13.6 17.6-13.6	
WPL - 9	0.20 MAX	0.40 1.06	-	0.030	0.030	-	1.60 2.24	-	Cu-0.75-1.25	63-88 (435-610)	46(315)	28/20 Long. 18/- Trans.	17.6/13.6 17.6/11.6	
WPL 3	0.20 MAX	0.31 0.64	0.13 0.37	0.050	0.050	-	3.18 3.82	-	-	65-90 (450-620)	35(240)	30/22Long 20/14 Trans	17.6/13.6 17.6/13.6.	
WPL 8	0.13 MAX	0.90 MAX	0.13 0.37	0.030	0.030	-	8.40 9.60	-	-	100-125 (690-865)	75(515)	22/16	33.9/27.1	

S. S. ROUND BAR CHEMICAL & PHYSICAL PROP

ASTM Grade	C	Mn	Si	S	P	Cr	Ni	Mo	Other	Tensile Ksi(MPa)	Yield Ksi(Mpa)	Elongation % Strip/Round	Impact Jules. Av. min	Redn. in Area
A479 TP 304	0.08 MAX	2.00 MAX	1.00 MAX	0.030 MAX	0.045 MAX	18.0 20.0	8.0 11.0	-	N2-0.10 MAX	75000 (515)	3000 (205)	30	-	40
A479 TP 316	0.08 MAX	2.00 MAX	1.00 MAX	0.030 MAX	0.045 MAX	16.0 18.0	10.0 14.0	2.0 3.0	N20.10 MAX	75000 (515	30000 (250))	30	-	40
A479 TP 317 L	0.035 MAX	2.00 MAX	1.00 MAX	0.030 MAX	0.045 MAX	18.0 20.0	11.0 15.0	3.0 4.0	N2-0.10 MAX	75000 (515)	30000 (250)	30	-	40
A479 TP 310S	0.08 MAX	2.00 MAX	1.00 MAX	0.030 MAX	0.045 MAX	24.0 26.0	19.0 22.0	-	-	75000 (515)	3000 (205)	30	-	40
A479 TP 316 H	0.04 0.10	2.00 MAX	1.00 MAX	0.030 MAX	0.040 MAX	16.0 18.0	10.0 14.0	2.0 3.0		75000 (515)	30000 (205)	30	-	40
A479 TP 347 H	0.04 0.10	2.00 MAX	1.00 MAX	0.030 MAX	0.040 MAX	17.0 19.0	9.0 13.0	-	Cb=Bxc -13.0	75000 (515)	30000 (205)	30	-	40

ROUND BAR - METRIC

Size	Weights in kg.	
	mm Wt. per ft.	Wt. per. Mtr
.5	.0004	.0015
1.0	.0018	.0062
1.5	.0042	.014
2.0	.0076	.039
2.5	.012	.039
3.0	.017	.055
3.5	.023	.076
4.0	.030	.099
4.5	.038	.125
5.0	.047	.154
5.5	.057	.187
6.0	.068	222
6.5	.079	.260
7.0	.092	.302
7.5	.106	.347
8.0	.120	.395
8.5	.136	.445
9.0	.152	.499
9.5	.169	.556
10	.188	.617
11	.227	.746
12	.271	.888
13	.317	1.04
14	.369	1.21
15	.424	1.39
16	.482	1.58
17	.543	1.78
18	.610	2.00
19	.680	2.23
20	.753	2.47

Size	Weights in kg.	
	mm Wt. per ft.	Wt. per. Mtr
21	.829	2.72
22	.908	2.98
23	.994	3.26
24	1.08	3.55
25	1.17	3.85
26	1.27	4.17
27	1.37	4.50
28	1.47	4.83
30	1.69	5.55
32	1.92	6.31
33	2.05	6.71
35	2.30	7.55
36	2.44	7.99
38	2.71	8.90
39	2.86	9.38
40	3.01	9.86
42	3.32	10.88
45	3.80	12.48
48	4.33	14.21
50	4.70	15.41
52	5.08	16.67
55	5.69	18.65
56	5.89	19.33
58	6.32	20.74
60	6.77	22.20
62	7.22	23.70
64	7.70	25.25
65	7.94	26.05
68	8.69	28.51
70	9.21	30.21

Size	Weights in kg.	
	mm Wt. per ft.	Wt. per. Mtr
72	9.74	31.96
75	10.57	34.68
80	12.03	39.46
90	15.22	49.94
100	18.79	61.65
110	22.74	74.6
120	27.07	88.8
130	31.70	104
140	36.88	121
150	42.37	139
160	48.16	158
170	54.26	178
180	60.96	200
190	67.97	223
200	75.3	247
220	90.8	298
240	108	355
250	117	385
260	127	417
280	147	483
300	169	555
320	192	631
340	217	713
350	230	755
360	244	799
380	271	890
400	301	986
500	469	1540

STAINLESS , ALLOY STEELS, ROUND BAR

WEIGHT OF S. S. ROUND

DIA (MM) X DIA (MM) X 0.0019 KG. (PER FEET)

HEXAGONAL BAR - METRIC

Size	Weights in kg.	
	mm Wt. per ft.	Wt. per. Mtr
..5	.0518	.170
5.5	0628	.206
7	.102	.333
8	.133	.435
10	.207	.680
11	.251	.823
12	.298	.979
13	.351	1.15
14	.405	1.33
15	.466	1.53

Size	Weights in kg.	
	mm Wt. per ft.	Wt. per. Mtr
16	.530	1.74
17	.597	1.96
18	.671	2.20
19	.747	2.45
20	.829	2.72
22	1.00	3.29
24	1.20	3.92
25	1.30	4.25
27	1.51	4.96
30	1.87	6.12

Size	Weights in kg.	
	mm Wt. per ft.	Wt. per. Mtr
32	2.12	6.56
35	2.54	8.33
36	2.69	8.81
38	2.99	9.82
40	3.32	10.9
41	3.48	11.4
46	4.39	14.4
48	4.79	15.7
50	5.18	17.0

SQUARE BAR - METRIC

Size	Weights in kg.	
	mm Wt. per ft.	Wt. per. Mtr
5	.0597	.196
5.5	.0722	.237
6	.0862	.283
7	.117	.385
8	.153	.502
9	.194	.636
10	.239	.785
11	.290	.950
12	.344	1.13
13	.405	1.33
14	.469	1.54
15	.540	1.77

Size	Weights in kg.	
	mm Wt. per ft.	Wt. per. Mtr
16	.613	2.01
17	.692	2.27
18	.774	2.54
19	.863	2.83
20	.957	3.14
21	1.06	3.46
22	1.16	3.80
23	1.27	4.15
24	1.38	4.52
25	1.50	4.91
26	1.62	5.31
27	1.74	5.72

Size	Weights in kg.	
	mm Wt. per ft.	Wt. per. Mtr
28	1.88	6.15
30	2.15	7.06
32	2.45	8.04
35	2.93	9.62
36	3.11	10.2
38	3.44	11.3
40	3.84	12.6
42	4.21	13.8
45	4.85	15.9
46	5.06	16.6
48	5.52	18.1
50	5.97	19.6

STAINLESS, ALLOY STEELS, HEXAGON, AND SQUARE BAR

WEIGHT OF S. S. HEXAGONAL ROD.

DIA (MM)X DIA (MM) X 0.002072 KG. (PER FEET)

MILD STEEL & HIGH TENSILE ANGLES (Equal Sides) Angles (Equal and unequal Sides)

Sides in	Thickness W										
mm	3	4	5	6	8	10	12	15	16	18	20
Equivalent											
20 x 20mm	0.9	1.1									
25 x 25 mm	1.1	1.4	1.8								
30 x 30mm	1.4	1.8	2.2								
35 x 35 mm	1.6	2.1	2.6	3.0							
40 x 40 mm	1.8	2.4	3.0	3.5							
45 x 45 mm	2.1	2.7	3.4	4.0							
50 x 50 mm	2.3	3.0	3.8	4.5							
55 x 55 mm			4.1	4.9	6.4	7.9					
60 x 60 mm			4.5	5.4	7.0	8.6					
65 x 65 mm			4.9	5.8	7.7	9.4					
70 x 70 mm			5.3	6.3	8.3	10.2					
75 x 75 mm			5.7	6.8	8.9	11.0					
45 x 30 mm	1.7	2.2	2.8	3.3							
75 x 50 mm			4.7	5.6	7.4	9.0					
90 x 60 mm				6.8	8.9	11.0	13.0				
100 x 75 mm				8.0	10.5	13.0	15.4				
125 x 75 mm				9.2	12.1	14.9					
125 x 95 mm				10.1	13.3	16.5	19.6				
150 x 75 mm					13.7	16.9	20.1				
150 x 115 mm					16.2	20.0	23.8	29.5			

Size in mm	Weight kg/M	Mill
ANGLES (equal)		
50x50x6	4.5	BMM
65x65x6	5.8	BMM
65x65x8	7.7	BMM
65x65x10	9.4	BMM
75x75x6	6.8	BMM
75x75x8	8.9	BMM
75x75x10	11.0	BMM
80x80x6	7.3	BMM
80x80x8	9.6	BMM
80x80x10	11.8	BMM
90x90x6	8.2	BMM
90x90x8	10.8	BMM
90x90x10	13.4	BMM
100x100x8	12.1	DSM
100x100x10	14.9	DSM
100x100x12	17.7	DSM
110x110x10	16.6	DSM
110x110x12	19.7	DSM
130x130x10	19.7	DSM
130x130x12	23.4	DSM
150x150x16	35.8	BRSM
150x150x20	44.1	BRSM
200x200x16	48.5	BRSM
200x200x20	60.0	BRSM

ANGLES (Equal)

Desig-nation	Size	Thickness		Weight		Desig-nation	Size	Thickness		Weight	
		Web	Flange	Meter	Foot			Web	Flange	Meter	Foot
	mm x mm	mm	mm	kg	lb		mm x mm	mm	mm	kg	lb
INST				(Normal tee)		ISDT			(Deep Legged Tee)		
20	20x20	3	3	0.9	0.60	100	100x50	5.8	10	8.7	
						150	150x75	8.0	11.6	15.7	
20	20x20	4	4	1.1							
30	30x30	3	3	1.4	0.9	ISLT					
30	30X30	4	4	1.8		200	200X163	8.0	12.5	28.4	
						250	250X180	9.2	14.1	37.5	
40	40x 40	6	6	3.5	2.35						
50	50 x 50	6	6	5.4	3.63	ISHT		(Slit Tee From H Section)			
75	75x75	9	9	10.0		75	75x150	8.4	9.0	15.3	10.28
75	75x75	10	10	10.95		100	100x200	7.0	9.0	20.0	13.48
						125	125x250	8.8	9.7	27.4	18.41
80	80x80	8	8	9.6	6.45	150	150x250	7.9	10.6	29.4	19.76
100	100x100	10	10	14.9							
150	150x150	10	10	22.7							

Common Grades IS 2062 E : 250 & S355J2H

Tolerance as per IS : 1852

Abbreviations used : DSM (Durgapur Section Mill)
BMM (Bhilai Merchant Mill)
BRSM (Bhilai Rail & structural Mill)

CHANNELS, MILD STEEL CHANNEL, BEAMS, ANGLES STEEL SIZE WEIGHT/KG/M

Size mm	Weight Kg/m
75x40x48	6.8
100x50x5	9.2
125x65x5.3	12.8
125x66x6	13.7
150x75x5.7	16.4
150x75x6.5	17.7
175x75x6	19.2
200x75x6.2	22.2
200x76x7.5	24.3
250x82x9	34.2
300x90x7.8	35.9
400x100x8.8	49.5

Designation	Size	Weight
	mm x mm	Kg x m
	Telegraph channel	
41T	41 x 32	4.79
1 Mtr.	Gate Channel	6.25

BEAMS

Size mm	Weight Kg/m
116x100	23.0
125x70x5	13.2
150x75x5	15.0
175x85x5.8	19.5
200x100x5.7	25.4
250x125x16.9	37.3
300x140x7.7	44.2
450x150x9.4	72.4
500x180x10.2	86.92
600x210x12.00	122.6
INP - 14 (140x66)	14.3
INP -16 (160x74)	17.9
INP -18 (180x82)	21.9
350 x 140 x 8.1	52.4
400 x 140 x 8.9	61.6

BUTTWELD & SOCKETWELD FORGED FITTINGS & FLANGES

Product Range

PIPE, PIPES FITTING LIKE ELBOW, TEE, REDUCER, STUBEND, COLLAR, CAP & FLANGE.

Material & Specification

Stainless Steel Pipe Fitting

Specification : ASTM A 403 & A 182, SMO254, 904L, 317L, 304L, 316L, 321H, 347H.

Duplex Pipe Fitting

Specification : Duplex SS - ASTM A744, A790,
With UNS S31803, S32205, S32750, S32760.

Carbon Steel Pipe Fitting (IBR & NON IBR)

Specification : A234-WPA, WPB, WPC & ASTM A105.

Alloy Steel Pipe Fitting

Specification : ASTM A182, A234 WP5 / WP11 / WP91/ WP12 / WP22

Inconel & Monel Pipe Fitting

Specification : Inconel 600/ 601/ 625- SB 366, ASTM B 366 Monel - 400.

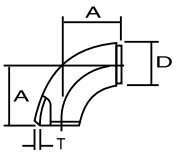
Cupro Nickel Pipe Fitting

Specification : 90/ 10 CuNi UNS C 70600, 70/ 30 CuNi UNS C71500.

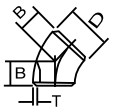
MATERIALS CHEMICAL COMPOSITION MECHANICAL PROPERTIES

Steel type	ASTM Grade	Chemical Composition									Mechanical Propertes				
		C% max	Mn%	P% max	S% max	Si%	Cr%	Mo%	Ni%	Others	R.min Tebsile Strength Mpa	S.min Yiled Strength Mpa	A%min (2/4D) Elongation		Impact test RCV (2) J
													Long	Trabsv	-
A234	WPB(1)	0.3	0.29-1.06	0.05	0.058	0.10 min	0.4	0.15	0.4	Cu = 0.4 V = 0.08 Cb = 0.02	415-585	240	30	20	-
	WPC(1)	0.35	0.29-1.08	0.05	0.058	0.10min	0.4	0.15	0.4	Cu = 0.4 V = 0.08 Cb = 0.02	485-655	275	30	20	-45*C 17.6/13.6
A420	WPL/6(1)	0.3	0.6-1.35	0.035	0.04	0.15-0.30	0.3	0.12	0.4	Cu = 0.4 V = 0.08 Cb = 0.02	415-585	240	30	16.5	-101*C 17.6/13.6
	WPL3	0.2	0.31-0.64	0.05	0.05	0.13-0.37	-	-	3.2-3.8	-	450-620	240	30	20	-
A234	Wp1	0.28	0.30-0.9	0.045	0.045	0.10-0.50	-	0.44-0.65	-	-	380-550	205	30	20	-
	WP12CL1	0.05-0.2	0.3-0.8	0.045	0.045	0.60	0.8-1.25	0.44-0.65	-	-	415-585	220	30	20	-
	WP12CL2	-	-	-	-	-	-	-	-	-	485-655	275	30	20	-
	WP11CL1	0.5-0.15	0.3-0.6	0.3	0.3	0.5-10	1.0-1.5	0.44-0.65	-	-	415-585	205	30	20	-
	WP11CL2	0.5-0.2	0.3-0.9	0.4	0.4	0.5-10	1.0-1.5	0.44-0.65	-	-	485-655	275	30	20	-
	WP11CL3	-	-	-	-	-	-	-	-	-	520-690	310	30	20	-
	WP22CL1	0.05-0.15	0.3-06	0.04	0.04	0.5	1.9-2.6	0.87-11.3	-	-	415-585	205	30	20	-
	WP22CL3	-	-	-	-	-	-	-	-	-	520-690	310	30	20	-
	WP5	0.15	0.3-0.6	0.04	0.03	0.5	4.0-6.0	0.44-0.65	-	-	415-585	205	30	20	-
	WP9	0.15	0.3-0.6	0.03	0.03	0.25-10	8.0-10.0	0.9-1.10	-	-	415-585	205	30	20	-
	WP91	0.08-0.12	0.3-0.6	0.02	0.01	0.2-0.5	8.0-9.5	0.85-1.05	0.4	V = 0.18-0.25 Cb = 0.08-0.10 N = 0.03-0.07 Al = 0.04	585-760	415	20	-	-
	WP304	0.08	2	0.045	0.03	1	18.20	-	8.0-11.0	-	515	205	28	20	-
	WP304L	0.035	2	0.045	0.03	1	18.20	-	8.0-13.0	-	485	170	28	20	-
	WP304H	0.04-0.10	2	0.045	0.03	1	18.20	-	8.0-11.0	-	515	205	28	20	-
	WP316	0.08	2	0.045	0.03	1	18.20	2.0-3.0	11.0-14.0	-	515	205	28	20	-
	WP316L	0.035	2	0.045	0.03	1	18.20	2.0-3.0	10.0-16.0	-	485	170	28	20	-
A403	WP321	0.08	2	0.045	0.03	1	17.0-20.0	-	9.0-13.0	Ti = 5XC max 0.70%	515	205	28	20	-
	WP321H	0.04-0.10	2	0.045	0.03	1	17.0-20.0	-	9.0-13.0	Ti = 4XC max 0.80%	515	205	28	20	-
	WP347	0.08	2	0.045	0.03	1	17.0-20.0	-	9.0-13.0	Cb+Ta>=10X%C max 0.10%	515	205	28	20	-
	WP347H	0.04-0.10	2	0.045	0.03	1	17.0-20.0	-	9.0-13.0	Cb+Ta>=8X%C max 0.10%	515	205	28	20	-
	WPS31254	0.02	1	0.03	0.01	0.8	19.5-20.5	6.06.5	17.5-18.5	N=0.18-0.22 Cu=0.5-1.0	515	205	28	20	-
A815	S 31803	0.03	2	0.03	0.02	1	21.0-23.0	2.5-3.5	4.5-6.5	N=0.8-0.2	620	450	25	-	-
	WP 410	0.15	1	0.04	0.03	1	11.5-13.5	-	0.5	-	485-655	205	20	-	-
B366	WPNIC10	0.06-0.10	1.5	-	0.015	1	19.0-23.0	-	30.0-35.0	Cu=0.75 Al=0.15-0.60	450	170	30	-	-
	WPNIC11	0.06-0.10	1.5	-	0.015	1	10.-23.0	-	30.0-35.0	Fo=39.5min Al+Ti=0.85-1.20	450	170	30	-	-

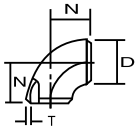
BUTT WELDING PIPE FITTING DIMENSIONAL STANDARD
ANSI B-16.9 /16.28 / MSS SP-43



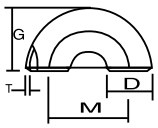
90° Elbow long radius



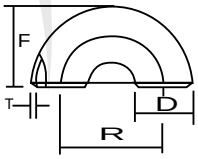
45° Elbow



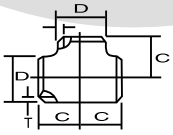
90° Elbow short radius



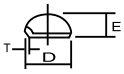
180° Return Bend short radius



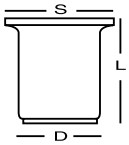
180° Return Bend long radius



Tee equal



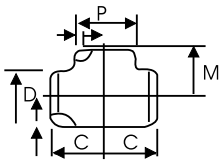
Caps



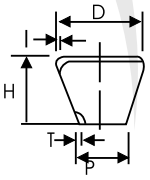
Stub-End

Nominal Pipe Size		Outside Diameter	Center to Face				Back to Face			Center to Center			Length 'L'	
Inch.	mm	D	A	B	C	N	E	F	G	R	M	S	MSS SP43	ANSI B 16.9
1/2	15	21.3	38	16	25	_	25	48	_	76	_	34.9	50.8	76.2
3/4	20	26.7	29	11	29	_	25	43	_	57	_	42.8	50.8	76.2
1	25	33.4	38	22	38	25	38	56	41	76	51	50.8	50.8	101.6
1 1/4	32	42.2	48	25	48	32	38	70	52	95	64	63.5	50.8	101.6
1 1/2	40	48.3	57	29	57	38	38	83	62	114	76	73	50.8	101.6
2	50	60.3	76	35	64	51	38	106	81	152	102	92	63.5	152.4
2 1/2	65	73	95	44	76	64	38	132	100	191	127	104.8	63.5	152.4
3	80	88.9	114	51	86	76	51	159	121	229	152	127	63.5	152.4
3 1/2	90	101.6	133	57	95	89	64	184	140	267	178	139.7	76.2	152.4
4	100	114.3	152	64	105	102	64	210	159	305	203	157.2	76.2	152.4
5	125	141.3	190	79	124	127	76	262	197	381	254	185.7	76.2	203.2
6	150	168.3	229	95	143	152	89	313	237	457	305	215.9	88.9	203.2
8	200	219.1	305	127	178	203	102	414	313	610	406	270	101.6	203.2
10	250	273.1	381	159	216	254	127	518	391	762	508	324	127.0	254.0
12	300	323.9	457	190	254	305	152	619	467	914	610	381	152.4	254.0
14	350	355.6	533	222	279	356	165	711	533	1067	711	412.8	152.4	305.0
16	400	406.4	610	254	305	406	178	813	610	1219	813	470	152.4	305.0
18	450	457.2	686	286	343	457	203	914	686	1372	914	533.4	152.4	305.0
20	500	508.0	762	318	381	508	229	1016	762	1524	1016	584.2	152.4	305.0
22	550	559.0	838	343	419	559	254	1118	838	1676	1118	614.4	152.4	305.0
24	600	610.0	914	381	432	610	267	1219	914	1829	1219	692.2	152.4	305.0
26	650	660.0	991	406	495	660	267							
28	700	711.0	1067	438	521	711	267							
30	750	762.0	1143	470	559	762	267							
32	800	813.0	1219	502	597	813	267							
34	850	864.0	1295	533	635	864	267							
36	900	914.0	1372	565	673	914	267							
38	950	965.0	1448	600	711	965	305							
40	1000	1016.0	1524	632	749	1016	305							
42	1050	1067.0	1600	660	762	1067	305							
44	1100	1118.0	1676	695	813	1118	343							
46	1150	1168.0	1753	727	851	1168	343							
48	1200	1219.0	1829	759	889	1219	343							

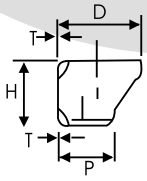
DIMENSIONS OF BUTT-WELDING FITTING ANSI B-16.9 / B-16.28



REDUCING TEES



CONCENTRIC REDUCERS



ECCENTRIC REDUCERS

Nominal Pipe Size		Outside Diameter		Center to End		Length
INCH	MM	D	P	C	M	H
1/2 x 3/8	15 x 10	21.3	17.1	25	25	-
1/2 x 1/4	15 x 8	21.3	13.7	25	25	-
3/4 x 1/2	20 x 15	26.7	21.3	29	29	38
3/4 x 3/8	20 x 10	26.7	17.1	29	29	38
1 x 3/4	25 x 20	33.4	26.7	38	38	51
1 x 1/2	25 x 15	33.4	21.3	38	38	51
11/4 x 1	32 x 25	42.2	33.4	48	48	51
11/4 x 3/4	32 x 20	42.2	26.7	48	48	51
11/4 x 1/2	32 x 15	42.2	21.3	48	48	51
11/2 x 11/4	40 x 32	48.3	42.2	57	57	64
11/2 x 1	40 x 25	48.3	33.4	57	57	64
11/2 x 3/4	40 x 20	48.3	26.7	57	57	64
11/2 x 1/2	40 x 15	48.3	21.3	57	57	64
2 x 11/2	50 x 40	60.3	48.3	64	60	76
2 x 11/4	50 x 32	60.3	42.2	64	57	76
2 x 1	50 x 25	60.3	33.4	64	51	76
2 x 3/4	50 x 20	60.3	26.7	64	44	76
21/2 x 2	65 x 50	73.0	60.3	76	70	89
21/2 x 11/2	65 x 40	73.0	48.3	76	67	89
21/2 x 11/4	65 x 32	73.0	42.2	76	64	89
21/2 x 1	65 x 25	73.0	33.4	76	57	89
3 x 21/2	80 x 65	88.9	73.0	86	83	89
3 x 2	80 x 50	88.9	60.3	86	76	89
3 x 11/2	80 x 40	88.9	48.3	86	73	89
3 x 11/4	80 x 32	88.9	42.2	86	70	89
4 x 31/2	100 x 90	114.3	101.6	105	102	102
4 x 3	100 x 80	114.3	88.9	105	98	102
4 x 21/2	100 x 65	114.3	73.0	105	95	102
4 x 2	100 x 50	114.3	60.3	105	89	102
4 x 11/2	100 x 40	114.3	48.3	105	86	102
5 x 4	125 x 100	141.3	114.3	124	117	127
5 x 31/2	125 x 90	141.3	101.6	124	114	127
5 x 3	125 x 80	141.3	88.9	124	111	127
5 x 21/2	125 x 65	141.3	73.0	124	108	127
5 x 2	125 x 50	141.3	60.3	124	105	127
6 x 5	150 x 125	168.3	141.3	143	137	140
6 x 4	150 x 100	168.3	114.3	143	130	140
6 x 31/2	150 x 90	168.3	101.6	143	127	140
6 x 3	150 x 80	168.3	88.9	143	124	140
6 x 21/2	150 x 65	168.3	73.0	143	121	140

Nominal Pipe Size		Outside Diameter		Center to End		Length
INCH	MM	D	P	C	M	H
8 x 6	200x150	219.1	168.3	178	168	152
8 x 5	200 x 125	219.1	141.3	178	162	152
8 x 4	200 x 100	219.1	114.3	178	156	152
8 x 31/2	200 x 90	219.1	101.6	178	152	152
10 x 8	250 x 200	273.1	219.1	216	203	178
10 x 6	250 x 150	273.1	168.1	216	194	178
10 x 5	250 x 125	273.1	141.3	216	191	178
10 x 4	250 x 100	273.1	114.3	216	184	178
12 x 10	300 x 250	323.9	273.1	254	241	203
12 x 8	300 x 200	323.9	219.1	254	229	203
12 x 6	300 x 150	323.9	168.3	254	219	203
12 x 5	300 x 125	323.9	141.3	254	216	203
14 x 12	350 x 300	355.6	323.9	279	270	330
14 x 10	350 x 250	355.6	273.1	279	257	330
14 x 8	350 x 200	355.6	219.1	279	248	330
14 x 6	350 x 150	355.6	168.3	279	238	330
16 x 14	400 x 350	406.4	355.6	305	305	356
16 x 12	400 x 300	406.4	323.9	305	295	356
16 x 10	400 x 250	406.4	273.1	305	283	356
16 x 8	400 x 200	406.4	219.1	305	273	356
16 x 6	400 x 150	406.4	168.3	305	264	356
18 x 16	450 x 400	457.0	406.4	343	330	381
18 x 14	450 x 350	457.0	355.6	343	330	381
18 x 12	450 x 300	457.0	323.9	343	321	381
18 x 10	450 x 250	457.0	273.1	343	308	381
18 x 8	450 x 200	457.0	219.1	343	298	381
20 x 18	500 x 450	508.0	457.0	381	368	508
20 x 16	500 x 400	508.0	406.4	381	356	508
20 x 14	500 x 350	508.0	355.6	381	356	508
20 x 12	500 x 300	508.0	323.9	381	346	508
20 x 10	500 x 250	508.0	273.1	381	333	508
20 x 8	500 x 200	508.0	219.1	381	324	508
24 x 22	600 x 550	610.0	559.0	432	432	508
24 x 20	600 x 500	610.0	508.0	432	432	508
24 x 18	600 x 450	610.0	457.0	432	419	508
24 x 16	600 x 400	610.0	406.4	432	406	508
24 x 14	600 x 350	610.0	355.6	432	406	508
24 x 12	600 x 300	610.0	323.9	432	397	508
24 x 10	600 x 250	610.0	273.1	432	384	508

All Dimensions in Millimeters

TOLERANCES ASME B - 16.9 / B - 16.28

	All Fittings			90° - 45° Elbows Tees	Reducers	Caps	180° Returns		
Norminal pipe size	Outside (1) diameter at bevel	Inside (2) diameter at end	Wall Thickness	Center to end A-B-C-M	Overall Length H	Length E	Center to center 0	Back to face	Alignement to ends
112" - 2 ½'	± 1	+0.8	Not less than 87.5% of nominal thickness	± 2	± 2	± 4	± 7	± 7	± 1
3"-3 ½"	± 1	+1.6		± 2	± 2	± 4	± 7	± 7	± 1
4"	± 2-1	+1.6		± 2	± 2	± 4	± 7	± 7	± 1
5" - 6"	±3-1	+1.6		± 2	± 2	± 7	± 7	± 7	± 1
8"	±4-2	+1.6		± 2	± 2	± 7	± 7	± 7	± 1
10"	±4-3	+3.2		± 2	± 2	± 7	± 10	± 7	± 2
12" - 18"	±4-3	+3.2		± 3	± 3	± 7	± 10	± 7	± 2
20" - 24"	±6-5	+4.8		± 3	± 3	± 7	± 10	± 7	± 2
26" - 30"	±7-5	+4.8		± 3	± 3	± 10			
32" - 48"	±7-5	+4.8		± 5	± 5	± 10			

Angularity Tolerance

Norminal Pipe Size	Off angle Q	Off angle P
1/2" - 4"	±1	±2
5" - 8"	±2	±4
10" - 12"	±3	±5
14" - 16"	±3	±7
18" - 24"	±4	±10
26" - 30"	±5	±10
32" - 42"	±5	±13
44" - 48"	±5	±20

CHEMICAL & PHYSICAL PROP. OF CARBON STEEL STAINLESS STEEL AND ALLOY STEEL FORGED FITTINGS

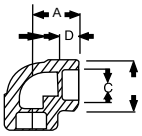
ASTM Grade	C	Mn	Si	S	P	Cr	Ni	Mo	Other	Tensile PSI(Kg/mm²)	Yield PSI(Kg/mm²)	Elongation %	Hardness BHN	Redn. in Area
A105	0.35 max	0.60 1.05	0.35 max	0.050 max	0.040 max	-	-	-	-	70000 49.46	36000 (25.50)	30Strip 22Round	187	30% Round
A 181 Cl 60 & 70	0.35 max	1.10 max	0.32 max	0.35 min	0.05 max	-	-	-	-	Cl.70-70000(49.46) Cl.60-60000(42.32)	30000 (20.90) 36000 (25.25)	22	-	35%
A 182 F 304	0.08 max	2.00 max	1.00 max	0.03 max	0.04 max	18.0 20.0	8.0 11.0	-	-	75000 (52.52)	30000 (20.90)	30	-	50%
A 182 F 304 L	0.085 max	2.00 max	1.00 max	0.03 max	0.04 max	18.0 20.0	8.0 13.0	-	-	70000 (49.46)	25000 (17.34)	30	-	50%
A 182 F 304 N	0.08 max	2.00 max	0.75 max	0.03 max	0.04 max	18.4 20.0	8.0 10.50	- -	- -	80000 (56.09)	35000 (24.47)	30(long) 25(trans)	-	50% (long) 45(trans)
A 182 F316	0.08 max	2.00 max	1.00 max	0.03 max	0.04 max	16 18.6	10.0 14.0	2.0 3.0	M=0.1-0.16	75000 (52.52)	30000 (20.90)	30	-	50%
A 182 F316L	0.35 max	2.00 max	1.00 max	0.03 max	0.04 max	16 18.0	10.0 15.0	2.0 3.0	-	70000 (49.46)	25000 (17.34)	30	-	50%
A 182 F316H	0.04 0.10	2.00 max	1.00 max	0.03 max	0.04 max	16 18.0	10. 14.0	2.0 3.0	-	75000 (52.52)	3000 (20.90)	30	-	50%
A 182 F 321	0.08 max	2.00 max	1.00 max	0.03	0.04	17 min	9 12.0	2.0 3.0	Ti=Cx5 0.70 max	75000 (52.52)	30000 (20.90)	30	-	50%
A 182 F 310	0.15 max	2.00 max	1.00 max	0.03	0.04	24.0 26.0	19.0 22.0	-	-	75000 (52.52)	3000 (20.90)	30	-	50%
A 182 F317L	0.03 max	2.00 max	1.00 max	0.03	0.045	18.0 20.0	11.0 15.0	3.0 4.0	- -	70000 (49.46)	25000 (17.34)	30	-	50%
A 182 F 347H	0.04 max	2.00 max	1.00 max	0.03 max	0.04 max	17.0 20.0	9.0 13.0		Cb+Ta + -8C-1.0	75000 (52.52)	30000 (20.90)	30	-	50%
A 182 F1	0.28 max	0.60 0.90	0.15 0.35	0.045 max	0.045 max	-	-	0.44 0.65	-	70000 (49.46)	40000 (28.05)	20	143-192	30
A 182 F 12 class2	0.10 0.20	0.30 0.80	0.10 0.60	0.04 max	0.04 max	0.8 1.25	-	0.44 0.65		70000 (49.46)	40000 (28.05)	20	143-207	30
A 182 F 11 class 2	0.10 0.20	0.30 0.80	0.50 1.0	0.04 max	0.04 max	1.0 1.50	-	0.44 0.65	-	70000 (49.46)	40000 (28.05)	20	143-207	30
A 182 F 22 class 3	0.05 0.15	0.30 0.60	0.5 max	0.04 max	0.04 max	2.0 2.50	-	0.87 1.13	-	75000 (52.52)	45000 (31.7)	20	156-207	30
A 182 F5	0.15 max	0.30 0.60	0.5 max	0.03 max	0.03 max	4.0 6.0	0.5 max	0.44 0.65	- -	70000 (49.46)	40000 (28.05)	20	143-217	35
A 182 F9	0.15 max	0.30 0.60	0.5 1.0	0.03 max	0.03 max	8.0 10.0	-	0.90 1.10	-	85000 (56.65)	55000 (38.75	20	179-217	40

CHAMPAK STEEL & ENGINEERING CO.

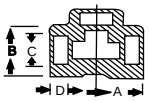
A CSEC Group Company

SOCKET WELD FITTING TO ANSI B-16.11

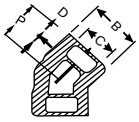
90°ELBOWS



TEE



45°ELBOW



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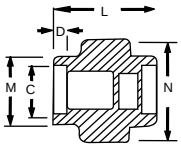
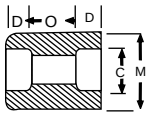
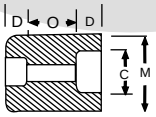


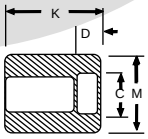
COUPLING



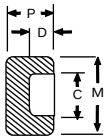
REDUCER



HALF COUPLING



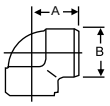
CAP



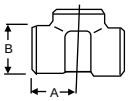
NOM BORE	PIPE O.D.	3000 LBS.									COMMON FACTORS				6000 LBS.				
		A max.	B max.	K	J	L	M	N	P	Q	C min.	D min.	O min.	O max.	A	B	M	K	N
1/8"	10.3	22	18.5	26	16	40	17.3	32	15	10	10.7	10	5	8	22	22	20	25	46
1/4"	13.7	22	22	26	18	43	21.2	32	15	10	14.1	10	5	8	27	25	24	25	51
3/8"	17.2	25	25	26	19	48	25.4	36	16.5	10	17.6	10	3	9	27	28	28	26	60
1/2"	21.3	27	32	30	21	51	31	43	16.5	10	21.7	10	6	13	31	34	34	31	72
3/4"	26.7	34	38	36	24	57	37	50	19.5	13	27	13	6	13	37	42	41	35	80
1"	33.4	37	46	40	25	64	45.2	60	22.5	13	33.8	13	9	17	42	50	50	40	94
1 1/4"	42.2	42	56	40	29	70	55	70	22.5	13	42.6	13	9	17	47	59	58	41	100
1 1/2"	48.3	47	62	40	30	79	61.4	78	24	13	48.7	13	9	17	53	67	66	43	122
2"	60.3	56	75	52	37	89	75	95	29	13	61.2	16	15	23	59	84	83	55	-
2 1/2"	73.02	60	92	52	48	114	91.3	125	32	16	73.8	16	14	24	-	102	-	56	-
3"	89.00	76	110	52	51	127	108.8	140	35	16	89.8	16	14	24	-	121	-	58	-
4"	114.50	88	137	58	-	150	136.9	-	32	19	115.5	19	14	24	-	152	-	64	-

FORGED SCREWED FITTING TO ANSI B-16.11 3000/6000 LBS. THREADED TO ASA B 2.1

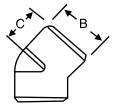
90° ELBOWS



TEE



45° ELBOW



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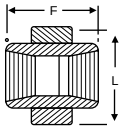
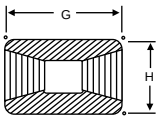
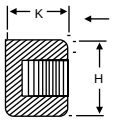


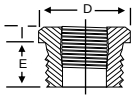
COUPLING



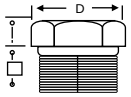
PIPE CAP



BUSHING



HEX HEAD PLUG



(DIMENSIONS IN MM)

HALF COUPLING =G/2

NOM BORE	PIPE O.D.	3000 L.B.S.						COMMON FACTORS						6000 L.B.S					
		A	B	C	G	H	K	D	E	F	I	J	L	A	B	C	G	H	K
1/8"	10.3	21	22	17	32	16	19	11	10	40	-	6	-	25	25	19	32	22	-
1/4"	13.7	25	25	19	35	19	25	16	11	43	3	6	32	29	33	22	35	25	27
3/8"	17.2	29	33	22	38	22	25	17.5	13	48	4	8	38	33	38	25	38	32	27
1/2"	21.3	33	38	25	48	29	32	22	15	51	5	8	46	38	46	29	48	38	33
3/4"	26.7	38	46	29	51	35	37	27	16	57	6	10	51	44	56	33	51	44	38
1"	33.4	44	56	33	60	44	41	35	19	64	6	10	60	51	62	35	60	57	43
1 1/4"	42.2	51	62	35	67	57	44	44.5	21	70	7	14	72	60	75	43	67	64	46
1 1/2"	48.3	60	75	43	79	64	44	51	21	79	8	16	80	64	84	44	79	76	48
2"	60.3	64	84	45	86	76	48	63.5	22	88	9	17	94	83	102	52	86	92	51
2 1/2"	73.02	83	102	52	92	92	60	76	27	118	10	21	122	95	121	64	92	108	64
3"	89.0	95	121	64	108	108	65	89	29	121	10	65	140	106	146	79	108	127	68
4"	114.5	114	152	79	121	140	68	117.5	32	150	13	25	180	114	152	79	121	159	75

SOCKET WELD PIPE FITTING - STANDARD DIMENSIONS

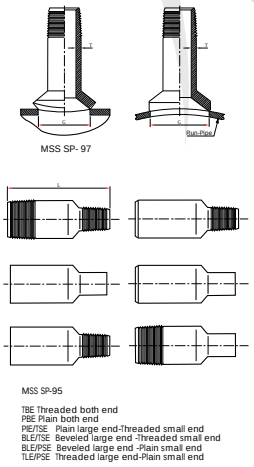
Nominal Pipe Size		inch	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 ½	2	2 ½	3	4
		mm	3.2	6.4	9.5	12.7	19.0	25.4	31.7	38.1	50.8	63.5	76.2	101.6
Length	A	mm	25.4	25.4	28.6	35.0	38.1	44.4	47.6	50.8	63.5	63.5	69.9	76.2
Cemtre to Face	B	mm	20.6	20.6	24.6	28.6	33.3	38.1	44.4	50.8	60.3	76.2	85.7	106.3
Cap Length	**C**	**mm**	17.46	17.46	19.05	22.23	25.4	26.99	30.16	31.75	38.10	38.10	44.45	47.63
Out Side	D	mm	19.0	22.2	25.4	31.7	38.1	44.5	57.2	63.5	76.2	92.1	1080	139.7
Diameter	E	mm	22.2	22.2	25.4	33.3	38.1	46.0	55.5	62.0	75.4	92.0	109.5	146.0
Socket Bore	F	mm	10.7	14.0	17.5	21.7	27.0	33.8	42.5	48.0	61.1	74.0	89.8	115.4
	MIN	mm	9.5	9.5	9.5	9.5	12.7	12.7	12.7	12.7	15.9	15.9	15.9	19.0
Depth of Socket	G MAX	mm	9.5	9.5	11.1	12.7	14.3	15.9	17.5	19.0	22.2	22.2	25.4	28.6
	H MAX	mm	9.5	9.5	11.1	12.7	14.3	15.9	17.5	19.0	22.2	286	35.0	39.7
Centre to Socket	J	mm	11.1	11.1	13.5	15.8	19.0	22.2	27.0	31.7	38.1	41.2	57.1	66.6
Back face	K	mm	8.0	8.0	8.0	11.1	12.7	14.3	17.4	20.6	25.4	28.6	31.7	41.2
Centre to face	L	mm	17.46	19.0	19.0	22.2	25.4	28.6	33.3	35.0	42.8	52.4	63.5	79.3
Wall Thik minimum		mm	30.18	3.30	3.51	4.09	4.27	4.98	5.28	5.54	6.05	7.65	8.31	9.35
Bore		mm	6.45	8.86	12.14	15.42	20.55	26.26	34.67	40.51	52.12	81.95	77.17	

Nominal Pipe Size		Inch	1/8	1/4	3/8	½	3/4	1	1 1/4	1 ½	2	2 ½	3	4
		mm	3.2	6.4	9.5	12.7	19.0	25.4	31.7	38.1	50.8	63.5	76.2	101.6
	A	mm	31.7	35.0	38.1	47.6	50.8	60.3	66.7	79.4	85.7	92.1	108.0	120.7
Face to Face Length	B	mm	15.9	17.5	19.0	23.8	25.4	30.2	33.3	39.7	42.9	46.0	54.0	60.3
	C	mm	19.0	25.4	25.4	31.7	36.5	41.3	44.5	44.5	47.6	60.3	65.1	68.3
	D	mm	20.6	24.6	28.6	333	38.1	44.4	50.8	60.3	63.5	85.5	95.2	114.3
Face to Centre Length	E	mm	15.9	24.6	28.6	333	38.1	44.4	57.2	63.5	76.2	92.1	108.0	139.7
	F	mm	22.2	25.4	33.3	38.1	46.0	55.5	62.0	75.4	84.1	101.6	120.6	152.4
	G	mm	6.35	8.13	9.14	10.92	12.70	14.73	17.02	17.78	19.05	23.67	25.81	27.79
	H	mm	17.5	19.0	22.2	25.4	28.6	33.3	35.0	42.8	43.6	52.4	63.5	79.3

SWAGED NIPPOLETS

3000# (in millimeters)

Run-Pipe Size	Outlet Size	Wall-T	G	Unit Weight (kg)
36-3/4	1/2	7.3	23.9	0.36
36-1	3/4	7.9	30.2	0.56
36-1 1/4	1	8.9	36.6	0.84
36-1 1/2	1 1/4	9.7	44.5	1.22
36-2	1 1/2	10.2	50.8	2.00
36-2 1/2	2	11.2	65.0	3.12



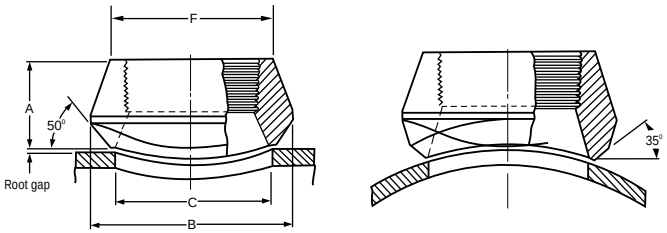
(in millimeters)

Large end Size	Small and Size	Length-L
1/2	3/8-1/8	70
3/4	1/2-1/8	76
1	3/4-1/8	89
1 1/4	1-1/8	102
1 1/2	1 1/4-1/8	114
2	1 1/2-1/8	165
2 1/2	2-1/8	178
3	2 1/2-1/8	203
3 1/2	3-1/8	203
4	3 ½-1/8	229

FORGED STEEL OUTLET FITTINGS SOCKOLETS

3000#, 6000#

Outlet Size	A		B		C	
	3000#	6000#	3000#	6000#	3000#	6000#
1/2	25.4	31.8	34.9	44.5	23.8	19.1
3/4	27.0	36.5	44.5	50.8	30.2	25.4
1	33.3	39.7	54.0	61.9	36.5	33.3
11/4	33.3	41.3	65.1	69.9	44.5	38.1
11/2	34.9	42.9	73.0	82.6	50.8	49.2
2	38.1	52.4	88.9	103.2	65.1	69.9
21/2	46.0	-	103.2	-	76.2	-
3	50.8	-	122.2	-	93.7	-
4	57.2	-	152.4	-	120.7	-

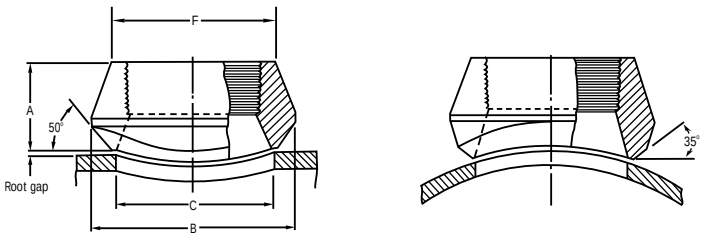


Applicable Run Pipe Sizes are From out-Let to 36"
For the 3000# and 6000# Sockolets and Thredolets, Inside Bore, Thread, Socket Bore and Socket depth Dimensions are According to ANSI B16.11
Pipe Schedule Numbers and Weight Designation are in Accordance With ANSI B36.10
When Ordering Sockolets and Thredolets, Include The Quantity, Run and Out-Let Size,
Item And Rating(or Schedule Number)and Material

FORGED STEEL OUTLET FITTINGS THREADOLETS

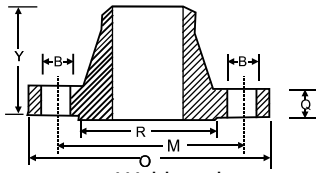
3000#, 6000#

Outlet Size	A		B		C	
	3000#	6000#	3000#	6000#	3000#	6000#
1/2	25.4	31.8	34.9	44.5	23.8	19.1
3/4	27.0	36.5	44.5	50.8	30.2	25.4
1	33.3	39.7	54.0	61.9	36.5	33.3
11/4	33.3	41.3	65.1	69.9	44.5	38.1
11/2	34.9	42.9	73.0	82.6	50.8	49.2
2	38.1	52.4	88.9	103.2	65.1	69.9
21/2	46.0	-	103.2	-	76.2	-
3	50.8	-	122.2	-	93.7	-
4	57.2	-	152.4	-	120.7	-

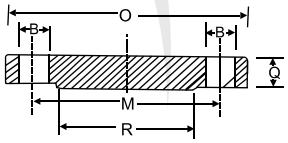


Applicable Run Pipe Sizes are From out-Let to 36"
For the 3000# and 6000# Sockolets and Threadolets, Inside Bore, Thread, Socket Bore and Socket depth Dimensions are According to ANSI B16.11
Pipe Schedule Numbers and Weight Designation are in Accordance With ANSI B36.10
When Ordering Sockolets and Threadolets, Include The Quantity, Run and Out-Let Size, Item And Rating(or Schedule Number)and Material

FORGED FLANGES DIMENSIONS



Weld neck



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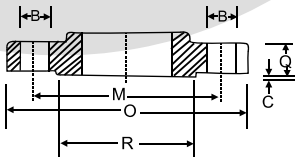


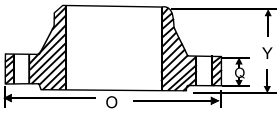
Slip-on

150 lbs

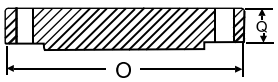
Normal pipe size (in mm)	Outside dia of flange	Minimum thickness of flange	Overall Length			bolt circle	No. and size of holes		O D of Raised face
			Welding neck	slip-on & socket welding	Lap joint				
	O	Q	Y			Dia.m	No.	B	R
15	89	11.2	47.6	15.9	15.9	60.5	4	15	35
20	98	12.7	52.4	15.9	15.9	70.0	4	15	43
25	108	14.3	55.6	17.5	17.5	79.5	4	15	51
32	117	15.9	57.2	20.6	20.6	89.0	4	15	64
40	127	17.5	61.9	22.2	22.2	98.5	4	15	73
50	152	19.1	63.5	25.4	25.4	120.5	4	19	92
65	178	22.3	69.8	28.6	28.6	139.5	4	19	105
80	190	23.9	69.8	30.2	30.2	152.5	4	19	127
90	216	23.9	71.4	31.8	31.8	178.0	8	19	140
100	229	23.9	76.2	33.3	33.3	190.5	8	19	157
125	254	23.9	88.9	36.5	36.5	216.0	8	22	186
150	279	25.4	88.9	39.7	39.7	241.5	8	22	216
200	343	28.6	101.6	44.4	44.4	298.5	8	22	270
250	406	30.2	101.6	49.2	49.2	362.0	12	25	324
300	483	31.8	114.3	55.6	55.6	432.0	12	25	381
350	533	35.0	127.0	57.2	79.4	476.0	12	29	413
400	597	36.6	127.0	63.5	87.3	539.5	16	29	470
450	635	39.7	139.7	68.3	96.8	578.0	16	32	533
500	698	42.9	144.5	73.0	103.2	635.0	20	32	584
600	813	47.7	152.4	82.6	111.1	749.5	20	35	692

300 lbs

Normal pipe size (in mm)	Outside dia of flange	Minimum thickness of flange	Overall Length			bolt circle	No. and size of holes		O D of Raised face
			Welding neck	slip-on & socket welding	Lap joint				
	O	Q	Y			Dia.m	No.	B	R
15	95	14.3	52.4	22.2	22.2	66.5	4	15	35
20	117	15.9	57.2	25.4	25.4	82.5	4	19	43
25	124	17.5	61.9	27.0	27.0	89.5	4	19	51
32	133	19.1	65.1	27.0	27.0	98.5	4	19	64
40	156	20.7	68.3	30.2	30.2	114.5	4	22	73
50	165	22.3	69.8	33.3	33.3	127.0	8	19	92
65	190	25.4	76.2	38.1	38.1	149.0	8	22	105
80	210	28.6	79.4	42.9	42.9	168.0	8	22	127
90	229	30.2	81.0	44.5	44.5	184.0	8	22	140
100	254	31.8	85.7	47.6	47.6	200.0	8	22	157
125	279	35.0	98.4	50.8	50.8	235.0	8	22	186
150	313	36.6	98.4	52.4	52.4	270.0	12	22	216
200	381	41.3	111.1	61.9	61.9	330.0	12	25	270
250	444	47.7	117..5	66.7	95.3	387.5	16	29	324
300	521	50.8	130.2	73.0	101.6	451.0	16	32	381
350	584	54.0	142.9	76.2	111.1	514.5	20	32	413
400	648	57.2	146.0	82.6	120.7	571.5	20	35	470
450	711	60.4	158.8	88.9	130.2	628.5	24	35	584
500	775	63.5	161.9	95.2	139.7	686.0	24	35	692
600	914	69.9	168.3	106.4	152.4	813.0	24	41	692



Weld neck



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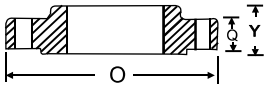


Slip-on

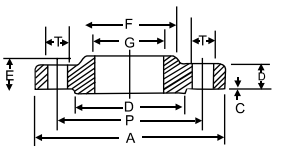
600 lbs

Normal pipe size (in mm)	Outside dia of flange	Minimum thickness of flange	Overall Length			bolt circle	No. and size of holes		O D of Raised face
			Welding neck	slip-on & socket welding	Lap joint				
	O	Q	Y			Dia.m	No.	B	R
15	95	14.3	52.4	22.2	22.2	66.5	4	15	35
20	117	15.9	57.2	25.4	25.4	82.5	4	19	43
25	124	17.5	61.9	27.0	27.0	89.5	4	19	51
32	133	20.7	66.7	28.6	28.5	98.5	4	19	64
40	156	22.3	69.8	31.8	31.8	114.5	4	22	73
50	165	25.4	73.0	36.5	36.5	127.0	8	19	92
65	190	28.6	79.4	41.3	41.3	149.0	8	22	105
80	210	31.8	82.6	46.0	46.0	168.0	8	22	127
90	229	35.0	85.7	49.2	49.2	184	8	25	140
100	273	38.1	101.6	54.0	54.0	216.0	8	25	157
125	330	44.5	114.3	60.3	60.3	266.5	8	29	186
150	356	47.7	117.5	66.7	66.7	292.0	12	29	216
200	419	55.6	133.4	76.2	76.2	349.0	12	32	270
250	508	63.5	152.4	85.7	115.1	432.0	16	35	324
300	559	66.7	155.6	92.1	111.1	489.0	20	35	381
350	603	69.9	165.1	93.7	117.5	527.0	20	38	413
400	686	76.2	177.8	106.4	127.0	603.0	20	41	470
450	743	82.6	184.2	117.6	139.7	654.0	20	45	533
500	813	88.9	190.5	127.0	165.1	724.0	24	45	584
600	940	101.6	203.2	139.7	184.2	838.0	24	51	692

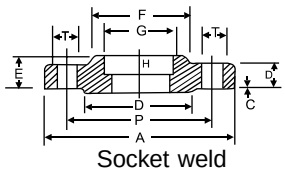
900 lbs

Normal pipe size (in mm)	Outside dia of flange	Minimum thickness of flange	Overall Length			bolt circle	No. and size of holes		O D of Raised face
			Welding neck	slip-on & socket welding	Lap joint				
	O	Q	Y			Dia.m	No.	B	R
15	121	22.3	60.3	31.8	31.8	82.5	4	22	35
20	130	25.4	69.8	34.9	34.9	89.0	4	22	43
25	149	28.6	73.0	41.3	41.3	101.5	4	25	51
32	159	28.6	73.0	41.3	41.3	111.0	4	25	64
40	178	31.8	82.6	44.4	44.4	124.0	4	29	73
50	216	38.1	101.6	57.2	57.2	165.0	8	25	92
65	244	41.3	104.8	63.5	63.5	190.5	8	29	105
80	241	38.1	101.6	54.0	54.0	190.5	8	25	127
100	292	44.5	114.3	69.8	69.8	235.0	8	32	157
125	349	50.8	127.0	79.4	79.4	279.5	8	35	186
150	381	55.6	139.7	85.7	85.7	317.5	12	32	216
200	470	68.5	161.5	101.8	114.3	393.5	12	38	270
250	546	69.9	184.2	108.0	127.0	470.0	16	38	324
300	610	79.4	200.0	117.5	142.9	533.5	20	38	381
350	641	85.8	212.7	130.2	155.6	559.0	20	41	413
400	705	88.9	215.8	133.4	165.1	616.0	20	45	470
450	787	101.6	228.6	152.4	190.5	686.0	20	51	533
500	857	108.0	247.6	158.8	209.6	749.5	20	54	584
600	1041	139.7	292.1	203.2	266.7	901.5	20	67	692

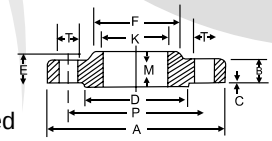
FORGED FLANGES DIMENSIONS



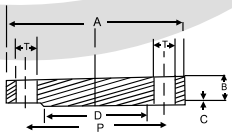
Slip-on



Socket weld



Screwed



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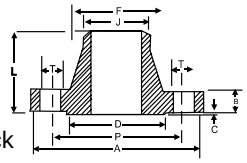
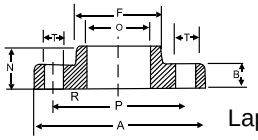


Weld-neck

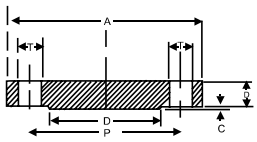


Lapped

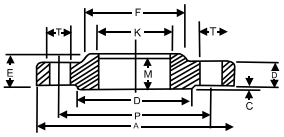
CLASS 1500 FLANGES - METRIC

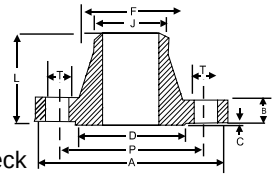
N.B.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	T	No.of Holes
15	121	22.2	6.4	35	32	38	22.4	9.5	21.3	23.5	60	22	32	23.0	82.6	3.0	22.2	4
20	130	25.4	6.4	43	35	44	27.7	11.0	26.7	29.0	70	25	35	28.0	88.9	3.0	22.2	4
25	149	28.6	6.4	51	41	52	34.5	12.5	33.4	36.0	73	29	41	35.0	101.6	3.0	25.4	4
32	159	28.6	6.4	64	41	64	43.2	14.5	42.2	44.5	73	30	41	43.5	111.1	5.0	25.4	4
40	178	31.8	6.4	73	44	70	49.5	16.0	48.3	50.5	83	32	44	50.0	123.8	6.5	28.6	4
50	216	38.1	6.4	92	57	105	62.0	17.5	60.3	63.5	102	38	57	62.5	165.1	8.0	25.4	8
65	244	41.3	6.4	105	64	124	74.7	19.0	73.0	76.0	105	48	64	75.0	190.5	8.0	28.6	8
80	267	47.6	6.4	127	73	133	--	--	88.9	92.0	117	51	73	91.5	203.2	9.5	31.8	8
100	311	54.0	6.4	157	91	162	--	--	114.3	118.0	124	57	91	17.0	241.3	11.0	34.9	8
125	375	73.0	6.4	186	105	197	--	--	141.3	145.0	156	64	105	145.0	292.1	11.0	41.3	8
150	394	82.6	6.4	216	119	229	--	--	168.3	171.0	171	70	119	171.0	317.5	12.5	38.1	12
200	483	92.1	6.4	270	143	292	--	--	219.1	222.0	213	76	143	222.0	393.7	12.5	44.4	12
250	584	108.0	6.4	324	159	368	--	--	273.0	276.0	254	84	178	277.0	482.6	12.5	50.8	12
300	673	123.8	6.4	381	181	451	--	-	323.9	329.0	283	92	219	328.0	571.5	12.5	54.0	16
350	749	133.4	6.4	413	--	495	--	--	356.6	--	298	--	241	360.0	635.0	12.5	60.3	16
400	826	146.1	6.4	470	--	552	--	--	406.4	--	311	--	260	411.0	704.8	12.5	6.7	16
450	914	161.9	6.4	533	--	597	--	--	457.2	--	327	--	276	462.0	774.7	12.5	73.0	16
500	984	178.0	6.4	584	--	641	--	--	508.0	--	356	--	292	514.0	831.8	12.5	79.4	16
600	1168	203.0	6.4	692	--	762	--	--	609.6	--	406	--	330	616.0	990.6	12.5	92.0	16

Blind

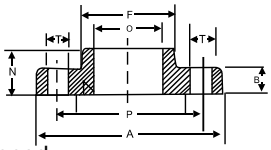


Screwed





Weld-neck



Lapped

CLASS 2500 FLANGES - METRIC

N.B.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	T	No of Holes
15	133	30.2	6.4	35	40	43	--	--	21.3	23.5	73	29	40	23.0	88.9	3.0	22.2	4
20	140	31.7	6.4	43	43	51	--	--	26.7	29.0	79	32	43	28.0	95.2	3.0	22.2	4
25	159	34.9	6.4	51	48	57	--	--	33.4	35.0	89	35	48	35.0	107.9	3.0	25.4	4
32	184	38.1	6.4	64	52	73	--	--	42.2	44.5	95	38	52	43.5	130.2	5.0	28.6	4
40	203	44.4	6.4	73	60	79	--	--	48.3	50.5	111	44	60	50.0	146.0	6.5	31.8	4
50	235	50.8	6.4	92	70	95	--	--	60.3	63.5	127	51	70	62.5	171.4	8.0	28.6	8
65	267	57.1	6.4	105	79	114	--	--	73.0	76.0	143	57	79	75.5	196.8	8.0	31.8	8
80	305	66.7	6.4	127	92	133	--	--	88.9	92.0	168	64	92	91.5	228.6	9.5	34.9	8
100	356	76.2	6.4	157	108	165	--	--	114.3	118.0	190	70	108	117.0	273.0	11.0	41.3	8
125	419	92.1	6.4	186	130	203	--	--	141.3	145.0	229	76	130	145.0	323.8	11.0	47.6	8
150	483	108.0	6.4	216	152	235	--	--	168.3	171.0	273	83	152	171.0	368.3	12.5	54.0	8
200	552	127.0	6.4	270	178	305	--	--	219.1	222.0	318	95	178	222.0	438.1	12.5	54.0	12
250	673	165.1	6.4	324	229	375	--	--	273.0	276.0	419	108	229	277.0	539.7	12.5	66.7	12
300	762	184.1	6.4	381	254	441	--	--	323.9	329.9	464	121	254	328.0	619.1	12.5	73.0	12

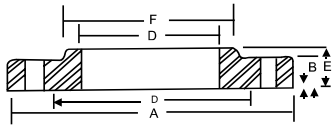
*Minimum length.

ANSI FLANGES WEIGHTS (KGS)

N. B. Size	150 lbs		300 lbs		600 lbs		900 lbs	
	WN	SO	WN	SO	WN	SO	WIN	SO
1/2”	0.7	0.4	0.8	0.7	0.9	0.8	1.9	1.8
3/4”	0.9	0.7	1.4	1.2	1.6	1.4	2.7	2.5
1”	1.1	0.8	1.7	1.4	1.9	1.7	3.9	3.6
1 1/4”	1.5	1.2	2.2	1.8	2.6	2.1	4.5	4.1
1 1/2”	1.8	1.4	3.2	2.7	3.5	3.1	6.2	5.6
2”	2.7	2.2	3.6	3.2	4.7	3.8	11.3	10.3
2 1/2”	4.4	3.5	5.5	4.5	6.7	5.5	15.5	14.3
3”	5.1	4.1	7.3	6.1	8.7	7.3	15	12.3
3 1/2”	6.4	5.2	9	7.5	11.2	8.9	--	--
4”	7.5	5.6	11.9	10	18.3	15.8	24	20.5
5”	9	6.3	16	12.5	30.5	25	37.5	33.5
6”	11	7.8	20	16.2	37	29.5	50	43
8”	18.5	12.6	31	25	55	44	85	74
10”	25	18	44.3	35	91	71	125	105
12”	38	27.5	64	50	108	85	165	136
14”	51	37	88	72	150	96	198	158
16”	63	46	112	90	180	145	224	184
18”	71	50	138	115	240	175	320	258
20”	88	64	171	137	295	220	375	316
24”	120	90	240	210	363	315	680	608

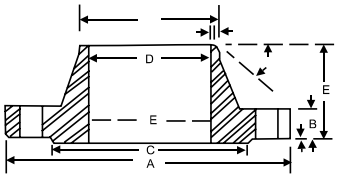
DIMENSIONAL TOLERANCES FOR FORGED STEEL FLANGES

Threaded, lap joint, slip-on and Blind Flanges ANSI B 16.5



Outside Diameter (A)	When O.D. is 24" or less	±1/16**	Outside Dia. of Hub (F)	12" and smaller	+3/32"*-1/16**
	When 0. D is over 24"	± 1/8**		Over 12"	± 1/8**
Inside Diameter (D)	Threaded	Within limits on Boring gauge	Drilling	Bolt Circle	± 1/16*
				Bolt hole spacing	±1/32*
	Slip on and Lap Joint	10" and smaller + 1/32", -0" 12" and larger + 1/16"-0"		Eccentricity between 2 ½" and smaller bolt circle diameter and machined facing Diameter	1/32" Max. 3" and larger 1/16" Max.
Diameter of Contact Face (C)	1/16 Raised Face	±1/32"	Overall Height (E)	On flanges 18" and smaller	+1/8"*-1/32"*
				On flanges larger than 13"	+3/15"*-1/16"*
	1/4 Raised Face, Tongue and Groove of male and Female	± 1/64"	Thickness (E)	13" and smaller	41/8"-0"
				Over 18"	+ 3/16"-0"
Diameter of Counter bore	Same as for inside diameter			Where allowance has been left On face for finish: All sizes + 1/8"*-1/16"*	

Welding neck flanges ANSI B 16.5



This tolerance not covered by ANSI B 16.5

Outside Diameter (A)	When O. D. is 24: or less	± 1/16"*	Drilling	Bolt Circle	± 1/16"
	When O. D. is over 24"	± 1/8"*		Bolt hole spacing	± 1/32"
smaller inside Diameter (D)	10" and smaller	± 1/32"		Eccentricity between ½" and smaller2½" and bolt circle diameter and machined facing diameter	1/32" max 3" and larger 1/16" max
	12" to 18"	± 1/16			
	Over 18"	+ 1/8-1/16"	Width of Land	All sizes	± 1/32"
Diameter of Contact Face (C)	1/16" Raised Face	± 1/32"	Angle of Hub Bevel	All Sizes 18" and smaller	± 2½" ± 1/16
	1/4" Raised face, Tongue and Groove, or Male and Female	± 1/64"			
Diameter of Hub at Point of Welding (G)	5" and smaller	+3/32"-1/32"	Overall Height (E)	12" and larger ±	± 1/8"
				10" and smaller	+ 1/8"-0"
	5" and larger	+5/32"-1/32	Thickness (E)	Over 18"	+ 3/16"-0"
Diameter of Hub at Base (F)	When "F" is 24" and smaller	± 1/8"*		Where allowance has been left on face for Finish, All size	+1/8"*-1/16"*
	When "F" is over 24"	± 1/8			

FORMULAE

1) WEIGHT OF STAINLESS STEEL PIPES & TUBES
OD (mm) - W.T. (mm) X W.T. (mm) X 0.02466 = Kg. per Mtr.

2) SHEET WIDTH REQUIRED FOR ROLLED AND WELDED PIPES
O.D. (mm) - THK (mm) X 3.14 = Sheet Width

3) WEIGHT OF STAINLESS STEEL SHEETS
Length (mtr.) x Wdth (mrt.) X Thk (mm) X 8 = Kg Per Sheet

4) WEIGHT OF STAINLESS STEEL CIRCLE & BLANKS
O.D. (mm) X O.D.> (mm) X Thk (mm) /160/1000 = Kg Per Pcs.

5) WEIGHT OF STAINLESS STEEL ROUNDS
Dia. (mm) X Dia. (mm) X 0.00623 = Per Mtr.

6) WEIGHT OF STAINLESS STEEL HEXAGONAL RODS
Dia. (mm) X Dia. (mm) X 0.00679 = Per Mtr.

7) WEIGHT OF STAINLESS STEEL SQUARE BARS
Dia. (mm) X Dia. (mm) X 0.00787 = Kg Per Mtr.

8) WEIGHT OF CARBON STEEL PIPES & TUBES
O.D. (mm) - W.T. (mm) X W.T. (mm) X 0.02466 = Kg. Per Mtr.

9) WEIGHT OF CARBON STEEL SHEETS - PLATES
Length (mtr.) X Width (mtr.) X Thk (mm) X 7.85 = Kg. Pert Sheet

10) WEIGHT OF COPPER PIPES
O.D. (mm) - W.T. (mm) X W.T. (mm) X 0.0256 = Kg. Per Mtr.

11) WEIGHT OF LEAD PIPES (appro.)
O.D. (mm) - W.T. (mm) X W.T. (mm) X 0.0345 = Per Mtr.

12) WEIGHT OF LEAD SHEETS (appro.)
Length (mtr.) X Width (mtr.) X Thk (mm) X 11.2 = Kg. Per Sheet

13) WEIGHT OF ALLUMINIUM PIPES (appro.)
O.D. (mm) - W.T. (mm) X W.T. (mm) X 0.0082 = Kg. Per Mtr.

14) WEIGTH OF ALLUMINIUM SHEETS (appro.)
Length (mtr.) X Width (mtr.) X Thk (mm) X 2.66 = Kg Per Sheet

CHAMPAK STEEL & ENGINEERING CO .

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