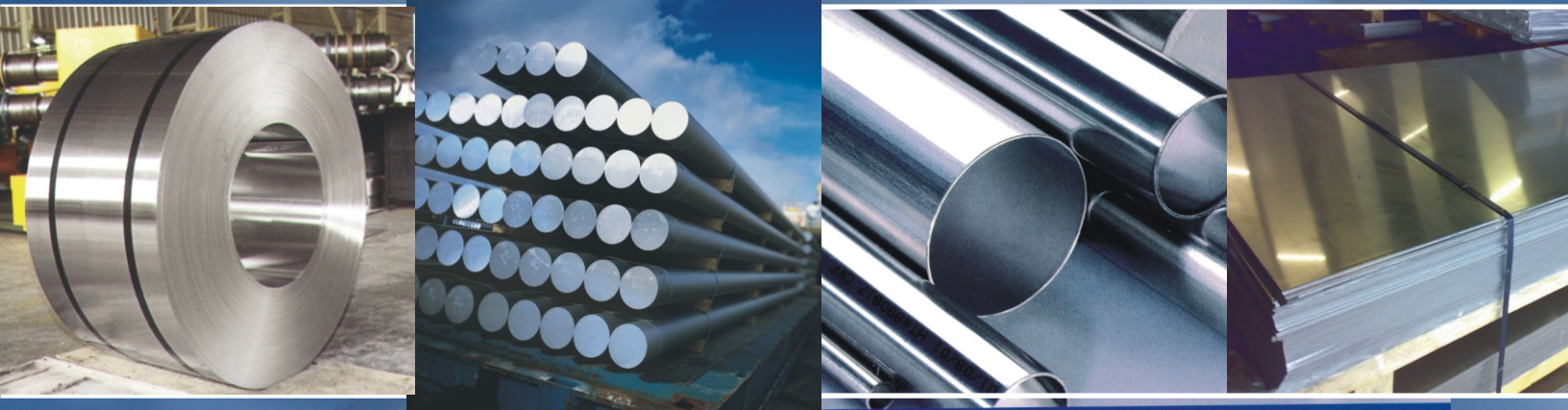




SURESH STEEL CENTRE



www.sureshsteelcentre.com



SURESH STEEL CENTRE

About us

Suresh Steel Centre is one of the leading company, Importing and exporting sheets, coils, seamless & Welded pipes / tubes, Fittings, Flanges etc that is striving to meet the exacting standards of quality accepted in various international markets and international projects.

Suresh Steel Centre is one of India's leading player and a major supplier to just about every branches of industry for the last decade serving with quality products, service & expert advice.

Suresh Steel Centre is a preferred supplier to various industries such as Govt. & Semi Govt., Department, Fertilizers, Gas Processing, Cement, Drugs, Power Plant, Refineries, Petrochemical, Offshore, Shipbuilding, Paper Mill, Boiler Manufacturers Transformers, Heat Exchanger etc.

Suresh Steel Centre's Customer-based approach is supported by the extensive range of products that it hold in stock and the comprehensive service package it offers, Suresh is truly your partner in complete range of seamless / welded pipes, tubes, sheets & coils.

This catalogue is bough out to act as a ready reckoner for our valued clients and friends an will wishers without co-operation we could not have achieved what we have now. We have achieved only very little and with all your co-operations only we can grow and glow like our well-wishers, winning Trust with Quality, Competition with varieties, mutual benefit, long term co-operation, common development is the sole purpose (Motto) of our company.

Quality Assurance System is strictly adhered to streamline all procedures & practice to achieve high degree of efficiency in operations.





Corporate Policy

Vision

Our vision is to be one of the most trusted and admired supplier of stainless steel products providing world class Quality valued customers at all time

Mission

To develop & maintain successful long term business relationship s & to provide quality, service & price ensuring : total customer satisfaction

Our corporate policy is to run our business so effeciently that naturally it becomes a mutually beneficial business association. Over the years of hardwork, experience and expertise has evolved us to think " CUSTOMER FIRST" in all our dealings.

We believe customer satisfaction is the biggest reward for our efficient sevice and every satisfied customer is beneficial to us in a way they bring more respectability and credibility in our business. We also make sure we improve and adopt to the changes in the market place continuously so that we are well informed about the technological, process and material preferences.

We request you to please send us your Vendor Registration form for registration of our firm in your approved vendor list and send as your requirement regularly, for which you assure will receive our best attention at all times.



Quality Policy

As per our corporate philosophy, we will always strive:-

- To improve the internal procedure control and to strengthen the communication and management
- Make best of our efforts to deliver high value added products to broaden the service scope
- To promote wide variety of value added services and to make sure all the customers requirements are met on time.
- Promoting technical skill to higher level and continuously putting the concept of

" Quality that inspires the customer confidence"



PRODUCT LIST



PIPES & TUBES

Stainless Steel Seamless & ERW Tubes for Boilers, Super Heaters, Heat Exchangers and Condensers as per ASTM 213, A249, A271 & A688 Gr. TP 201, 202, 304, 304L, 304H, 304LN, 309, 309S, 309H, 310H, 316, 316L, 316H, 316LN, 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, & A376 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 A358, and A409, Gr. TP 304, 304L, 304H, 304LN, 309, 309S, 309H, 310S, 310H, 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 A213 Gr. T2, T5, T11, T12 & T22 with IBR Test Certificate.
Carbon Steel Seamless Pipes as per ASTM A 106 Gr. B, A53 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 I Gr. 320, BS 3059, Part II Gr. 360, 440 & 620 with IBR Test Certificate.

Carbon Steel Seamless Heat Exchanger Tubes as per ASTM A 179, ASTM A 210 Gr. A1 & ASTM A 192 with 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 & 3589 Gr. Fe 330 & 410.

SAW/EFW Pipes as per ASTM A53 Gr. B, API 5L Gr. B & ASTM A671, 672 & 691 in all Class with IBR Test Certificate.

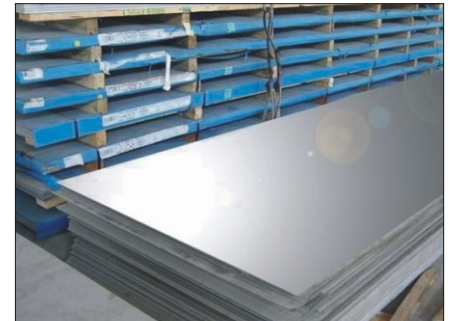
Stainless Steel Sheets, Plates & Coils as per ASTM A 240 Gr. TP 304, 304L, 304LN, 309, 309S, 309H, 310S, 310H, 316, 316L, 316H, 316LN, 316TI, 317, 317L, 321, 321H, 347, 347H, 348, 348H, 409, 410, 420, 430 etc.

Alloy Steel Plates as per ASTM A 387 Gr. 2, 5, 9, 11, 12 & 22 in class 1 & 2, ASTM A 204, 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 A 516 Gr. 60 & 70 ASTM A 515 Gr. 70.

Abrasion Resistant Steel Plates : 400, 450, 500 (SAILHARD, TISCRA, JISCRA, HARDOX, DILLIBUR, ABRASO, RAEX, FORA, CREUSBRO)

High Tensile Steel Plates : Salma 350, 5275J2G3, S355, J2G3, S355JR



SHEETS & PLATES



BARS

Stainless Steel Bars as per ASTM A 276, A314, A582, A479, & A 484 Gr. TP 304, 304L 304H, 304LN, 309, 309S, 309H, 310S, 310H, 316, 316L, 316H, 316LN, 316TI, 317, 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 A105 & IS 2062 Gr. A & B.

PRODUCT LIST



BUTT-WELD FITTINGS

Stainless Steel Fittings for High Temperature Services as per ASTM A 403, 304L, 304H, 304LN, 309, 309S, 309H, 310S, 310H, 316, 316H, 316LN, 317, 317L, 321, 321H, 347, 347H, 348, 348H etc.

Alloy Steel Fittings for Moderate & Elevated Temperature Services as per ASTM A 234 Gr. WP1, WP2, WP5, WP9, WP11, WP12, WP 22 & WP 91 in CL - 1, CL - 2 & CL - 3.

Carbon Steel Fittings for Moderate & Elevated Temperature Services as per ASTM A 234 Gr. WPB & WPC.

Carbon Steel Fittings for Low Temperature Services as per ASTM A420 Gr. WPL 3 & WPL 6.

Butt- Welding Fittings 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, B 16.28 MSS SP-43 & MSS SP-95 etc.

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

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

Carbon Steel Forged Socket Weld & Screwed Fittings 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 Reducer, Full/Half Coupling Caps, Cross, Unions, Hex/Reducing Flash Bushing, Plugs, Nipples, Swage Nipples, Concentric/Eccentric, Swages, Reducer Insert Boss, Laterals, Street Elbows & Outlets/Branch Connections (Weldolets, Thredolets, Sockolets, Flexolets, Latrolets, Elbolet, Swapolets, Insert Weldolets, Nippolets, Brazolets, Coupolets) are manufactured according to ANSI B 16.11, BS 3799, MSS SP-79 & MSS SP -95 etc.



FORGED FITTINGS



FLANGES

Stainless Steel Flanges ASTM A182 F304/ 304L/ 304H/ 316/ 316L/ 317/ 317L/ 321/ 310/ 347/ 904L/ etc.

Carbon Steel Flanges ASTM A105/ A694 F42/ 46/ 52/ 56/ 60/ 65/ 70 /A350 LF3/ A350 LF2, etc.

Alloy Steel Flanges ASTM A182 F1/ F5/ F9/ F11/ F22/ F91/ etc.

Duplex Steel Flanges 2205 (Duplex), 2507 (Super Duplex) UNS - 31803, 32750, 32990

Others: Monel, Nickel, Inconel, Hastalloy, Copper, Brass, Bronze, Titanium, Tantalum, Bismuth, Aluminium, High Speed Steel, Zinc, Lead, etc.

Types: Weldneck, Slipon, Blind, Socket Weld, Lap Joint, Spectacles, Ring Joint, Orifcaae, Long Weldneck, Deck Flange, etc.

Size: 1/8" NB TO 48" NB.

Class: 150#, 300#, 400#, 600#, 900#, 1500# & 2500#. also as per the National & International Standard.

Flanges such as SORF, SOFF, SOLJ SWRF, SWFF, WNRF, WNFF, WNRTJ, LWNRF, BLRF, BLFF, BLRTJ, Threaded, Spectacle 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 2566, DIN 2576, DIN 2632, DIN 2633, DIN 2634, DIN 2635, DIN 2642, BS 10, IS 1538 & IS 6392, etc.

**STAINLESS STEEL PLATES - CHEMICAL COMPOSITION**

UNS Designation ^B	Type ^C	Carbon ^D	Manganese	Phosphorus	Sulphur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements ^{EF}
Austenitic (Chromium-Nickel)(Chromium-Manganese-Nickel)												
N08020	...	0.07	2.00	0.045	0.035	1.00	19.0-21.0	32.0-38.0	2.00-3.00	...	3.0-4.0	Cb 8xC min, 1.00 max
N08367	...	0.030	2.00	0.040	0.030	1.00	20.0-22.0	23.5-25.5	6.0-7.0	0.18-0.25	0.75	Fe ^H 39.5 min
N08800	800 ^G	0.010	1.50	0.0045	0.015	1.00	19.0-23.0	30.0-35.0	...	...	0.75	Al 0.15-0.60
N08810	800H ^G	0.05-0.10	1.50	0.045	0.015	1.00	19.0-23.0	30.0-35.0	...	...	0.75	Ti 0.15-0.60
N08811	...	0.06-0.10	1.50	0.040	0.015	1.00	19.0-23.0	30.0-35.0	...	...	0.75	Fe ^H 39.5 min
N08904	904L ^G	0.020	2.00	0.045	0.030	1.00	19.0-23.0	23.0-28.0	4.0-5.0	0.10	1.0-2.0	Ti 0.15-0.60
N08926	...	0.020	2.00	0.030	0.010	0.50	19.0-21.0	24.0-26.0	6.0-7.0	0.15-0.25	0.5-1.5	...
S20100	201	0.15	5.5-7.5	0.060	0.030	1.00	16.0-18.0	3.5-5.5	...	0.25	...	...
S20103	...	0.03	5.5-7.5	0.045	0.030	0.75	16.0-18.0	3.5-5.5	...	0.25	...	...
S20153	...	0.03	6.4-7.5	0.045	0.015	0.75	16.0-17.5	4.0-5.0	...	0.10-0.25	1.00	...
S20161	...	0.15	4.0-6.0	0.040	0.040	3.0-4.0	15.0-18.0	4.0-6.0	...	0.08-0.20	...	...
S20200	202	0.15	7.5-10.0	0.060	0.030	1.00	17.0-19.0	4.0-6.0	...	0.25	...	...
S20400	...	0.030	7.0-9.0	0.040	0.030	1.00	15.0-17.0	1.50-3.00	...	0.15-0.30	...	Cb 0.10-0.30
S20910	XM-19 ^J	0.06	4.0-6.0	0.040	0.030	0.75	20.5-23.5	11.5-13.5	1.50-3.00	0.20-0.40	...	V 0.10-0.30
S21400	XM-31 ^J	0.12	14.0-16.0	0.045	0.030	0.30-1.00	17.0-18.5	1.00	...	0.35 MIN	...	...
S21600	XM-17 ^J	0.08	7.5-9.0	0.045	0.030	0.75	17.5-22.0	5.0-7.0	2.00-3.00	0.25-0.50	...	...
S21603	XM-18 ^J	0.03	7.5-9.0	0.045	0.030	0.75	17.5-22.0	5.0-7.0	2.00-3.00	0.25-0.50	...	...
S21800	...	0.10	7.0-9.0	0.060	0.030	3.5-4.5	16.0-18.0	8.0-9.0	...	0.08-0.18	...	...
S24000	XM-29 ^J	0.08	11.5-14.5	0.060	0.030	0.75	17.0-19.0	2.3-3.7	...	0.20-0.40	...	...
S30100	301	0.15	2.00	0.045	0.030	1.00	16.0-18.0	6.0-8.0	...	0.10	...	...
S30103	301L ^G	0.03	2.00	0.045	0.030	1.00	16.0-18.0	6.0-8.0	...	0.20	...	...
S30153	301LN ^G	0.03	2.00	0.045	0.030	1.00	16.0-18.0	6.0-8.0	...	0.07-0.20	...	...
S30200	302	0.15	2.00	0.045	0.030	0.75	17.0-19.0	8.0-10.0	...	0.10	...	...
S30400	304	0.08	2.00	0.045	0.030	0.75	18.0-20.0	8.0-10.5	...	0.10	...	...
S30403	304L	0.030	2.00	0.045	0.030	0.75	18.0-20.0	8.0-10.5	...	0.10	...	...
S30409	304H	0.04-0.10	2.00	0.045	0.030	0.75	18.0-20.0	8.0-10.5	...	0.10	...	...
S30415	...	0.04-0.06	0.80	0.045	0.030	0.75	18.0-20.0	8.0-10.5	...	...	...	Ce 0.03-0.08
S30451	304N	0.08	2.00	0.045	0.030	1.00-2.00	18.0-19.0	9.0-10.0	...	0.12-0.18	...	...
S30452	XM-21 ^J	0.08	2.00	0.045	0.030	0.75	18.0-20.0	8.0-10.5	...	0.10-0.16	...	...
S30453	304LN	0.030	2.00	0.045	0.030	0.75	18.0-20.0	8.0-10.5	...	0.16-0.30	...	...
S30500	305	0.12	2.00	0.045	0.030	0.75	18.0-20.0	8.0-12.0	...	0.10-0.16	...	...
S30600	...	0.018	2.00	0.020	0.020	3.7-4.3	17.0-18.5	10.5-13.0	0.20	...	0.50	...
S30601	...	0.015	0.50-0.80	0.030	0.013	5.0-5.6	17.0-18.0	14.0-15.5	0.05	0.35	...	...
S30615	...	0.16-0.24	2.00	0.030	0.030	3.2-4.0	17.0-19.5	17.0-18.0	...	...	...	Al 0.80-1.50
S30815	...	0.05-0.10	0.80	0.040	0.030	1.40-2.00	20.0-22.0	10.0-12.0	...	0.14-0.20	...	Ce 0.03-0.08
S30908	309S	0.08	2.00	0.045	0.030	0.75	22.0-24.0	12.0-15.0	...	...	...	...
S30909	309H ^G	0.04-0.10	2.00	0.045	0.030	0.75	22.0-24.0	12.0-15.0	...	...	...	...
S30940	309Cb ^G	0.08	2.00	0.045	0.030	0.75	22.0-24.0	12.16.0	...	...	...	Cb 10
XCMIN												
S30941	309HCb ^G	0.04-0.10	2.00	0.045	0.030	0.75	22.0-24.0	12.0-16.0	...	...	...	1.10 MAX
S31008	310S	0.08	2.00	0.045	0.030	1.50	24.0-26.0	19.0-22.0	...	...	...	Cb 10XC min
S31009	310H ^G	0.04-0.10	2.00	0.045	0.030	0.75	24.0-26.0	19.0-22.0	...	...	...	...
S31040	310Cb ^G	0.08	2.00	0.045	0.030	1.50	24.0-26.0	19.0-22.0	...	...	...	Cb 10xC min



STAINLESS STEEL PLATES - CHEMICAL COMPOSITION

UNS Designation ^B	Type ^C	Carbon ^D	Manganese	Phosphorus	Sulphur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements ^{E,F}
S31041	310HCb ^E	0.04-0.10	2.00	0.045	0.030	0.75	24.0-26.0	19.0-22.0	...	...	...	Cb 10xc min, 1.10 max
S31050	310MoLN ^E	0.020	2.00	0.030	0.010	0.50	24.0-26.0	20.5-23.5	1.60-2.60	0.09-0.15	...	...
S31254	...	0.020	1.00	0.030	0.010	0.80	19.5-20.5	17.5-18.5	6.0-6.5	0.18-0.22	0.50-1.00	...
S31266	...	0.030	2.0-4.0	0.035	0.020	1.00	23.0-25.0	21.0-24.0	5.2-6.2	0.35-0.60	1.00-2.50	W 1.50-2.50
S31600	316	0.08	2.00	0.045	0.030	0.75	16.0-18.0	10.0-14.0	2.00-3.00	0.10	...	...
S31603	316L	0.030	2.00	0.045	0.030	0.75	16.0-18.0	10.0-14.0	2.00-3.00	0.10	...	...
S31609	316H	0.04-0.10	2.00	0.045	0.030	0.75	16.0-18.0	10.0-14.0	2.00-3.00	...	...	...
S31635	316Ti	0.08	2.00	0.045	0.030	0.75	16.0-18.0	10.0-14.0	2.00-3.00	0.10	...	Ti 5xc (C+N) min 0.70 max Cb 10xc min, 1.10 max
S31640	316Cb	0.08	2.00	0.045	0.030	0.75	16.0-18.0	10.0-14.0	2.00-3.00	0.10	...	...
S31651	316N	0.08	2.00	0.045	0.030	0.75	16.0-18.0	10.0-14.0	2.00-3.00	0.10-0.16	...	...
S31653	316LN	0.030	2.00	0.045	0.030	0.75	16.0-18.0	10.0-14.0	2.00-3.00	0.10-0.16	...	...
S31700	317	0.08	2.00	0.045	0.030	0.75	18.0-20.0	11.0-15.0	3.0-4.0	0.10	...	...
S31703	317L	0.030	2.00	0.045	0.030	0.75	18.0-20.0	11.0-15.0	3.0-4.0	0.10	...	...
S31725	317LM ^G	0.030	2.00	0.045	0.030	0.75	18.0-20.0	13.5-17.5	4.0-5.0	0.20	...	...
S31726	317LMN ^G	0.030	2.00	0.045	0.030	0.75	17.0-20.0	13.5-17.5	4.0-5.0	0.10-0.20	...	...
S31753	317LN	0.030	2.00	0.045	0.030	0.75	18.0-20.0	11.0-15.0	3.0-4.0	0.10-0.22	0.40	...
S32050	...	0.030	1.50	0.035	0.020	1.00	22.0-24.0	20.0-23.0	6.0-6.8	0.21-0.32	...	Ti 5 x (C+N) min 0.70 max Ti 4 x (C+N) min 0.70 max
S32100	321	0.08	2.00	0.045	0.030	0.75	17.0-19.0	9.0-12.0	...	0.10	...	...
S32109	321H	0.04-0.10	2.00	0.045	0.030	0.75	17.0-19.0	9.0-12.0	9.0-12.0	...	...	...
S32615	...	0.07	2.00	0.045	0.030	4.8-6.0	16.5-19.5	19.0-22.0	0.30-150	...	1.50-2.50	...
S32654	...	0.020	2.0-4.0	0.030	0.005	0.50	24.0-25.0	21.0-23.0	7.0-8.0	0.45-0.55	0.30-0.60	...
S33228	...	0.04-0.08	1.00	0.020	0.015	0.30	26.0-28.0	31.0-33.0	...	...	...	Ce0.05-0.10 Cb 0.6-1.0 Al 0.025 AL 0.15-0.60 Ti 0.15-0.60
S33400	334 ^E	0.08	1.00	0.030	0.015	1.00	18.0-20.0	19.0-21.0	...	...	...	...
S34565	...	0.030	5.0-7.0	0.030	0.010	1.00	23.0-25.0	16.0-18.0	4.0-5.0	0.40-0.60	...	...
S34700	347	0.08	2.00	0.045	0.030	0.75	17.0-19.0	9.0-13.0	...	...	...	Cb 0.10 Cb 10 x c min 1.00 max Cb 8 x c min 1.00 max (Cb+Ti) 10 x c min 1.00 max Ti 0.10 Co 0.20 (Cb+Ti) 8 x c min 1.00 max Ti 0.10 Co 0.20 Al 0.15-0.60 Ti 0.15-0.60 Ti 0.40-1.00 Ce 0.03-0.10
S34709	347H	0.04-0.10	2.00	0.045	0.030	0.75	17.0-19.0	9.0-13.0	...	...	...	...
S34800	348	0.08	2.00	0.045	0.030	0.75	17.0-19.0	9.0-13.0	...	...	...	...
S34809	348H	0.04-0.10	2.00	0.045	0.030	0.75	17.0-19.0	9.0-13.0	...	...	...	...
S35045	...	0.06-0.10	1.50	0.045	0.015	1.00	25.0-29.0	32.0-37.0	...	...	0.75	...
S35135	...	0.08	1.00	0.045	0.015	0.60-1.00	20.0-25.0	30.0-38.0	4.0-4.8	...	0.75	...
S35315	...	0.04-0.08	2.00	0.040	0.030	1.20-2.00	24.0-26.0	34.0-36.0	...	0.12-0.18	...	...
S38100	XM-15	0.08	2.00	0.030	0.030	1.50-2.50	17.0-19.0	17.0-18.0	...	...	...	...
Duplex (Austenitic Ferritic)												
S31200	...	0.030	2.00	0.045	0.030	1.00	24.0-26.0	5.5-6.5	1.20-2.00	0.14-0.20	...	W0.10-0.50
S31260	...	0.03	1.00	0.030	0.030	0.75	24.0-26.0	5.5-7.5	2.5-3.5	0.10-0.30	0.20-0.80	...
S31803	...	0.03	2.00	0.030	0.020	1.00	21.0-23.0	4.5-6.5	2.5-3.5	0.08-0.20	...	...
S32001	...	0.030	4.0-6.0	0.040	0.030	1.00	19.5-21.5	1.00-3.00	0.60	0.05-0.17	1.00	...
S32205	2205 ^G	0.030	2.00	0.030	0.020	1.00	22.0-23.0	4.5-6.5	3.0-3.5	0.14-0.20	...	...



STAINLESS STEEL PLATES A 240 / A240 M

UNS Designation ^B	Type ^C	Carbon ^D	Manganese	Phosphorus	Sulphur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper Elements ^{EF}	Other
S32304	2304 ^G	0.030	2.50	0.040	0.030	1.00	21.5-24.5	3.0-5.5	0.05-0.60	0.05-0.60	0.05-0.60	...
S32520	...	0.030	1.50	0.035	0.020	0.80	24.0-26.0	5.5-8.0	3.0-4.0	0.20-0.35	0.50-2.00	...
S32550	255 ^G	0.040	1.50	0.040	0.030	1.00	24.0-27.0	4.5-6.5	2.9-3.9	0.10-0.25	1.50-2.50	...
S32750	2507 ^G	0.030	1.20	0.035	0.020	0.80	24.0-26.0	6.0-8.0	3.0-5.0	0.24-0.32	0.50	...
S32760	...	0.030	1.00	0.030	0.010	1.00	24.0-26.0	6.0-8.0	3.0-4.0	0.20-0.30	0.50-1.00	w 0.50-1.00
S32900	329	0.080	1.00	0.040	0.030	0.75	23.0-28.0	2.0-5.00	1.00-2.00	...	...	...
S32950	...	0.030	2.00	0.035	0.010	0.60	26.0-29.0	3.5-5.2	1.00-2.50	0.15-0.35	...	...
Ferritic or Martensitic (Chromium)												
S32803	...	0.015	0.50	0.020	0.035	0.55	28.0-29.0	3.0-4.0	1.80-2.50 (C+N)0.030	0.020	min, 0.15-0.50	Cb 12x(C+N) Al 0.10-0.30
S40500	405	0.08	1.00	0.040	0.030	1.00	11.5-14.5	0.60	...	...	...	Al 0.10-0.30
S40900 ^L	409	0.030	1.00	0.040	0.020	1.00	10.5-11.7	0.50	...	0.030	0.50 max, Cb 0.17	Ti 6x(C+N) min, Ti 8x(C+N) min,
S40920	...	0.030	1.00	0.040	0.020	1.00	10.5-11.7	0.50	...	0.030	Ti 0.15-0.50 Cb 0.10	Ti 8x(C+N) min, (Ti+Cb)[0.08+8
S40930	...	0.030	1.00	0.040	0.020	1.00	10.5-11.7	0.50	...	0.030	x(C+N)] min 0.75 max Ti 0.05 min	(Ti+Cb)[0.08+8
S40945	...	0.030	1.00	0.040	0.030	1.00	10.5-11.7	0.50	...	0.030	...	Cb 0.18-0.40
S40975	...	0.030	1.00	0.040	0.030	1.00	10.5-11.7	0.50-1.00	...	0.030	...	Ti 6x (C+N)
S40977	...	0.030	1.50	0.040	0.015	1.00	10.5-12.5	0.30-1.00	...	0.030	min, 0.75 max	...
S41000	410	0.08-0.15	1.00	0.040	0.030	1.00	11.5-13.5	0.75	...	...	...	...
S41003	...	0.030	1.50	0.040	0.030	1.00	10.5-12.5	1.50	...	0.030	...	...
S41008	...	0.08	1.00	0.040	0.030	1.00	11.5-13.5	0.60	...	...	...	...
S41045	...	0.030	1.00	0.040	0.030	1.00	12.0-13.0	0.50	...	0.030	...	Cb 9x (C+N)
S41050	...	0.04	1.00	0.045	0.030	1.00	10.5-12.5	0.60-1.10	...	0.10	min, 0.60 max	...
S41500 ^H	...	0.05	.50-1.00	0.030	0.030	0.60	11.5-14.0	3.5-5.5	...	...	...	...
S42035	...	0.08	1.00	0.045	0.030	1.00	13.5-15.5	1.0-2.5	0.50-1.00	...	...	...
S42900	429 ^G	0.12	1.00	0.040	0.030	1.00	14.0-16.0	...	0.2-1.2	...	...	Ti 0.30-0.50
S43000	430	0.12	1.00	0.040	0.030	1.00	16.0-18.0	0.75	...	...	...	...
S43035	439	0.07	1.00	0.040	0.030	1.00	17.0-19.0	0.50	...	0.04	...	Ti
S43400	434	0.12	1.00	0.040	0.030	1.00	16.0-18.0	...	0.75-1.25	...	[0.20+4(C+N)] min, 1.10 max	...
S43600	436	0.12	1.00	0.040	0.030	1.00	16.0-18.0	...	0.75-1.25	...	Al 0.15	...
S43932	...	0.030	1.00	0.040	0.030	1.00	17.0-19.0	0.50	...	0.030	min,0.80 max	Cb 5xc (Ti+Cb)
S43940	...	0.030	1.00	0.040	0.015	1.00	17.5-18.5	...	...	...	[0.20+4(C+N)] min, 0.75 max	...
S44400	444	0.025	1.00	0.040	0.030	1.00	17.5-19.5	1.00	1.75-2.50	0.035	Al 0.15 [0.30+(3xC)] min	Ti 0.10-0.60Cb (Ti+Cb) [

STAINLESS STEEL PLATES - CHEMICAL COMPOSITION

UNS Designation ^B	Type ^C	Carbon ^D	Manganese	Phosphorus	Sulphur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements ^{E,F}
S44500	...	0.020	1.00	0.040	0.012	1.00	19.0-21.0	0.60	...	0.03	0.30-0.60	Cb 10x(C+N) min, 0.80 max
S44626	XM-33 ^G	0.06	0.75	0.040	0.020	0.75	25.0-27.0	0.50	0.75-1.50	0.04	0.20	Ti 0.20-1.00 Ti 7 (C+N) min
S44627	XM-27 ^H	0.010 ^N	0.40	0.020	0.020	0.40	25.0-27.5	0.50	0.75-1.50	0.015 ^N	0.20	Cb 0.05-0.20 (Ni+Cu) 0.50
S44635	...	0.025	1.00	0.040	0.030	0.75	24.5-26.0	3.5-4.5	3.5-4.5	0.035	...	(Ti+Cb) [0.20+4 (C+N)] min 0.80 max
S44660	...	0.030	1.00	0.040	0.030	1.00	25.0-28.0	1.0-3.5	3.0-4.0	0.040	...	(Ti+Cb) 0.20 - 1.00, Ti + Cb 6 x (C+N) min
S44700	...	0.010	0.30	0.025	0.020	0.20	28.0-30.0	0.15	3.5-4.2	0.020	0.15	(C+N) 0.025
S44735	...	0.030	1.00	0.040	0.030	1.00	28.0-30.0	1.00	3.6-4.2	0.045	...	(Ti+Cb) 0.20-1.00 (Ti+Cb) 6 x (C+N) min
S44800	...	0.010	0.30	0.025	0.020	0.20	28.0-30.0	2.00-2.50	3.5-4.2	0.020	0.15	(C+N) 0.025
S46800	...	0.030	1.00	0.040	0.030	1.00	18.0-20.0	0.50	...	0.030	...	Ti 0.07-0.30 Cb 0.10-0.60 (Ti+Cb) [0.20+4 (C+N)] min 0.80 max

A) Maximum unless range or minimum is indicated.

B) Designation established in accordance with practice E 527 and SAE J 1086.

C) Unless otherwise indicated, a grade designation originally assigned by the American Iron and Steel Institute (AISI)

D) Carbon analysis shall be reported to nearest 0.01% except for the low-carbon type, which shall be reported to nearest 0.001 %

E) The terms Columbium (Cb) and Niobium (Nb) both related to the same element.

F) When two minimums or two maximums are listed for a single type, as in the case of both a value from a formula and an absolute value, the higher minimum or lower maximum shall apply.

G) Common name, not a trademark, widely used, not associated with any one producer.

H) Iron shall be determined arithmetically by difference of 100 minus the sum of the other specified elements.

I) (Al + Ti) 0.85- 1.20

J) Naming system developed and applied by ASTM.

K) Cr + 3.3 Mo + 16 N = 40 min

L) S40900 (Type 409) has been replaced by S40910, S40920, and S40930. Unless otherwise specified in the ordering information, an other specifying S40900 or Type 409 shall be satisfied by any one of S40910, S 40920 or S40930 at the option of the seller. Material meeting the requirements of S40910, S40920 or S40930, may at the option the manufacturer by certified as S40900.

M) Plate version of CA-6NM

N) Product (Check or verification) analysis tolerance over the maximum limit for C and N in XM-27 shall be 0.002 %.



SUMMARY OF THE MAIN ASTM STANDARDS GENERALLY USED FOR SHEETS / PLATES

ASTM	Chemical requirements percent (%)										Mechanical requirements					
	Grade	C max	Mn max	P max	S max	Si max	Ni	Cr.	Mo	Cu	Others	Tensile Strength mini-MPa	Yield Strength mini-MPa	Elong mini %	Brinell	Rockwell
A240	304	0.08	2.00	0.045	0.030	0.75	8.00-10.5	18.00-20.0				515	205	40	201	92
	304L	0.03	2.00	0.045	0.030	0.75	8.00-12.0	18.00-20.0				485	170	40	201	92
	316	0.08	2.00	0.045	0.030	1.50	19.0-22.0	24.0-26.0				515	205	40	217	95
	316L	0.03	2.00	0.045	0.030	0.75	10.0-14.0	16.0-18.0	2.00-3.00			515	205	40	217	95
	317L	0.03	2.00	0.045	0.030	0.75	10.0-14.0	16.0-18.0	2.00-3.00			485	170	40	217	95
	321	0.08	2.00	0.045	0.030	0.75	11.0-15.0	18.0-20.0	3.00-4.00			515	205	40	217	95
	347	0.08	2.00	0.045	0.030	0.75	9.00-12.0	17.0-19.0			Ti=0.01-0.10 Cb+Ti>0.00<1.10	515	205	40	217	95
	2	0.05-0.21	0.55-0.80	0.035	0.040	0.15-0.40		0.50-0.80	0.45-0.60			Class 1	Class 2	40	201	92
	5	0.15	0.30-0.60	0.04	0.030	0.050		4.00-6.00	0.45-0.65			380	230	22	max201HB	max92HRB
	7	0.15	0.30-0.60	0.030	0.030	1.00		6.00-8.00	0.45-0.65			415	205	18	max202HB	max92HRB
A 387 Class1 Class2	9	0.15	0.30-0.60	0.030	0.030	1.00		8.00-10.0	0.90-1.10			415	205	18	max217HB	max95HRB
	11	0.04-0.17	0.40-0.65	0.035	0.04	0.50-0.80		1.00-1.50	0.45-0.65			415	240	22	max217HB	max95HRB
	12	0.04-0.17	0.40-0.65	0.035	0.04	0.15-0.40		0.80-1.15	0.45-0.60			380	230	22	max217HB	max95HRB
	21	0.04-0.17	0.30-0.60	0.035	0.035	0.50		2.75-3.25	0.90-1.10			415	205	18	max201HB	max92HRB
	22	0.05-0.17	0.30-0.60	0.035	0.035	0.50		2.00-2.50	0.90-1.10			415	205	18	max201HB	max92HRB
	55	0.22	0.90	0.035	0.04	0.15-0.40						380-515	205	27		
	60	0.27	0.90	0.035	0.04	0.15-0.40						415-550	220	25		
	65	0.31	0.90	0.035	0.04	0.15-0.40						450-585	240	23		
	70	0.33	1.20	0.035	0.04	0.15-0.40						485-620	260	21		
	55	0.20	0.60-1.20	0.035	0.04	0.15-0.40						380-515	205	27		
A 516	60	0.23	0.85-1.20	0.035	0.04	0.15-0.40					415-550	202	25			
	65	0.26	0.85-1.20	0.035	0.04	0.15-0.40					450-585	240	23			
	70	0.28	0.85-1.20	0.035	0.04	0.15-0.40					485-620	260	21			
	Class 1	0.24	0.70-1.35	0.035	0.040	0.15-0.40	0.25 max	0.80 max	0.35 max			485-620	345	22		
A 537	Class 2	0.24	0.70-1.35	0.035	0.040	0.15-0.40	0.25 max	0.80 max	0.35 max			550-690	415	22		

Out side diameter of pipe complies with ISO recommendation R64

IS-2002-62 STEEL PLATES FOR BOILERS

Designation	Chemical Composition					Tensile Test			Elongation	
	C max	Si max	P max	S max	Tensile strength Mpa	Yield Strength Mpa	Test Piece	%min		
IS 2002-1	0.18	0.10-0.35	0.040	0.040	362-442	540	5.65So 40So	26 30		
IS 2002-2A	0.20	0.10-0.35	0.050	00.50	412-491	491	5.60So 40So	25 29		
IS 2002-2B	0.22	0.10-0.35	0.050	0.050	510-608	491	5.65So 40So	20 24		

IS-2002-92 STEEL FOR GENERAL STRUCTURAL PURPOSES

Grade	% Chemical Composition				Tensile strength (Min) Kg/mm ²	Yield Strength (Min) Mpa		Bend Test	Stictest Piece Charpy V Notch Impact Energy Joule min
	C max	MN max	S max	P max		<20 min	>0min		
A	0.23	1.5	0.060	0.050	41.8	250	240	3t	-
B	0.22	1.5	0.045	0.045	41.8	250	250	t<25mm	2t for 27 3t for t>25mm
C	0.20	1.5	0.040	0.040	41.8	250	250	2t	27

Formula - Weight of Stainless Steel Sheets/Plates = Length (mm) x Width (mm) x Thickness (mm) x 7.86 = Kg./Sheet.



**PHYSICAL & CHEMICAL PROPERTIES OF
STAINLESS STEEL, ALLOY STEEL & CARBON STEEL BARS**

ASTM A479 STAINLESS STEEL ROUND BAR CHEMICAL & PHYSICAL PROPERTIES														
ASTM GRADE	C	Mn	Si	S	P	Cr	Ni	Mo	Other	Tensile Psi(MPa)	Yield Psi(MPa)	Elongation Strip/Round	Hardn.	Redu. in Area. (%)
A479TP 304	0.08 max	2.00 max	1.00 max	0.030 max	0.045 max	18.0	8.0	-	-	75000 (515)	30000 (205)	30	-	40
A479TP 316	0.08 max	2.00 max	1.00 max	0.030 max	0.045 max	16.0	10.0	2.0	-	75000 (515)	30000 (205)	30	-	40
A479TP 317L	0.035 max	2.00 max	1.00 max	0.030 max	0.045 max	18.0	14.0	3.0	-	75000 (515)	30000 (205)	30	-	40
A479TP 310	0.08 max	2.00 max	1.00 max	0.030 max	0.045 max	20.0	15.0	4.0	-	75000 (515)	30000 (205)	30	-	40
A479TP 347H	0.04 max	2.00 max	1.00 max	0.030 max	0.040 max	26.0	22.0	-	Cb-BxC	75000 (515)	30000 (205)	30	-	40
479TP 321	0.10 max	2.00 max	1.00 max	0.030 max	0.045 max	17.0	13.0	-	-13.0	75000 (515)	30000 (205)	30	-	40
	0.08 max	2.00 max	1.00 max	0.030 max	0.045 max	19.0	12.0	-	5(C+N)<Ti <0.70%	75000 (515)	30000 (205)	30	-	40

ASTM A182 ALLOY STEEL ROUND BAR CHEMICAL & PHYSICAL PROPERTIES														
ASTM GRADE	C	Mn	Si	S	P	Cr	Ni	Mo	Other	Tensile Psi(MPa)	Yield Psi(MPa)	Elongation Strip/Round	Hardn.	Redu. in Area. (%)
182F 11 Class 2	0.10 max	0.30 max	0.50 max	0.04 max	0.04 max	1.0	-	0.44	-	70000 (45.46)	40000 (27.05)	20	143-207	30
A 182 F22 Class 3	0.05 max	0.30 max	0.50 max	0.04 max	0.04 max	2.0	-	0.87	-	75000 (52.52)	45000 (31.7)	20	156-207	30
A 182 F 5	0.15 max	0.60 max	0.50 max	0.03 max	0.03 max	4.0	0.5 max	0.65	-	70000 (48.45)	40000 (27.05)	20	143-217	35
A 182 F9	0.15 max	0.30 max	0.50 max	0.03 max	0.03 max	8.0	-	0.90	-	85 (56.65)	55 (380)	20	179-217 (BHN)	40

IS-1875 ASTM A105 CARBON STEEL ROUND BAR CHEMICAL & PHYSICAL PROPERTIES														
ASTM GRADE	C	Mn	Si	S	P	Cr	Ni	Mo	Other	Tensile Psi(MPa)	Yield Psi(MPa)	Elongation Strip/Round	Hardn.	Redu. in Area. (%)
A 105	0.35 max	0.60 max	0.35 max	0.50 max	0.040 max	-	-	-	-	70000 (485)	36000 (250)	30-strip	187 max	30 Round
ALF2	0.30 max	1.35 max	0.15 max	0.040 max	0.035 max	0.30 max	0.40 max	0.12 max	Cu-0.4 max Cb-0.02 max Va-0.3max	70-95 (485-655)	36 (250)	22-Round 22/30	20/16 (-45.60)	36

Formula-Weight of stainless steel rounds = Dia. (mm)x0.00623=Kg Per Mtr.
 Weight of Stainless Steel Hexagonal Rods=Dia. (mm)x0.00679=Kg Per Mtr.
 Weight of Stainless Steel Square Bars = Dia. (mm)x Dia (mm)x 0.00787= Kg. Per Mtr.
 Weight of Stainless Steel Circle & Blanks = O.D. (mm)x O.D.(mm)x Thik (mm) /160/1000= Kg Per Pcs.

**PIPES & TUBES ASTM / API / BS / DIN / IS****MATERIAL SPECIFICATION FOR PIPES & TUBES 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)		
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	485	170	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	515	205	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	TT%=(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	TT%=(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	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	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	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	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	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	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	40	N%=0.10 Max, TT%=(5XC)-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	40	Cb%=(10XC)-1.00, HRB=92 Max
ASTMA 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
ASTMA 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
ASTMA 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
ASTMA 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
ASTMA 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
ASTMA 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=65 Max
ASTMA 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
ASTMA 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	
ASTMA 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	
ASTMA 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	
ASTMA 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	
ASTMA 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	
ASTMA 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	
ASTMA 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	
ASTMA 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	-	N%=0.16-0.25, N%=0.030-0.070, A(%)=0.02 Max, Cb%=0.06-0.10
ASTMA 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	30	HRB=85 Max
ASTMA 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	30	HRB=85 Max
ASTMA 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	30	HRB=85 Max
ASTMA 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	30	HRB=85 Max
ASTMA 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	30	HRB=85 Max
ASTMA 179	0.06-0.18	0.27-0.63	0.035	0.035	-	-	-	-	325	180	35	35	HRB=72 Max
ASTMA 210 Gr. A1	0.27 Max	0.93 Max	0.035	0.035	0.10 Min	-	-	-	415	255	30	30	HRB=79 Max

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

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. (Mpa)	Y.S. (Mpa)	Elong. (Min)	L		T
API 5L Gr. A	0.22 Max	0.90 Max	0.030	0.030	-	-	-	-	331	207	For Seamless : C% Will be 0.028 for Gr. B to x 70 Mn% will be 1.40 for Gr. X65 to X 70 $\sigma = 625 \text{ 000 } A^{0.2} / C^{0.9}$			
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	-	-	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	-	-	-	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	-	-	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	-	-	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	-	-	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	-	-	325	460-610	20			
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	-	490	690-850	17			
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				
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				

**STAINLESS STEEL SCHEDULE PIPE DIMENSION, WALL THICKNESS & WEGHT / METER**

DESIGNATION		O/D	NOMINAL WALL THICKNESS														
OF DIAMETER		DIA	SCH.5S		SCH.5		SCH.10S		SCH.10		SCH.20S.		SCH.30		SCH.40S		SCH.40
(A)	(B)	METER MM	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK
6	1/8	10.3	1.0	0.23			1.2	0.27			1.5	.33			1.73	0.37	
8	1/4	13.72	1.2	0.37			1.65	0.49			2.00	.58			2.24	0.64	
10	3/8	17.2	1.2	0.47			1.65	0.63			2.00	.74			2.31	0.87	
15	1/2	21.3	1.65	0.81	1.65	0.81	2.11	1.02	2.11	1.02	2.5	1.15			2.77	1.29	
20	3/4	26.7	1.65	1.03	1.65	1.03	2.11	1.30	2.11	1.30	2.5	1.49			2.87	1.71	
25	1	33.4	1.65	1.31	1.65	1.31	2.77	2.12	2.77	2.12	3.00	2.24			3.38	2.54	
32	1-1/4	42.2	1.65	1.67	1.65	1.67	2.77	2.73	2.77	2.73	3.00	2.90			3.56	3.44	
40	1-1/2	48.3	1.65	1.93	1.65	1.93	2.77	3.15	2.77	3.15	3.00	3.35			3.68	4.11	
50	2	60.3	1.65	2.42	1.65	2.42	2.77	3.99	2.77	3.99	3.5	4.90			3.91	5.52	
65	2-1/2	73.0	2.11	3.75	2.11	3.75	3.05	5.34	3.05	5.34	3.5	6.00			5.16	8.77	
80	3	88.9	2.11	4.59	2.11	4.59	3.05	6.56	3.05	6.56	4.00	8.37			5.49	11.50	
90	3-1/2	101.6	2.11	5.25	2.11	5.25	3.05	7.53	3.05	7.53	4.00	9.62			5.74	13.78	
100	4	114.3	2.11	5.93	2.11	5.93	3.05	8.50	3.05	8.50	4.5	12.18			6.02	16.32	
125	5	141.3	2.77	9.61	2.77	9.61	3.40	11.74	3.40	11.74	5.00	16.80			6.55	22.10	
150	6	168.3	2.77	11.47	2.77	11.47	3.40	14.04	3.40	14.04	5.5	22.08			7.11	28.69	
200	8	219.1	2.77	15.00	2.77	15.00	3.76	20.27	3.76	20.27	6.35	33.82	7.04	37.38	8.18	43.20	
250	10	273.1	3.40	22.95	3.40	22.95	4.19	28.20	4.19	28.20	6.35	42.41	7.80	51.81	9.27	61.22	
300	12	323.9	3.96	31.72	4.19	33.60	4.57	36.54	4.57	36.54	6.35	50.48	8.38	66.20	9.53	75.01	10.31
350	14	355.6	3.96	34.86			4.78	41.99	6.35	55.53	7.92	68.95	9.53	82.58	9.53	82.58	11.13
400	16	406.4	4.19	42.20			4.78	48.07	6.35	63.61	7.92	79.03	9.53	94.70	9.53	94.70	12.70
450	18	457.2	4.19	47.46			4.78	54.15	6.35	71.69	7.92	89.10	11.13	124.32	9.53	106.83	14.27
500	20	508.0	4.78	60.23			5.54	69.70	6.35	79.76	9.53	118.93	12.70	157.51	9.53	118.93	15.06
550	22	558.8	4.78	65.95			5.54	76.75	6.35	87.84	9.53	131.07	12.70	173.66	9.53	131.07	15.88
600	24	609.6	5.54	83.80			6.35	95.92	6.35	95.92	9.53	143.20	14.27	212.72	9.53	143.20	17.45
650	26	660.4							7.92	129.40	12.70	205.97			9.53	155.32	
700	28	711.2							7.92	139.47	12.70	222.13	15.88	276.48	9.53	167.44	
750	30	762.0	6.35	120.15			7.92	149.55	7.92	149.55	12.70	238.28	15.88	296.68	9.53	179.56	
800	32	812.8							7.92	159.62	12.70	254.44	15.88	316.88	9.53	191.69	17.48
850	34	863.6							7.92	169.64	12.70	270.50	15.88	336.96	9.53	203.74	17.48
900	36	914.4							7.92	179.77	12.70	286.75	15.88	357.28	9.53	215.93	19.05



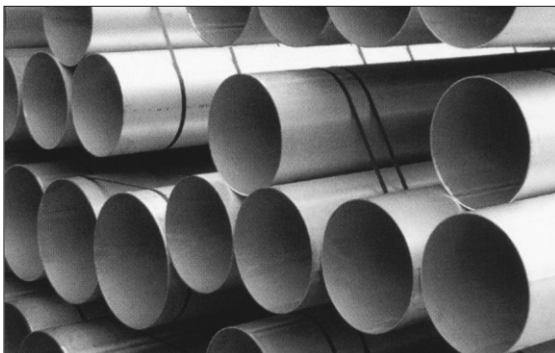
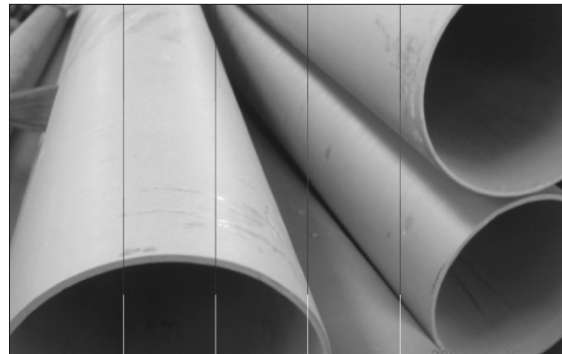
STAINLESS STEEL SCHEDULE PIPE DIMENSION, WALL THICKNESS & WEGHT / METER

				NOMINAL WALL THICKNESS																				
		SCH 60		SCH 80 S		SCH.80		SCH.100		SCH.120		SCH.140		SCH.160		SCH.XXS								
WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR	WALL THK	WEIGHT KG/MTR								
			2.41	0.47																				
			3.02	0.82																				
			3.20	1.12																				
			3.73	1.64									4.78	1.98	7.47	2.59								
			3.91	2.23									5.56	2.94	7.82	3.69								
			4.55	3.29									6.35	4.30	9.09	5.53								
			4.85	4.53									6.35	5.59	9.70	7.88								
			5.08	5.49									7.14	7.35	10.16	9.69								
			5.54	7.60									8.74	11.29	11.07	13.65								
			7.01	11.60									9.53	15.15	14.02	20.72								
			7.62	15.51									11.13	21.67	15.24	28.11								
			8.08	18.92											16.15	34.56								
			8.56	22.66					11.13	28.75			13.49	34.05	17.12	41.66								
			9.53	31.44					12.70	40.90			15.88	49.87	19.05	58.31								
			10.97	43.21					14.27	55.03			18.26	68.59	21.95	79.2								
	10.81	53.90	12.70	65.63			15.06	76.93	18.24	91.73	20.62	102.47	23.01	112.97	22.23	108.00								
	12.20	82.80	12.70	82.80	15.06	97.27	18.24	116.38	21.41	134.90	25.40	155.50	28.58	174.95	25.40	155.5								
80.94	14.27	110.62	12.70	98.95	17.45	133.88	21.41	162.14	25.40	189.82	28.58	211.31	33.32	242.40	25.40	189.82								
96.00	15.06	128.42	12.70	109.04	19.05	160.54	23.80	197.74	27.76	227.88	31.75	257.47	35.71	286.04										
125.20	16.66	162.59	12.70	125.20	21.41	206.40	26.19	249.34	30.94	290.88	36.53	338.32	40.46	370.74										
158.27	19.05	209.00	12.70	141.35	23.80	258.29	29.36	314.54	34.93	369.34	39.67	414.74	45.24	466.67										
185.89	20.62	251.65	12.70	157.51	26.19	315.97	32.54	387.41	38.10	448.30	44.45	515.94	49.99	573.31										
216.04	22.23	298.55	12.70	173.66	28.57	379.70	34.92	457.83	41.27	535.17	47.62	609.30	53.97	682.57										
258.74	24.59	360.21	12.70	189.82	30.94	448.30	38.89	555.76	46.02	649.44	52.37	730.72	59.51	819.70										
			12.70	205.97	24.66D-t) t 1000 Wt/pam + formula Weight stainless steel pipe OD (mm) - W.T. (mm) XW.T. (mm) X 0.02466 = Kg. per mtr.																			
			12.70	222.13																				
			1270	238.28																				
348.11			12.70	254.44																				
370.22			12.70	270.50																				
427.09			12.70	286.75																				



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





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	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												
6	1/4	13.7						2.24	0.63	2.24	0.63					3.02	0.80												
10	3/8	17.1						2.31	0.84	2.31	0.84					3.20	1.10												
15	1/2	21.3						2.77	1.27	2.77	1.27					3.73	1.62												
20	3/4	26.7						2.87	1.69	2.87	1.69					3.91	2.20												
25	1	33.4						3.38	2.50	3.38	2.50					4.55	3.24												
32	1 1/4	42.2						3.56	3.39	3.56	3.39					4.85	4.47												
40	1 1/2	48.3						3.68	4.05	3.68	4.05					5.08	5.41												
50	2	60.3						3.91	5.44	3.91	5.44					5.54	7.48												
65	2 1/2	73.0						5.16	8.63	5.16	8.63					7.01	11.41												
80	3	88.9						5.49	11.3	5.49	11.3					7.62	15.3												
90	3 1/2	101.6						5.74	13.57	5.74	13.57					8.08	18.63												
100	4	114.3						6.02	16.07	6.02	16.07					8.56	22.3			11.13	28.32								
125	5	141.3						6.55	21.77	6.55	21.77					9.53	30.9			12.7	40.2								
150	6	168.3						7.11	28.26	7.11	28.26					10.97	42.5			14.3	54.2								
200	8	219.1						8.18	42.5	8.18	42.5					12.7	64.6			15.1	75.92			20.6	100.9				
250	10	273.0						9.27	60.3	9.27	60.3					12.7	81.5			18.3	114.7			25.4	155				
300	12	323.8						9.53	73.8	10.31	79.7					12.7	97.4			21.4	160.0			28.6	208				
350	14	355.6						9.53	81.3	11.13	94.6					12.7	107.0			23.8	195.0			31.8	253.5				
400	16	406.4						9.53	93.3	12.7	123.0					12.7	123.0			26.2	245.0			33.3	366.0				
450	18	457.2						11.13	122.0	14.20	156.0					12.7	139.0			29.36	310.0			39.7	408.3				
500	20	508.0						12.7	155.1	15.09	183.0					12.7	155.1			32.5	381.0			44.4	508				
550	22	558.8						12.7	171.0	17.48	255.0					12.7	171.0			34.9	451.0			47.6	600				
600	24	610.0						14.3	210.0	17.48	255.0					12.7	187.0			38.8	547.7			60.0	720.15				
650	26	660.0														12.7	202							62.4	720.15				
700	28	711.0														12.7	218							64.0	720.15				
750	30	762.0														12.7	235							67.0	720.15				
800	32	812.8														12.7	251							67.0	720.15				
850	34	863.6														12.7	266							67.0	720.15				
900	36	914.4														12.7	282							67.0	720.15				



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



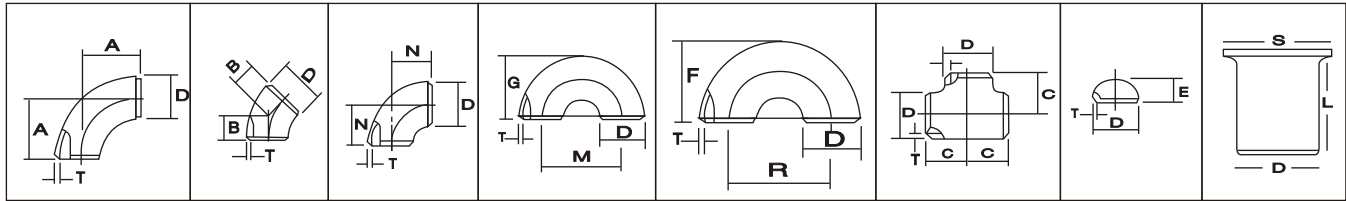
BUTT-WELDING FITTING ASTM

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) %	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, Va% = 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, Va% = 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, Va% = 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, N% = 0.03-0.07, Al% = 0.04 Max



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



90 Elbow Long Radius

45 Elbow

90 Elbow Short Radius

180 Return Short Radius

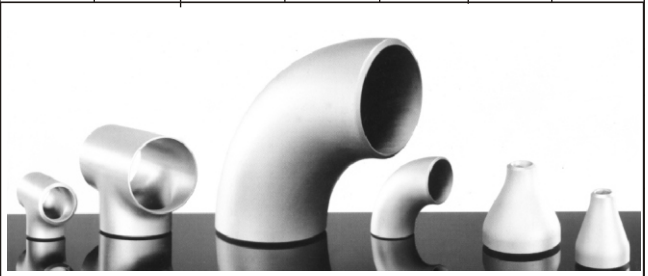
180 Return Long Radius

Tee Equal Tee

Caps

Stub-End

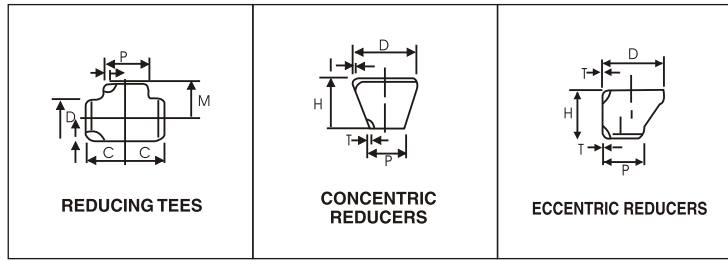
Nominal Pipe Size		Outside Diameter	Center to Face				Back to Face			Center to Center			Length 'L'	
INCH	MM	D	A R=1.5D	B	C	N R=1D	E	F	G	R	M	S	Short L	Long L
1/2	15	21.3	38.00	16.0	25.0	-	25.0	48.0	-	76.0		35.0	50.8	76.2
3/4	20	26.7	29.00	11.0	29.0	-	25.0	43.0	-	57.0		43.0	50.8	76.2
1	25	33.4	38.00	22.0	38.0	25.0	38.0	56.0	41.0	76.0	51.0	51.0	50.8	101.6
1.1/4	32	42.2	48.00	25.0	48.0	32.0	38.0	70.0	52.0	95.0	64.0	64.0	50.8	101.6
1.1/2	40	48.3	57.15	29.0	57.0	38.0	38.0	83.0	62.0	114.0	76.0	73.0	50.8	101.6
2	50	60.3	76.00	35.0	64.0	51.0	38.0	106.0	81.0	152.0	102.0	93.0	63.5	152.4
2.1/2	65	73.0	95.25	44.0	76.0	64.0	38.0	132.0	100.0	191.0	127.0	105.0	63.5	152.4
3	80	88.9	114.30	51.0	86.0	76.0	51.0	159.0	121.0	229.0	152.0	127.0	63.5	152.4
3.1/2	90	101.6	133.35	57.0	95.0	89.0	64.0	184.0	140.0	267.0	178.0	140.0	76.2	152.4
4	100	114.3	152.0	64.0	105.0	102.0	64.0	210.0	159.0	305.0	203.0	157.0	76.2	152.4
5	125	141.3	190.0	79.0	123.0	127.0	76.0	262.0	197.0	381.0	254.0	186.0	76.2	203.2
6	150	168.3	229.0	95.0	143.0	152.0	89.0	313.0	237.0	457.0	305.0	218.0	88.9	203.2
8	200	219.1	305.0	127.0	178.0	203.0	102.0	414.0	313.0	610.0	406.0	270.0	101.6	203.2
10	250	273.1	381.0	159.0	216.0	254.0	127.0	515.0	391.0	762.0	508.0	324.0	127.0	254.0
12	300	323.8	457.0	190.0	254.0	305.0	152.0	619.0	467.0	914.0	610.0	381.0	152.4	254.0
14	350	355.6	533.0	222.0	279.0	356.0	165.0	711.0	533.0	1067.0	711.0	413.0	152.4	305.0
16	400	406.4	610.0	254.0	305.0	406.0	178.0	813.0	610.0	1219.0	813.0	470.0	152.4	305.0
18	450	457.2	686.0	286.0	343.0	457.0	203.0	914.0	686.0	1372.0	914.0	533.0	152.4	305.0
20	500	508.0	762.0	318.0	381.0	508.0	229.0	1016.0	762.0	1524.0	1016.0	584.0	152.4	305.0
22	550	559.0	838.0	343.0	419.0	559.0	254.0	1118.0	838.0	1676.0	1118.0	614.4	152.4	305.0
24	600	610.0	914.0	381.0	432.0	610.0	267.0	1219.0	914.0	1829.0	1219.0	692.0	152.4	305.0
26	650	660.0	991.0	405.0	495.0	660.0	267.0							
28	700	711.0	1067.0	438.0	521.0	771.0	267.0							
30	750	762.0	1143.0	470.0	559.0	762.0	267.0							
32	800	813.0	1219.0	502.0	597.0	813.0	267.0							
34	850	864.0	1295.0	533.0	635.0	864.0	267.0							
36	900	914.4	1372.0	565.0	673.0	914.0	267.0							



All Dimensions in Millimeters



DIMENSIONAL TOLERANCE ANSI B16.9 / B16.8 /MSS SP - 43



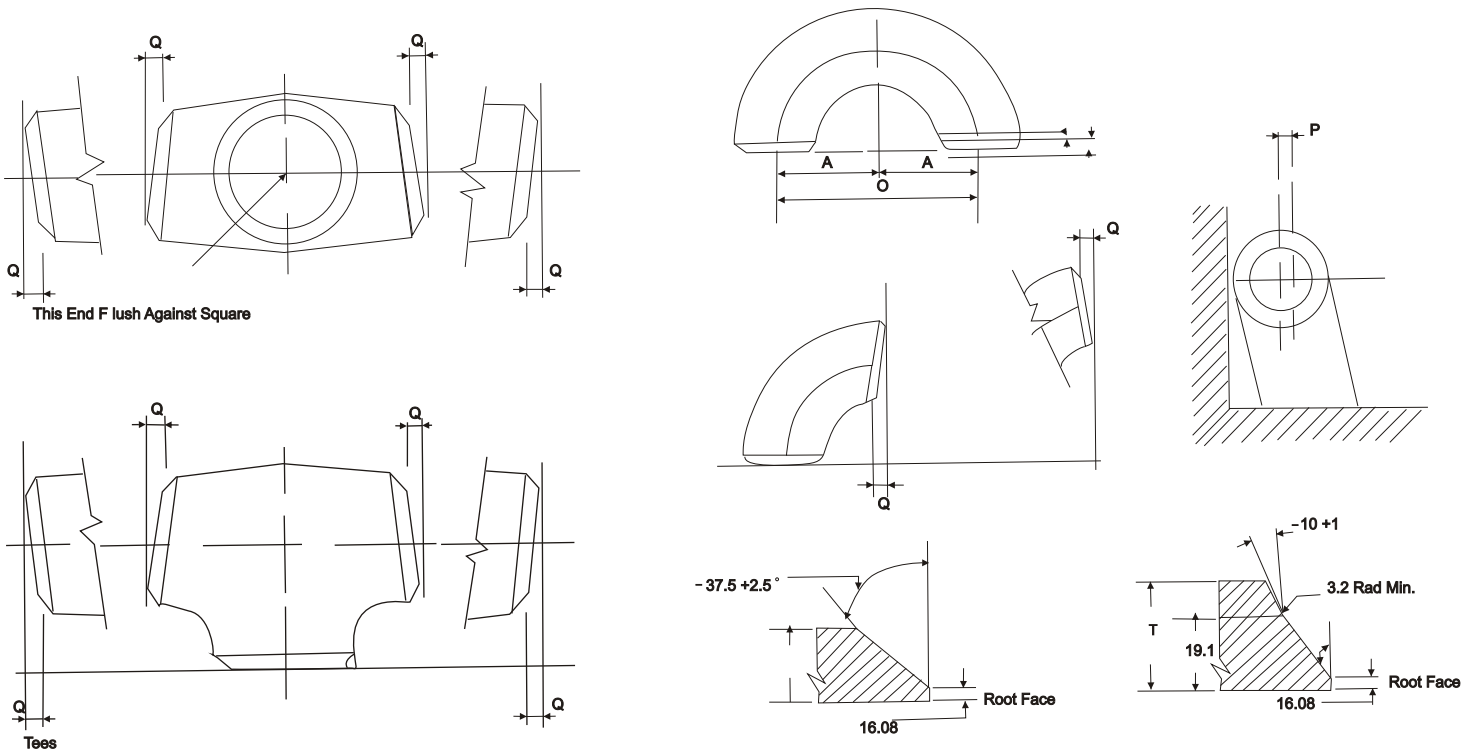
Nominal Pipe Size		Outside Diameter		Center to End		Length
INCH	MM	D	P	C	M	H
1/2 x 3/8	15 x 10	21.3	17.1	25	25	-
1/2 x 1/4	15 x 8	21.3	13.7	25	25	-
3/4 x 1/2	20 x 15	26.7	21.3	29	29	38
3/4 x 3/8	20 x 10	26.7	17.1	29	29	38
1 x 3/4	25 x 20	33.4	26.7	38	38	51
1 x 1/2	25 x 15	33.4	21.3	38	38	51
1 1/4 x 1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

Nominal Pipe Size		Outside Diameter		Center to End		Length
INCH	MM	D	P	C	M	H
8 x 6	200x150	219.1	168.3	178	168	152
8 x 5	200 x 125	219.1	141.3	178	162	152
8 x 4	200 x 100	219.1	114.3	178	156	152
8 x 3 1/2	200 x 90	219.1	101.6	178	152	152
10 x 8	250 x 200	273.1	219.1	216	203	178
10 x 6	250 x 150	273.1	168.1	216	194	178
10 x 5	250 x 125	273.1	141.3	216	191	178
10 x 4	250 x 100	273.1	114.3	216	184	178
12 x 10	300 x 250	323.9	273.1	254	241	203
12 x 8	300 x 200	323.9	219.1	254	229	203
12 x 6	300 x 150	323.9	168.3	254	219	203
12 x 5	300 x 125	323.9	141.3	254	216	203
14 x 12	350 x 300	355.6	323.9	279	270	330
14 x 10	350 x 250	355.6	273.1	279	257	330
14 x 8	350 x 200	355.6	219.1	279	248	330
14 x 6	350 x 150	355.6	168.3	279	238	330
16 x 14	400 x 350	406.4	355.6	305	305	356
16 x 12	400 x 300	406.4	323.9	305	295	356
16 x 10	400 x 250	406.4	273.1	305	283	356
16 x 8	400 x 200	406.4	219.1	305	273	356
16 x 6	400 x 150	406.4	168.3	305	264	356
18 x 16	450 x 400	457.0	406.4	343	330	381
18 x 14	450 x 350	457.0	355.6	343	330	381
18 x 12	450 x 300	457.0	323.9	343	321	381
18 x 10	450 x 250	457.0	273.1	343	308	381
18 x 8	450 x 200	457.0	219.1	343	298	381
20 x 18	500 x 450	508.0	457.0	381	368	508
20 x 16	500 x 400	508.0	406.4	381	356	508
20 x 14	500 x 350	508.0	355.6	381	356	508
20 x 12	500 x 300	508.0	323.9	381	346	508
20 x 10	500 x 250	508.0	273.1	381	333	508
20 x 8	500 x 200	508.0	219.1	381	324	508
24 x 22	600 x 550	610.0	559.0	432	432	508
24 x 20	600 x 500	610.0	508.0	432	432	508
24 x 18	600 x 450	610.0	457.0	432	419	508
24 x 16	600 x 400	610.0	406.4	432	406	508
24 x 14	600 x 350	610.0	355.6	432	406	508
24 x 12	600 x 300	610.0	323.9	432	397	508
24 x 10	600 x 250	610.0	273.1	432	384	508

All Dimensions in Millimeters

DIMENSION TOLERANCE ANSI B16.9 / B16.8 /MSS SP - 43

ALL FITTINGS				90°/60°/45° 30° ELBOWS & TEES		REDUCERS		180° RETURNS				CAPS		ANGULARITY TOLERANCE						
Nominal Pipe size INCH/MM	Outside Diameter at Bevel	Inside Dia Meter	Wall Thickness at End	Center to End	Overall Length Dimension	Center to End	Back to Face Dimension	Alignment of End Dimensions	Overall Length	Nominal Pipe Size	Off Angel Inch/mm	Off Plane								
D		T		A,B,C,M		H		O		K		U		E		Q		P		
(1) B16.9	MSS Sp43	(2) B16.9	B16.9	MSS SP43	B16.9	MSS SP43	B16.9	MSS SP43	B16.9	MSS SP43	B16.9	MSS SP43	B16.9	MSS SP43	B16.9	MSS SP75	B16.9			
1/2" - 2 1/2" 15 - 65	±1.6 -0.8		±0.8		FROM 1/2" TO 18 15 TO 600	FROM 3/4" 15 TO 600	FROM 1/2" - 24" 15 - 600	FROM 1/2" - 8" 15 - 200							±3	±3.17	1/2" - 4" 15 - 100	±1		±2
3" - 3 1/2" 80 - 90	±1.6	±0.80	±1.6	Not Less Than 87.5% Nominal Thk	±2	±1.60	±2	±1.60	±6	±6.35	±6.0	±6.4	±1	±0.8	±6	±6.35	5" - 8" 125 - 200	±2	16" - 24" 400 - 600	±4
4" 100																				
5" - 6" 125 - 150	+2.4 -1.6	+1.60 -0.80															10" - 12" 250 - 300	±3		±5
8" 200																	14" - 16" 350 - 400	±3		±7
10" - 18" 250 - 450	+4 -3.2	+2.38 -0.80	±3.2					10" - 24" 250 - 600									18" - 24" 450 - 600	±4		±10
20" - 24" 500 - 600	+6.4 -4.8	3.17 0.79							±10	±10							26" - 30" 650 - 750	±5	26" - 36" 650 - 900	±10
26" - 30" 650 - 750	+6.4 -4.8	+4.8	±4.8														32" - 42" 800 - 1050	±5		±13
32" - 48" 800 - 1200	+6.4 -4.8																44" - 48" 1100 - 1200	±5	32" - 48" 950 - 1200	±20
																	42" - 48" 1050 - 1200	±5		±20





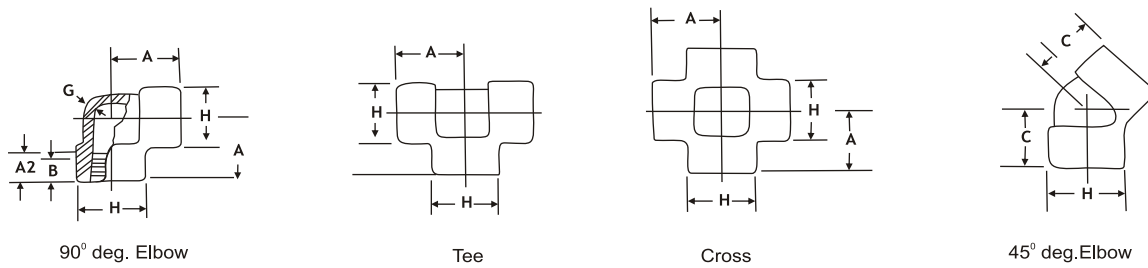
MATERIAL SPECIFICATION FOR FORGED FITTINGS & FLANGES

SPECIFICATION (ASTM-2002)	CHEMICAL PROPERTIES					MECHANICAL PROPERTIES					OTHERS			
	C%	Mn%	P% (Max)	S% (Max)	Si%	Cr%	Ni%	Mo%	U.T.S. (Min) Mpa	ELONG. (Min) %		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	8.0-13.0	-	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	8.0-10.5	-	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
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	0.30-0.80	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

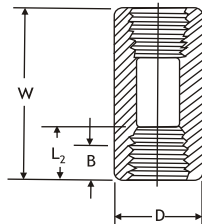
DIMENSIONS OF SOCKET-WELDING FITTINGS ANSI B 16.11

Nominal Pipe Size	Socket Bore Diameter, B (Note 1)	Bore Diameter of Fitting 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			Class Designation			Couplings	Half Couplings	A	E	F	3000	6000	9000							
		3000	6000	9000	Min.	Avg.	Min.	Avg.	Min.		3000	6000	9000									90deg Elbows, Tees and Crosses	45deg Elbows					
6	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	...	6.5	16.0	1.0	1.5	1.0	4.8	6.4	...	
8	14.6	10.0	7.1	...	3.78	3.30	4.60	4.01	...	3.02	3.68	...	9.5	11.0	13.5	...	8.0	8.0	...	6.5	16.0	1.0	1.5	1.0	4.8	6.4	...	
10	18.0	13.3	9.9	...	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	22.2	16.6	12.5	7.2	4.67	4.09	5.97	5.18	9.35	8.18	3.73	4.78	7.47	9.5	15.5	19.5	25.5	11.0	12.5	15.5	9.5	22.5	1.5	3.0	1.5	6.4	7.9	11.2
20	27.6	21.7	16.3	11.8	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	19.0	9.5	24.0	1.5	3.0	1.5	6.4	7.9	12.7
25	34.3	27.4	21.5	16.0	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	20.5	12.5	28.5	2.0	4.0	2.0	9.6	11.2	14.2
32	43.1	35.8	30.2	23.5	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	22.5	12.5	30.0	2.0	4.0	2.0	9.6	11.2	14.2
40	49.2	41.6	34.7	28.7	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	25.5	12.5	32.0	2.0	4.0	2.0	11.2	12.7	15.7
50	61.7	53.3	43.6	38.9	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	28.5	19.0	41.0	2.0	4.0	2.0	12.7	15.7	19.0
65	74.4	64.2	...	...	...	...	...	...	...	...	...	...	...	16.0	41.0	...	...	28.5	...	...	19.0	43.0	2.5	5.0	2.5	15.7	19.0	...
80	90.3	79.4	...	...	...	...	...	...	...	...	...	...	...	16.0	57.0	...	...	32.0	...	...	19.0	44.5	2.5	5.0	2.5	19.0	22.4	...
100	115.7	103.8	...	...	...	...	...	...	...	...	...	...	...	19.0	66.5	...	...	41.0	...	...	19.0	48.0	2.5	5.0	2.5	22.4	28.4	...

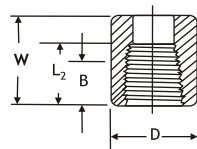
(1) All Dimensions Are In Millimeters
 (2) Upper and lower values for each size are the respective maximum and minimum dimensions.
 (3) Average of socket wall thickness around periphery shall be no less than listed values. The minimum values are permitted in localized areas.

DIMENSIONS OF THREADED FITTING ANSI B 16.11


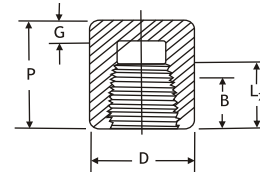
Nominal Pipe Size	Center to End Elbows, Tees, Crosses A	Center to End 45° Elbow C			Outside Diameter of Bend H			Minimum Wall Thickness G			Length of Thread Min (1)				
		NB	INCH	2000	3000	6000	2000	3000	6000	2000	3000	6000	B	L2	
6	1/8	21	21	25	17	17	19	22	22	25	3.18	3.18	6.35	6.4	6.7
8	1/4	21	25	28	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



Coupling



Half-Coupling

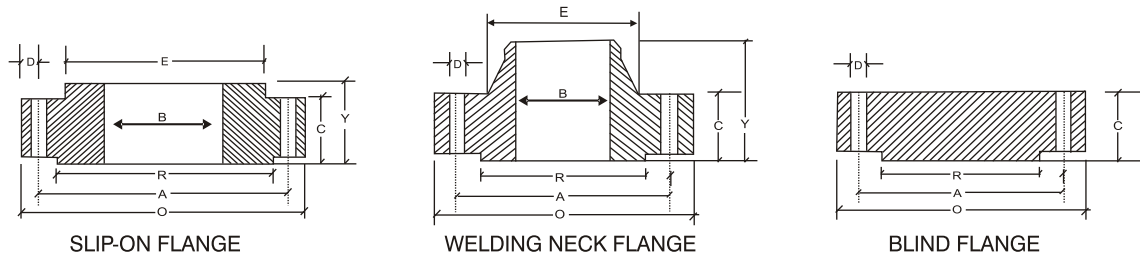


Cap

Nominal Pipe Size	End to End Couplings W	End to End Caps P		Outside Diameter D		End Wall Thickness G		Length of Thread Note-1		
		NB	INCH	3000 & 6000	3000	6000	3000	6000	B	L2
6	1/8	32	19	-	16	22	4.8	-	6.4	6.7
8	1/4	35	25	27	19	25	4.8	6.4	8.1	10.2
10	3/8	38	25	27	22	32	4.8	6.4	9.1	10.4
15	1/2	48	32	33	28	38	6.4	7.9	10.9	13.6
20	3/4	51	37	38	35	44	6.4	7.9	12.7	13.9
25	1	60	41	43	44	57	9.7	11.2	14.7	17.3
32	1 1/4	67	44	46	57	64	9.7	11.2	17.0	18.0
40	1 1/2	79	44	48	64	76	11.2	12.7	17.8	18.4
50	2	86	48	51	76	92	12.7	15.7	19.0	19.2
65	2 1/2	92	60	64	92	108	15.7	19.0	23.6	28.9
80	3	108	65	68	108	127	19.0	22.4	25.9	30.5
100	4	121	68	75	140	159	22.4	28.4	27.7	33.0

All Dimensions are in Millimeters

DIMENSIONS OF FORGED FLANGES ANSI B 16.5



ASA 150 CLASS

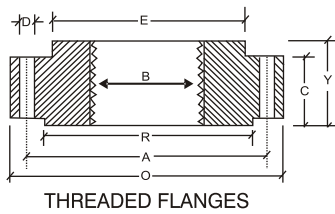
Nominal Pipe Size	Flange Dia	Dia of Bolt Circle	Dia of Bolt Holes	No. of Holes	Thk of Flange	Dia of Hub	Lenght through Hub			Dia of Bore		Dia of R/F	Depth of Socket	Pipe Dia	
							S/O & S/W	W/N	L/J	S/O & S/W	L/J				
(MM) (INCH.)	O	A	D	C	E	Y	Y	Y	B	B	R	F	X		
15	1/2	88.9	60.3	15.9	4	11.1	30.2	15.9	47.6	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	1 1/4	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	1 1/2	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	2 1/2	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

All Dimensions are in Millimeters • Flanges except Lap Joint will be furnished with (1.6mm) Raised Face, which is included in Thickness(C) and Lenght through Hub(Y).

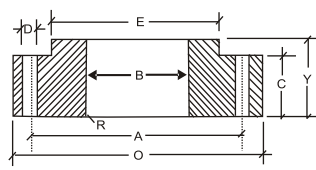
ASA 300 CLASS

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	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	1 1/4	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	1 1/2	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	2 1/2	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

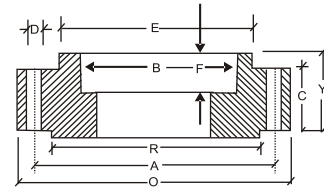
All Dimensions are in Millimeters • Flanges except Lap Joint will be furnished with (1.6mm) Raised Face, which is included in Thickness(C) and Lenght through Hub(Y).

DIMENSIONS OF FORGED FLANGES ANSI B 16.5


THREADED FLANGES



LAP JOINT FLANGES



SOCKET WELD FLANGES

ASA 600 CLASS

Nominal Pipe Size (MM)	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Lenght through Hub			Dia of Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
							S/O & S/W	W/N	L/J	S/O & S/W	L/J			
							Y	Y	Y	B	B			
15	95.2	66.7	15.9	4	14.3	38.1	22.2	52.4	22.3	22.3	22.8	34.9	9.5	21.33
20	117.5	82.5	19.0	4	15.9	47.6	25.4	57.1	25.4	27.7	28.1	42.9	11.1	26.67
25	123.8	88.9	19.0	4	17.5	54.0	27.0	61.9	26.9	34.5	35.0	50.8	12.7	33.40
32	133.3	98.4	19.0	4	20.6	63.5	28.6	66.7	28.4	43.2	43.6	63.5	14.2	42.16
40	155.6	114.3	22.2	4	22.2	69.8	31.7	69.8	31.7	49.5	50.0	73.0	15.8	48.26
50	165.1	127.0	19.0	8	25.4	84.1	36.5	73.0	36.5	62.0	62.4	92.1	17.4	60.31
65	190.5	149.2	22.2	8	28.6	100.0	41.3	79.4	41.1	74.7	75.4	104.8	19.0	73.02
80	209.5	168.3	22.2	8	31.8	117.5	46.0	82.5	45.9	90.7	91.4	127.0	-	88.90
100	273.0	215.9	25.4	8	38.1	152.4	54.0	101.6	53.8	116.1	116.8	157.2	-	114.30
125	330.2	266.7	28.6	8	44.4	188.9	60.3	114.3	60.4	143.8	144.5	185.7	-	141.30
150	355.6	292.1	28.6	12	47.6	222.2	66.7	117.5	66.5	170.7	171.4	215.9	-	168.27
200	419.1	349.2	31.7	12	55.6	273.0	76.2	133.3	76.2	221.5	222.2	269.9	-	219.07
250	508.0	431.8	34.9	16	63.5	342.9	85.7	152.4	111.2	276.3	277.4	323.8	-	273.05
300	558.8	488.9	34.9	20	66.7	400.0	92.1	155.6	117.3	327.1	328.2	381.0	-	323.85
350	603.2	527.0	38.1	20	69.9	431.8	93.7	165.1	127.0	359.1	360.1	412.7	-	355.60
400	685.8	603.2	41.3	20	76.2	495.3	106.4	177.8	139.7	410.5	411.2	469.9	-	406.40
450	742.9	654.0	44.4	20	82.6	546.1	117.5	184.1	152.4	461.8	462.3	533.4	-	457.20
500	812.8	723.9	44.4	24	88.9	609.9	127.0	190.5	165.1	513.1	514.3	584.2	-	508.00
600	939.8	838.2	50.8	24	101.6	717.5	139.7	203.2	184.1	615.9	615.9	692.1	-	609.60

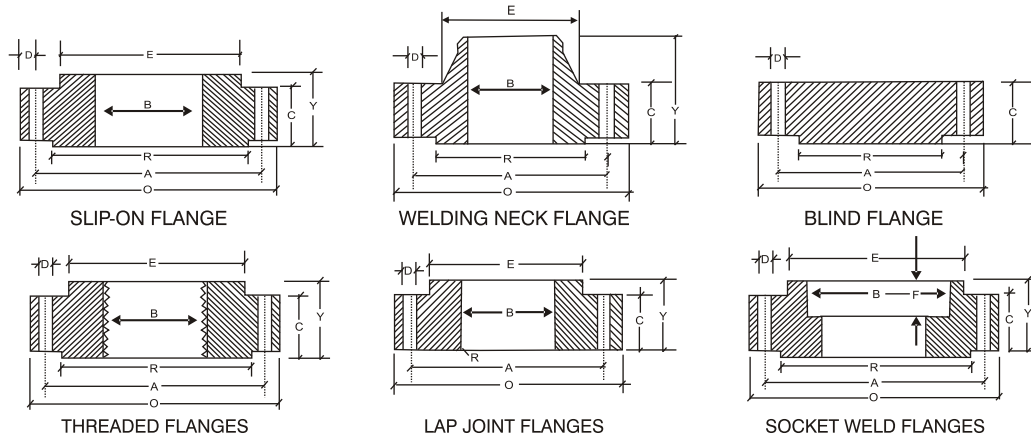
All Dimensions are in Millimeters • Flanges except Lap Joint will be furnished with(6.35mm) Raised Face, which is not included in Thickness(C) and Lenght through Hub(Y).

ASA 900 CLASS

Nominal Pipe Size (MM)	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Lenght through Hub			Dia of Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
							S/O & S/W	W/N	L/J	S/O & S/W	L/J			
							Y	Y	Y	B	B			
15	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	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	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	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	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	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	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	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	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	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	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	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	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	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(6.35mm) Raised Face, which is not included in Thickness(C) and Lenght through Hub(Y).

DIMENSIONS OF FORGED FLANGES ANSI B 16.5



ASA 1500 CLASS

Nominal Pipe Size (MM) | (INCH.)	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Length Through Hub			Dia of Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X	
							S/O & S/W Y	W/N Y	L/J Y	S/O & S/W B	L/J B				
For Dimensions from 1/2" to 2 1/2" kindly refer ASA 900 LBS Table.															
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

All Dimensions are in Millimeters • Flanges except Lap Joint will be furnished with(6.35mm) Raised Face, which is not included in Thickness(C) and Length through Hub(Y).

ASA 2500 CLASS

Nominal Pipe Size (MM) | (INCH.)	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Length Through Hub			Dia of Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X	
							S/O & S/W Y	W/N Y	L/J Y	S/O & S/W B	L/J B				
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	1 1/4	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	1 1/2	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	2 1/2	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	-	273.05
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(6.35mm) Raised Face, which is not included in Thickness(C) and Length through Hub(Y).



DIMENSIONAL TOLERANCES OF FORGED FLANGES

Welding Neck				Threaded, Slip on, Lap Joint socket Welding and Blind			
Outside Diameter	O.D. 600 or similar O.D. Over 600		± 1.6 ± 3.1	Outside Diameter	O.D. 50 or similar O.D. Over 600		± 1.6 ± 3.1
Inside Diameter (Bore)	250 and similar 12 through 450 500 or larger	+ 3.1	± 0.7 ± 1.6 - 1.6	Inside Diameter (Bore)	Threaded : to standard gauge limits Slip - on : lap joint : socket - Welding : 250 and smaller 300 and larger Threaded	+ 0.7 + 1.6	- 0.0 - 0.0
Diameter of Contact Face	1.6 raised face 6.3 raised face : tongue & grooved mate and female	± 0.7 ± 0.4		Diameter of Contact Face	250 and smaller 300 and larger	± 0.7 + 1.6	- 0.0 - 0.0
Diameter of Hub at Base	When E is 600 or smaller When E is over 600	± 1.6 ± 3.1		Outside Diameter of Hub	300 and smaller 350 and larger	± 2.3	1.6 ± 3.1
Diameter of Hub at point of welding	125 and smaller 150 and larger	± 0.7 ± 4.0	± 0.7 ± 0.0	Diameter of Contact Face	1.6 raised face 6.3 raised face : tongue & grooved male and female		± 0.7 ± 0.4
Thickness	450 and smaller 500 and larger	+ 3.1 + 4.7	- 1.5 - 2.0	Thickness	450 and smaller 500 and larger	+ 3.1 + 4.7	- 1.5 - 2.0
Length through Hub	250 and smaller 300 and larger Bolt Circle	+ 3.1	± 1.6 ± 3.1 ± 1.6	Length through Hub	250 and smaller 300 and larger Bolt Circle	+ 3.1	± 1.6 ± 3.1 ± 1.6
Drilling	Bolt hole spacing Eccentricity with respect to bore		± 0.7 0.7 max	Drilling	Bolt hole spacing Eccentricity with respect to bore		± 0.7 0.7 max

WELDING NECK FLANGE BORE

NPS (NB)	O.D. (MM)	Sch. 10	Sch. 20	Sch. 30	Sch. Std	Sch. 40	Sch. XS	Sch. 80	Sch. 120	Sch. 160	Sch. XXS
15	21.33	17.1	-	-	15.7	15.7	13.8	13.8	-	11.7	6.4
20	26.67	22.5	-	-	20.8	20.8	18.8	18.8	-	15.5	11.0
25	33.40	27.9	-	-	26.6	25.4	24.3	24.3	-	20.7	15.2
32	42.16	36.6	-	-	35.0	35.0	32.4	32.4	-	29.4	22.7
40	48.26	42.7	-	-	40.8	40.8	38.1	38.1	-	33.7	27.9
50	60.31	54.8	-	-	52.3	52.3	49.2	49.2	-	42.8	38.1
65	73.02	66.9	-	-	62.4	62.4	59.0	59.0	-	53.9	44.9
80	88.90	82.8	-	-	77.9	77.9	73.6	73.6	-	66.6	58.4
100	114.30	108.2	-	-	102.2	102.2	97.1	97.1	92.0	87.3	80.0
125	141.30	134.5	-	-	128.1	128.1	122.2	122.2	115.9	109.5	103.2
150	168.27	161.5	-	-	154.0	154.0	146.3	146.3	139.7	131.7	124.3
200	219.07	211.6	206.2	204.9	202.7	202.7	193.6	193.6	182.5	173.0	174.6
250	273.05	264.7	260.3	257.4	254.5	254.5	247.6	242.8	230.1	215.9	222.2
300	323.85	314.7	311.1	307.0	304.8	303.2	298.4	288.8	273.0	257.2	273.0
350	355.60	346.2	337.8	336.5	336.5	333.3	330.2	317.5	300.0	284.1	-
400	406.40	396.7	390.3	387.3	387.3	381.0	381.0	363.5	344.5	325.4	-
450	457.20	447.5	441.1	434.9	438.1	428.6	431.8	409.5	387.3	366.7	-
500	508.00	497.3	488.9	482.6	488.9	477.8	482.6	455.6	431.8	407.9	-
600	609.60	596.9	590.5	581.0	590.5	574.6	584.2	547.6	517.5	490.5	-



NICKEL BASE ALLOYS

NOMINAL CHEMICAL COMPOSITION, % (not for specification purposes)													
Nickel	Ni	C	Mn	Fe	S	Si	Cu	Cr	Co	Mo	Al	Ti	Other
Nickel200	99.2	0.10	0.3	0.4	0.005	0.18	0.10	-	0.25	-	-	-	-
Nickel201	99.0	0.02	0.35	0.4	0.005	0.18	0.25	-	0.25	-	-	-	-
Nickel205	99.6	0.02	0.3	0.2	0.004	0.08	0.05	-	0.1	-	-	0.03 Mg	0.05
Nickel212	97.7	0.010	2.0	0.05	0.005	0.05	0.03	-	-	-	-	-	-
Nickel222	99.5	0.01	0.02	0.04	0.0025	0.01	0.01	0.01	0.06	0.01	0.01	Mg0.08	-
Nickel270	99.98	0.01	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	Mg<0.001	-
K.MONEL alloy 400	Ni 63.0 min	C 0.15	Mn 1.25 max	Fe 2.5max	S 0.024max	Si 0.05max	Cu 31.0	Cr -	Co -	Mo -	Al -	Ti -	Other -
K.MONEL alloy 500	Ni 63.0 min	C 0.25	Mn 1.5 max	Fe 2.0max	S 0.010max	Si 0.5	Cu 30.0	Cr -	Co -	Mo -	Al 2.9	Ti 0.6	Other -
Cast MONEL alloy	Ni 63.0 min	C 0.07	Mn 0.75	Fe 2.5max	S 0.02 max	Si 0.04max	Cu 30.0	Cr 0.10max	Co -	Mo 0.20max	Al 0.05max	Ti 0.01max	Other -
Cast MONEL alloy	Ni 63.0 min	C 0.03max	Mn 0.020max	Fe 2.5max	S 0.02max	Si 0.04max	Cu 30.0	Cr 0.10	Co -	Mo 0.20max	Al 0.05max	Ti 0.01max	Other -
INCONEL alloy 600	Ni 72.0 min	C 0.025 max	Mn 1.0 max	Fe 8.0	S 0.05 max	Si 0.05max	Cu 0.05 max	Cr 14 - 17	Co -	Mo -	Al -	Ti -	Other Nb +
INCONEL alloy 625	Ni Bal	C 0.025max	Mn 0.25	Fe 3.0max	S 0.015max	Si 0.5 max	Cu -	Cr 21 - 23	Co -	Mo 8 - 10	Al 0.25	Ti 0.25	Other 3.65
INCOLOY alloy 800	Ni 32 - 34	C 0.025max	Mn 1.5max	Fe Bal.	S 0.015max	Si -	Cu 0.75 max	Cr 20 - 22	Co 0.5 max	Mo -	Al 0.15 - 0.40	Ti 0.35 - 0.60	Other Al + Ti max. 1.0
INCOLOY alloy 825	Ni 38 - 46	C 0.025max	Mn 1.0max	Fe Bal.	S 0.03 max	Si 0.5max	Cu 2.25	Cr 19.5 - 23.5	Co 1.5 - 3	Mo 2.5 - 3.5	Al 0.20max	Ti 0.9	Other Ti 0.6 - 1.2
INCOLOY alloy 904	Ni 32.5	C 0.025	Mn 0.025	Fe Bal.	S 0.015	Si 0.25	Cu 0.25	Cr 14.5	Co -	Mo -	Al 0.1	Ti 1.6	Other -
INCOLOY alloy DS	Ni 37.0	C 0.10 max	Mn 0.21 max	Fe Bal.	S -	Si 2.3 max	Cu 2.3 max	Cr 18.0	Co -	Mo -	Al -	Ti -	Other -
Hastalloy C22	Ni Bal	C 0.010 max	Mn -	Fe 2 - 6	S -	Si 0.08 max.	Cu -	Cr 20 - 22.5	Co 2.5 max.	Mo 12.5-14.5	Al 2.50	Ti Co	Other W-2.50 3.50
Hastalloy C-276	Ni Bal	C 0.010 max	Mn 1.00	Fe 5.50	S -	Si -	Cu -	Cr 15 - 16.5	Co 15 - 16.5	Mo 15 - 17	Al -	Ti -	Other W-3.75uV.1-0.3 Si-0.02 Co-2.50
Hastalloy C-4	Ni Bal	C 0.009 max.	Mn 1.00	Fe 3.00	S 0.7	Si -	Cu -	Cr 14.5 17.5	Co 5.575	Mo 14.00 17.00	Al -	Ti 0.70	Other Co-2.00 Si-0.05 P-0.04

PHYSICAL AND MECHANICAL PROPERTIES

	Density Kg/dm ³	Melting Range °C	Specefic heat at 20 °C J/KgC	Thermal Conductivity at 20 °C W/mC	Thermal Expansion 10-6 °C 20-95 °C	Electrical resistivity at 20 °C microohm cm	Tensile strength N/mn ²	Hardness HV
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	340-410	75-100
Nickel 205	8.89	1435-1445	456	74.9	13.3	9.5	340	77
Nickel 212	8.86	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	1455	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	580-730	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



APPLICATION INDUSTRIES



- PHARMACY INDUSTRIES
 - FOOD INDUSTRIES
 - OIL & GAS INDUSTRIES
 - TEXTILE INDUSTRIES
- CEMENT INDUSTRIES.
 - REFINERY PLANTS
 - CHEMICAL INDUSTRIES
 - PAPER & PULP MILLS
- SUGAR INDUSTRIES
 - WATER PIPING SYSTEM
 - BEVERAGE INDUSTRIES
 - ENGINEERING

FORMULAE OF CALCULATING WEIGHT

1) Weight of Stainless Steel Pipe / Carbon Steel Pipe O.D. (mm) - W. Thick (mm) X W. Thick (mm) X 0.0248 = Wt. Per Mtr. O.D. (mm) - W. Thick (mm) X W. Thick (mm) X 0.00756 = Wt. Per Feet	8) Weight of Brass Pipes / Copper Pipes O.D. (mm) - W. Thick (mm) X W. Thick (mm) X 0.0260 = Wt. Per Mtr.
2) Weight of Stainless Steel Round Bar Dia (mm) X Dia (mm) X 0.00623 = Wt. per Mtr. Dia (mm) X Dia (mm) X 0.0019 = Wt. per Feet	9) Making of Pipe from Sheet / Plates O.D (mm) x Thick (mm) X 3.14 = Width of Cutting Sheet / Plates
3) Weight of Stainless Steel Square Bar Dia (mm) X Dia (mm) X 0.00788 = Wt. per Mtr. Dia (mm) X Dia (mm) X 0.0024 = Wt. per Feet	10) Weight of Aluminium Pipe O.D. (mm) - W. Thick (mm) X W. Thick (mm) X 0.0083 = Wt. per Mtr.
4) Weight of Stainless Steel Hexagonal Bar A/F (mm) X A/F (mm) X 0.00680 = Wt. per Mtr. A/F (mm) X A/F (mm) X 0.002072 = Wt. per Feet	11) Weight of Aluminium Sheet Lenght (Mtrs) X Width(Mtrs) X Thick (mm) X 2.69 = Weight per PC
5) Weight of Stainless Steel Flat Bar Width (mm) X Thickness (mm) X 0.00798 = Weight per Mtr. Width (mm) X Thickness (mm) X 0.00243 = Weight per Feet	12) Weight of Mtr. / 3.2808 Wt per Ft. Barlow's Formula for calculating bursting pressure $P = 2ST/D$ or $t-DP/2S$ or $S-DP/2T$ or $D=2ST/P$ P = Bursting Pressure P Si., S= Tensile Strenght of tube, T = Wall Thickness (in inches) D = Outside Diameter (in inches)
6) Weight of Stainless Steel Sheets & Plates Lenght (Mtrs) X Width (Mtrs) X Thick (mm) X 8 = Weight per PC Lenght (Feet) X Width (Feet) X Thick (mm) X 3/4 = Weight per PC	13) Formula for Healthy Business Honesty + Quality of Goods + Quick Service + Reasonable Rate = Good Healthy Business
7) Weight of Stainless Steel Circle Dia (mm) X Dia (mm) X Thick (mm) / 160 = Gms. per PC Dia (mm) X Dia (mm) X Thick (mm) X 0.0000063 = Kg. per PC	

Our Testing Laboratory is Approved By

- American Bureau of Shipping
- Bureau Veritas
- Certification Engineers International Ltd.
- Indian Oil Tanking
- Indian Register of Shipping
- Lloyds Register
- Projects & Development India Ltd.
- Rites Ltd.
- SGS India Private Limited
- Six Sigma Quality International

Testing Facility

Chemical Analysis



Optical Emission Spectrometer



Wet Chemical Analysis



Positive Material Identification (PMI)

Non-Destructive Testing



Ultrasonic Inspection



Ultrasonic Thickness Measurement

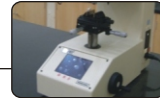


Coating Thickness Gauge Measurement

Non-Destructive Testing



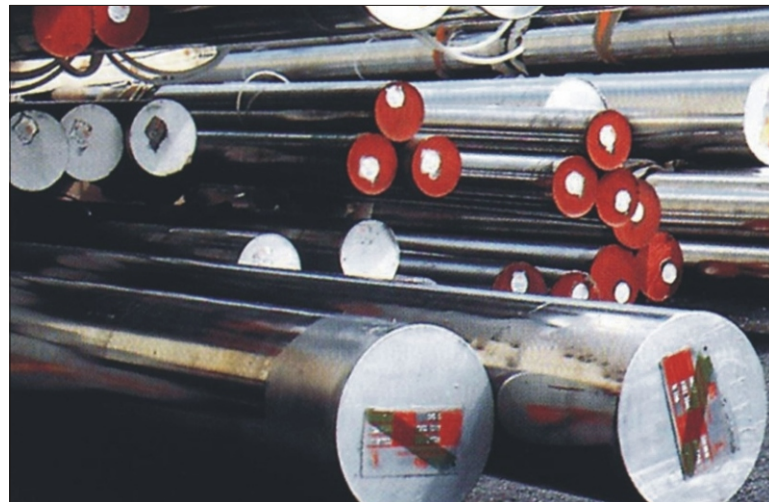
Magnetic Particle Testing



Hardness Testing



Optical Micro Examination





SURESH STEEL CENTRE

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Manufacturer, Exporters, Stockists & Suppliers of: Stainless Steel, Duplex,
Carbon & Alloy Steel, Sheet, Plate, Pipes, Pipe Fittings, Rod
& Everything in Non Ferrous Metal

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