



Reliable
Steel Distributors

AN ISO 9001:2015 CERTIFIED COMPANY

**Manufactures & Exporters of
Stainless Steel, Carbon Steel, Nickel Alloy,
Alloy Steel for Pipes, Pipe Fittings, Flanges, Sheets,
Coil & Plates**



www.reliablesteel.in

Company Profile

Reliable Steel Distributors, is established with a view to cater to the needs of both domestic and international market. Reliable is one of the leading manufacturers for Pipes, Pipe Fittings, Flanges, Reliable Steel Distributors is based in Mumbai with a distance of 20km from both sea port and airport. Reliable stocks supplies and exports Stainless Steel, Carbon Steel, Alloy Steel, High Nickel Alloy, Aluminum, Brass, Copper and Titanium materials.

Reliable has been exporting to USA, UAE, Kuwait, Itan, Iraq, Oman, Saudi Arabia, Qatar, Bahrain, Germany, UK, France, Netherlands, Brazil, Columbia, Mexico, Ecuador, Singapore, Malaysia, Indonesia, Vietnam, Korea, Australia, etc.

Reliable has a wide stock range of material right from API 5L, Monel, Inconel, Duplex, Super Duplex, Hastelloy Pipes and Tubes in both seamless and welded. It specializes in API pipes and tubes from Grade B to X80 in PSL1/2 and High Nickel Alloy Pipes & Tubes.

Mission

Our Mission is to provide prompt delivery and quality products at competitive price. Reliable has been surviving the industry smoothly due to its network, certified quality, innovation, value for human resources and focus on clients.

Third Party Inspection (TPI)

We can do TPI for following :



SPECIAL PRODUCTS FOR OIL & GAS INDUSTRIES



INSERT PIPE SLEEVE



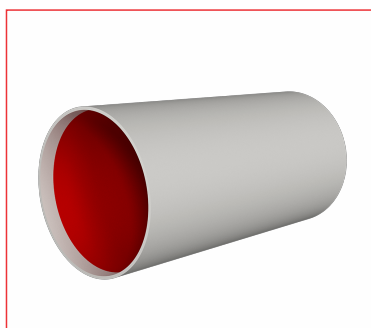
HALF PIPE SLEEVE



SPLIT REPAIR CLAMP



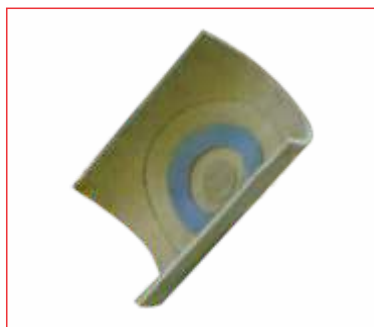
GALVANISED WALL SLEEVES



INTERNALLY COATED PIPE



COATED PIPE SPOOL



LEAK DEFECT REPAIR SLEEVES



MACHINING COMPONENTS



CEMENT MOTOR SLEEVES



BIDI PIG



PINHOLE CLAMP



ANODE

Carbon Steel Pipes & Tubes (Seamless & Welded)

ASTM Standard

ASTM A53	ASTM A179	ASTM A334	ASTM A513	ASTM A595	ASTM A822
ASTM A106	ASTM A192	ASTM A369	ASTM A523	ASTM A671	ASTM A984
ASTM A134	ASTM A252	ASTM A381	ASTM A524	ASTM A672	ASTM A1005
ASTM A135	ASTM A214	ASTM A500	ASTM A556	ASTM A691	ASTM A1024
ASTM A139	ASTM A210	ASTM A501	ASTM A587	ASTM A787	ASTM A1037
ASTM A178	ASTM A333	ASTM A512	ASTM A589	ASTM A795	API 5L DSAW/LSAW/SAW/ERW/HFW

API 5L Pipes

Types

Seamless | LSAW | DSAW | HSAW | ERW | HFW

Grades

PSL 1 - API 5L Gr B, X42, X46, X52, X56, X60, X65, X70

PSL 2 - API 5L Gr B, X42, X46, X52, X56, X60, X65, X70, X80, X100, X120

PSL 1 / PSL 2 - L245, L290, L320, L360, L390, L415, L450, L485, L555

Sizes

LSAW / DSAW - 16" OD to 120" OD (6.35MM to 100MM THK)

HSAW - 8" NB to 120" NB (5MM to 25MM THK)

Seamless - 1/2" NB to 48" NB (SCH 10 to SCH XXS & Heavier)

ERW / HFW - 1/2" NB to 24" NB (2 MM to 24MM THK)

Origin

Reliable imports & stocks material from :

Europe, Japan, USA, South Africa, Korea, India, Germany, China, Taiwan, Turkey, Ukraine.

Supplementary Requirements

NACE MR0175, NACE MR0103, ISO 15156, HIC- NACE TM0284, SSC - NACE TM0177, SOUR SERVICES, OFF SHORE SERVICES, WITH LOW SULPHUR <0.002%, IMPACT TEST AT -50°C, BEAD CRUSH, RADIOGRAPHY (X RAY)

Coating

Special Coating i.e Cement Mortar Lining, FBE Coating, Galvanized (Hot Dipped), 3 LPP, 3 LPE, PTFE Coating, Epoxy Coating can be provided.

Delivery Condition

As Rolled, Normalized, Thermomechanical Rolled / Formed, Normalized & Tempered, Quenched & Tempered, Stress Relieved.

Stainless Steel Pipes & Tubes (Seamless & Welded)

ASTM Standard

ASTM A213	ASTM A358	ASTM A530	ASTM A789	ASTM A903	AS1163 201
ASTM A249	ASTM A372	ASTM A554	ASTM A790	ASTM A928	AS1528 201
ASTM A268	ASTM A376	ASTM A632	ASTM A791	ASTM A943	G3459 201
ASTM A269	ASTM A409	ASTM A688	ASTM A803	ASTM A949	ANSI/ASME B36.10M
ASTM A270	ASTM A450	ASTM A731	ASTM A813	ASTM A1012	ANSI/ASME B36.19M
ASTM A312	ASTM A511	ASTM A778	ASTM A814	ASTM A1053	MIL-P-1144

Origin

Reliable imports & stocks material from :

Europe, Japan, USA, South Africa, Korea, India, Germany, China, Taiwan, Turkey, Ukraine.

Type

Seamless, Welded, ERW & EFW, Straight-Seam Welded, Heavily Cold Worked

Supplementary Requirements

Transverse Tension Test, Flattening Test, Flaring Test, Etching Test, Stabilizing Heat Treatment, NDE, Eddy Current, Hydro Test.

Delivery Condition

Solution Annealed, Polished, Mill Finish, Electropolished, Solution treatment, Normalize and Tempered, Full or Isothermal Anneal

Speciality

Nace MR0175 / ISO15156, Impact Test at -100°C, Radiography (X-Ray), Grain Size 7 or Coarser (For High Carbon), IGC Test with Practice A, B, C, D & E.

Nickel Alloy Pipes & Tubes

ASTM Standard

ASTM B163 (Nickel 200 / Nickel 201 / UNS N02200 / UNS N02201

ASTM A209, ASTM A213, ASTM A250, ASTM A335, ASTM A369, ASTM A691

ASTM B161	ASTM B517	ASTM B407	ASTM B690
ASTM B165	ASTM B444	ASTM B514	ASTM B423
ASTM B622	ASTM B704	ASTM B515	ASTM B673
ASTM B626	ASTM B705	ASTM B535	ASTM B674
ASTM B163	ASTM B464	ASTM B710	ASTM B677
ASTM B167	ASTM B468	ASTM B675	
ASTM B516	ASTM B729	ASTM B676	

Ni-Mo alloys

N10001	Ni-cr-fe-mo-cu alloys n06007	N06059
N10665	N06030	Low c-ni-cr-mo-cu alloy n06200
N10675	Ni-Mo-Cr-Fe Alloy N10242	Low c-ni-fe-cr-mo-cu alloy n08031
N10629	Low C Ni Cr-Mo Alloys N10276	Low c-ni-cr-mo-w alloy n06686
N06022	Ni-fe-cr-mo alloys n08320	Ni-co-cr-si alloy n12160
N06035	Ni-cr-mo-fe alloy n06002	Cr-ni-fe-n alloy r20033
N06455	Ni-fe-cr-co alloy r30556	Low c-ni-mo-cr-ta alloy n06210
N06975	Ni-cr-w-mo alloy n06230	
N06985	Low c-ni-cr-mo alloy n06058	

Origin

Reliable imports & stocks material from :

Europe, Japan, USA, South Africa, Korea, India, Germany, China, Taiwan, Turkey, Ukraine.

Supplementary Requirements

NACE MR0175, MR0103 / ISO 3183 / NACE TM0284, HIC & SSC TESTED PIPES.

Condition

Hot Finish, Cold Drawn

Alloy Steel Pipes & Tubes (Seamless & Welded)

ASTM Standard

ASTM A209	ASTM A369	ASTM A530	ASTM A714
ASTM A213	ASTM A426	ASTM A595	ASTM A847
ASTM A250	ASTM A450	ASTM A618	ASTM A1016
ASTM A334	ASTM A513	ASTM A691	
ASTM A335	ASTM A519	ASTM A697	

Grade

ASTM A209 T1, T1a, T1b
 ASTM A213 T2, T5, T5b, T5c, T9, T11, T12, T17, T21, T22, T23, T24, T36, T91, T92, T122, T911
 ASTM A250 T1, T1a, T1b, T2, T11, T12, T22
 ASTM A335 P1, P2, P5, P5b, P5c, P9, P11, P12, P15, P21, P22, P23, P24, P36, P91, P92, P122, P911
 ASTM A369 FPA, FPB, FP1, FP2, FP5, FP9, FP11, FP12, FP21, FP22, FP91, FP92
 ASTM A691 CM65, CM70, CM75, CMSH70, CMS75, CMSH80, ½ Cr, 1Cr, 1¼ Cr, 2 ¼ Cr, 3Cr, 5Cr, 9Cr, 91

Type

Seamless, Welded, ERW, EFW, HFW, LSAW, HSAW, Forged.

Supplementary Requirements

NACE MR0175, NACE MR0103, ISO 15156, HIC- NACE TM0284, SSC - NACE TM0177, SOUR SERVICES, OFF SHORE SERVICES, WITH LOW SULPHUR <0.002%, IMPACT TEST AT -50°C, BEAD CRUSH, RADIOGRAPHY (X RAY).

Services

Sour Service, Cut Length, Bevelling, Grinding, Machining, Taper Boring, Low Stress Stamping, Non Destructive Testing, Destructive Testing, Colour Coding, Marking, Export Packing, Heavy Wall Thickness, Odd Sizes, Fast Delivery, Hydro testing, Hardness Test, PMI Test, Hot Tensile & Other testing Services available on request

Fittings

ASTM Standard

ASTM A105	ASTM A234	ASTM A437	ASTM A727	ASTM A836	ASTM B366
ASTM A181	ASTM A320	ASTM A453	ASTM A733	ASTM A854	ASTM B381
ASTM A182	ASTM A350	ASTM A522	ASTM A758	ASTM A860	ASTM B462
ASTM A193	ASTM A403	ASTM A540	ASTM A774	ASTM A988	ASTM B564
ASTM A194	ASTM A420	ASTM A694	ASTM A815	ASTM B363	ASTM B637

Origin

Reliable imports & stocks material from :

Europe, Japan, USA, South Africa, Korea, India, Germany, China, Taiwan, Turkey, Ukraine.

Supplementary Requirements

Macrotech Test, Heat Treatment, Corrosion Test, Hardness Test, Grain Size, Stabilization Treatment,

Speciality

NACE MR0175, NACE MR0103, ISO 15156, HIC- NACE TM0284, SSC - NACE TM0177, SOUR SERVICES, OFF SHORE SERVICES, WITH LOW SULPHUR <0.002%, IMPACT TEST AT -50°C, BEAD CRUSH, RADIOGRAPHY (X RAY).

Heavy Wall Thickness, Odd Sizes.

Coating

Special Coating i.e Cement Mortar Lining, FBE Coating, Black / Galvanized (Electro / Hot Dip), 3 LPP, 3 LPE, PTFE Coating, Epoxy Coating can be provided.

Delivery Condition

Normalized, Annealed, Normalized and Tempered, Quenched & Tempered, Stress Relieved, Solution Annealed

Services

Bevelling, Grinding, Machining, Taper Boring, Low Stress Stamping, Non Destructive Testing, Destructive Testing, Colour Coding, Marking, Export Packing, Hydro testing, Hardness Test, PMI Test & Other testing Services available on request

Flanges

ASTM Standard

ASTM A105	ASTM A420	ASTM B381
ASTM A182	ASTM A522	ASTM B462
ASTM A234	ASTM A694	ASTM B564
ASTM A350	ASTM A707	
ASTM A403	ASTM A988	

Origin

Reliable imports & stocks material from : Europe, Japan, USA, South Africa, Korea, India, Germany, China, Taiwan, Turkey, Ukraine.

Type

AWWA Hub Flange, Paddle-Blank FLANGE, AWWA Ring Flange, Paddle-Spacer Flange, Blind Flange, Slip-on Flange, Socket Weld Flange, Spectacle Blind Flange, Equal Barrel Flange Stud Out FLange, Heavy Barrel Flange, Threaded Flange, Lap-Joint Flange, Weld Neck Flange, Long Weld Neck Flange, Connection Flanges Orifice Flange, Spades and Spacers, Anchor Flange, Swivel Ring Flange, Nipo Flange

Supplementary Requirements

Macro Test, Heat Treatment, Corrosion Test, Hardness Test, Grain Size, Stabilization Treatment, Impact Test

Speciality

NACE MR0175, NACE MR0103, ISO 15156, HIC- NACE TM0284, SSC - NACE TM0177, SOUR SERVICES, OFF SHORE SERVICES, WITH LOW SULPHUR <0.002%, Heavy Wall Thickness, Odd Sizes.

Coating

Special Coating i.e Cement Mortar Lining, FBE Coating, Black / Galvanized (Electro / Hot Dip), 3 LPP, 3 LPE, PTFE Coating, Epoxy Coating can be provided.

Delivery Condition

Normalized, Annealed, Normalized and Tempered, Quenched & Tempered, Stress Relieved, Solution Annealed

Round Bars

ASTM Standard & Grade

Round Bars are available in various materials : Stainless Steel | Nickel Alloy | Non Ferrous Metal | Alloy Steel | Carbon Steel

Stainless Steel Grades : 202, 304, 304L, 304H, 316, 316L, 316LN, 316Ti, 309, 310S, 317L, 321, 347, 409, 410, 420, 430, 440A, 440B, 440C, 446.

Carbon Steel Grades : 202, 304, 304L, 304H, 316, 316L, 316LN, 316Ti, 309, 310S, 317L, 321, 347, 409, 410, 420, 430, 440A, 440B, 440C, 446.

Nickel Alloy Grades : Cupro Nickel (90/10, 70/30), Hastelloy (C-4, C-22, C276, B-2), Nickel (200 / 201 / 205), Monel (K400 & K500), Inconel (600, 601, 625 & 825), Incolloy (800, 800H), Alloy 20, Titanium, Tungston, Moly, Kanthal, Nimonic Nichrome (80:20), Ferro Nickel Alloy (55/45, 60/40, 70/30), Cobalt, Sanicro (28, SS 904L).

Non Ferrous Metals :

Copper : 99.99% (Rolled – Hot & Cold, Electrolytic & Commercial)

Brass : Extruded & Drawn Free Cutting, Naval Brass, 60/40 Brass, Forging Brass

Phosphorus Bronze : PB2, 90/10

Gun Metal : 90/10, 70/30

Lead : 99.95 to 99.99%

Alloy Steel Grades : A-182 - F5, F9, F11, F12, F21, F22 & F91

Finish

Bright, Polish & Black

Supply Condition

Machining (CNC), Centreless Grinding (CG), Heat Treatment, Annealing, Pickling, Polish, Rolling, Forging, Cutting, Bending, Rolling, Machining (CNC),

Stainless Steel Plates

ASTM Standard

ASTM A240, EN 10028

Stainless Steel

Austenitic Grades

ASTM A240 304 / 304L - BS EN 10028-7 - 1.4301/1.4307

ASTM A240 316 / 316L - BS EN 10028-7 - 1.4301/1.4304

ASTM A240 321 / 321H - BS EN 10028-7 - 1.4541

ASTM A240 304H - BS EN 10028-7 - 1.4948

Duplex

ASTM A240 UNS S31803 - BS EN 10028-7 - 1.4462

Super Duplex

ASTM A240 UNS S32750

Nickel Alloy

Inconel® 600, 601, 617, 625, 718, X-750 Inco Alloy HX:

Incoloy® 800/800H, Alloy 330, Alloy 188, L-605

Supply Condition

In standard & non standard sizes | Available in other thicknesses, widths and lengths | Thickness tolerance to BS EN 10029 Class B, NACE Hardness to MR 0175 | Annealed and pickled | Inter Granular Corrosion test (IGC) to ASTM A 262 Practice E | Hot rolled Mill Finish No. 1 Polished to meet your requirements - dull or bright polishing

Nickel Alloy Plates

ASTM Standard

Nickel Alloy

ASTM B162 (UNS N02200, UNS N02201)

ASTM B127 (UNS N04400)

ASTM B435 (UNS N06002, UNS N06230, UNS N12160, AND UNS R30556)

ASTM B582 (ALLOY N06007, ALLOY N06975, ALLOY N06985, ALLOY N06030)

ASTM B575 (ALLOY N06035, ALLOY N10276, ALLOY N06022, ALLOY N06455,
ALLOY N06059, ALLOY N06058, ALLOY N06200, ALLOY N06210, ALLOY N06686)

ASTM B168 (UNS N06600, UNS N06601, UNS N06617, UNS N06690,
UNS N06693, UNS N06025, UNS N06045, UNS N06603, UNS N06696,
UNS N06617)

ASTM B443 (UNS N06625, UNS N06219)

ASTM B463 (UNS N08026, UNS N08020, UNS N08024)

ASTM B625 (UNS N08925, UNS N08031, UNS N08932, UNS N08926,
UNS N08354, UNS R20033)

ASTM B409 (ALLOY N08120, ALLOY N08890, ALLOY N08800,
ALLOY N08810, ALLOY N08811)

ASTM B536 (UNS N08330, UNS N08332)

ASTM B688 (N08366, N08367)

ASTM B424 (UNS N08825, UNS N08821)

ASTM B333 (ALLOY N10001, ALLOY N10665, ALLOY N10675, ALLOY N10629, ALLOY N10624)

ASTM B434 (UNS N10242, UNS N10003)

Supply Condition

In standard & non standard sizes | Available in other thicknesses, widths and lengths | Thickness tolerance to BS EN 10029 Class B, NACE Hardness to MR 0175 | Annealed and pickled | Inter Granular Corrosion test (IGC) to ASTM A 262 Practice E | Hot rolled Mill Finish No. 1 Polished to meet your requirements - dull or bright polishing

Carbon & Alloy Steel Plates

We carry the widest range of Sizes and Specifications in Steel Plate available within India.

EN10025

High Strength Low Alloy Steel Plates

A36
A572 Grade 42, 50, 60, 65
C SA G40.21 Grade 44W, 50W, 50A
A709 Grade 36, 50, 50W
A709 Grade HPS 50W, 70W
A ASHTO M270 Grade 50, 50W
A588 & A606
A 871 - 65
A656 Grade 50, 60, 70, 80
A 573 Grade 58, 65, 70
A283

Alloy Quenched & Tempered Steel Plate

A514 Grade B, E, F, H, Q, S
130 ksi/890 MPa Yield Strength
140 ksi/960 MPa Yield Strength
TMCP 100 ksi/690 MPa
A710
ASTM A829-4140

Abrasion Resistant Steel Plate

A R Medium : AR200/AR235
A R 400/400F
A R 450/450F
A R 500/500F
A R 600

Pressure Vessel Steel Plate

A516 Grade 55, 60, 65, 70
TC 128
A 612
A 537
A 285

Offshore & Marine Steel Plate

ABS Grade A, B, AH36, DH36, EH36
API 2H Grade 50
A633

Armor & Ballistic Steel Plate

MIL A 46100
MIL A 12560
MIL A 46177

Low/High Carbon Non-Structural Steel Plate

A 830-1045
C1020

Caterpillar Spec Steel

EN Standard Steel Plate

S235
S275
S355
S420
S690
S890

Offshore & Structural Plate

Boiler, Pressure Vessel & Chrome Moly Steel

Pressure Vessel Steel

ASME SA516/ASTM 516-Gr70
EN 10028:3 P355 NL1 & P355 NL2
BS 1501 224 490B LT50
BS 1501 223 490B LT30
BS 1501 225 490B LT50
EN 10028:3 P355NH
ASME SA537/ASTM A537-Class 1
ASME SA516/ASTM A516-Gr-65
ASME SA516/ASTM A516-Gr-60
EN 10028:3 P460NL1
EN 10028:3 P460NL2
EN 10028:3 P460NH

Boiler Plate Steel

ASME SA516/ASTM A516 Gr 60

EN 10028:3 P275NH
BS 1501 161 430 A/B
EN 10028:2 P265 GH
EN 10207 P2655

HIC Steel Plate

ASME SA516 HIC & ASTM A516HIC
CarElso HIC Premium+

API Plate

API 2H Plate
API 2W Plate
API 2Y Plate

Quenched & Tempered

EN 10025 S690QC
RQT 701
EN 10025 S 890QC

Abrasion Resistant Steel

Abrazo 400

High Yield Steel Plate

460 Yield Steel Plate

EN 10028:3 P460NL1
EN 10028:3 P460NL2
EN 10028:3 P460NH
EN 10025:3 S460N
EN 10025:3 S460NL

Armour Plate

Chrome Moly Plate

ASME SA 387 & ASTM A387

SA 387 / A387 Gr 11
SA 387 / A387 Gr 12
SA 387 / A387 Gr 22

Offshore & Structural Steel Plate

Services

Stockholding, Mill Supplies,
Finishing, Profiling, Cut pieces
(Water Jet, Plasma, Sawing, Laser),
Testing etc.

Other Steel Plate

P275NH - 1.0487
P275NL1 - 1.0488
P275NL2 - 1.1104
P355N - 1.0562
P355NH - 1.0565
P355NL1 - 1.0566
P355NL2 - 1.1106
P460NH - 1.8935
P460NL1 - 1.8915
P460NL2 - 1.8918

Hollow Section

ASTM Standard

ASTM A554, EN 10219

Grade

Stainless Steel - 301, 302, 304, 304L, 305, 309S, 309S-Cb, 310S, 316, 316L, 317, 321, 330, 347, 429, 430, 430-Ti.

Carbon Steel - S235JRH, S275JOH, S275J2H, S355JOH, S355J2H, S355K2H

Size

Square Hollow Section - 20 x 20 - 300 x 300

Rectangular Hollow Section - 30 x 20 - 400 x 200

Services

Cut to Length, Multiple Length, Laser Cutting, Polishing, Special Materials.

Delivery Condition

The Tubes shall be Furnished in any of the following conditions as specified :

As welded, Welded and Annealed, Cold Reduced, Cold Reduced and Annealed, Seamless

The inside diameter bead shall be furnished in any of the following conditions as specified :

Bead not removed

Bead controlled to 0.005 in (0.13 mm) or 15% of the specified wall thickness, whichever is greater,

Bead Removed

Bend Pipes

We are supplier of mandrel bends to the stainless steel fabrication industry. Our products are used in a wide range of markets in India and overseas, also bending to customers specifications we stock a wide range of stainless steel, mild steel and aluminium butt weld bends, safety grab rails and swimming pool ladder rails. With many years of experience and expertise in forming tube & pipe, Rolf is committed to providing top quality, bent tube and box section in Stainless Steel, Mild Steel, CDS, T45, Aluminum and on time service to our clients .

Mandrel Bending | Rolling | Swaging & Flaring | CNC Capability | One-off Bends to Multiples | Fast & Accurate | Quick turn-around | Stainless, Aluminium, Copper, Brass & Pipe

Tube size from 6mm to 114.3 mm OD can be manipulated on a variety of different centre line radii to accommodate differing wall thicknesses required by fabricators. Various areas of product design and fabrication have recognised the potential in utilising this specialist capability, including architectural designers, where the use of high-performance stainless tube matches many contemporary design visions.

A variety of methods can be used for bending stainless steel tubing. If the bend has a large radius, the tubing can be curved with three-roll benders (also called section benders, profile benders, or angle rolls.) If the bend has a tight radius, the tubing can be bent on a rotary-draw bender through a process called mandrel tube bending.

Both welded and seamless tubing can be curved. When the desired radius is very tight, seamless usually bends better.

Since the application of bent stainless tube often involves products for the pharmaceutical and food industries, care must be taken to avoid carbon contamination of the steel. The machinery and tooling should be cleaned and prepared to avoid such contamination. Furthermore, care should be taken to avoid having metal strapping in contact with the stainless parts. Cardboard, wood or plastic can be used to protect the tubing during transit.

After bending stainless steel tubing, a nut and sleeve can be slid over the ends which then can be flared. Process piping is often supplied this way.

Tubing is also becoming increasingly popular in construction in roof trusses, canopies, balconies, and many other applications. Accuracy of 0.1 of a degree is achieved for a variety of applications, automotive, architectural and marine.

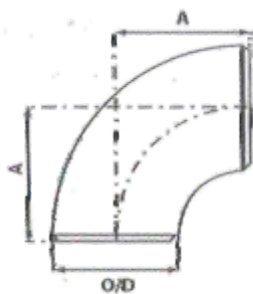
Steel Grades Correlation in different Standards

		ASTM (USA)	UNS (USA)	B.S. (UK)	EN / DIN (Germany)	AFNOR NF (France)	UNI (Italy)	SS (Sweden)	JIS (Japan)	GB/PR (China)	KS (Korea)
General service and wet corrosion	Austenitic	304	S30400	304S31 / 304S15	1.4301	Z7 CN 18-09/ Z6 CN 18-09	X5CrNi18 10	2333	SUS 304	0Cr18Ni9	STS 304
		304L	S30403	304S11	1.4306	Z2 CN 18-10	X2CrNi18 11	2352	SUS 304L	00Cr19Ni10	STS 304L
					1.4307	Z3 CN 18-10					
		304LN	S30453	304S61	1.4311	Z3 CN 18-10 Az		2371	SUS 304LN	00Cr18Ni 10N	STS 304LN
		316	S31600	316S31	1.4401	Z7 CND 17-11-02	X5CrNiMo 17 12	2347	SUS 316	0Cr17Ni 12Mo2	STS 316
				316S33/ 316S31	1.4436	Z7 CND 18-12-03	X5CrNiMo 17 13	2343			
		316L	S31603	316S11/ 316S14	1.4404	Z3 CND 17-11-02 / Z3 CND 18-12-02	X5CrNiMo 17 12	2348	SUS 316L	00Cr17Ni 14Mo2	STS 316L
				316S13/ 316S11	1.4435	Z3 CND 18-14-03	X2CrNiMo 17 13	2353			
		316N	S31651	—	—	—		—	—	—	—
		316LN	S31653	316S61	1.4406	Z3 CND 17-11 Az		—	SUS 316LN	00Cr17Ni 12Mo2N	STS 316LN
		316Ti	S31635	320S31	1.4571	Z6 CNDT 17-12-02	X6CrNiMo Ti17 13	2350	SUS 316Ti	0Cr18Ni12 Mo2Ti	STS 316Ti
		316H	S31609	316S52	1.4401/ 1.4919	Z6 CND 17-12-02	X8CrNiMo 17 12	—	—	—	—
		321	S32100	321S31	1.4541	Z6 CNT 18-10	X6CrNiTi18 11	2337	SUS 321	1Cr18Ni9Ti	STS 321
		317	S31700	317S16	1.4449	—		—	SUS 317		
	317L	S31703	317S12	1.4438	Z3 CND 19-15-04		2367	SUS 317L	00Cr19Ni13 Mo3	STS 317L	
	347	S34700	347S31	1.4550	Z6 CNNb 18-10	X6CrNiNb 18 11	2338	SUS 347	0Cr18Ni11 Nb	STS 347	
	904L	N08904	904S13	1.4539	Z2 NCDU 25-20		2562	—	—	STS 317J5L	
	Duplex	—	S31803	—	1.4462	Z2 CND 22-05 Az		2377	—	—	—
		—	S32205	318S13	1.4462	Z3 CND 22-05 Az		2377	SUS 329J3L	00Cr22 Ni5Mo3N	STS 329J3L
	Ferritic	405	S40500	405S17	1.4002	Z6 C Al 13		—	SUS 405		
		410	S41000	410S21	1.4006	Z12C13	X12Cr13	2302	SUS 410	1Cr12	STS 410
		430	S43000	430S17	1.4016	Z8 C17	X8Cr17	2320	SUS 430	1Cr17	STS 430
		430Ti	—	—	1.4510	Z8 CT17		—	SUS 430LX	—	—
	SuperDuplex	—	S32750	—	1.4410	—		—	—	—	—
		—	S32760	—	—	—		—	—	—	—
Heat resistant	Austenitic	304H	S30409	304S51	1.4948	Z6 CN 18-09	X8CrNi 18 10	2333	SUS 304	1Cr18Ni9	STS 304
		321H	S32109	321S51	1.4878	Z6 CNT 18-10	X8CrNiTi 18 11	2337	SUS 321		
		347H	S34709	347S51	—	—	X8CrNiNb 18 11	2347	—	—	—
		310S	S31008	310S16/ 310S24	1.4845	Z8 CN 25-20/ Z12 CN 25-20	X6CrNi 25 20	2361	SUS 310S	0Cr25Ni20	STS 310S
		310H	S31009	—	—	—		—	—	—	—
		314	S31400	—	1.4841	Z15 CNS 25-20	—	—	—	—	—

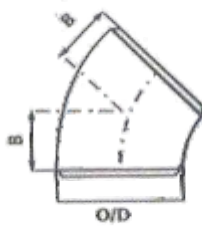
Pipe Chart as per ANSI Pipe Schedule

Nominal Pipe Size		Outside Diameter (mm)	Nominal Wall Thickness Schedule																
NPS	DN	OD	SCH 5s	SCH 10s	SCH 10	SCH 20	SCH 30	SCH 40s	SCH STD	SCH 40	SCH 60	SCH 80s	SCH XS	SCH 80	SCH 100	SCH 120	SCH 140	SCH 160	SCH XXS
1/8	6	10.3		1.24				1.73	1.73	1.73		2.41	2.41	2.41					
1/4	8	13.7		1.65				2.24	2.24	2.24		3.02	3.02	3.02					
3/8	10	17.1		1.65				2.31	2.31	2.31		3.20	3.20	3.20					
1/2	15	21.3	1.65	2.11				2.77	2.77	2.77		3.73	3.73	3.73				4.78	7.47
3/4	20	26.7	1.65	2.11				2.87	2.87	2.87		3.91	3.91	3.91				5.56	7.82
1	25	33.4	1.65	2.77				3.38	3.38	3.38		4.55	4.55	4.55				6.35	9.09
1 1/4	32	42.2	1.65	2.77				3.56	3.56	3.56		4.85	4.85	4.85				6.35	9.70
1 1/2	40	48.3	1.65	2.77				3.68	3.68	3.68		5.08	5.08	5.08				7.14	10.15
2	50	60.3	1.65	2.77				3.91	3.91	3.91		5.54	5.54	5.54				8.74	11.07
2 1/2	65	73	2.11	3.05				5.16	5.16	5.16		7.01	7.01	7.01				9.53	14.02
3	80	88.9	2.11	3.05				5.49	5.49	5.49		7.62	7.62	7.62				11.13	15.24
3 1/2	90	101.6	2.11	3.05				5.74	5.74	5.74		8.08	8.08	8.08					
4	100	114.3	2.11	3.05				6.02	6.02	6.02		8.56	8.56	8.56		11.13		13.49	17.12
5	125	141.3	2.77	3.40				6.55	6.55	6.55		9.53	9.53	9.53		12.70		15.88	19.05
6	150	168.3	2.77	3.40				7.11	7.11	7.11		10.97	10.97	10.97		14.27		18.26	21.95
8	200	219.1	2.77	3.76		6.35	7.04	8.18	8.18	8.18	10.31	12.70	12.70	12.70	15.09	18.26	20.62	23.01	22.23
10	250	273.1	3.40	4.19		6.35	7.80	9.27	9.27	9.27	12.70	12.70	12.70	15.09	18.26	21.44	25.40	28.58	25.40
12	300	323.9	3.96	4.57		6.35	8.38	9.53	9.53	10.31	14.27	12.70	12.70	17.48	21.44	25.40	28.58	33.32	25.40
14	350	355.6	3.96	4.78	6.35	7.92	9.53		9.53	11.13	15.09		12.70	19.05	23.83	27.79	31.75	35.71	
16	400	406.4	4.19	4.78	6.35	7.92	9.53		9.53	12.70	16.66		12.70	21.44	26.19	30.96	36.53	40.49	
18	450	457.2	4.19	4.78	6.35	7.92	11.13		9.53	14.27	19.05		12.70	23.83	29.36	34.93	39.67	45.24	
20	500	508	4.78	5.54	6.35	9.53	12.70		9.53	15.09	20.62		12.70	26.19	32.54	38.10	44.45	50.01	
22		559	4.78	5.54	6.35	9.53	12.70		9.53		22.23		12.70	28.58	34.93	41.28	47.63	53.98	
24	600	610	5.54	6.35	6.35	9.53	14.27		9.53	17.48	24.61		12.70	30.96	38.89	46.02	52.37	59.54	
26		660			7.92	12.70			9.53				12.70						
28	700	711			7.92	12.70	15.88		9.53				12.70						
30		762	6.35	7.92	7.92	12.70	15.88		9.53				12.70						
32	800	813			7.92	12.70	15.88		9.53	17.48			12.70						
34		884			7.92	12.70	15.88		9.53	17.48			12.70						
36	900	914			7.92	12.70	15.88		9.53	19.05			12.70						
38		965							9.53				12.70						
40	1000	1016						9.53		12.70									
42		1067				12.70	15.88		9.53	19.05			12.70						
44	1100	1118							9.53				12.70						
46		1168							9.53				12.70						
48	1200	1219							9.53			12.70							
52		1321																	
56	1422																		
60	1524																		

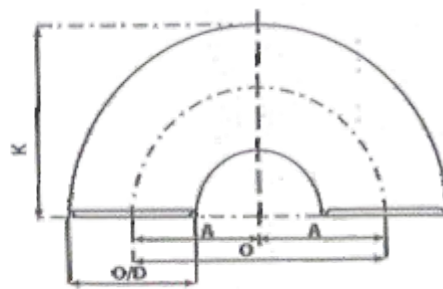
Butt Weld Pipe Fittings



90 Deg. LR ELBOW



45 Deg. LR ELBOW



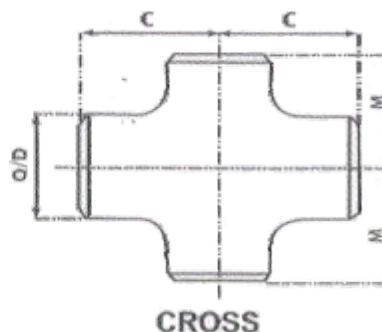
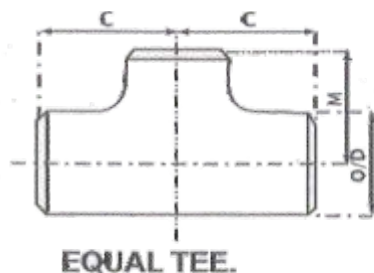
180 Deg. LR RETURN BEND

AS PER B 16.9

Nominal Pipe Size (NPS)	Outside Diameter at Bevel (O/D)	Dimension A	Dimension B	Center to Center O	Back to Face K
1/2"	21.3	38.0	16	76	48
3/4"	26.7	38.0	19	76	51
1"	33.4	38.0	22	76	56
1.1/4"	42.2	48.0	25	95	70
1.1/2"	48.3	57.0	29	114	83
2"	60.3	76.0	35	152	106
2.1/2"	73.0	95.0	44	190	132
3"	88.9	114.0	51	229	159
3.1/2"	101.6	133.0	57	267	184
4"	114.3	152.0	64	305	210
5"	141.3	190.0	79	381	262
6"	168.3	229.0	95	457	313
8"	219.1	305.0	127	610	414
10"	273.0	381.0	159	762	518
12"	323.8	457.0	190	914	619
14"	355.6	533.0	222	1067	711
16"	406.4	610.0	254	1219	813
18"	457.0	686.0	286	1372	914
20"	508.0	762.0	318	1524	1016
22"	559.0	838.0	343	1676	1118
24"	610.0	914.0	381	1829	1219
26"	660.0	991.0	406	-	-
28"	711.0	1067.0	438	-	-
30"	762.0	1143.0	470	-	-
32"	813.0	1219.0	502	-	-
34"	864.0	1295.0	533	-	-
36"	914.0	1372.0	565	-	-

NOTE : ALL DIMENSIONS ARE IN MM

Butt Weld Pipe Fittings

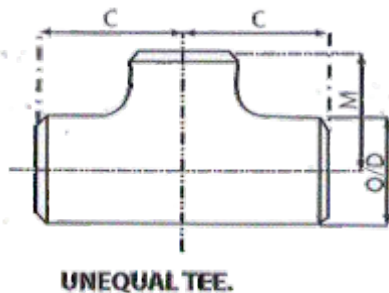


AS PER B 16.9

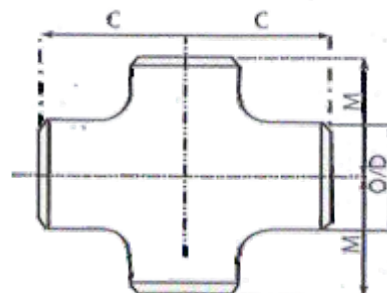
Nominal Pipe Size (NPS)	Outside Diameter at Bevel (O/D)	Run 'C'	Outlet 'M'
1/2"	21.3	25	25
3/4"	26.7	29	29
1"	33.4	38	38
1.1/4"	42.2	48	48
1.1/2"	48.3	57	57
2"	60.3	64	64
2.1/2"	73.0	76	76
3"	88.9	86	86
3.1/2"	101.6	95	95
4"	114.3	105	105
5"	141.3	124	124
6"	168.3	143	143
8"	219.1	178	178
10"	273.0	216	216
12"	323.8	254	254
14"	355.6	279	279
16"	406.4	305	305
18"	457.0	343	343
20"	508.0	381	381
22"	559.0	419	419
24"	610.0	432	432
26"	660.0	495	495
28"	711.0	521	521
30"	762.0	559	559
32"	813.0	597	597
34"	864.0	635	635
36"	914.0	673	673

NOTE : ALL DIMENSIONS ARE IN MM

Butt Weld Pipe Fittings



UNEQUAL TEE.



CROSS UNEQUAL

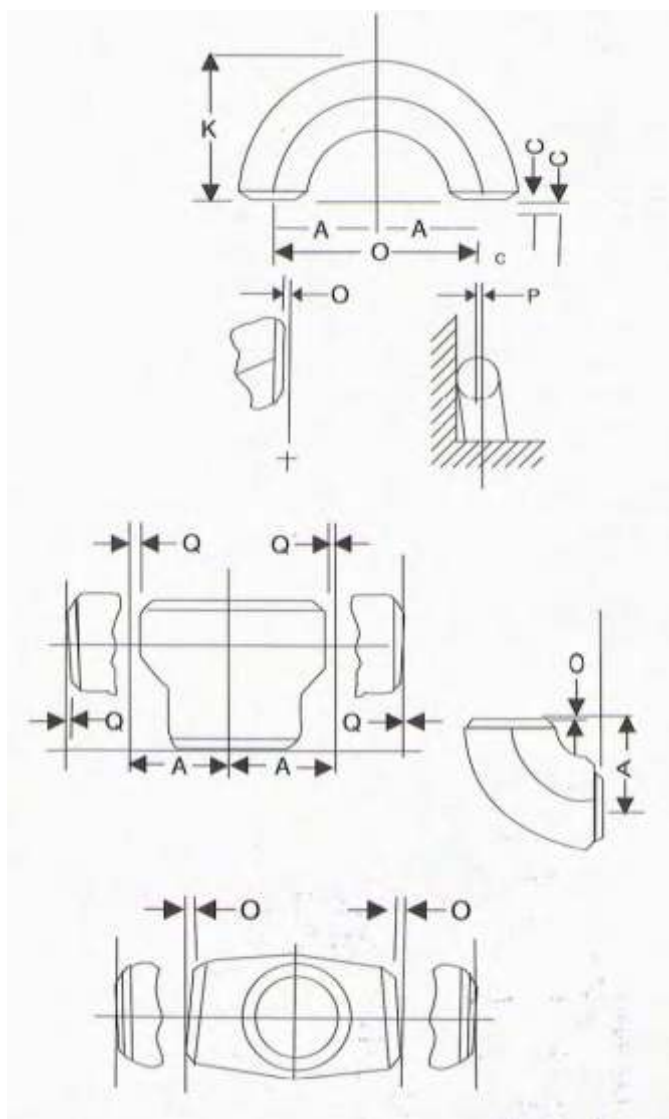
Nominal Pipe Size (NPS)	Outside Diameter at Bevel (O/D)		Center - to Center		Nominal Pipe Size (NPS)	Outside Diameter at Bevel (O/D)		Center - to Center	
	Run	Outlet	Run 'C'	Outlet 'M'		Run	Outlet	Run 'C'	Outlet 'M'
1/2" x 3/8"	21.3	17.3	25	25	10" x 8"	273.0	219.1	216	203
1/2" x 1/4"	21.3	13.7	25	25	10" x 6"	273.0	168.3	216	194
3/4" x 1/2"	26.7	21.3	29	29	10" x 5"	273.0	141.3	216	191
3/4" x 3/8"	26.7	17.3	29	29	10" x 4"	273.0	114.3	216	184
1" x 3/4"	33.4	26.7	38	38	12" x 10"	323.8	273.0	254	241
1" x 1/2"	33.4	21.3	38	38	12" x 8"	323.8	219.1	254	229
1.1/4" x 1"	42.2	33.4	48	48	12" x 6"	323.8	168.3	254	219
1.1/4" x 3/4"	42.2	26.7	48	48	12" x 5"	323.8	141.3	254	216
1.1/4" x 1/2"	42.2	21.3	48	48	14" x 12"	355.6	323.8	279	270
1.1/2" x 1.1/4"	48.3	42.2	57	57	14" x 10"	355.6	273.0	279	257
1.1/2" x 1"	48.3	33.4	57	57	14" x 8"	355.6	219.1	279	248
1.1/2" x 3/4"	48.3	26.7	57	57	14" x 6"	355.6	168.3	279	238
1.1/2" x 1/2"	48.3	21.3	57	57	16" x 14"	406.4	355.6	305	305
2" x 1.1/2"	60.3	48.3	64	60	16" x 12"	406.4	323.8	305	295
2" x 1.1/4"	60.3	42.2	64	57	16" x 10"	406.4	273.0	305	283
2" x 1"	60.3	33.4	64	51	16" x 8"	406.4	219.1	305	273
2" x 3/4"	60.3	26.7	64	44	16" x 6"	406.4	168.3	305	264
2.1/2" x 2"	73.0	60.3	76	70	18" x 16"	457.0	406.4	343	330
2.1/2" x 1.1/2"	73.0	48.3	76	67	18" x 14"	457.0	355.6	343	330
2.1/2" x 1.1/4"	73.0	42.2	76	64	18" x 12"	457.0	323.8	343	321
2.1/2" x 1"	73.0	33.4	76	57	18" x 10"	457.0	273.0	343	308
3" x 2.1/2"	88.9	73.0	86	83	18" x 8"	457.0	219.1	343	298
3" x 2"	88.9	60.3	86	76	20" x 18"	508.0	457.0	381	368
3" x 1.1/2"	88.9	48.3	86	73	20" x 16"	508.0	406.4	381	356
3" x 1.1/4"	88.9	42.2	86	70	20" x 14"	508.0	355.6	381	356
3.1/2" x 3"	101.6	88.9	95	92	20" x 12"	508.0	323.8	381	346
3.1/2" x 2.1/2"	101.6	73.0	95	89	20" x 10"	508.0	273.0	381	333
3.1/2" x 2"	101.6	60.3	95	83	20" x 8"	508.0	219.1	381	324
3.1/2" x 1.1/2"	101.6	48.3	95	79	22" x 20"	559.0	508.0	419	406
4" x 3.1/2"	114.3	101.6	105	102	22" x 18"	559.0	457.0	419	394
4" x 3"	114.3	88.9	105	98	22" x 16"	559.0	406.4	419	381
4" x 2.1/2"	114.3	73.0	105	95	22" x 14"	559.0	355.6	419	381
4" x 2"	114.3	60.3	105	89	22" x 12"	559.0	323.8	419	371
4" x 1.1/2"	114.3	48.3	105	86	22" x 10"	559.0	273.0	419	359
5" x 4"	141.3	114.3	124	117	24" x 22"	610.0	559.0	432	432
5" x 3.1/2"	141.3	101.6	124	114	24" x 20"	610.0	508.0	432	432
5" x 3"	141.3	88.9	124	111	24" x 18"	610.0	457.0	432	419
5" x 2.1/2"	141.3	73.0	124	108	24" x 16"	610.0	406.4	432	406
5" x 2"	141.3	60.3	124	105	24" x 14"	610.0	355.6	432	406
6" x 5"	168.3	141.3	143	137	24" x 12"	610.0	323.8	432	397
6" x 4"	168.3	114.3	143	130	24" x 10"	610.0	273.0	432	384
6" x 3.1/2"	168.3	101.6	143	127	26" x 24"	660.0	610.0	495	483
6" x 3"	168.3	88.9	143	124	26" x 22"	660.0	559.0	495	470
6" x 2.1/2"	168.3	73.0	143	121	26" x 20"	660.0	508.0	495	457
8" x 6"	219.1	168.3	178	168	26" x 18"	660.0	457.0	495	444
8" x 5"	219.1	141.3	178	162	26" x 16"	660.0	406.4	495	432
8" x 4"	219.1	114.3	178	156	26" x 14"	660.0	355.6	495	432
8" x 3.1/2"	219.1	101.6	178	152	26" x 12"	660.0	323.8	495	422
					28" x 26"	711.0	660.0	521	521
					28" x 24"	711.0	610.0	521	508
					28" x 22"	711.0	559.0	521	495
					28" x 20"	711.0	508.0	521	483

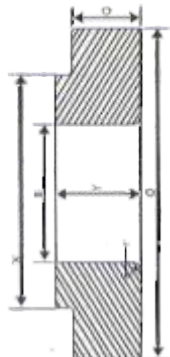
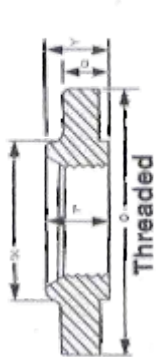
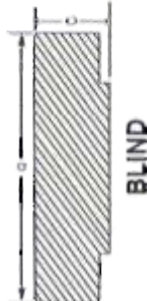
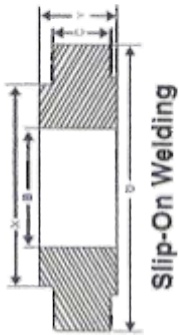
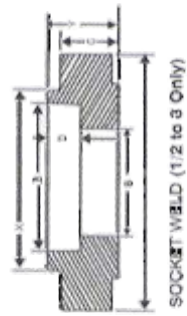
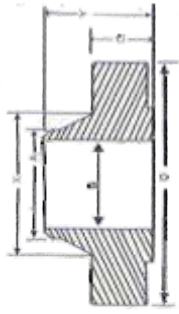
NOTE : ALL DIMENSIONS ARE IN MM

DIMENSIONAL TOLERANCES AS PER ANSI B 16.9/ B 16.28/ MSS SP - 43 BUTT WELD FITTING

All Fittings	Outside Diameter at Bevel (1), (2) D	Inside Diameter at End (1), (2), (3)	Wall Thickness (3)	0 deg. and 45 deg. elbows and Tees	Reducers & Lap Joints Stub Ends	Caps	180 deg Returns			Lap Joint Stub Ends		
							Center to end Dimension A,B,C,M	Center to Overall Length F,H	Overall Length E	Center to Center Dimension O	Back to Face Dimension K	Alignment of ends U
Nominal Pipe Size (NPS)	1/2 to 2/12	-	0.8	2	2	4	7	7	1	+0.1	+0.1	See Table 7 for limiting dimensions
	3 to 3/12	-	1.6	2	2	4	7	7	1	+0.1	+0.1	
	4	+2	1.6	2	2	4	7	7	1	+0.1	+0.1	
	5 to 6	-3	1.6	2	2	7	7	7	1	+0.1	+0.1	
		8	+4	1.6	2	2	7	7	7	1	+0.1	
	10	+4	3.2	2	2	7	10	7	2	+0.2	+0.2	
	12 to 18	+4	3.2	2	2	7	10	7	2	+0.2	+0.2	
	20 to 24	+6	4.8	3	3	7	10	7	2	+0.2	+0.2	
	26 to 30	+7	4.8	3	3	10	-	-	-	-	-	
	32 to 48	+7	4.8	5	5	10	-	-	-	-	-	

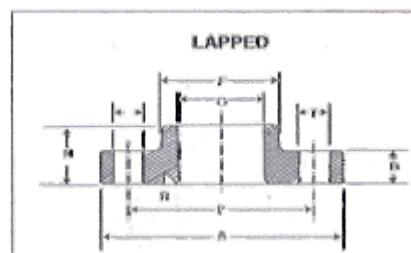
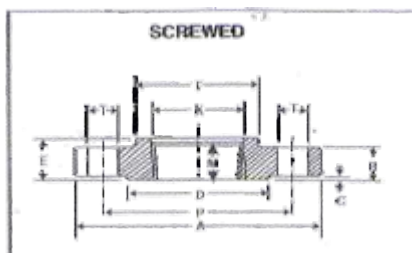
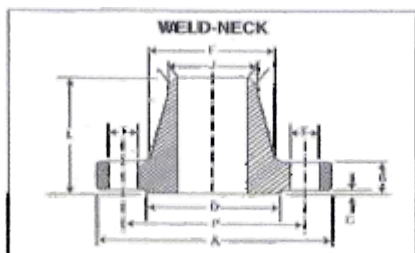
Nominal Pipe Size (NPS)	Angularity - Tail	
	Off Angle Q	Off Plane P
1/2 to 4	1	2
5 to 8	2	4
10 to 12	3	5
14 to 16	3	7
18 to 24	4	10
26 to 30	5	10
32 to 42	5	13
44 to 48	5	20





DIMENSIONS FO CLASS 150 FLANGES AS PER B 16.5

Nominal Pipe Size (NPS)	Outside Dia of Flange 'Q'	Thickness of Flange 'C'	Dia of Hub 'X'	Length Through Hub 'Y'			Thread Length T	Bore 'B'			Depth of Socket
				Threaded Slip on Socket Welding	Lapped	Weld Neck		Slip on on Socket Welding	Lapped	Weld Neck Socket Welding	
1/2"	88.9	11.2	30.226	15.748	15.748	47.752	15.748	22.352	22.86	15.748	9.652
3/4"	98.6	12.7	38.1	15.748	15.748	52.324	15.748	27.686	28.194	20.828	11.176
1"	108.0	14.2	49.276	17.526	17.526	55.626	17.526	34.544	35.052	26.67	12.7
1.1/4"	117.3	15.7	58.674	20.574	20.574	57.15	20.574	43.18	43.688	35.052	14.224
1.1/2"	127.0	17.5	65.024	22.352	22.352	61.976	22.352	49.53	50.038	40.894	15.748
2"	152.4	19.1	77.724	25.4	25.4	63.5	25.4	61.976	62.484	52.578	17.526
2.1/2"	177.8	22.4	90.424	28.448	28.448	69.85	28.448	74.676	75.438	62.738	19.05
3"	190.5	23.9	107.95	30.226	30.226	69.85	30.226	90.678	91.44	77.978	20.574
3.1/2"	215.9	23.9	122.174	31.75	31.75	71.374	31.75	103.378	104.14	90.17	-
4"	228.6	23.9	134.874	33.274	33.274	76.2	33.274	116.84	116.84	102.362	-
5"	254.0	23.9	163.576	36.576	36.576	88.9	36.576	143.764	144.526	128.27	-
6"	279.4	25.4	192.24	39.624	39.624	88.9	39.624	170.688	171.45	154.178	-
8"	342.9	28.4	246.126	44.45	44.45	101.6	44.45	221.488	222.25	202.692	-
10"	406.4	30.2	304.8	49.276	49.276	101.6	49.276	276.352	277.368	254.508	-
12"	482.6	31.8	365.252	55.626	55.626	114.3	55.626	327.152	328.168	304.8	-
14"	533.4	35.1	400.05	57.15	79.248	127	57.15	359.156	360.172	-	-
16"	596.9	36.6	457.2	63.5	87.376	127	63.5	410.464	411.226	-	-
18"	635.0	40.1	504.952	68.326	96.774	139.7	68.326	461.772	462.28	-	-
20"	698.5	42.9	558.8	73.152	103.124	144.526	73.152	513.08	514.35	-	-
24"	812.8	47.8	663.448	82.55	111.252	152.4	82.55	615.95	615.95	-	-



DIMENSIONAL OF CLASS 600 FLANGES AS PER ANSI B 16.5

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	23.0	66.7	3.0	15.9	4
20	117	15.9	6.4	43	25	48	27.7	11.0	26.7	29.0	57	16	25	28.0	82.6	3.0	19.0	4
25	124	17.5	6.4	51	27	54	34.5	12.5	33.4	36.0	62	17	27	35.0	88.9	3.0	19.0	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	19.0	4
40	156	22.2	6.4	73	32	70	49.5	16.0	48.3	50.5	70	22	32	50.0	114.3	6.5	22.2	4
50	165	25.4	6.4	92	37	84	62.0	17.5	60.3	63.5	73	29	37	62.5	127.0	8.0	19.0	8
65	190	28.6	6.4	105	41	100	74.7	19.0	73.0	76.0	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	92.0	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	105.0	86	40	49	104.0	184.2	9.5	25.4	8
100	273	38.1	6.4	157	54	152	116.1	-	114.3	118.0	102	41	54	117.0	215.9	11.0	25.4	8
125	330	44.4	6.4	186	60	189	143.8	-	141.3	145.0	114	48	60	145.0	266.7	11.0	28.6	8
150	356	47.6	6.4	216	67	222	170.7	-	168.3	171.0	117	51	67	171.0	292.1	12.5	28.6	12
200	419	55.6	6.4	270	76	273	221.5	-	219.1	222.0	133	57	76	222.0	349.2	12.5	31.8	12
250	508	63.5	6.4	324	86	343	276.4	-	273.0	276.0	152	65	111	277.0	431.8	12.5	34.9	16
300	559	66.7	6.4	381	92	400	327.2	-	323.9	329.0	156	70	117	328.0	489.0	12.5	34.9	20
350	603	69.8	6.4	413	94	432	359.2	-	355.6	360.0	165	73	127	360.0	527.0	12.5	38.1	20
400	686	76.2	6.4	470	106	495	410.5	-	406.4	411.0	178	78	140	411.0	603.2	12.5	41.3	20
450	743	82.6	6.4	533	117	546	461.8	-	457.2	462.0	184	79	152	462.0	654.0	12.5	44.4	20
500	813	88.9	6.4	584	122	610	513.1	-	508.0	513.0	190	83	165	514.0	723.9	12.5	44.4	24
600	940	101.6	6.4	692	140	718	616.0	-	609.6	614.0	203	92	184	616.0	838.2	12.5	50.8	24

DIMENSIONAL OF CLASS 1500 FLANGES AS PER ANSI B 16.5

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	75.5	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	117.0	241.3	11.0	34.9	8
125	325	73.0	6.4	186	105	197	-	-	141.3	145.0	156	64	105	145.0	292.1	11.0	41.3	12
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	75	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	16
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	66.7	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

1) All dimensions are in Millimeters

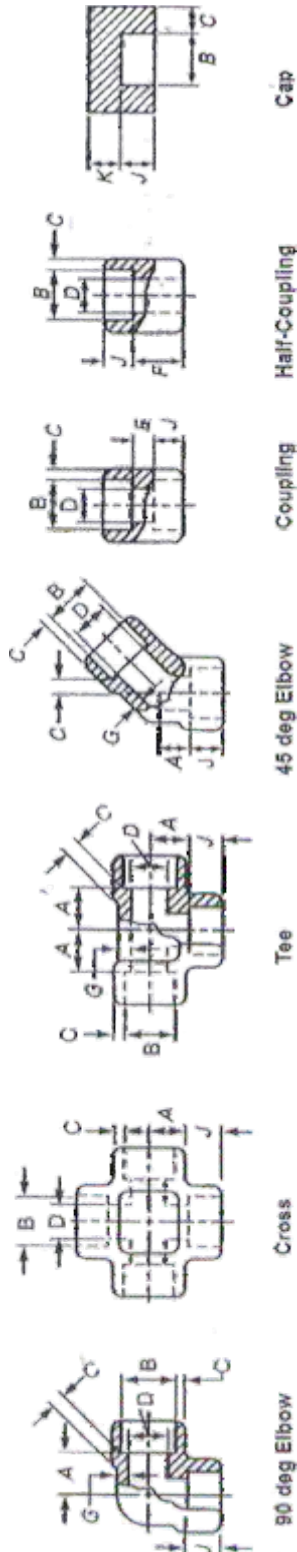
2) Flanges except Lap Joint will be furnished with (1.6) Raised Face, which is included in "Thickness(C)" and "Length through Hub(Y)".

Dimension Tolerances

Thread, Socket-Welding, Slip-on, Lap Joint and Blind		
Outside Diameter	When O.D. is 24" or Less	± 1/16" (1.6mm)
	When O.D. is over 24"	± 1/8" (3.2mm)
Inside Diameter	Threaded	Within limits on boring gauge
	Socket-welding, Slip-on and Lap Joints	10" & Smaller +1/32"(0.8mm) -0" 12" & Larger +1/16" (1.6mm). -0"
	12" and Smaller	+1/32" (0.8mm) -1/16"(1.6mm)
Outside Diameter of Hub	14" and Larger	± 1/8" (3.2mm)
	1/16" Raised Face	± 1/32" (0.8mm)
	1/4" Raised Face Tongue & Groove Male, Female	± 1/64" (0.4mm)
Same as for Inside Diameter		
Drilling	Bolt Circle	± 1/16" (1.6mm)
	Bolt Hole Spacing	± 1/32" (0.8mm)
	Eccentricity of Bolt Circle with Respect to Facing	2 1/2" & Smaller 1/32"(0.8mm) max 3" & Larger 1/16"(1.6mm) max
	18" and Smaller	+1/8" (3.2mm). 0"
Thickness	20" and Larger	+3/16"(4.8mm).0"
	10" and Smaller	± 1/16" (1.6mm)
Length thru Hub	12" and Larger	± 1/8" (3.2mm)

Welding Neck		
Outside Diameter	When O.D. is 24" or Less	± 1/16" (1.6mm)
	When O.D. is over 24"	± 1/8" (3.2mm)
Inside Diameter	10" and Smaller	± 1/32" (0.8mm)
	12" thru 18"	± 1/16" (1.6mm)
	20" and larger	+ 1/8" (3.2mm) - 1/16" (1.6mm)
Diameter of Contact Face	1/16" Raised Face	± 1/32" (0.8mm)
	1/4" Raised Face Tongue & Groove Male, Female	± 1/64" (0.4mm)
Diameter of Hub at Base	When Hub Base. is 24" or Smaller	± 1/16" (1.6mm)
	When Hub Base is over 24"	± 1/8" (3.2mm)
Diameter of Hub at Point of Welding	5" and Smaller	+ 3/32" (2.4mm) - 1/32" (0.8mm)
	6" and Larger	+ 5/32" (4.0mm) - 1/32" (0.8mm)
	Bolt Circle	± 1/16" (1.6mm)
Drilling	Bolt Hole Spacing	± 1/32" (0.8mm)
	Eccentricity of Bolt Circle with Respect to Facing	2 1/2" & Smaller 1/32"(0.8mm) max 3" & Larger 1/16"(1.6mm) max
	Eccentricity of Bolt Circle with Respect to Bore	1/32"(0.8mm) max
	Eccentricity of Facing with Respect to Bore	1/32"(0.8mm) max
	18" and Smaller	+1/8" (3.2mm). 0"
Thickness	20" and Larger	+3/16"(4.8mm).0"
	10" and Smaller	± 1/16" (1.6mm)
Length thru Hub	12" and Larger	± 1/8" (3.2mm)

Forged Fittings, Socket-Welding & Threaded



AS PER B 16.5

SOCKET-WELDING FITTINGS

Nominal Pipe Size	Socket Bore Diameter B [Note(1)]	Bore Diameter of Fittings, D [Note (1)]		Socket Wall Thickness, C [Note (2)]								Body Wall, G		Min. Depth of Socket J	Center to Bottom of Socket, A					Laying Lengths		Tolerances, ±		End Wall Thickness, K _{min.}				
		Class Designation		Class Designation				Class Designation				Class Designation			90 deg Elbows, Tees, and Crosses					45 deg Elbows,		Couplings E	Half Couplings F	A	E	F	Class Designation	
		3000	6000	9000	Avg.	Min.	Avg.	Min.	Avg.	Min.	3000	6000	9000		3000	6000	9000											
DN		3000	6000	9000	Avg.	Min.	Avg.	Min.	Avg.	Min.	Avg.	Min.	3000	6000	9000	3000	6000	9000	6.5	16.0	1.0	1.5	1.0	4.8	6.4	---		
6	1/8	11.2	7.6	4.8	--	3.18	3.18	3.96	3.43	---	2.41	3.15	---	9.5	11.0	11.0	8.0	8.0	8.0	6.5	16.0	1.0	1.5	1.0	4.8	6.4	---	
8	1/4	10.8	6.1	3.2	--	3.78	3.30	4.60	4.01	---	3.02	3.68	---	9.5	11.0	13.5	8.0	8.0	8.0	6.5	16.0	1.0	1.5	1.0	4.8	6.4	---	
10	3/8	14.6	10.0	7.1	--	4.01	3.50	5.03	4.37	---	3.20	4.01	---	9.5	13.5	15.5	8.0	11.0	---	6.5	17.5	1.5	3.0	1.5	4.8	6.4	---	
15	1/2	18.0	13.3	9.9	--	4.67	4.09	5.97	5.18	9.35	8.18	3.73	4.78	7.47	9.5	15.5	19.0	25.5	11.0	12.5	9.5	22.5	1.5	3.0	1.5	6.4	7.9	11.2
20	3/4	21.8	15.0	11.0	5.6	4.90	4.27	6.96	6.04	9.78	8.56	3.91	5.56	7.82	12.5	19.0	22.5	28.5	13.0	14.0	9.5	24.0	1.5	3.0	1.5	6.4	7.9	12.7
25	1	27.2	20.2	14.8	10.3	5.69	4.98	7.92	6.93	11.38	9.96	4.55	6.35	9.09	12.5	22.5	27.0	32.0	14.0	17.5	12.5	28.5	2.0	4.0	2.0	9.6	11.2	14.2
32	1 1/4	34.3	27.4	21.5	16.0	6.07	5.28	7.92	6.93	12.14	10.62	4.85	6.35	9.70	12.5	27.0	32.0	35.0	17.5	20.5	12.5	30.0	2.0	4.0	2.0	9.6	11.2	14.2
40	1 1/2	43.1	35.8	30.2	23.5	6.35	5.54	8.92	7.80	12.70	11.12	5.08	7.14	10.15	12.5	32.0	38.0	38.0	20.5	25.5	12.5	32.0	2.0	4.0	2.0	11.2	12.7	15.7
50	2	42.7	34.3	28.7	22.0	6.35	5.54	8.92	7.80	12.70	11.12	5.08	7.14	10.15	12.5	32.0	38.0	38.0	20.5	25.5	12.5	32.0	2.0	4.0	2.0	11.2	12.7	15.7
65	2 1/2	49.2	41.6	34.7	28.7	6.93	6.04	10.92	9.50	13.84	12.12	5.54	8.74	11.07	16.0	38.0	41.0	54.0	25.5	28.5	19.0	41.0	2.0	4.0	2.0	12.7	15.7	19.0
80	3	61.7	53.3	43.6	38.9	8.76	7.67	---	---	---	---	---	---	---	16.0	41.0	41.0	54.0	28.5	---	19.0	43.0	2.5	5.0	2.5	15.7	19.0	---
100	4	73.9	61.2	---	---	9.52	8.30	---	---	---	---	---	---	---	16.0	57.0	---	---	32.0	---	19.0	44.5	2.5	5.0	2.5	19.0	22.4	---
		90.3	79.4	---	---	10.69	9.35	---	---	---	---	---	---	---	19.0	66.5	---	---	41.0	---	19.0	48.0	2.5	5.0	2.5	22.4	28.4	---
		89.8	76.4	---	---	---	---	---	---	---	---	---	---	---	19.0	---	---	---	---	---	19.0	---	---	---	---	---	---	---
		115.7	103.8	---	---	---	---	---	---	---	---	---	---	---	19.0	---	---	---	---	---	19.0	---	---	---	---	---	---	---
		115.2	100.7	---	---	---	---	---	---	---	---	---	---	---	19.0	---	---	---	---	---	19.0	---	---	---	---	---	---	---

ASME B16.11-2001

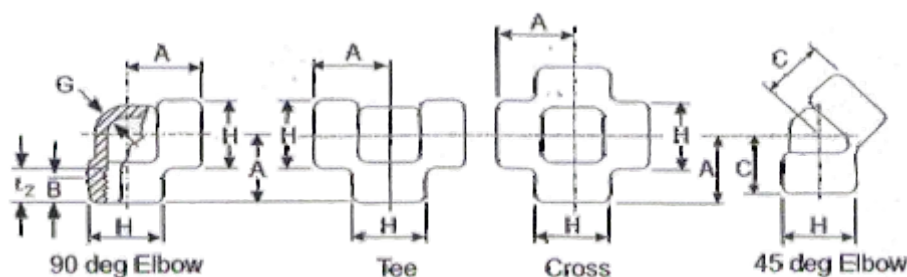
GENERAL NOTE : Dimension are in millimeters.

NOTES:

(1) Upper and lower values for each size are the respective maximum and minimum dimensions.

(2) Average of socket wall thickness around periphery shall be no less than listed values. The minimum values are permitted in localized area.

Forged Fittings, Socket-Welding & Threaded



FORGED THREADED FITTINGS

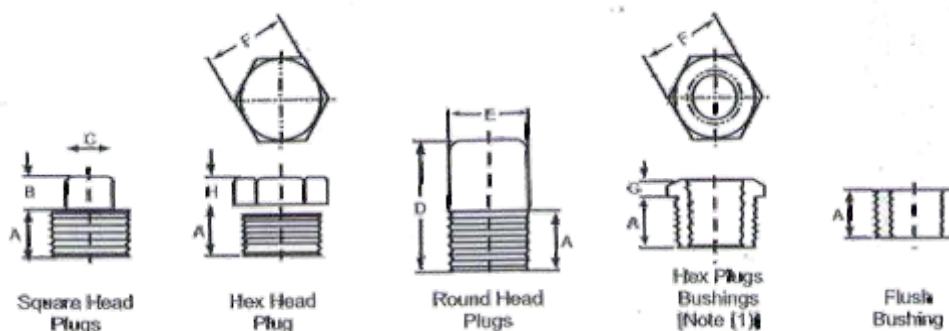
DN	Nominal Pipe Size	Center-to-End Elbows, Tees, Crosses A			Center-to-End 45 deg Elbow, C			Outside Diameter of Band, H			Min. Wall Thickness G			Min. Length of Thread [Note (1)]	
		2000	3000	6000	2000	3000	6000	2000	3000	6000	2000	3000	6000	B	L ₁
6	1/8	21	21	25	17	17	19	22	22	25	3.18	3.18	6.35	6.4	6.7
8	1/4	21	25	28	17	19	22	22	25	33	3.18	3.30	6.60	8.1	10.2
10	3/8	25	28	33	19	22	25	25	33	38	3.18	3.51	6.98	9.1	10.4
15	1/2	28	33	38	22	25	28	33	38	46	3.18	4.09	8.15	10.9	13.6
20	3/4	33	38	44	25	28	33	38	46	56	3.18	4.32	8.53	12.7	13.9
25	1	38	44	51	28	33	35	46	56	62	3.68	4.98	9.93	14.7	17.3
32	1 1/4	44	51	60	33	35	43	56	62	75	3.89	5.28	10.59	17.0	18.0
40	1 1/2	51	60	64	35	43	44	62	75	84	4.01	5.56	11.07	17.8	18.4
50	2	60	64	83	43	44	52	75	84	102	4.27	7.14	12.09	19.0	19.2
65	2 1/2	76	83	95	52	52	64	92	102	121	5.61	7.65	15.29	23.6	28.9
80	3	86	95	106	64	64	79	109	121	146	5.99	8.84	16.64	25.9	30.5
100	4	106	114	114	79	79	79	146	152	152	6.55	11.18	18.67	27.7	33.0

GENERAL NOTE: Dimensions are in millimeters.

NOTE :

(1) Dimension B is minimum length of perfect thread. The length of useful thread (B plus threads with fully formed roots and flat crests) shall not be less than L_2 (effective length of external thread) required by American National Standard for Pipe Threads (ASME B1.20.1). See para 6.3.

Forged Fittings, Socket-Welding & Threaded



PLUGS AND BUSHINGS

ASME B16.11-2001

			Square Head Plugs		Round Head Plugs		Hex Plugs and Bushings		
DN	Nominal Pipe Size	Min Length A	Min Square Height B	Min Width Flats C	Nominal Head Diameter E	Min Length D	Nominal Width Flats E	Min. Hex Height	
								Bushing G	Plug H
6	1/8	10	6	7	10	35	11	---	6
8	1/4	11	6	10	14	41	16	3	6
10	3/8	13	8	11	18	41	18	4	8
15	1/2	14	10	14	21	44	22	5	8
20	3/4	16	11	16	27	44	27	6	10
25	1	19	13	21	33	51	36	6	10
32	1 1/4	21	14	24	43	51	46	7	14
40	1 1/2	21	16	28	48	51	50	8	16
50	2	22	18	32	60	64	65	9	18
65	2 1/2	27	19	36	73	70	75	10	19
80	3	28	21	41	89	70	90	10	21
100	4	32	25	65	114	76	115	13	25

GENERAL NOTE: Dimensions are in millimeters.

NOTE :

(1) Cautionary Note Regarding Hex Bushings: Hex head bushings of one-size reduction should not be used in services where they might be subject to harmful loads and forces other than internal pressures.

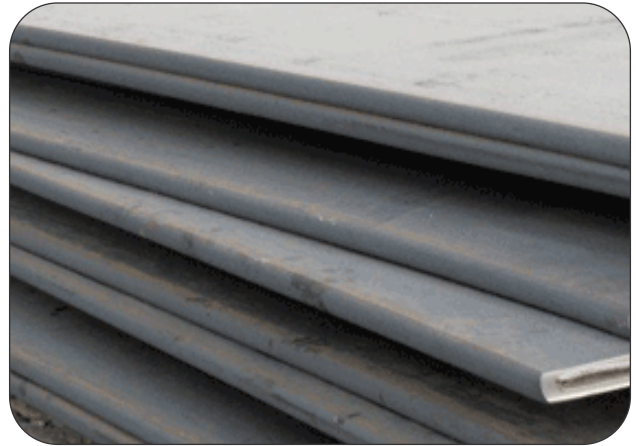
Materials Chemical Composition & Mechanical Properties

Steel Type	ASTM Grade	Chemical Composition									Mechanical Properties				
		C% max	Mn%	P% max	S% max	Si%	Cr%	Mo%	Ni%	Others	R. min. Tensile Strength MPa	S. min. Yield Strength MPa	A% min.(2" /4D) Elongation		Impact test KCV (2) J
													Long	Transv.	
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	0.29-1.06	0.05	0.058	0.10 min	0.4	0.15	0.4	Cu=0.4 V=0.08 Cb=0.02	485-655	275	30	20	-
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	-45°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	-101°C 17.6/13.6
	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	0.6	0.8-1.25	0.44-0.65	-	-	415-585	220	30	20	-
	WP12CL2	-	-	-	-	-	-	-	-	-	485-655	275	30	20	-
A234	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	0.3-0.8	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	0.3-0.6	0.04	0.04	0.5	1.9-2.6	0.87-113	-	-	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=0.06-0.10 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	-
	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 0.60%	515	205	28	20	-
A403	WP347	0.08	2	0.045	0.03	1	17.0-20.5	-	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	17.0-20.5	-	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	6.0-6.5	17.5-18.5	N=0.18-0.22 Cu= 0.5-1.0	515	205	28	20	-
	S 31803	0.03	2	0.03	0.02	1	21.0-23.0	2.5-3.5	4.5-6.5	N=0.08-0.2	620	450	25	-	-
	WP410	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 Ti=0.15-0.60 Fe=39.5 min. Al+Ti=0.85-1.20	450	170	30		
	WPNIC11	0.06-0.10	1.5		0.015	1	19.0-23.0	-	30.0-35.0		450	170	30		



Titanium alloys, Nickel alloys, Inconel alloys, Coupro nickel & Aluminium alloys are also available upon request.

For each reduction of 0.01% below the specified carbon max., an increase of 0.06% Mn above the specified max. will be permitted upto 1.35% max.
2) Relative to 10x10 specimen.







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