CHHAJED

STEEL & ALLOYS PVT. LTD.

We Stand for Quality....Not for Competition

Leading Distributors,
Importers, Stockists &
Suppliers of :

- Wear Plates
- Pipes
- Sheets / Plates / Coils
- Fittings
- Flanges
- Bars / Rods
- Fasteners
- Valves

An ISO 9001 : 2015, ISO 14001 : 2015, OHSAS 18001 : 2007 & CE certified Co.

We almost supply everything in Steel

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Steel & Alloys Pvt. Ltd.

Quality Policy

We at Chhajed Steel & Alloys Pvt. Ltd. will provide to its customers products and services that demonstrate quality, reliability of products, dependability of service, and on-time delivery. To fulfill our mission and policy, we will utilize a systematic approach to quality assurance and management. The processes used to support customer satisfaction and business performance will continuously be monitored and improved to achieve Performance Excellence."

The key to our success is the development of relationships with our suppliers and customers that emphasize continuous improvement, customer satisfaction and performance excellence.

Our Clientele

HINDUSTAN ZINC · ESSAR · JSW · MURUGAPPA GROUP · vedanta · Crompton Greaves · SAIL · marico · DLF · Ashok Leyland · LANCO INSPIRING GROWTH · GNFC · ador WELDING · talbros · BHABHA ATOMIC RESEARCH · GARWARE · JAI KISAN · ESAB · SANDVIK · JINDAL Jindal Aluminium Ltd. · DEMPO · SURYA · DLF

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Company Profile

Chhajed Steel & Alloys Pvt. Ltd. established in the year 1990 are one of the leading Distributors, manufacturers, importers, exporters, stockists and suppliers of Stainless steel, Alloy steel, Carbon Steel, Nickel alloy, Non ferrous metals, Engineering & Industrial items in form of pipes, Sheets, plates, Bars, Pipe Fittings, valves, Fasteners etc., in all shapes and size.

30 years of
30
valuable service to industry

Acquiring the ISO 9001, 14001, 18001 & CE certification has been a major landmark in our company's history for we have been providing quality industrial raw materials for world class engineering projects ranging from high tech nuclear plants to extreme pressure endurable petrochemical plants, on repeat order basis, till date.

Over the years, the company has excelled in experience and deep understanding of diversified business needs in various industries and in supplying quality materials for new projects, expansion, shutdown applications, maintenance, to name a few.

Continuous improvements is a way of life.

At Chhajed our knowledge of International Standard & specification, expertise in workmanship and responsibilities towards our customers which are the main elements of our mission.

We have very ambitions plans to expand our activities & further build good source to improve quality and reduce costing with fastest delivery, looking at the huge demand of our products.

At the same time we at Chhajed are building up quality systems in the line of International Standards.

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PIPES & TUBES

Stainless Steel Seamless & ERW Tubes for Boilers, Super Heaters, Heat Exchangers and Condensers as per ASTM A 213, A 249, A 271 & A 688 Gr. TP 201, 202, 304, 304L, 304H, 304LN, 309, 309S, 309H, 310S, 310H, 316, 316L, 316H, 316LN, 317, 317L, 321, 321H, 347, 347H, 348, 348H etc.

Stainless Steel Seamless & ERW Tubes and Pipes for High Temperature services as per ASTM A 269, A 312 & A 376 Gr. TP 304, 304L, 304H, 304LN, 309, 309S, 309H, 310S, 310H, 316, 316L, 316H, 316LN, 317, 317L, 321, 321H, 347, 347H, 348, 348H etc.

Stainless Steel ERW Large Diameter Pipes as per ASTM A 358 and A 409 Gr. TP 304, 304L, 304H, 304LN, 309, 309S, 309H, 310S, 310H, 316, 316L, 316H, 316LN, 316TI, 317, 317L, 321, 321H, 347, 347H, 348, 348H etc.

Alloy Steel Seamless Pipes & Tubes for High Temperature/Pressure services as per ASTM A 335 Gr. P1, P2, P5, P9, P11, P12, P22, P91; ASTM A 213 Gr. T2, T5, T11, T12 & T22 with IBR Test Certificate.Class with IBR Test Certificate.

Carbon Steel Seamless Pipes as per ASTM A 106 Gr. B, A 53 Gr. B, API 5L Gr. A, B, X42, X46, X52, X56 & X60 with IBR Test Certificate.

Carbon Steel Seamless Pipes & Tubes for Low Temperature services as per ASTM A 333 Gr. 1 & Gr. 6 with IBR TC.

Carbon Steel ERW & Seamless Boiler Tubes as per BS 3059 Part I Gr. 320, BS 3059 Part II Gr. 360, 440 & 620 with IBR Test Certificate.

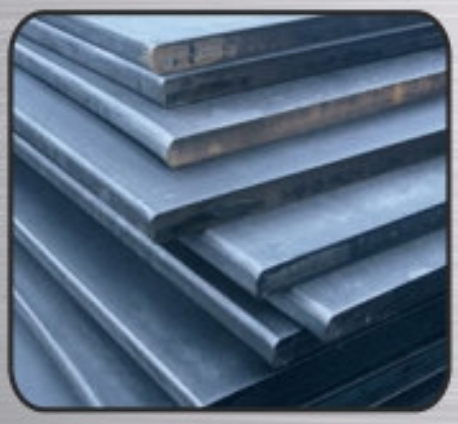
Carbon Steel Seamless Heat Exchangers Tubes as per ASTM A 179, ASTM A 210 Gr. A1 & ASTM A 192 with IBR Test Certificate etc.

CDW & ERW Air Heater Tubes as per IS 3601, BS 1775 & BS 6323.

MS ERW & Hot dipped Galvanised (G.I.) ERW Pipes as per IS 1239 & IS 3589 Gr. Fe 330 & 410.

SAW/EFW Pipes as per ASTM A 53 Gr. B, API 5L Gr. B & ASTM A 671, 672 & 691 in all Class with IBR Test Certificate.

SHEET & PLATES



Stainless Steel Sheets & Plates as per ASTM A240, Gr. TP 304, 304L, 304H, 304LN, 309, 309S, 309H, 310S, 310H, 316, 316H, 316LN, 316Ti, 317, 317L, 321, 321H, 347, 348, 348H, 409, 410, 420, 430, etc.

Alloy Steel Plates as per ASTM A387 Gr. 2,5,9,11,12 & 22 in class 1 & 2 ; ASTM A204, Gr. A & B DIN 17175, Gr. 15Mo3 & 16Mo3 with IBR Test Certificate.

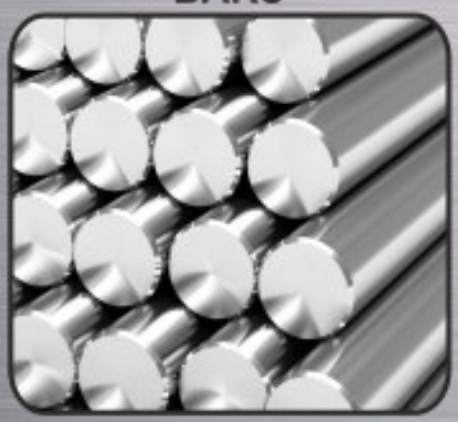
Carbon Steel / Boiler Quality Plates as per IS 2062 Gr. A, B & C, IS 2002 Gr. 1 & 2 ASTM A516 Gr. 60 & 70, ASTM A515 Gr.70

UTTAM HARD / SAILHARD / TISCRAL / JINDAL HARD 200BHN, 400, 450, 500, 600 BHN (HARDOX, ABREX, QUARD, RAEX, JFE, XAR, SIDUR, ROCKSTAR, DILLIDUR)

SAILMA HIGH STRENTH STRUCTURAL STEEL Sailma 300, 300HI, 350, 350HI, 410, 410HI, 450, 450HI, E350, S355J2+N, E350 C

HIGH STRENTH STRUCTURAL STEEL PLATES S690QL, STRENX 700, DOMEX 700, S700MC, WELTEN 780E, HITEN 780

BARS



Stainless Steel Bars as per ASTM A276, A314, A582, A479 & A484 Gr. TP 304, 304L, 304H, 304LN, 309, 309S, 309H, 310S, 310H, 316, 316L, 316H, 316LN, 316Ti, 317, 317L, 321, 317L, 321, 321H, 347, 347H, 348, 348H, 409, 410, 420, 430, 440 etc.

Alloy Steel Bars as per ASTM A 182, Gr. F1, F2, F5, F9, F11, F12, F22, F91 etc.

Carbon Steel Bars as per ASTM A 105, IS 2062 Gr. A & B, EN Series etc.

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BUTT-WELD FITTINGS

Stainless Steel Fittings for High Temperature Services as per ASTM A403 Gr. Wp 304, 304L, 304H, 304LN, 309, 309S, 309H, 310S, 310H, 316, 316L, 316H, 316LN, 317, 317L, 321, 321H, 347, 347H, 348, 348H etc.

Alloy Steel Fittings for Moderate & Elevated Temperature Services as per ASTMA 234Gr.WP1, WP2, WP5, WP9, WP11, WP12, WP22 & WP91 in CL-1, CL-2 & CL-3.

Carbon Steel Fitting for Moderate & Elevated Temperature Services as per ASTM A234 Gr. WPB & WPC.

Carbon Steel Fitting for Low Temperature Services as per ASTM A420 Gr. WPL3 & WPL6.
Butt-Welding Fitting such as Long/Short Radius Elbows, Equal/Unequal Tees, Concentric/Eccentric Reducers, Caps, Cross, Short/Long Neck Stub-Ends, Long Piggable Bends 3D/5D/6D/8D upto 22D, S/J/U/Expansion Bends & Swivels are manufactured according to ANSI B 16.9, B16.28, MSS SP-43 & MSS SP-95 etc.

FORGED FITTINGS

Stainless Steel Forged Socket Weld, Screwed Fittings & Flanges for High Temperature Services as per ASTM A 182 Gr. F304, 304L, 304H, 304LN, 309, 309S, 309H, 310S, 310H, 316, 316L, 316H, 316LN, 317, 317L, 321, 321H, 347, 347H, 348, 348H etc.

Alloy Steel Forged Socket Weld, Screwed Fittings & Flanges for high Temperature Services as per ASTM A 182 Gr.F1, F2, F5, F9, F11, F12, F22 & F91.

Carbon Steel Forged Socket Weld, Screwed Fittings & Flanges for Elevated Temperature Services as per ASTM A 105.

Carbon Steel Forged Socket Weld, Screwed Fittings & Flanges for Low Temperature Services as per ASTM A 350 Gr. LF1, LF2, LF3, LF5, LF6 & LF9.

Forged Fittings such as Elbows, Equal/Unequal Tees, Concentric/Eccentric Reducers, Full/Half Couplings, Reducing Coupling, Caps, Cross, Unions, Hex/Reducing/Flash Bushings, Plugs, Nipples, Swage Nipples, Concentric/Eccentric Swages, Reducer Insert, Boss, Laterals, Street Elbows & Outlets/Branch Connections (Weldolets, Thredolets, Sockolets, Flangeolets, Latrolets, Elbowlets, Sweepolets, Insert Weldolets, Nippolets, Brazolets, Couplets) are manufactured according to ANSI B 16.11, BS3799, MSS SP-79, MSS SP-97 & MSS SP-95 etc.

FLANGES

Flanges such as SORF, SOFF, SOLJ, SWRF, SWFF, WNRF, WNFF, WNRTJ, LWNRF, BLRF,BLFF, BLRTJ, Threaded, Spactacle Blind, Orifice & Studding Outlet are manufactured according to ANSI B 16.5, B 16.47 Series A (MSS SP-44),B 16.47 Series B (API 605), MSS SP-43, DIN 2527, DIN 2576, DIN 2632, DIN 2633, DIN 2634, DIN 2635, DIN2642, BS-10, IS 1538 & IS 6392 etc.

Fasteners & Gaskets for Flanges can be supplied upon customer's request.

Pipes, Tubes, Pipe-Fittings, Forged Fittings, Flanges, Sheets, Plates & Bars also available in **HEAT & CORROSION RESISTANCE METALS, like INCONEL, INCOLOY, HASTELLOY, MONEL, NICKEL, NIMONIC, ALLOY-20, ALLOY-904L, TITANIUM, TANTALUM & NON-FERROUS METALS like ALUMINIUM, COPPER, BRASS, CUPRO-NICKEL.**

MATERIALS CAN BE SUPPLIED AS PER CUSTOMER'S SPECIAL REQUIREMENTS / DIMENSIONS / DRAWINGS / SPECIFICATION & VARIOUS OTHER NATIONAL & INTERNATIONAL STANDARDS.

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CHHAJED Steel & Alloys Pvt. Ltd.

ABRASION RESISTANT PLATES

Abrasion resistant steel is used in areas where there is likely to be a high degree of abrasion or wear of the steel plate. Typical applications are in beds, attachments to diggers and earth movers and in processing applications in the mining industry.

The key quality for wear resistant steels is their hardness. We sell wear plate according to its hardness measured on the Brinell Hardness Test-usual 400HB grades.400HB steel is over 3 times harder than mild steel (120HB), but only a third as stainless steel (150HB). Example uses are for construction machinery, skips, bulldozers and excavators, buckets & conveyors.

It is not registered at International standard association such as ASTM, JIS, DIN. So each manufacturer has their own Brand name like HARDOX, ABREX, ROCKSTAR, RAEX, JFE, XAR, BIS. Grades of AR Plates Brand Names & Chemical Composition.

200 BRINEL WEAR RESISTANT STEELS - LINER PLATES

	CHEMICAL COMPOSITION						MECHANICAL PROPERTIES
GRADE	C% max	Mn% max	P% max	S% max	Si% max	CE max	
SAILHARD/ TISCRAL UTTAM HARD	0.23	1.6	0.050	0.050	0.50	-	HARDNESS - 200 BHN (MIN) BRANDS - LAS O7 / TISCRAL / UTTAM HARD / SAIL HARD / JINDAL HARD
Al 3.10 max, Cr. 0.65 max, Nb +V+Ti 0.15 max							

HARDOX WEAR RESISTANT STEELS

GRADE	Plate Thickness mm	CHEMICAL COMPOSITION IN % (Max)									Typical Values		
		C	Si	P	S	Mn	Ni	Cr	Mo	B	Hardness HB	Ys Mpa	UTS Mpa
HARDOX 400	2-130	0.32	0.70	0.025	0.010	1.60	1.50	2.40	0.60	0.004	370-430	1000	1250
HARDOX 450	0.7-130	0.26	0.70	0.025	0.019	1.60	1.50	1.40	0.60	0.005	390-475	1200	1400
HARDOX 500	2-103	0.30	0.70	0.020	0.010	1.60	1.50	1.50	0.60	0.005	450-540	1250	1400
HARDOX 600	3-65	0.47	0.70	0.015	0.010	1.50	2.50	1.20	0.70	0.005	550-640	-	-

400 BRINEL WEAR RESISTANT STEELS

GRADE	Plate Thickness mm	CHEMICAL COMPOSITION IN % (Max)									Typical Values		
		C	Si	P	S	Mn	Ni	Cr	Mo	B	Hardness HB	Ys Mpa	UTS Mpa
JFE 400	5-100	0.17	0.55	0.020	0.010	1.60	-	0.40	0.35	0.004	361-440	1058	1308
ABREX 400	5-100	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	6-100	0.20	0.80	0.025	0.010	1.50	-	1.00	0.50	0.005	360-440	1050	1250
ROCKSTAR 400	6-100	0.16	0.70	0.025	0.010	1.60	0.25	0.50	0.25	0.004	370-430	1000	1200
CREUSABRO 4800	8-100	0.20	-	0.018	0.005	1.60	0.20	1.90	0.40	-	340-400	900	1200

500 BRINEL WEAR RESISTANT STEELS

GRADE	Plate Thickness mm	CHEMICAL COMPOSITION IN % (Max)									Typical Values		
		C	Si	P	S	Mn	Ni	Cr	Mo	B	Hardness HB	Ys Mpa	UTS Mpa
ABREX 500	5-100	0.35	0.70	0.015	0.010	2.00	1.00	1.20	0.60	0.005	450-550	1373	1552
JFE 500	6-100	0.29	0.55	0.200	0.010	1.60	-	1.20	0.50	0.004	460-540	1203	1681
XAR 500	4-100	0.28	0.80	0.025	0.010	1.50	-	1.00	6.5	0.005	450-530	1500	1600
ROCKSTAR 500	6-100	0.30	0.70	0.0025	0.010	1.60	1.50	1.50	0.70	0.004	450-540	1250	1500
CREUSABRO 8000	5-100	0.28	-	0.018	0.005	1.6	1.0	1.6	0.40	-	470	1250	1630

We almost supply everything in Steel

CHHAJED Steel & alloys pvt. ltd.

QUENCHED & TEMPERED STEEL

STRENX 700 / 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

STRENX 700E

Grade	Thickness mm	CHEMICAL COMPOSITION IN % (Max)										Typical Values	
		C	S	Si	P	Mn	Ni	Cr	Mo	B	Aj	V	Ys Mpa	UTS Mpa
STRENX 700E	4-160	0.2	0.01	0.6	0.02	1.6	2	0.6	0.7	0.005	0.015	-	700	780-900
DILLIMAX 690 E	6-200	0.18	0.010	0.50	0.020	1.60	1.80	1.50	0.60	0.004	-	-	690	770-940
NAXTRA 700	4-150	0.20	0.010	0.08	0.020	1.60	-	1.5	0.6	-	-	-	700	770-940
RQT 701	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
WELDOX 700 E	4.0-50	0.20	0.010	0.60	0.020	1.60	2	0.70	0.70	0.005	0.015	0.09	700	780-930
HITEN 780 LE	5-200	0.20	0.015	0.40	0.025	1.40	-	0.20	0.15	0.005	-	0.08	685	780-930
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
S690QL	3-150	0.18	0.01	0.50	0.02	1.60	1.15	1.00	0.60	0.005	-	0.1	690	790-940

SAILMA PLATES

It's A high Strength Micro Alloy Structural Steel Semi-killed. Hardness Available

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 bend.
300	0.25	1.5	0.055	0.055	-	-	300	440-560	20	3T
300Hi	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
350Hi	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
410Hi	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
450Hi	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° C for 300HI, 450HI at 0° C, 30J at-20° C for 350HI, 35J at-0° C, 25J at-20° C for 410 HI, 3J at-20° C, 20J at-20° C for 450HI. Impact will be given for any one temperature for 450 HI impact is for > 10 mm. For < 12mm. Impact to be given only specified.		

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WORK-HARDENING STEEL PLATE (MANGANESE STEEL PLATES)

A high manganese, fully austenitic, quench annealed, non magnetic, work-hardening steel with on exceptionally high level of wear resistance when subjected to work-harding 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) Mn13

C	Si	Mn	S	P
1.13	0.40	12-14	0.003	0.20

MECHANICAL PROPERTIES

	Hardness HB	Yield Strength	UTS MPa	El%	KCV 20°O (68°P)-J
Typical Values	220	380 (55 KSI)	940 (136 KSI)	40	⩾ 112 J (⩾ 83 ft. lbs)
Guaranteed Values*	180/245	350 (51 KSI)	800 (116 KSI)	30	64 J (47 ft. lbs)

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PROTECTION / ARMOUR PLATES

Series 500 - standard 500HB ARMOUR plates with good welding and bending properties.

CHEMICAL COMPOSITION

ARMOUR	Thickness [mm]	C	Si	Mn	P	S	Cr	Ni	Mo	B
500	6.5 – 60	0.30	1.3	0.8	0.02	0.003	0.8	1.5	0.5	0.004
All values are in max. %										

TYPICAL MECHANICAL PROPERTIES

	Tensile properties				Impact properties		Hardness
ARMOUR	Thickness [mm]	Yield strength $R_{p\,0.2}$ [MPa]	Tensile strength Rm [MPa]	Elongation A5 [%]	Test temperature [°C]	Impact energy Charpy V transverse [J]	HB
500	6.5 - 60	1200	1700	10	-20	25	480 - 530

Impact test:
According ISO 148 – 1 (one test per thickness of each heat)
Impact result is average of three tests in transvers to rolling direction with standard V - notch.
For the thicknesses below 12mm subsize – recalculated values are used.

Tensile test:
According to EN ISO 6892 -1 (one test per thickness of each heat)
Hardness test:
Brinell testing according EN ISO 6506 – 1 (one test per mother plate)

Dimensions ARMOUR 500 is supplied in plates from thicknesses 6.5-60mm.

Series 600 - steel with high hardness and toughness for superb ballistic performance.

CHEMICAL COMPOSITION

ARMOUR	Thickness [mm]	C	Si	Mn	P	S	Cr	Ni	Mo	B
600	6.5 – 60	0.45	1.0	0.8	0.02	0.003	0.9	3.5	0.5	0.004
All values are in max. %										

TYPICAL MECHANICAL PROPERTIES

	Tensile properties				Impact properties		Hardness
ARMOUR	Thickness [mm]	Yield strength $R_{p\,0.2}$ [MPa]	Tensile strength Rm [MPa]	Elongation A5 [%]	Test temperature [°C]	Impact energy Charpy V transverse [J]	HB
600	6.5 – 60	1500	2100	9	-40	20	601-650

Impact test:
According ISO 148 - 1 (one test per thickness of each heat)
Impact result is average of three tests in transvers to rolling direction with standard V - notch.
For the thicknesses below 12mm subsize – recalculated values are used.

Tensile test:
According to EN ISO 6892 -1 (one test per thickness of each heat)
Hardness test:
Brinell testing according EN ISO 6506 – 1 (one test per mother plate)

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ALLOY STEEL CHROME MOLY PLATES AS PER ASTM & EN STANDARDS -387

ASME SA 387/ ASTM A 387	Chemical Composition, % Grade and UNS Number															
	Carbon: Heat analysis Product analysis	Manganese max: Heat analysis Product analysis	Phosphorus max: Heat analysis Product analysis	Sulfur: 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	Zirconium 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	0.30-0.60	0.035	0.035	0.50 max	2.00-2.50	0.90-1.10	-	-	-	-	-	-	-	-
K21590	0.04-0.15	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	0.15 max	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	0.15 max	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

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	Grades 11	Grades 22, 21, 5, 9, 21L, 22L
Tensile strength, ksi (Mpa)	55 to 80 (380 to550)	60 to 85 (415 to585)	60 to 85 (415 to585)
Yield strength, min, ksi (Mpa)	33 (230)	35 (230)	30 (205)
Elongation in 8 in. (200 mm), Min, %A	19	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	Grades 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 90 (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 purchase is included in specification A 20/A 20M. Several of those considered suitable for use with this specification are available. Other tests may be performed by agreement between the supplier and the purchaser.

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

Designation	%Chemical Composition									Heat Treatment	Tensile Strength			Elongation % min	
	C Max	Si	Mn	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
A 537 Class1	0.24	0.15-0.50	0.70-1.35	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 Class2	0.24	0.15-0.50	0.70-1.35	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	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

WEATHER RESISTANT STEELS (CORTEN STEEL)

PRODUCT DESCRIPTION

Cor-ten Steel oxidizes naturally over time, giving it an orange-brown color and a rough and granular texture. It has a very high tensile strength, and in spite of its rusted appearance it is actually more resistant to damaging corrosion than standard forms of carbon steel. Cor-ten is a combination of alloys that through the chemical interaction of weather and steel, prevents rust from penetrating the surface and creating rust holes. The steel actually forms a shield over the steel. Cor-ten is highly resistant to exposure-related corrosion once the initial oxidation process reaches saturation levels.

Weathering steel has become extremely popular in architectural applications for both residential and commercial project. It's used for both siding and roofing materials in corrugated, standing seam and plate cladding systems. Special care should be taken in detailing projects to allow for proper isolation of the material from incompatible substrates and to allow for proper runoff to avoid possible staining from early releases of iron oxide.

FEATURES & BENEFITS

- Weather resistant
- Maintenance-free
- Beautiful, aged patina that develops over time.

APPLICATIONS

- Roofing
- Facades
- Fences & gates
- Sculpture
- Rural building
- Gazebos
- Interior ceilings & accents

Chemical composition of steels with improved atmospheric corrosion resistance

Grade	C% max	Si% max	Min %	P %	S % max	N % max	Cr %	Cu %	V %	Ni %	Z %	Al %	Mo %	YS (Mpa) Min	UTS (Mpa) Min	El%(200mm) Min
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 Manufactuer Trademarks																
Cor-Ten A	0.12	0.25-0.75	0.20-0.50	0.07-0.15	0.03	-	0.50-1.25	0.25-0.55	-	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 respective product.

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M.S. STRUCTURE CHART

M.S. ANGLES

Size in mm.	Weight in kgs. per Feet	Weight in kgs. per Mtr.
20 X 20 X 3	0.274	0.899
25 X 25 X 3	0.335	1.099
25 X 25 X 5	0.548	1.798
30 x 30 x 3	0.400	1.400
35 X 35 X 5	0.792	2.599
40 X 40 X 3	0.548	1.798
40 X 40 X 5	0.915	3.002
40 X 40 X 6	1.066	3.498
45 x 45 x 4	0.800	2.700
45 x 45 x 5	1.000	3.400
45 x 45 x 6	1.220	4.000
50 x 50 x 4	0.700	2.300
50 X 50 X 5	1.158	3.799
50 X 50 X 6	1.372	4.502
65 x 65 x 4	1.200	4.000
65 x 65 x 5	1.500	4.900
65 X 65 X 6	1.767	5.798
65 X 65 X 8	2.346	7.697
65 X 65 X 10	2.864	9.397
75 x 75 x 5	1.700	5.700
75 X 75 X 6	2.072	6.798

M.S. ANGLES

Size in mm.	Weight in kgs. per Feet	Weight in kgs. per Mtr.
75 x 75 x 8	2.712	8.898
75 x 75 x 10	3.352	10.998
90 x 90 x 6	2.499	8.199
90 x 90 x 8	3.292	10.801
90 x 90 x 10	4.094	13.400
100 x 100 x 6	2.804	9.200
100 x 100 x 8	3.687	12.097
100 x 100 x 10	4.545	14.912
100 x 100 x 12	5.395	17.701
110 x 110 x 8	4.080	13.40
110 x 110 x 10	5.028	16.497
110 x 110 x 12	5.970	19.6
130 x 130 x 8	4.850	15.9
130 x 130 x 10	6.004	19.699
130 x 130 x 12	8.810	28.9
150 x 150 x 10	6.950	22.803
150 x 150 x 12	8.290	27.199
150 x 150 x 16	10.911	35.799
150 x 150 x 20	13.441	44.100

M.S. BEAMS

Size in mm.	Weight in kgs. per Feet	Weight in kgs. per Mtr.
100 X 50	2.432	7.979
125 X 70	4.023	13.199
150 X 75	4.571	14.997
175 X 85	5.943	19.499
200 X 100	7.893	25.897
250 X 125	11.612	38.099
300 X 140	14.782	48.500
350 X 140	16.125	52.906
400 X 140	19.080	62.601
450 X 150	22.280	73.100
500 X 180	26.730	87.700
600 X 210	37.370	122.660

M.S. UNEQUAL ANGLES

Size in mm.	Weight in kgs. per Mtr.
45 x 30 x 5	2.8
75 X 50 X 6	5.6
75 X 50 X 8	7.4
75 X 50 X 10	9.0
100 x 75 x 6	8.0
100 X 75 X 8	10.5
100 X 75 X 10	13.0
125 x 75 x 6	9.2
125 X 75 X 8	12.1
125 X 75 X 10	14.9
150 x 75 x 8	13.7
150 x 75 x 10	16.9
150 x 75 x 12	20.1
150 x 115 x 10	20.0
150 x 115 x 12	23.5

M.S. CHANNELS

Size in mm.	Weight in kgs. per Feet	Weight in kgs. per Mtr.
75 X 40	2.172	7.126
100 X 50	2.925	9.597
125 X 65	3.992	13.098
150 X 75	5.120	16.799
175 X 75	5.973	19.597
200 X 75	6.796	22.298
250 X 80	9.326	30.599
300 X 90	11.063	36.298
400 X 100	15.270	50.300

M.S. ROUNDS & SQUARES

Size in mm.	Round Kg. / P. Mtr.	Square Kg. / P. Mtr.
5.0	0.15	0.20
5.5	0.19	0.38
6.0	0.22	0.28
7.0	0.30	0.38
8.0	0.39	0.5
9.0	0.50	0.64
10.0	0.62	0.78
11.0	0.75	0.95
12.0	0.89	1.13
14.0	1.20	1.50
16.0	1.58	2.01
18.0	2.0	2.54
20.0	2.47	3.14
22.0	3.00	0.90
24.0	3.56	-
25.0	2.98	3.80
27.0	4.48	-
28.0	4.83	6.15
30.0	5.55	-
32.0	6.31	8.04
33.5	6.92	-
34.0	7.14	-

M.S. ROUNDS & SQUARES

Size in mm.	Round Kg. / P. Mtr.	Square Kg. / P. Mtr.
36.00	7.99	10.17
40	9.86	12.59
42	10.87	-
45	12.49	15.9
47	13.62	-
50	15.41	19.62
53	17.32	-
56	19.34	24.62
60	22.20	-
63	24.47	31.16
67	27.68	-
71	31.80	39.57
80	39.46	50.24
90	49.94	63.58
100	81.66	78.50
110	74.60	94.98
125	96.34	122.66
140	120.84	153.86
160	157.84	200.95
180	200.00	254.34
200	246.62	324.00

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Globe Valve

BS 5352 / BS 6755 / BS 1873 / BS 6755 / ASME B 16.4 / DIN 3356
Stainless Steel (BAR STOCK)
Rating : 150# / 300 #
Size : 8mm to 100 mm
Forged Carbon Steel / S. Steel
Rating : 150# / 300# / 800# / 1500#
Size : 15mm to 50 mm

Cast Carbon Steel S. Steel /Alloy Steel
Rating : 125# / 150#
Size : 25mm to 600 mm
Cast Iron
Rating : 150# / 300# / 600# / 900#
Size : 15mm to 400 mm

	FORGED RANGE	CAST RANGE
Design (mfg.) Std.	BS 5352	BS 1873 / DIN 3356
Test (Inspection) Std.	BS 6755	BS 6755

Strainer

Cast Carbon Steel
Design : Y type (PN 40 / DIN 3356/ (BS 1873)
Size : 15mm to 80 mm
Stainless Steel (BAR STOCK)
Design : Y type (150#)
Ends : Screwed / Socketweld
Size : 15mm to 80 mm

Cast Iron
Design : Y type (150#)
Ends : Screwed / Flanged
Size : 15mm to 300 mm
Design : POT type
Ends : Flanged
Size : 40mm to 300 mm
Design : T type (Dirt Box)
Ends : Flanged
Size : 25 mm to 300 mm

Gate Valve

BS 1414 / BS 5352 / API 600 / API 602 API 6D / ASME B 16.34 / API 598
Stainless Steel (BAR STOCK)
Rating : 150# / 300 #
Size : 8mm to 100 mm
Forged Carbon Steel / S. Steel
Rating : 150# / 300# / 800# / 1500#
Size : 15mm to 50 mm

Cast Iron
Rating : 125# / 150#
Size : 25mm to 600 mm
Cast Carbon Steel S. Steel/ Alloy Steel
Rating : 150# / 300# / 600# / 900#
Size : 15mm to 600 mm

	FORGED RANGE	CAST RANGE
Pressure / Temp Rating	ANSI B 16.4 / API 6D	ANSI B 16.4
Design (mfg.) Std.	API 602 / BS 5352	API 600 / API 6D
Test (Inspection) Std.	API 598 / BS 6755	API 598 / API 6D

Butterfly Valve

API 609 / BS 5155 / IS 13095
Mfg. Std. : BS 3155 / AWWA C 504 / API 609 / IS 13095
Test Std. : BS 5155 / BS 6755

Cast Carbon Steel
Operation : Lever / Manual Gear
Design : Sureseal / Replaceable / Rubber Lining
Ends : Water type
Size : 40 mm to 500 mm
Design : Offset Disc
Operation : Lever / Gear (ISI marked)
Ends : Water type/ Double / Flanged / Lugged type
Size : 350 mm to 1200 mm

Cast Iron
Design : Sureseal / Replaceable / Rubber Lining
Ends : Water type
Size : 40 mm to 300 mm

Stainless Steel
Design : Offset Disc
Operation : Lever / Manual Gear / Motorised Gear
Ends : Water type
Size : 40 mm to 300 mm

Non Return Valve

BS 6755 / BS 1868 / ASME B 16.34 / API 6D
Stainless Steel (BAR STOCK)
Rating : 150# / 300 #
Size : 8mm to 100 mm
Forged Carbon Steel / S. Steel
Rating : 150# / 300# / 800# / 1500#
Size : 15mm to 50 mm

Cast Iron
Rating : 125# / 150#
Size : 25mm to 400 mm
Cast Carbon Steel S. Steel /Alloy Steel
Rating : 150# / 300# / 600# / 900#
Size : 15mm to 600 mm

	FORGED RANGE	CAST RANGE
Design (mfg.) Std.	BS 5352	BS 1873 / API 6D
Test (Inspection) Std.	BS 6755	BS 6755 / API 6D

Ball Valve

Cast Iron
Design : 1 PC / 3 PC
Ends : Screwed / Socketweld / Flanged
Size : 15 mm to 100 mm
Cast Carbon Steel / Polypropylene
Design : Screwed / Socketweld / Flanged
Size : 15 mm to 400 mm
Stainless Steel
MOC : SS 304 / 316 (Bar stock)
Design : 1 PC / 3 PC
Ends : Screwed / Socketweld / Flanged
Size : 6 mm to 100 mm

Diaphram Valve

Cast Iron / SS 304 / 316
Lining : Natural rubber / Ebonite / Neoprene / Nitrile
Size : 15mm to 200 mm
Ends : Screwed / Flanged / Triclover

Also available

1. Check Valve
2. Plug Valve
3. Needle Valve
4. Safety Relief Valve
2. SluiceValve
3. Pressure Reducing Valve

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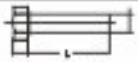
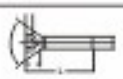
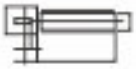
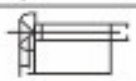
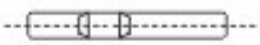
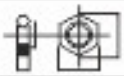
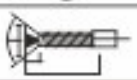
M.S./ HIGH TENSILE / HOT DEEP GALVANIZED FASTENERS PRODUCT RANGE CHART
SS-202 / 304 / 316 STAINLESS STEEL FASTENERS PRODUCT RANGE CHART

PRODUCT	FIGURE	SIZE RANGE			
		M.S.		S.S.	
		METRIC	INCH	METRIC	INCH
HEXAGONAL HEAD SCREWS		M3 TO M56	3/16" TO 2"	3 TO 20	3/16 TO 3/4
HEXAGON NUTS		M3 TO M56	3/16" TO 2"	N.A	N.A
SOCKET HEAD CAP SCREWS		M3 TO M24	3/16" TO 1"	4 TO 12	3/16 TO 3/8
BUTTON HEAD CAP SCREWS		M3 TO M20	3/16" TO 3/4"	6 TO 12	1/4 TO 3/8
ALLEN CSK SCREWS		M3 TO M20	3/16" TO 3/4"	4 TO 12	3/16 TO 3/8
SLOTTED CHEESE HEAD SCREWS		M1.6 TO M12	1/8" TO 1/2"	4 TO 12	3/16 TO 3/8
SLOTTED CSK SCREWS		M1.6 TO M12	1/8" TO 1/2"	4 TO 12	3/16 TO 1/2
PHILIPS PAN HEAD SCREWS		M2 TO M14	N.A	4 TO 12	3/16 TO 1/2
PHILIPS CSK HEAD SCREWS		M1.6 TO M12	3/16" TO 1/2"	4 TO 12	3/16 TO 1/2
PLAIN WASHERS		M3 TO M56	1/8" TO 2 1/2"	3 TO 20	3/16 TO 3/4
SPRING WASHERS FLAT SECTION		M3 TO M56	1/8" TO 1 1/2"	3 TO 20	3/16 TO 3/4
THREADED BARS		M3 TO M56	3/16" TO 2"	6 TO 12	5/16 TO 1/2
STUD BARS		M6 TO M12	1/4" TO 1/2"	6 TO 12	1/4TO 1/2
LOCK NUTS		M3 TO M24	3/16" TO 1"	5 TO 20	1/4 TO 3/4
SQUARE NUTS		M5 TO M10	1/4" TO 5/16"	5 TO 20	1/4 TO 3/4
SELF TAPPING SCREWS		NO.2 TO 14	N.A	NO.4 TO 12	LENGTH 9.5 TO 50
WOOD SCREWS		NO.2 TO 14	N.A	NO.4 TO 12	LENGTH 9.5 TO 100

Special Note : We can also manufacture as per your drawings & any special tailor made items.

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MILD STEEL PIPES DIMENSIONS & TOLERANCE

MILD STEEL PIPES (CONFIRM TO IS 1239)								
NB	NB	OD	Light		Medium		Heavy	
			Thick	Weight	Thick	Weight	Thick	Weight
MM	IN	MM	MM	kg/mtr.	MM	kg/mtr.	MM	kg/mtr.
6mm	1/8"	10.32	1.80	0.361	2.00	0.407	2.65	0.493
8mm	1/4"	13.49	1.80	0.517	2.35	0.650	2.90	0.769
10mm	3/8"	17.10	1.80	0.674	2.35	0.852	2.90	1.020
15mm	1/2"	21.43	2.00	0.952	2.65	1.122	3.25	1.450
20mm	3/4"	27.20	2.35	1.410	2.65	1.580	3.25	1.900
25mm	1"	33.80	2.65	2.010	3.25	2.440	4.05	2.970
32mm	11/4"	42.90	2.65	2.580	3.25	3.140	4.05	3.840
40mm	11/2"	48.40	2.90	3.250	3.25	3.610	4.05	4.430
50mm	2"	60.30	2.90	4.110	3.65	5.100	4.47	6.170
65mm	21/2"	76.20	3.25	5.840	3.65	6.610	4.47	7.900
80mm	3"	88.90	3,25	6.810	4.05	8.470	4.85	10.100
100mm	4"	114.30	3.65	9.890	4.50	12.100	5.40	14.400
125mm	5"	139.70	—	—	4.85	16.200	5.40	17.800
150mm	6"	165.10	—	—	4.85	19.200	5.40	21.200

BIG DIAMETER ERW PIPES (CONFIRM TO IS 3589)								
Wall thickness mm	7"NB 193.7 Kg/Mtr.	8"NB 219.1 Kg/Mtr.	10"NB 273 Kg/Mtr.	12"NB 323.7 Kg/Mtr.	14"NB 355.6 Kg/Mtr.	16"NB 406.4 Kg/Mtr.	18"NB 454 Kg/Mtr.	20"NB 508 Kg/Mtr.
4.85	22.59	25.62	32.07	38.13	-	-	-	-
5.20	24.17	27.43	34.34	40.84	-	-	-	-
5.60	26.00	29.28	36.93	43.93	48.11	-	-	-
6.00	27.88	31.53	39.50	47.02	51.49	61.00	69.00	-
6.35	29.34	33.28	41.73	49.67	54.43	62.35	70.50	78.50
7.01	32.27	36.76	46.43	55.45	61.82	69.04	-	-
7.94	-	41.00	50.95	61.85	67.98	77.92	87.80	-
8.18	-	42.56	53.42	65.12	-	-	-	-
9.53	-	51.50	60.24	73.75	81.21	93.13	105.00	117.00
12.70	-	-	-	-	107.28	123.30	139.00	155.00

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CARBON STEEL & ALLOY STEEL PIPE DIMENSIONS ANSI B 36.10

Nominal Pipe size		O/D	Schedule 10		Schedule 20		Schedule 30		Schedule STD		Schedule 40		Schedule 60		Schedule XS		Schedule 80		Schedule 100		Schedule 120		Schedule 140		Schedule 160		Schedule XXS	
MM	INCH	MM	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M
3	1/8	10.3	-	-	-	-	-	-	1.73	0.37	1.73	0.37	-	-	2.41	0.47	2.41	0.47	-	-	-	-	-	-	-	-	-	-
6	1/4	13.7	-	-	-	-	-	-	2.24	0.63	2.24	0.63	-	-	3.02	0.80	3.02	0.80	-	-	-	-	-	-	-	-	-	-
10	3/8	17.1	-	-	-	-	-	-	2.31	0.84	2.31	0.84	-	-	3.20	1.10	3.20	1.10	-	-	-	-	-	-	-	-	-	-
15	1/2	21.3	-	-	-	-	-	-	2.77	1.27	2.77	1.27	-	-	3.73	1.62	3.73	1.62	-	-	-	-	-	-	4.78	1.95	7.5	2.55
20	3/4	26.7	-	-	-	-	-	-	2.87	1.69	2.87	1.69	-	-	3.91	2.20	3.91	2.20	-	-	-	-	-	-	5.56	2.90	7.82	3.64
25	1	33.4	-	-	-	-	-	-	3.38	2.50	3.38	2.50	-	-	4.55	3.24	4.55	3.24	-	-	-	-	-	-	6.35	4.24	9.1	5.45
32	1¼	42.2	-	-	-	-	-	-	3.56	3.39	3.56	3.39	-	-	4.85	4.47	4.85	4.47	-	-	-	-	-	-	6.35	5.61	9.7	7.77
40	1½	48.3	-	-	-	-	-	-	3.68	4.05	3.68	4.05	-	-	5.08	5.41	5.08	5.41	-	-	-	-	-	-	7.14	7.25	10.2	9.56
50	2	60.3	-	-	-	-	-	-	3.91	5.44	3.91	5.44	-	-	5.54	7.48	5.54	7.48	-	-	-	-	-	-	8.74	11.11	11.1	13.4
65	2½	73.0	-	-	-	-	-	-	5.16	8.63	5.16	8.63	-	-	7.01	11.41	7.01	11.41	-	-	-	-	-	-	9.53	14.92	14.0	20.4
80	3	88.9	-	-	-	-	-	-	5.49	11.3	5.49	11.3	-	-	7.62	15.3	7.62	15.3	-	-	-	-	-	-	11.13	21.35	15.24	27.7
90	3½	101.6	-	-	-	-	-	-	5.74	13.57	5.74	13.57	-	-	8.08	18.63	8.08	18.63	-	-	-	-	-	-	-	-	-	-
100	4	114.3	-	-	-	-	-	-	6.02	16.07	6.02	16.07	-	-	8.56	22.3	8.56	22.3	-	-	11.13	28.32	-	-	13.5	33.5	17.12	41.03
125	5	141.3	-	-	-	-	-	-	6.55	21.77	6.55	21.77	-	-	9.53	30.9	9.53	30.9	-	-	12.7	40.2	-	-	15.9	49.11	19.0	57.4
150	6	168.3	-	-	-	-	-	-	7.11	28.26	7.11	28.26	-	-	10.97	42.5	10.97	42.5	-	-	14.3	54.2	-	-	18.3	67.5	21.95	79.22
200	8	219.1	-	-	6.35	33.3	7.0	36.8	8.18	42.5	8.18	42.5	10.31	53.1	12.7	64.6	12.7	64.5	15.1	75.92	18.3	90.4	20.6	100.9	23.0	111.27	22.23	108.0
250	10	273.0	-	-	6.35	41.7	7.8	51.3	9.27	60.3	9.27	60.3	12.7	81.5	12.7	81.5	15.1	96.0	18.3	114.7	21.44	133.0	25.4	155.0	28.6	172.3	25.4	155.0
300	12	323.8	-	-	6.35	49.7	8.4	65.2	9.53	73.8	10.31	79.7	14.27	109.0	12.7	97.4	17.5	132.0	21.4	160.0	25.4	187.0	28.6	208.0	33.3	238.7	25.4	187.0
350	14	355.6	6.35	54.7	7.92	68.1	9.53	81.3	9.53	81.3	11.13	94.6	15.09	126.0	12.7	107.0	19.0	158.0	23.8	195.0	27.8	224.0	31.8	253.5	35.7	281.0	-	-
400	16	406.4	6.35	62.6	7.92	77.9	9.53	93.3	9.53	93.3	12.7	123.0	16.66	160.0	12.7	123.0	21.44	203.0	26.2	245.0	30.9	286.0	36.53	333.0	40.5	366.0	-	-
450	18	457.2	6.35	70.6	7.92	87.7	11.13	122.0	9.53	105.0	14.20	156.0	19.05	206.0	12.7	139.0	23.8	254.6	29.35	310.0	34.0	363.0	39.7	408.3	45.2	459.0	-	-
500	20	508.0	6.35	78.5	9.53	117.2	12.7	155.1	9.53	117.2	15.09	183.0	20.62	248.0	12.7	155.1	26.2	311.0	32.5	381.0	38.1	441.0	44.4	508.0	50.0	564.0	-	-
550	22	558.8	6.35	86.6	9.53	129.0	12.7	171.0	9.53	129.0	-	-	22.2	294.0	12.7	171.0	28.6	373.0	34.9	451.0	41.3	527.0	47.6	600.0	54.0	672.0	-	-
600	24	610.0	6.35	94.5	9.53	141.0	14.3	210.0	9.53	141.0	17.48	255.0	24.61	355.0	12.7	187.0	30.9	442.06	38.8	547.7	46.0	640.0	52.4	720.15	59.5	808.22	-	-
650	26	660.0	7.92	127.3	12.7	203.0	-	-	9.53	153.0	-	-	-	-	12.7	202.0												
700	28	711.0	7.92	137.4	12.7	218.0	15.88	272.0	9.53	165.0	-	-	-	-	12.7	218.0												
750	30	762.0	7.92	147.9	12.7	234.6	15.88	282.2	9.53	176.0	-	-	-	-	12.7	235												
800	32	812.8	7.92	157.9	12.7	250.6	15.88	312.0	9.53	168.2	17.48	342.0	-	-	12.7	251												
850	34	863.6	7.92	167.9	12.7	266.5	15.88	331.7	9.53	200.0	17.48	364.9	-	-	12.7	266												
900	36	914.4	7.92	176.9	12.7	282.4	15.88	352.2	9.53	212.0	19.05	420.6	-	-	12.7	282												

All Dimensions in millimeters. W.T. = Wall Thickness. KG/M = Kilograms per Meter.

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STAINLESS STEEL PIPE DIMENSIONS ANSI B 36.19

Nominal Pipe size		Outside Diameter	Schedule 5S		Schedule 10S		Schedule 20S		Schedule 40S		Schedule 80S		Schedule 160S		Schedule XXS	
MM	INCH	MM	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T.	KG/M	W.T	KG/M
3	1/8	10.3	1.2	0.26	1.24	0.28	1.5	0.33	1.73	0.37	2.41	0.47	-	-	-	-
6	1/4	13.7	1.2	0.37	1.65	0.49	2.00	0.58	2.24	0.63	3.02	0.80	-	-	-	-
10	3/8	17.1	1.2	0.47	1.65	0.63	2.00	0.74	2.31	0.84	3.20	1.10	-	-	-	-
15	1/2	21.3	1.65	0.80	2.11	1.00	2.30	1.07	2.77	1.27	3.73	1.62	4.78	1.94	7.47	2.55
20	3/4	26.7	1.65	1.02	2.11	1.28	2.55	1.52	2.87	1.69	3.91	2.20	5.56	2.90	7.82	3.64
25	1	33.4	1.65	1.30	2.77	2.09	2.55	1.94	3.38	2.50	4.55	3.24	6.35	4.24	9.09	5.45
32	1.1/4	42.2	1.65	1.65	2.77	2.70	3.00	2.90	3.56	3.39	4.85	4.47	6.35	5.61	9.70	7.77
40	1.1/2	48.3	1.65	1.90	2.77	3.11	3.00	3.35	3.68	4.05	5.08	5.41	7.14	7.25	10.15	9.55
50	2	60.3	1.65	2.39	2.77	3.93	3.00	4.24	3.91	5.44	5.54	7.48	8.74	11.11	11.07	13.44
65	2.1/2	73.0	2.11	3.69	3.05	5.26	4.00	6.81	5.16	8.63	7.01	11.41	9.53	14.91	14.02	20.39
80	3	88.9	2.11	4.51	3.05	6.45	4.00	8.37	5.49	11.29	7.62	15.27	11.1	21.30	15.24	27.68
100	4	114.3	2.11	5.84	3.05	8.36	4.50	12.18	6.02	16.07	8.56	22.32	13.49	33.54	17.12	41.03
125	5	141.3	2.77	9.47	3.40	11.57	5.00	16.80	6.55	21.8	9.53	30.97	15.88	49.11	19.05	57.43
150	6	168.3	2.77	11.32	3.40	13.82	6.35	25.36	7.11	28.26	10.97	42.56	18.25	67.53	21.95	79.22
200	8	219.1	2.77	14.78	3.76	19.96	6.35	33.31	8.18	42.55	12.7	64.64	23.01	111.27	22.23	107.92
250	10	273.1	3.40	22.61	4.19	27.78	6.35	41.77	9.27	60.31	12.7	81.55	28.58	172.33	25.40	155.15
300	12	323.8	3.96	31.24	4.57	36.00	6.35	49.70	9.53	73.85	12.7	97.43	33.32	238.68	25.40	186.90
350	14	355.6	3.96	34.34	4.78	41.30	7.92	67.90	11.13	94.54						
400	16	406.4	4.19	41.56	4.78	47.34	7.92	77.82	12.7	123.30						
450	18	457.2	4.19	46.81	4.78	53.32	7.92	87.74	14.27	155.86						
500	20	508.0	4.78	59.31	5.54	68.64	9.53	117.14	15.09	183.42						
600	24	610.0	5.54	82.57	6.35	94.52	9.53	141.11	17.48	255.41						

ASTM A 312 GR. TP 304/304L ()

ASTM A 312 GR. TP 316/316L ()

ASTM A 358 GR. TP 317L ()

All Dimensions in millimeters. W.T. = Wall Thickness. KG/M = Kilograms per Meter.

DIMENSIONS TOLERANCE ANSI B 36.10 / B 36.19

Tubes Specification ASTM	Nominal Pipe Size (mm)	Permissible variations in Outside Diameter (mm)		Permissible variations in THK	Permissible variations in Length (mm)		Straight tolerance
		Over	Under		Over	Under	Max. curvature in any metere Length
A 106 CS Seamless Pipe for High Temp.	3 to 40 Incl	0.4	0.8	-12.5%			Up to 125 mm O/D and 12 mm THK Pipe -0.76 mm
	Over 40 to 100 Incl.	0.8	0.8				
A 312 Seamless & Welded Austenitic SS Pipes	Over 100 to 200 Incl.	1.6	0.8				Over125 mm O/D to 200 mm O/D Inclusive -1.15 mm
	Over 200 to 450 Incl.	2.4	0.8				
A333 Seamless & Welded pipe for LT Service A 335 Seamless Ferritic Alloy Steel Pipe for High Temp. Service	Over 450 to 650 Incl.	3.2	0.8	Except for Welded pipe will filler Metal Added	6	0	Over 200 mm O/D to 324 mm O/D Inclusive -1.52 mm
	Over 650 to 850 Incl.	4.0	0.8				
	Over 850 to 1200 Incl.	4.8	0.8				
A 358 ERW Austenitic Cr-NiAs pipe for High Temp.serv.	All Sizes (upto 200 NB)	+0.5% (Based on Circum-ferencial Measurement)	-0.5%	-0.3 mm			3 mm 3/metres
A409 ERW Large Dia Austenitic Steel Pipes	450 to 750 (SCH 5 S & 10 S)	+0.2% +0.4% Based on Circumferential Measurement	+0.2% (For T<4.8mm) -0.4% (For T 4.8 mm)	-0.46 mm			4.8mm/3 metres

MATERIAL SPECIFICATION FOR PIPES & TUBES OF STAINLESS STEEL, ALLOY STEEL, CARBON STEEL & MILD STEEL.

PIPE SPECIFICATION	CHEMICAL PROPERTIES								MECHANICAL PROPERTIES			OTHERS
	C%	Mn%	P% (Max)	S% (Max)	Si%	Cr%	Ni%	Mo%	U.T.S. (Min) Mpa	Y.S. (Min) Mpa	ELONG. (Min) L T	
API 5L Gr. A	0.22 Max	0.90 Max	0.030	0.030	-	-	-	-	331	207	e=625 000 $A^{0.2}$ / $U^{0.9}$	For Seamless : C% Will be 0.028 for Gr. B to x 70 Mn% will be 1.40 for Gr. X65 to X 70
API 5L Gr. B	0.26 Max	1.20 Max	0.030	0.030	-	-	-	-	414	241		
API 5L Gr. X 42	0.26 Max	1.30 Max	0.030	0.030	-	-	-	-	414	290		
API 5L Gr. X 46	0.26 Max	1.40 Max	0.030	0.030	-	-	-	-	434	317		
API 5L Gr. X 52	0.26 Max	1.40 Max	0.030	0.030	-	-	-	-	455	359		
API 5L Gr. X 56	0.26 Max	1.40 Max	0.030	0.030	-	-	-	-	490	386		
API 5L Gr. X 60	0.26 Max	1.45 Max	0.030	0.030	-	-	-	-	517	414		
API 5L Gr. X 65	0.26 Max	1.65 Max	0.030	0.030	-	-	-	-	531	448		
API 5L Gr. X 70	0.26 Max	1.65 Max	0.030	0.030	-	-	-	-	565	483		
BS 3059 PT-I Gr. 320	0.16 Max	0.30-0.70	0.040	0.040	0.35 Max	-	-	-	320-480	195	25	
BS 3059 PT-II Gr. 360	0.17 Max	0.40-0.80	0.035	0.035	0.10-0.35	-	-	-	360-500	235	24	
BS 3059 PT-II Gr. 440	0.12-0.18	0.90-1.20	0.035	0.035	0.10-0.35	-	-	-	440-580	245	21	
BS 3059 PT-I Gr. 620	0.10-0.15	0.40-0.70	0.030	0.030	0.10-0.35	0.70-0.10	-	0.45-0.65	460-610	180	22	
BS 6323 Gr. 1	0.13 Max	0.60 Max	0.050	0.050	-	-	-	-	300	200	20	
BS 6323 Gr. 2	0.16 Max	0.70 Max	0.050	0.050	-	-	-	-	340	250	15	
BS 6323 Gr. 3	0.20 Max	0.90 Max	0.050	0.050	0.35 Max	-	-	-	400	300	12	
BS 1387	0.20 Max	1.20 Max	0.045	0.045	-	-	-	-	320-460	195	20	
DIN 17175 Gr. St 35.8	0.17 Max	0.40-0.80	0.040	0.040	0.10-0.35	-	-	-	225	360-480	25	
DIN 17175 Gr. St 45.8	0.21 Max	0.40-1.20	0.040	0.040	0.10-0.35	-	-	-	245	410-530	21	
DIN 17175 Gr. 17Mn4	0.14-0.20	0.90-1.20	0.040	0.040	0.20-0.40	0.30 Max	-	-	275	460-580	23	
DIN 17175 Gr. 19Mn5	0.17-0.22	1.00-1.30	0.040	0.040	0.30-0.36	0.30 Max	-	-	315	510-610	19	
DIN 17175 Gr. 15Mo3	0.12-0.20	0.40-0.80	0.035	0.035	0.10-0.35	-	-	0.25-0.35	275	550-600	22	
DIN 17175 Gr. 13CrMo44	0.10-0.18	0.40-0.80	0.035	0.035	0.10-0.35	0.70-1.10	-	0.45-0.65	295	440-590	22	
DIN 17175 Gr. 10CrMo910	0.08-0.15	0.40-0.70	0.035	0.035	0.50 Max	2.00-2.50	-	0.90-1.20	385	550-600	20	
DIN 17175 Gr. 13CrMo910	0.10-0.18	0.40-0.70	0.035	0.035	0.10-0.35	0.70-1.10	-	0.45-0.65	295	440-590	22	
DIN 17175 Gr. 14MoV63	0.10-0.18	0.40-0.70	0.035	0.035	0.10-0.35	0.50-0.70	-	0.50-0.70	325	460-610	20	V: 0.22-0.32
DIN 17175 Gr. X20CrMoV121	0.17-0.23	1.00 Max	0.030	0.030	0.50 Max	0.80-1.20	0.30-0.80	0.80-1.20	490	690-850	17	V: 0.25-0.35
IS 1239 Part I	-	-	0.050	0.050	-	-	-	-	320	-	20	
IS 3589 Gr. Fe 380	0.16 Max	1.20 Max	0.040	0.040	-	-	-	-	330	195	20	
IS 3589 Gr. Fe 410	0.20 Max	1.30 Max	0.040	0.040	-	-	-	-	410	235	18	
IS 1979 Gr. YST 290	0.28 Max	1.25 Max	0.040	0.050	-	-	-	-	410	290	e=1942 57 $A^{0.2}$ / $U^{0.9}$	
IS 1979 Gr. YST 320	0.30 Max	1.35 Max	0.040	0.050	-	-	-	-	430	320		
IS 1979 Gr. YST 360	0.30 Max	1.35 Max	0.040	0.050	-	-	-	-	450	360		
IS 1979 Gr. YST 390	0.26 Max	1.35 Max	0.040	0.050	-	-	-	-	490	390		
IS 1979 Gr. YST 410	0.26 Max	1.35 Max	0.040	0.050	-	-	-	-	520	410		
IS 1979 Gr. YST 450	0.26 Max	1.40 Max	0.040	0.050	-	-	-	-	530	450		
IS 1979 Gr. YST 480	0.26 Max	1.60 Max	0.040	0.040	-	-	-	-	565	480		
IS 1978 Gr. YST 210	0.22 Max	0.90 Max	0.040	0.050	-	-	-	-	330	210		
IS 1978 Gr. YST 240	0.27 Max	1.15 Max	0.040	0.050	-	-	-	-	410	240		

PIPES & TUBES ASTM / API / BS / DIN / IS

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MATERIAL SPECIFICATION FOR PIPES & TUBES OF STAINLESS STEEL, ALLOY STEEL, CARBON STEEL & MILD STEEL.

PIPE SPECIFICATION	CHEMICAL PROPERTIES								MECHANICAL PROPERTIES				OTHERS
	C%	Mn%	P% (Max)	S% (Max)	Si%	Cr%	Ni%	Mo%	U.T.S. (Min) Mpa	Y.S. (Min) Mpa	ELONG. (Min) L	ELONG. (Min) T	
ASTMA 312 Gr. TP 304	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	35	25	-
ASTMA 312 Gr. TP 304L	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-13.0	-	485	170	35	25	-
ASTMA 312 Gr. TP 304H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	35	25	-
ASTMA 312 Gr. TP 304LN	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-12.0	-	515	205	35	25	N%=0.10-0.16
ASTMA 312 Gr. TP 309S	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	22.0-24.0	12.0-15.0	0.75 Max	515	205	35	25	-
ASTMA 312 Gr. TP 310S	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	24.0-26.0	19.0-22.0	0.75 Max	515	205	35	25	-
ASTMA 312 Gr. TP 316	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.00-3.00	515	205	35	25	-
ASTMA 312 Gr. TP 316L	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	10.0-14.0	2.00-3.00	485	170	35	25	-
ASTMA 312 Gr. TP 316H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.00-3.00	515	205	35	25	-
ASTMA 312 Gr. TP 316LN	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.00-3.00	515	205	35	25	N%=0.10-0.16
ASTMA 312 Gr. TP 317	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	11.0-14.0	3.00-4.00	515	205	35	25	-
ASTMA 312 Gr. TP 317L	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	11.0-15.0	3.00-4.00	515	205	35	25	-
ASTMA 312 Gr. TP 321	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-12.0	-	515	205	35	25	Ti%=(5XC)-0.70
ASTMA 312 Gr. TP 321H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-12.0	-	515	205	35	25	Ti%=(4XC)-0.60
ASTMA 312 Gr. TP 347	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-13.0	-	515	205	35	25	Cb%=(10XC)-1.00
ASTMA 312 Gr. TP 347H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-13.0	-	515	205	35	25	Cb%=(8XC)-1.10
ASTMA 358 Gr. TP 304	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	18.0-20.0	8.0-10.5	-	515	205	40		N%=0.10 Max, HRB=92 Max
ASTMA 358 Gr. TP 304L	0.035 Max	2.00 Max	0.045	0.030	0.75 Max	18.0-20.0	8.0-12.0	-	485	170	40		N%=0.10 Max, HRB=92 Max
ASTMA 358 Gr. TP 309S	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	22.0-24.0	12.0-15.0	-	515	205	40		HRB=95 Max
ASTMA 358 Gr. TP 310S	0.080 Max	2.00 Max	0.045	0.030	1.50 Max	24.0-26.0	19.0-22.0	-	515	205	40		HRB=95 Max
ASTMA 358 Gr. TP 316	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	16.0-18.0	10.0-14.0	2.00-3.00	515	205	40		N%=0.10 Max, HRB=95 Max
ASTMA 358 Gr. TP 316L	0.035 Max	2.00 Max	0.045	0.030	0.75 Max	16.0-18.0	10.0-14.0	2.00-3.00	485	170	40		N%=0.10 Max, HRB=95 Max
ASTMA 358 Gr. TP 321	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	17.0-19.0	9.0-12.0	-	515	205	40		N%=0.10 Max, Ti%=5X(C+N)-0.70, HRB=95 Max
ASTMA 358 Gr. TP 347	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	17.0-19.0	9.0-13.0	-	515	205	40		Cb%=(10XC)-1.00, HRB=92 Max
ASTM A 106 Gr. A	0.25 Max	0.27-0.93	0.035	0.035	0.10 Min	0.40 Max	0.40 Max	0.15 Max	330	205	35	25	Cu%:0.40 Max, Va%: 0.08
ASTM A 106 Gr. B	0.30 Max	0.29-1.06	0.035	0.035	0.10 Min	0.40 Max	0.40 Max	0.15 Max	415	240	30	16.5	Cu%:0.40 Max, Va%: 0.08
ASTM A 106 Gr. C	0.35 Max	0.29-1.06	0.035	0.035	0.10 Min	0.40 Max	0.40 Max	0.15 Max	485	275	30	16.5	Cu%:0.40 Max, Va%: 0.08
ASTM A 53 Gr. A	0.25 Max	0.95 Max	0.050	0.045	-	0.40 Max	0.40 Max	0.15 Max	330	205	30	16.5	Cu%:0.40 Max, Va%: 0.08
ASTM A 53 Gr. B	0.30 Max	1.20 Max	0.050	0.045	-	0.40 Max	0.40 Max	0.15 Max	415	240	30	16.5	Cu%:0.40 Max, Va%: 0.08
ASTM A 333 Gr. 1	0.30 Max	0.40-1.06	0.025	0.025	-	-	-	-	380	205	35	25	Impact Test= -45 °C, J=18 Min, HRB=85 Max
ASTM A 333 Gr. 6	0.30 Max	0.29-1.06	0.025	0.025	0.10 Min	-	-	-	415	240	30	16.5	Impact Test=-45 °C, J=18 Min, HRB=85 Max
ASTM A 335 Gr. P1	0.10-0.20	0.30-0.80	0.025	0.025	0.10-0.50	-	-	0.44-0.65	380	205	30	20	
ASTM A 335 Gr. P2	0.10-0.20	0.30-0.61	0.025	0.025	0.10-0.30	0.50-0.81	-	0.44-0.65	380	205	30	20	
ASTM A 335 Gr. P5	0.15 Max	0.30-0.60	0.025	0.025	0.50 Max	4.00-6.00	-	0.45-0.65	415	205	30	20	
ASTM A 335 Gr. P9	0.15 Max	0.30-0.60	0.025	0.025	0.25-1.00	8.00-10.00	-	0.90-1.10	415	205	30	20	
ASTM A 335 Gr. P11	0.05-0.15	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	-	0.44-0.65	415	205	30	20	
ASTM A 335 Gr. P12	0.05-0.15	0.30-0.61	0.025	0.025	0.50 Max	0.80-1.25	-	0.44-0.65	415	220	30	20	
ASTM A 335 Gr. P22	0.05-0.15	0.30-0.60	0.025	0.025	0.50 Max	1.90-2.60	-	0.87-1.13	415	205	30	20	
ASTM A 335 Gr. P91	0.08-0.12	0.30-0.60	0.020	0.010	0.20-0.50	8.00-9.50	0.40 Max	0.85-1.05	620	440	20	-	V%=0.18-0.25, Ni%=0.030-0.070, Al%=0.02 Max, Cb%=0.06-0.10
ASTM A 213 Gr. T2	0.10-0.20	0.30-0.61	0.025	0.025	0.10-0.30	0.50-0.81	-	0.44-0.65	415	205	30		HRB=85 Max
ASTM A 213 Gr. T5	0.15 Max	0.30-0.60	0.025	0.025	0.50 Max	4.00-6.00	-	0.45-0.65	415	205	30		HRB=85 Max
ASTM A 213 Gr. T11	0.05-0.15	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	-	0.44-0.65	415	205	30		HRB=85 Max
ASTM A 213 Gr. T12	0.05-0.15	0.30-0.61	0.025	0.025	0.50 Max	0.80-1.25	-	0.44-0.65	415	220	30		HRB=85 Max
ASTM A 213 Gr. T22	0.05-0.15	0.30-0.60	0.025	0.025	0.50 Max	1.90-2.60	-	0.87-1.13	415	205	30		HRB=85 Max
ASTM A 179	0.06-0.18	0.27-0.63	0.035	0.035	-	-	-	-	325	180	35		HRB=72 Max
ASTM A 210 Gr. A1	0.27 Max	0.93 Max	0.035	0.035	0.10 Min	-	-	-	415	255	30		HRB=79 Max

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Stainless Steel Plates Chemical Compositions (%)

UNS Designation[A]	Type[B]	Carbon[C]	Manganese	Phos-phorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements[D]
AUSTENITIC (CHROMIUM-MANGANESE-NICKEL)												
N08904	904L[E]	0.020	2.00	0.045	0.035	1.00	19.00-23.00	23.00-28.00	4.0-5.0	0.10	1.0-2.0	...
S20200	202	0.15	7.50-10.0	0.060	0.030	1.00	17.00-19.00	4.00-6.00	...	0.25	...	...
S30400	304	0.07	2.00	0.045	0.030	0.75	17.50-19.50	8.00-10.50	...	0.10	...	...
S30403	304L	0.030	2.00	0.045	0.030	0.75	17.50-19.50	8.00-12.00	...	0.10	...	...
S30409	304H	0.045-0.10	2.00	0.045	0.030	0.75	18.00-20.00	8.00-10.50	...	...	...	...
S30453	304LN	0.030	2.00	0.045	0.030	0.75	18.00-20.00	8.00-12.00	...	0.10-0.16	...	...
S30908	309S	0.08	2.00	0.045	0.030	0.75	22.00-24.00	12.00-15.00	...	...	...	...
S31008	310S	0.08	2.00	0.045	0.030	1.50	24.00-26.00	19.00-22.00	...	...	...	...
S31600	316	0.08	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	0.10	...	...
S31603	316L	0.030	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	0.10	...	...
S31609	316H[F]	0.04-0.10	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	...	...	...
S31635	316Ti	0.08	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.0-3.0	0.10	...	Ti 5 x (C +N) min, 0.70 max
S31653	316LN	0.030	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	0.10-0.16	...	...
S31700	317[G]	0.08	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	0.10	...	...
S31703	317L	0.030	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	0.10	...	...
S31753	317LN	0.030	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	0.10-0.22	...	...
S32100	321	0.08	2.00	0.045	0.030	0.75	17.00-19.00	9.00-12.00	...	0.10	...	Ti 5 x (C+N) min, 0.70 max
S32109	321H	0.04-0.10	2.00	0.045	0.030	0.75	17.00-19.00	9.00-12.00	...	...	...	Ti 4 x (C+N) min, 0.70 max
S34700	347	0.08	2.00	0.045	0.030	0.75	17.00-19.00	9.00-13.00	...	...	...	Cb 10 x C min, 1.00 max
S34709	347H	0.04-0.10	2.00	0.045	0.030	0.75	17.00-19.00	9.00-13.00	...	...	...	Cb 8 x C min, 1.00 max
FERRITIC OR MARTENSITIC (CHROMIUM)												
S40500	405	0.08	1.00	0.040	0.030	1.00	11.50-14.50	0.60	...	...	...	Al 0.10-0.30
S41000	410	0.15	1.00	0.040	0.030	1.00	11.50-13.50	0.75	...	...	...	...
S41008	410S	0.08	1.00	0.040	0.030	1.00	11.50-13.50	0.60	...	...	...	...
S42900	429[G]	0.12	1.00	0.040	0.030	1.00	14.00-16.00	...	...	...	...	...
S43000	430	0.12	1.00	0.040	0.030	1.00	16.00-18.00	0.75	...	...	...	...
S43035	439	0.07	1.00	0.040	0.030	1.00	17.00-19.00	0.060	...	0.04	...	Ti 0.20 + 4 (C+ N) min; 1.10

* Although every care has been taken during the production of this brochure, we regret that we cannot accept any liability in respect of any incorrect information it may contain or any damages which may arise through the misinterpretation of its contents

Mechanical Test Requirements For Stainless Steel Plates

UNS Designation	Type[B]	Tensile Strength, min ksi	Tensile Strength, min MPa	Yield strength[H] (0.2% offset) min ksi	Yield strength[H] (0.2% offset) min MPa	Elongation in 2 in. or 50 mm, min, %	Hardness, max[I] Brinell	Hardness, max[I] Rockwell B	Cold Bend[J]
Austenitic (Chromium-Nickel) (Chromium-Manganese-Nickel)									
N08904	904L[K]	71	490	31	220	35.0	...	90	not required
S20200	202	90	620	38	260	40.0	241	...	...
S30400	304	75	515	30	205	40.0	201	92	not required
S30403	304L	70	485	25	170	40.0	201	92	not required
S30409	304H	75	515	30	205	40.0	201	92	not required
S30453	304LN	75	515	30	205	40.0	201	92	not required
S30908	309S	75	515	30	205	40.0	217	95	not required
S31008	310S	75	515	30	205	40.0	217	95	not required
S31600	316	75	515	30	205	40.0	217	95	not required
S31603	316L	70	485	25	170	40.0	217	95	not required
S31653	316LN	75	515	30	205	40.0	217	95	not required
S31609	316H	75	515	30	205	40.0	217	95	not required
S31635	316Ti[K]	75	515	30	205	40.0	217	95	not required
S31700	317	75	515	30	205	35.0	217	95	not required
S31703	317L	75	515	30	205	40.0	217	95	not required
S31753	317N	80	550	35	240	40.0	217	95	not required
S32100	321	75	515	30	205	40.0	217	95	not required
S32109	321H	75	515	30	205	40.0	217	95	not required
S34700	347	75	515	30	205	40.0	201	92	not required
S34709	347H	75	515	30	205	40.0	201	92	not required
S40500	405	60	415	25	170	20.0	179	88	180
S41000	410	65	450	30	205	20.0	217	96	180
S41008	410S	60	415	30	205	22.0[M]	183	89	180
S42900	429[K]	65	450	30	205	22.0[M]	183	89	180
S43000	430	65	450	30	205	22.0[M]	183	89	180
S43035	439	60	415	30	205	22.0	183	89	180

[A] Unless otherwise indicated, a grade designation originally assigned by the American Iron Steel Institute (AISI).
[H] Yield strength shall be determined by the offset method at 0.2 % in accordance with Test methods and Definitions A 370. Unless otherwise specified (see Specification A 480/A 480M, paragraph 4.1.11 in Ordering Information), an alternative method of determining yield strength
may be based on total extension under load of 0.5 %.
[I] Either brinell or Rockwell B Hardness is permissible.
[J] Common name, not a trademark, widely used, not associated with any one producer.
[K] Material 0.050 in (1.27 mm) and under in thickness shall have a minimum elongation of 20.0 %.

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CHEMICAL & PHYSICAL PROPERTIES OF NICKEL BASE ALLOYS

NOMINAL CHEMICAL COMPOSITION, % (not for specification purposes)													
Nickel	NI	C	Mn	Fe	S	Si	Cu	Cr	Co	Mo	Al	TI	Other
Nickel 200	99.5	0.08	0.018	0.2	0.005	0.18	0.13	-	-	-	-	-	-
Nickel 201	99.5	0.01	0.018	0.2	0.005	0.18	0.13	-	-	-	-	-	-
Nickel 205	99.5	0.08	0.018	0.10	0.004	0.06	0.08	-	-	-	-	0.03 Mg	0.05
Nickel 212	97.7	0.010	2.0	0.05	0.005	0.05	0.03	-	-	-	-	-	-
Nickel 222	99.5	0.01	0.02	0.04	0.0025	0.01	0.01	0.01	0.06	-	0.01	0.01	Mg0.08
Nickel 270	99.98	0.01	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	Mg<0.001
MONEL alloy 400	63.0 min	0.15	1.0	2.5max	0.024max	0.05max	31.0	-	-	-	-	-	-
MONEL alloy 500	63.0 min	0.015	1.5 max	2.0max	0.010max	0.5	30.0	-	-	-	0.9	0.6	-
Cast MONEL alloy	63.0 min	0.07	0.75	2.5max	0.02 max	0.04max	30.0	0.10max	-	0.20max	0.05max	0.01max	-
Cast MONEL alloy	63.0 min	0.03max	0.20max	2.5max	0.02max	0.04max	30.0	0.10	-	0.20max	0.05max	0.01max	-
INCONEL alloy 600	72.0MIN	0.15MAX	1.0MAX	8.0	0.015 max	0.05max	0.05 max	15.5	-	-	-	-	Nb + Ta
INCONEL alloy 625	60.5	0.10max	0.25	5.0max	0.015max	0.5 max	-	21.5	-	9.0	0.25	0.25	3.65
INCOLOY alloy 800	32.5	0.10max	1.5max	Bal.	0.015max	1.0max	0.75 max	21.0	-	-	0.38	0.38	-
INCOLOY alloy 825	42.0	0.05max	1.0max	Bal.	0.03 max	0.5max	2.25	21.5	-	3.0	0.20 max	0.9	-
INCOLOY alloy 904	32.5	0.025	0.025	Bal.	0.015	0.25	0.25	-	14.5	-	0.1	1.6	-
INCOLOY alloy DS	37.0	0.10	1.2	Bal.	-	2.3 max	2.3 max	18.0	-	-	-	0.20	
Hastelloy B	Rest/Bal	0.10	0.80	0.58	0.7		0.6	1.25	28	-	-	-	-
Hastelloy C	Rest/Bal	0.10	0.80	0.75	0.7		16.0	1.25	17 -	-	-	-	
Hastelloy G	Rest/Bal	0.05	1.0-2.0	18.0-21.0	0.7		1.5	1.25	5.575	-	-	-	-

PHYSICAL AND MECHANICAL PROPERTIES

Nickel	Density Kg/mm³ C	Melting range at 20°C	Specific heat Conductivity J/Kg C	Thermal expansion at 20°C W/m C	Thermal resistivity 10-c/C 20-95°C	Electrical Strength at 20°C Microhm cm	Tensile HV N/mm²	Hardness
Nickel 200	8.89	1435-1445	456	74.9	13.3	9.5	380-550	90-120
Nickel 201	8.89	1435-1445	456	79.2	13.3	7.6	340-420	75-100
Nickel 205	8.89	1435-1445	456	74.9	13.3	9.5	340	77
Nickel 212	8.89	1435-1445	430	44.1	-	10.9	476	144
Nickel 222	8.89	1435-1445	456	74.9	13.3	8.8	340	77
Nickel 270	8.89	1435-1445	460	85.7	13.3	7.5	340	80
MONEL alloy 400	8.83	1300-1350	419	21.7	14.1	51.0	480-620	111-151
MONEL alloy K-500	8.46	1315-1350	419	17.4	13.7	61.4	620-760	141-189
INCONEL alloy 600	8.42	1370-1425	461	14.8	13.3	103	550-690	121-173
INCONEL alloy 625	8.44	1290-1350	410	9.8	12.8	129	830-1040	146-247
INCOLOY alloy 800	7.95	1355-1385	502	11.7	14.2	99	520-700	121-188
INCOLOY alloy 825	8.14	1370-1400	441	10.9	14.0	113	590-730	121-183
INCOLOY alloy 904	8.12	-	442	14.9	4.6	72	923	-
INCOLOY alloy DS	7.92	1330-1400	452	12.0	14.1	108	680	208

MATERIAL SPECIFICATION FOR SEAMLESS/WELDED BUTT-WELDING PIPE-FITTINGS.

SPECIFICATION (ASTM-2002)	CHEMICAL PROPERTIES								MECHANICAL PROPERTIES					OTHERS
	C%	Mn%	P% (Max)	S% (Max)	Si%	Cr%	Mo%	Ni%	U.T.S. (Min) Mpa	Y.S. (Min) Mpa	ELONG. (Min) L	ELONG. (Min) T	Hardness (Max) BHN	
STAINLESS STEEL														
A 403 Gr. WP 304	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	-	8.0-11.0	515	205	28	20	-	
A 403 Gr. WP 304L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	-	8.0-12.0	485	170	28	20	-	
A 403 Gr. WP 304H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	-	8.0-11.0	515	205	28	20	-	
A 403 Gr. WP 304LN	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	-	8.0-11.0	515	205	28	20	-	N%=0.10-0.16
A 403 Gr. WP 309	0.20 Max	2.00 Max	0.045	0.030	1.00 Max	22.0-24.0	-	12.0-15.0	515	205	28	20	-	
A 403 Gr. WP 310S	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	24.0-26.0	-	19.0-22.0	515	205	28	20	-	
A 403 Gr. WP 316	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	2.0-3.0	10.0-14.0	515	205	28	20	-	
A 403 Gr. WP 316L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	2.0-3.0	10.0-14.0	485	170	28	20	-	
A 403 Gr. WP 316H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	2.0-3.0	10.0-14.0	515	205	28	20	-	
A 403 Gr. WP 316LN	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	2.0-3.0	10.0-13.0	515	205	28	20	-	N%=0.10-0.16
A 403 Gr. WP 317	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	3.0-4.0	11.0-15.0	515	205	28	20	-	
A 403 Gr. WP 317L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	3.0-4.0	11.0-15.0	515	205	28	20	-	
A 403 Gr. WP 321	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	-	9.0-12.0	515	205	28	20	-	Ti%=(5XC)-0.70
A 403 Gr. WP 321H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	-	9.0-12.0	515	205	28	20	-	Ti%=(4XC)-0.70
A 403 Gr. WP 347	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	-	9.0-12.0	515	205	28	20	-	Cb%=(10XC)-1.10
A 403 Gr. WP 347H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	-	9.0-12.0	515	205	28	20	-	Cb%=(8XC)-1.10
CARBON STEEL														
A 234 Gr. WPB	0.30 Max	0.29-1.06	0.050	0.058	0.10 Min	0.40 Max	0.15 Max	0.40 Max	415-655	240	30	20	197	Cu%=0.40 Max, Ni%=0.08 Max, Cb%=0.02 Max
A 234 Gr. WPC	0.35 Max	0.29-1.06	0.050	0.058	0.10 Min	0.40 Max	0.15 Max	0.40 Max	485-655	275	30	20	197	Cu%=0.40 Max, Ni%=0.08 Max, Cb%=0.02 Max
LOW TEMPERATURE CARBON STEEL														
A 420 Gr. WPL6	0.30 Max	0.50-1.35	0.035	0.040	0.15-0.40	0.30 Max	0.12 Max	0.40 Max	415-655	240	30	16.5	197	Cu%=0.40 Max, Ni%=0.08 Max, Cb%=0.02 Max Impact Test=-45°C, J=17.3-13-6
A 420 Gr. WPL 3	0.20 Max	0.31-0.64	0.050	0.050	0.13-0.37	-	-	3.20-3.80	450-620	240	30	20	197	Impact Test=-45°C, J=17.3-13-6
ALLOY STEEL														
A 234 Gr. WP 1	0.28 Max	0.30-0.90	0.045	0.045	0.10-0.50	-	0.44-0.65	-	380-550	205	30	20	197	
A 234 Gr. WP 5	0.15 Max	0.30-0.60	0.040	0.030	0.50 Max	4.0-6.0	0.44-0.65	-	415-585	205	30	20	217	
A 234 Gr. WP 9	0.15 Max	0.30-0.60	0.030	0.030	1.00 Max	8.0-10.0	0.90-1.10	-	415-585	205	30	20	217	
A 234 Gr. WP 11 CL1	0.05-0.15	0.30-0.60	0.030	0.030	0.50-1.0	1.0-1.5	0.44-0.65	-	415-585	205	30	20	197	
A 234 Gr. WP 11 CL2	0.05-0.20	0.30-0.80	0.040	0.040	0.50-1.0	1.0-1.5	0.44-0.65	-	485-655	275	30	20	197	
A 234 Gr. WP 11 CL3	0.05-0.20	0.30-0.80	0.040	0.040	0.50-1.0	1.0-1.5	0.44-0.65	-	520-690	310	30	20	197	
A 234 Gr. WP 12 CL1	0.05-0.20	0.30-0.80	0.045	0.045	0.60 Max	0.80-1.25	0.44-0.65	-	415-585	220	30	20	197	
A 234 Gr. WP 12 CL2	0.05-0.20	0.30-0.80	0.045	0.045	0.60 Max	0.80-1.25	0.44-0.65	-	485-655	275	30	20	197	
A 234 Gr. WP 22 CL1	0.05-0.15	0.30-0.60	0.040	0.040	0.50 Max	1.90-2.60	0.87-1.13	-	415-585	205	30	20	197	
A 234 Gr. WP 22 CL3	0.05-0.15	0.30-0.60	0.040	0.040	0.50 Max	1.90-2.60	0.87-1.13	-	520-690	310	30	20	197	
A 234 Gr. WP 91	0.08-0.12	0.30-0.60	0.020	0.010	0.20-0.50	8.0-9.5	0.85-1.05	0.40 Max	585-760	415	20	-	248	Va%=0.18-0.25, Cb%=0.06-0.10, Mn%=0.03-0.07, Al%=0.04 Max

BUTT-WELDING FITTINGS ASTM

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MATERIAL SPECIFICATION FOR FORGED FITTINGS & FLANGES

SPECIFICATION (ASTM-2002)	CHEMICAL PROPERTIES								MECHANICAL PROPERTIES					OTHERS
	C%	Mn%	P% (Max)	S% (Max)	Si%	Cr%	Ni%	Mo%	U.T.S. (Min) Mpa	Y.S. (Min) Mpa	ELONG. (Min) %	RED. AREA %	Hardness (Max) BHN	
STAINLESS STEEL														
A 182 Gr. F 304	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	30	50	-	-
A 182 Gr. F 304L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-12.0	-	485	170	30	50	-	-
A 182 Gr. F 304H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	30	50	-	-
A 182 Gr. F 304LN	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	30	50	-	N%=0.10-0.16
A 182 Gr. F 309H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	22.0-24.0	12.0-15.0	-	515	205	30	50	-	-
A 182 Gr. F 310	0.25 Max	2.00 Max	0.045	0.030	1.00 Max	24.0-26.0	19.0-22.0	-	515	205	30	50	-	-
A 182 Gr. F 316	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	10.0-14.0	2.0-3.0	515	205	30	50	-	-
A 182 Gr. F 316L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	10.0-15.0	2.0-3.0	485	170	30	50	-	-
A 182 Gr. F 316H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	10.0-14.0	2.0-3.0	515	205	30	50	-	-
A 182 Gr. F 316LN	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.0-3.0	515	205	30	50	-	N%=0.10-0.16
A 182 Gr. F 317	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	11.0-15.0	3.0-4.0	515	205	30	50	-	-
A 182 Gr. F 317L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	11.0-15.0	3.0-4.0	485	170	30	50	-	-
A 182 Gr. F 321	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-12.0	-	515	205	30	50	-	Ti%=(5xC)-0.70
A 182 Gr. F 321H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-12.0	-	515	205	30	50	-	Ti%=(4xC)-0.70
A 182 Gr. F 347	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-20.0	9.0-13.0	-	515	205	30	50	-	Cb%=(10xC)-1.10
A 182 Gr. F 347H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-20.0	9.0-13.0	-	515	205	30	50	-	Cb%=(8xC)-1.10
CARBON STEEL														
A 105	0.35 Max	0.60-1.05	0.035	0.040	0.10-0.35	0.30 Max	0.40 Max	0.12 Max	485	250	22	30	187	Cu%=0.40 Max, Va %= 0.08 Max, Cb%=0.02 Max
LOW TEMPERATURE CARBON STEEL														
A 350 Gr. LF 1	0.30 Max	0.60-1.35	0.035	0.040	0.15-0.30	0.30 Max	0.40 Max	0.12 Max	415-585	205	25	38	197	Cu%=0.40Max, Cb%=0.02 Max, Va %= 0.05 Max, Impact Test =-28.9°C, J=18 Min
A 350 Gr. LF 2	0.30 Max	0.60-1.35	0.035	0.040	0.15-0.30	0.30 Max	0.40 Max	0.12 Max	485-655	250	22	30	197	Cu%=0.40Max, Cb%=0.02 Max, Va %= 0.05 Max, Impact Test =-45.6°C, J=18 Min
A 350 Gr. LF 3	0.20 Max	0.90 Max	0.035	0.040	0.20-0.35	0.30 Max	3.30-3.70	0.12 Max	485-655	260	22	35	197	Cu%=0.40Max, Cb%=0.02 Max, Va %= 0.03 Max, Impact Test =-101°C, J=20 Min
ALLOY STEEL														
A 182 Gr. F 1	0.28 max	0.60-0.90	0.045	0.045	0.15-0.35	-	-	0.44-0.65	485	275	20	30	143-192	-
A 182 Gr. F 2	0.05-0.21	0.30-080	0.040	0.040	0.10-0.60	0.50-0.81	-	0.44-.65	485	275	20	30	143-192	-
A 182 Gr. F 5	0.15 max	0.30-0.60	0.030	0.030	0.50 Max	4.0-6.0	0.5 Max	0.44-0.65	485	275	20	35	143-217	-
A 182 Gr. F 9	0.15 max	0.30-0.60	0.030	0.030	0.50-1.00	8.0-10.0	-	0.90-1.10	585	380	20	40	179-217	-
A 182 Gr. F 11 CL1	0.05-0.15	0.30-0.60	0.030	0.030	0.50-1.00	1.0-1.50	-	0.44-0.65	415	205	20	45	121-174	-
A 182 Gr. F 11 CL2	0.10-0.20	0.30-0.80	0.040	0.040	0.50-1.0	1.0-1.50	-	0.40-0.65	485	275	20	30	143-207	-
A 182 Gr. F 11 CL3	0.10-0.20	0.30-0.80	0.040	0.040	0.50-1.0	1.0-1.50	-	0.44-0.65	515	310	20	30	156-207	-
A 182 Gr. F 12 CL1	0.05-0.15	0.30-0.60	0.045	0.045	0.50 Max	0.80-1.25	-	0.44-0.65	415	220	20	45	121-174	-
A 182 Gr. F 12 CL2	0.10-0.20	0.30-0.80	0.040	0.040	0.10-0.60	0.80-1.25	-	0.44-0.65	485	275	20	30	143-207	-
A 182 Gr. F 22 CL1	0.05-0.15	0.30-0.60	0.040	0.040	0.50 Max	2.0-2.5	-	0.87-1.13	415	205	20	35	170	-
A 182 Gr. F 22 CL3	0.05-0.15	0.30-0.60	0.040	0.040	0.50 Max	2.0-2.50	-	0.87-1.13	515	310	20	30	156-207	-
A 182 Gr. F 91	0.08-0.12	0.30-0.60	0.020	0.010	0.20-0.50	8.0-9.5	0.40 Max	0.85-1.05	585	415	20	40	248	Cb%=0.06-0.10, N%=0.03-0.07, Va %= 0.18-0.25

FORGED FITTINGS & FLANGES ASTM

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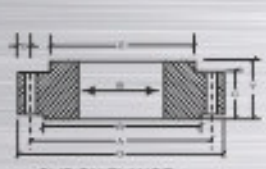
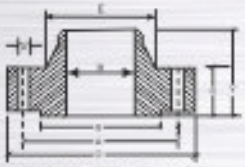
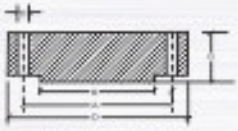
DIMENSIONS OF FORGED FLANGES AS PER (ANSI B 16.5)



SLIP-ON FLANGE



WELDING NECK FLANGE



BLIND FLANGE

150 LBS

Nominal Pipe Size		Flange Dia	Dia of Bolt Circle	Dia of Bolt Holes	No. of Holes	Thk. of Flange	Dia of Hub	Length through Hub			Dia of Bore		Dia of R/F	Depth of Socket	Pipe Dia.
(MM)	(INCH.)	O	A	D		C	E	S/O & S/W Y	W/N Y	L/J Y	S/O & S/W B	L/J B	R	F	
15	1/2	88.9	60.3	15.9	4	11.1	30.2	15.9	47.6	15.9	22.3	22.9	34.9	9.5	21.33
20	3/4	98.4	69.8	15.9	4	12.7	38.1	15.9	52.4	15.9	27.7	28.2	42.9	11.1	26.67
25	1	107.9	79.4	15.9	4	14.3	49.2	17.5	55.6	17.5	34.5	35.0	50.8	12.7	33.40
32	1¼	117.5	88.9	15.9	4	15.9	58.7	20.6	57.1	20.6	43.2	43.7	63.5	14.3	42.16
40	1½	127.0	98.4	15.9	4	17.5	65.1	22.2	61.9	22.2	49.5	50.0	73.0	15.9	48.26
50	2	152.4	120.6	19.0	4	19.0	77.8	25.4	63.5	25.4	62.0	62.5	92.1	17.5	60.31
65	2½	177.8	139.7	19.0	4	22.2	90.5	28.6	69.8	28.6	74.7	75.4	104.8	19.0	73.02
80	3	190.5	152.4	19.0	4	23.8	107.9	30.2	69.8	30.2	90.7	91.4	127.0	20.6	88.90
100	4	228.6	190.5	19.0	8	23.8	134.9	33.3	76.2	33.3	116.1	116.8	157.2	23.8	114.30
125	5	254.0	215.9	22.2	8	23.8	163.5	36.5	88.9	36.5	143.8	144.5	185.7	23.8	141.30
150	6	279.4	241.3	22.2	8	25.4	192.1	39.7	88.9	39.7	170.7	171.4	215.9	27.0	168.27
200	8	342.9	298.4	22.2	8	28.6	246.1	44.4	101.6	44.4	221.5	222.2	269.9	31.7	219.07
250	10	406.4	361.9	25.4	12	30.2	304.8	49.2	101.6	49.2	276.3	277.4	323.8	33.3	273.05
300	12	482.6	431.8	25.4	12	31.8	365.1	55.6	114.3	55.6	327.1	328.2	381.0	39.7	323.85
350	14	533.4	476.2	28.6	12	34.9	400.0	57.1	127.0	79.4	359.1	360.2	412.7	41.3	355.60
400	16	596.9	539.7	28.6	16	36.5	457.2	63.5	127.0	87.3	410.5	411.2	469.9	44.4	406.40
450	18	635.0	577.8	31.7	16	39.7	504.8	68.3	139.7	96.8	461.8	462.3	533.4	49.2	457.20
500	20	698.5	635.0	31.7	20	42.9	558.8	73.0	144.5	103.2	513.1	514.3	584.2	54.0	508.00
600	24	812.8	749.3	34.9	20	47.6	663.6	82.5	152.4	111.1	615.9	615.9	692.1	63.5	609.60

300 LBS

Nominal Pipe Size		Flange Dia	Dia of Bolt Circle	Dia of Bolt Holes	No. of Holes	Thk. of Flange	Dia of Hub	Length through Hub			Dia of Bore		Dia of R/F	Depth of Socket	Pipe Dia.
(MM)	(INCH.)	O	A	D		C	E	S/O & S/W Y	W/N Y	L/J Y	S/O & S/W B	L/J B	R	F	
15	1/2	95.2	66.7	15.9	4	14.3	38.1	22.2	52.4	22.2	22.3	22.9	34.9	9.5	21.33
20	3/4	117.5	82.5	19.0	4	15.9	47.6	25.4	57.1	25.4	27.7	28.2	42.9	11.1	26.67
25	1	123.8	88.9	19.0	4	17.5	54.0	27.0	61.9	27.0	34.5	35.0	50.8	12.7	33.40
32	1¼	133.3	98.4	19.0	4	19.0	63.5	27.0	65.1	27.0	43.2	43.7	63.5	14.3	42.16
40	1½	155.6	114.3	22.2	4	20.6	69.8	30.2	68.3	30.2	49.5	50.0	73.0	15.9	48.26
50	2	165.1	127.0	19.0	8	22.2	84.1	33.3	69.8	33.3	62.0	62.5	92.1	17.5	60.31
65	2½	190.5	149.2	22.2	8	25.4	100.0	38.1	76.2	38.1	74.7	75.4	104.8	19.0	73.02
80	3	209.5	168.3	22.2	8	28.6	117.5	42.9	79.4	42.9	90.7	91.4	127.0	20.6	88.90
100	4	254.0	200.0	22.2	8	31.8	146.0	47.6	85.7	47.6	116.1	116.8	157.2	23.8	114.30
125	5	279.4	234.9	22.2	8	34.9	177.8	50.8	98.4	50.8	143.8	144.5	185.7	-	141.30
150	6	317.5	269.9	22.2	12	36.5	206.4	52.4	98.4	52.4	170.7	171.4	215.9	-	168.27
200	8	381.0	330.2	25.4	12	41.3	260.3	61.9	111.1	61.9	221.5	222.2	269.9	-	219.07
250	10	444.5	387.3	28.6	16	47.6	320.7	66.7	117.5	95.2	276.3	277.4	323.8	-	273.05
300	12	520.7	450.8	31.7	16	50.8	374.6	73.0	130.2	101.6	327.1	328.2	381.0	-	323.85
350	14	584.2	514.3	31.7	20	54.0	425.4	76.2	142.9	111.1	359.1	360.2	412.7	-	355.60
400	16	647.7	571.5	34.9	20	57.2	482.6	82.5	146.0	120.6	410.5	411.2	469.9	-	406.40
450	18	711.2	628.5	34.9	24	60.3	533.4	88.9	158.7	130.2	461.8	462.3	533.4	-	457.20
500	20	774.7	685.8	34.9	24	63.5	587.4	95.2	161.9	139.7	513.1	514.3	584.2	-	508.00
600	24	914.4	812.8	41.3	24	69.8	701.7	106.4	168.3	152.4	615.9	615.9	692.1	-	609.60

All dimensions are in Millimeters. Flanges except Lap joint will be furnished with (6.35 mm) raised face, which is included in "thickness(C)"and "length through hub(Y)"

Flanges available upto size 100" in 150# & 300#, up to 48" in 600# & 900# and upto 24" in 1500# & 2500#

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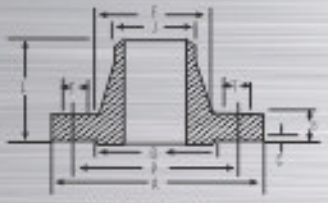
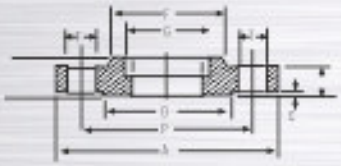
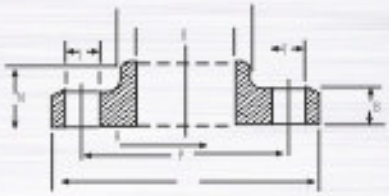
DIMENSIONS OF CLASS 600 FLANGES AS PER (ANSI B 16.5)



WELD - NECK



SOCKET WELD



LAPPED

600 LBS

N.B.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	T	No. of Holes
15	95	14.3	6.4	35	22	38	22.4	9.5	21.3	23.5	52	16	22	23	66.7	3.0	15.9	4
20	117	15.9	6.4	43	25	48	27.7	11	26.7	29	57	16	25	28	82.6	3.0	19	4
25	124	17.5	6.4	51	27	54	34.5	12.5	33.4	36	62	17	27	35	88.9	3.0	19	4
32	133	20.6	6.4	64	29	64	43.2	14.5	42.2	44.5	67	21	29	43.5	98.4	5.0	19	4
40	155	22.2	6.4	73	32	70	49.5	16	48.3	50.5	70	22	32	50	114.3	6.5	22.2	4
50	165	25.4	6.4	92	37	84	62	17.5	60.3	63.5	73	29	37	62.5	127	8.0	19	8
65	190	28.6	6.4	105	41	100	74.7	19	73	76	79	32	41	75.5	149.2	8.0	22.2	8
80	210	31.8	6.4	127	46	117	90.7	20.5	88.9	92	83	35	46	91.5	168.3	9.5	22.2	8
90	229	34.9	6.4	140	49	133	103.4	-	101.6	105	86	40	49	104	184.2	9.5	25.4	8
100	273	38.1	6.4	157	54	152	116.1	-	114.3	118	102	41	54	117	215.9	11.0	25.4	8
125	330	44.4	6.4	186	60	189	143.8	-	141.3	145	114	48	60	145	266.7	11.0	28.6	8
150	356	47.6	6.4	216	67	222	170.7	-	168.3	171	117	51	67	171	292.1	12.5	28.6	12
200	419	55.6	6.4	270	76	273	221.5	-	219.1	222	133	57	76	222	349.2	12.5	31.8	12
250	506	63.5	6.4	324	86	343	276.4	-	273	276	152	65	111	277	431.8	12.5	34.9	16
300	559	66.7	6.4	361	92	400	327.2	-	323.9	329	156	70	117	328	489	12.5	34.9	20
350	603	69.8	6.4	413	94	432	359.2	-	355.6	360	165	73	127	360	527	12.5	38.1	20
400	686	76.2	6.4	470	106	495	410.5	-	406.4	411	178	78	140	411	603.2	12.5	41.3	20
450	743	82.6	6.4	533	117	546	461.8	-	457.2	462	184	79	152	462	654	12.5	44.4	20
500	813	88.9	6.4	584	127	610	513.1	-	508	513	190	83	165	514	723.9	12.5	44.4	24
600	940	101.6	6.4	692	140	718	616	-	609.6	614	203	92	184	616	838.2	12.5	50.8	24

900 LBS

Nominal Pipe Size		Flange Dia	Dia of Bolt Circle	Dia of Bolt Holes	No. of Holes	Thk of Flange	Dia of Hub	Lenght through Hub			Dia of Bore		Dia of RF	Depth of Socket	Pipe Dia
								S/O & S/W	W/N	L/J	S/O & S/W	L/J			
(MM)	(INCH)	O	A	D		C	E	Y	Y	Y	B	B	R	F	X
15	1/2	120.6	82.5	22.2	4	22.2	38.1	31.7	60.3	31.7	22.3	22.8	34.9	9.5	21.33
20	3/4	130.2	88.9	22.2	4	25.4	44.4	34.9	69.8	35.0	27.7	28.1	42.9	11.1	26.67
25	1	149.2	101.6	25.4	4	28.6	52.4	41.3	73.0	41.1	34.5	35.0	50.8	12.7	33.40
32	1¼	158.7	111.1	25.4	4	28.6	63.5	41.3	73.0	41.1	43.2	43.6	63.5	14.2	42.16
40	1½	177.8	123.8	28.6	4	31.8	69.8	44.4	82.5	44.4	49.5	50.0	73.0	15.8	48.26
50	2	215.9	165.1	25.4	8	38.1	104.8	57.1	101.6	57.1	62.0	62.4	92.1	17.4	60.31
65	2½	244.5	190.5	28.6	8	41.3	123.8	63.5	104.8	63.5	74.7	75.4	104.8	19.0	73.02
80	3	241.3	190.5	25.4	8	38.1	127.0	53.9	101.6	53.8	90.7	91.4	127.0	-	88.90
100	4	292.1	234.9	31.7	8	44.4	158.7	69.8	114.3	69.8	116.0	116.8	157.2	-	114.30
125	5	349.2	279.4	35.0	8	50.8	190.5	79.3	127.0	79.2	143.7	144.5	185.7	-	141.30
150	6	381.0	317.5	31.7	12	55.6	234.9	85.8	139.7	85.8	170.6	171.4	215.9	-	168.27
200	8	469.9	393.7	38.1	12	63.5	298.4	101.6	162.0	114.3	221.4	222.2	269.9	-	219.07
250	10	546.1	469.9	38.1	16	69.8	368.3	107.9	184.1	127.0	276.3	277.3	323.8	-	273.05
300	12	609.6	533.4	38.1	20	79.3	419.1	117.4	200.0	142.7	327.1	328.1	381.0	-	323.85

All dimensions are in Millimeters. Flanges except Lap joint will be furnished with (6.35 mm) raised face, which is included in "thickness(C)"and "length through hub(Y)"

Flanges available upto size 100" in 150# & 300#, up to 48" in 600# & 900# and upto 24" in 1500# & 2500#

CHHAJED
Steel & alloys pvt. ltd.

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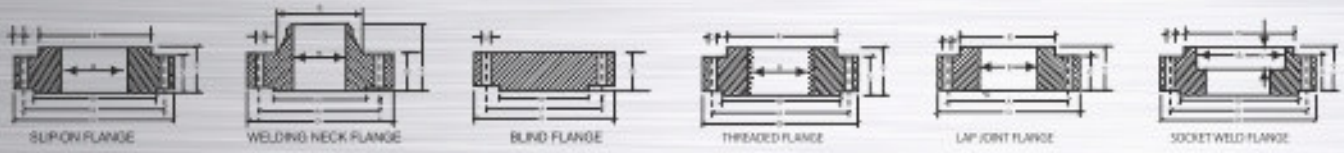
DIMENSIONS OF FORGED FLANGES AS PER (ANSI B 16.5)



1500 LBS

Nominal Pipe Size		Flange Dia	Dia of Bolt Circle	Dia of Bolt Holes	No. of Holes	Thk of Flange	Dia of Hub	Lenght through Hub			Dia of Bore		Dia of R/F	Depth of Socket	Pipe Dia
								S/O & S/W	W/N	L/J	S/O & S/W	L/J			
(MM)	(INCH)	O	A	D		C	E	Y	Y	Y	B	B	R	F	X
15	1/2	120.6	82.5	22.2	4	22.2	38.1	31.7	60.3	31.7	22.3	22.8	34.9	9.5	21.33
20	3/4	130.2	88.9	22.2	4	25.4	44.4	34.9	69.8	34.9	27.7	28.1	42.9	11.1	26.67
25	1	149.2	101.6	25.4	4	28.6	52.4	41.3	73.0	41.3	34.5	35.0	50.8	12.7	33.40
32	1¼	158.7	111.1	25.4	4	28.6	63.5	41.3	73.0	41.3	43.2	43.6	63.5	14.2	42.16
40	1½	177.8	123.8	28.6	4	31.8	69.8	44.4	82.5	44.4	49.5	50.0	73.0	15.8	48.26
50	2	215.9	165.1	25.4	8	38.1	104.8	57.1	101.6	57.1	62.0	62.0	92.1	17.4	60.31
65	2½	244.5	190.5	28.6	8	41.3	123.8	63.5	104.8	63.5	74.7	75.4	104.8	19.0	73.02
80	3	266.7	203.2	31.7	8	47.6	133.3	73.0	117.5	73.0	90.7	91.4	127.0	-	88.90
100	4	311.1	241.3	34.9	8	54.0	161.9	90.5	123.0	90.4	116.1	116.8	157.2	-	114.30
125	5	374.6	292.1	41.3	8	73.0	196.8	104.8	155.6	104.8	143.8	144.5	185.7	-	141.30
150	6	393.7	317.5	38.1	12	82.6	228.6	119.1	171.4	119.1	170.7	171.4	215.9	-	168.27
200	8	482.6	393.7	44.4	12	92.1	292.1	142.9	212.7	142.8	221.5	222.2	269.9	-	219.07
250	10	584.2	482.6	50.8	12	107.9	368.3	158.7	254.0	177.8	276.3	277.3	323.8	-	273.05
300	12	673.1	571.5	54.0	16	123.8	450.8	181.0	282.5	218.9	327.1	328.1	381.0	-	323.85

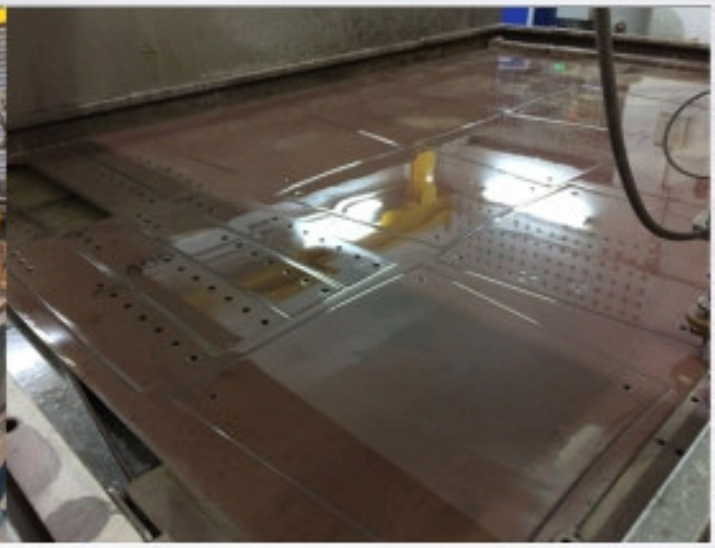
2500 LBS

Nominal Pipe Size		Flange Dia	Dia of Bolt Circle	Dia of Bolt Holes	No. of Holes	Thk of Flange	Dia of Hub	Lenght through Hub			Dia of Bore		Dia of R/F	Depth of Socket	Pipe Dia
								S/O & S/W	W/N	L/J	S/O & S/W	L/J			
(MM)	(INCH)	O	A	D		C	E	Y	Y	Y	B	B	R	F	X
15	1/2	133.3	88.9	22.2	4	30.2	42.9	39.7	73.0	39.7	22.3	22.3	34.9	"	21.33
20	3/4	139.7	95.3	22.2	4	31.7	50.8	42.9	79.4	42.9	27.7	27.7	42.9	"	26.67
25	1	158.7	107.9	25.4	4	34.9	57.1	47.7	88.9	47.7	34.5	34.5	50.8	"	33.40
32	1¼	184.1	130.2	28.6	4	38.1	73.0	52.4	95.2	52.4	43.2	43.2	63.5	"	42.16
40	1½	203.2	146.0	31.7	4	44.4	79.4	60.3	111.1	60.3	49.5	49.5	73.0	"	48.26
50	2	234.9	171.4	28.6	8	50.8	95.2	69.8	127.0	69.8	62.4	62.0	92.1	"	60.31
65	2½	266.7	196.8	31.7	8	57.1	114.3	79.4	142.9	79.4	74.7	74.7	104.8	"	73.02
80	3	304.8	228.6	34.9	8	66.7	133.3	92.1	168.3	92.1	90.7	90.7	127.0	"	88.90
100	4	355.6	273.0	41.2	8	76.2	165.1	107.9	190.5	107.9	116.1	116.1	157.2	"	114.30
125	5	419.1	323.8	47.6	8	92.1	203.2	130.0	228.6	130.0	143.8	143.8	185.7	"	141.30
150	6	482.6	368.3	54.0	8	107.9	234.9	152.4	273.0	152.4	170.7	170.7	215.9	"	168.27
200	8	552.4	438.1	54.0	12	127.0	304.8	177.8	317.5	177.8	221.5	221.5	269.9	"	129.07
250	10	673.1	539.7	66.7	12	165.1	374.6	228.6	419.1	228.6	276.3	276.3	323.8	"	273.06
300	12	762.0	619.1	73.0	12	184.1	441.3	254.0	463.5	254.0	327.1	327.1	381.0	"	323.85

All dimensions are in Millimeters. Flanges except Lap joint will be furnished with (6.35 mm) raised face, which is included in "thickness(C)"and "length through hub(Y)"

Flanges available upto size 100" in 150# & 300#, up to 48" in 600# & 900# and upto 24" in 1500# & 2500#

Excellent in-house facility available for profile cutting of Sheets & plates of various thickness. other facilities include Plate rolling, Grinding, Buffing etc.



List Of Machinery On Fabrication Shop

- Shearing Machine [8mm x 3000 Long]
- Plate rolling machine [cap. 20mm]
- CNC Press brake [8mm x 3000 Long]
- Drill Machines [pillar type]
- TIG Welding Machine
- Grinding and Buffing Motors
- Gas cutting Sets
- Hand Grinding Machine

List of Man Power

- CNC Programmer [1]
- CNC operators [3]
- QC Inspector [1]
- Store [1]
- Fabricators [2]
- Welder [1]
- Buffers and Grinder Man [1]
- Support [3]

Leading Distributors, Importers, Stockists & Suppliers of :

- **Wear Plates**
- **Pipes**
- **Sheets/Plates/Coils**
- **Fittings**
- **Flanges**
- **Bars/Rods**
- **Fasteners**
- **Valves**

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ISO 14001:2015
OHSAS 18001:2007
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