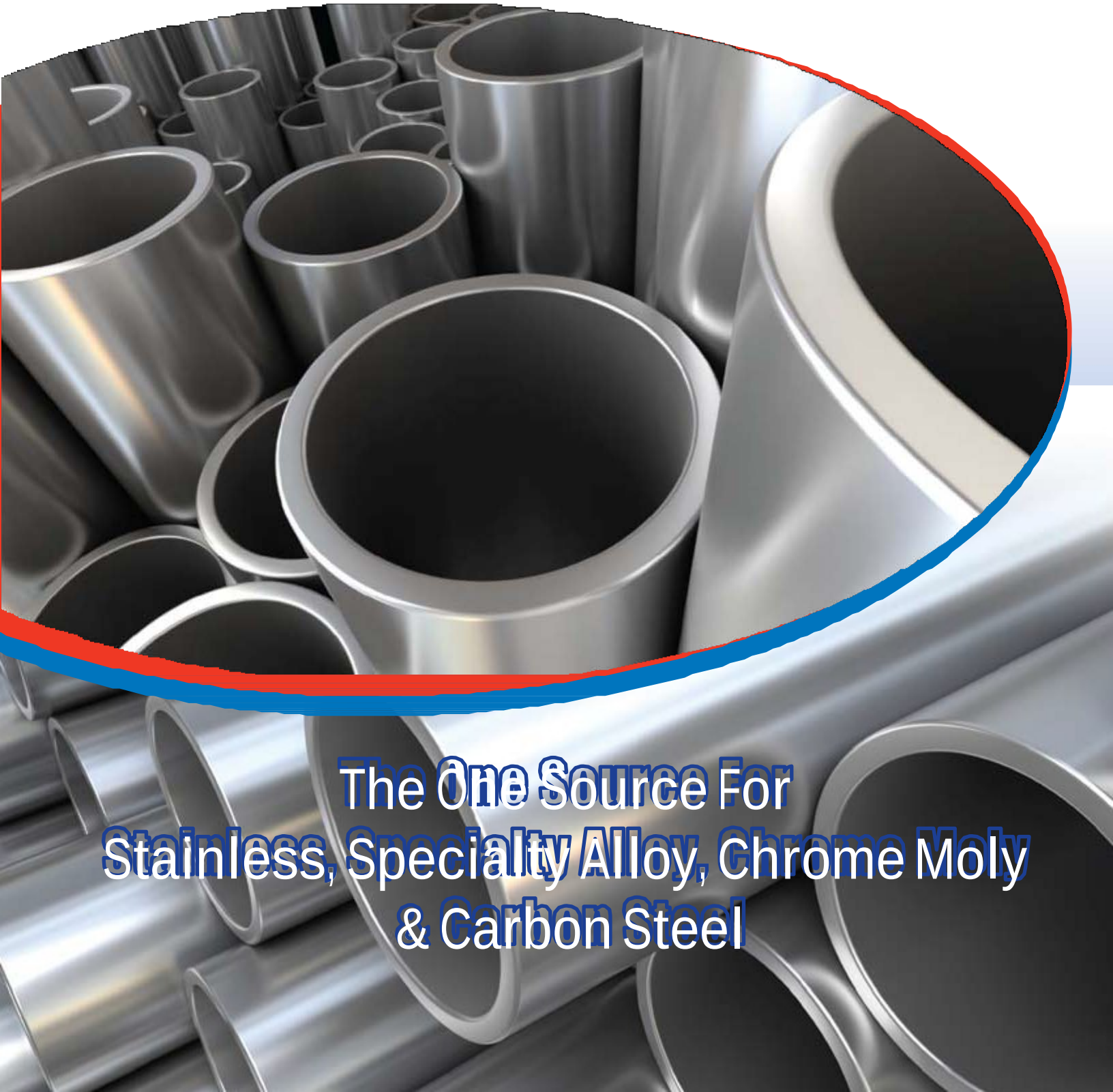
MultiAlloy



The One Source For
Stainless, Specialty Alloy, Chrome Moly
& Carbon Steel

What We Do

Our customers rely on us for…

- Competitive prices
- Buying only what is needed
- Meeting all job specifications
- Rapid response to inquiries
- 24-hour service
- Product knowledge
- One-stop shopping

Because we…

- Buy in large quantities
- Custom-cut and break bundles
- Carry a full line of domestic and imported products
- Maintain the largest inventory in the industry
- Fill after-hour requests
- Have decades of experience in the business
- Carry a complete line of pipe, plate, sheet, flanges, fittings, round bar, and valves

Machining Capabilities

Whatever your machining needs, MultAlloy can do it for you. Many installations require unique components, or individually-designed parts. We are in the business of making sure our customers have everything they need to get the job done right the first time.

Our deep inventories combined with manufacturing capabilities, make us a superior single source for any alloy piping project. We offer a range of machining capabilities, including:

- Manufacture of made-to-order items
- Special cut-to-length services
- Tap, Bore, Taper Bore, Bevel, Groove, Socket Weld, Thread
- Reducing Flanges, Special Facings
- Branch Outlets, Swage Nipples, Adapters, Inserts, Plugs

We routinely support our customers with:

- Quick turnaround for standard and non-standard items
- Global shipping
- Quality assurance

MultAlloy is committed to providing superior service to our customers and ensuring their complete satisfaction. Visit www.multalloy.com from more information.

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Grade	Product	Size Range (in Inches)	Walls / Pressure
304/304L 304/304H	Seamless Welded Butt-Weld Fittings Butt-Weld Fittings SMLS Flanges Pressure Fittings 150# Fittings Tubing Bar △	1/8 - 24 1/4 - 36 1/2 - 36 1/2 - 36 1/2 - 24 1/8 - 4 1/8 - 4 1/8 - 1/2 1/8 - 12	All Walls All Walls 10S, 40S, 80S, 160 10S, 40S, 80S All Pressures 3000#, 6000#, 9000# All Walls
310S/310H	Seamless Welded Butt-Weld Fittings Bar △	1/2 - 8 8 - 12 1/2 - 8 1 - 8	10S, 40S, 80S 10S, 40S 10S, 40S, 80S
316/316L 316/316H	Seamless Welded Butt-Weld Fittings Butt-Weld Fittings SMLS Flanges Pressure Fittings 150# Fittings Tubing Valves Bar	1/8 - 24 1/4 - 36 1/2 - 36 1/2 - 36 1/2 - 24 1/8 - 4 1/8 - 4 1/8 - 1/2 1/2 - 24 1/8 - 12	All Walls All Walls 10S, 40S, 80S, 160 10S, 40S, 80S All Pressures 3000#, 6000#, 9000# All Walls 150#, 300#, 600#
317L	Seamless Welded Butt-Weld Fittings Flanges Pressure Fittings Bar △	1/2 - 8 1/2 - 14 1/2 - 8 1/2 - 12 1/2 - 2 1 - 8	10S, 40S, 80S 10S, 40S 10S, 40S, 80S 150#, 300#
321/321H	Seamless Welded Butt-Weld Fittings Flanges Pressure Fittings Bar △	1/2 - 16 10 - 12 1/2 - 12 1/2 - 12 1/2 - 2 1 - 8	40S, 80S, 160, XXS 40S, 80S 40S, 80S, 160 150#, 300#, 600#
347/347H	Seamless Welded Butt-Weld Fittings Pressure Fittings Bar △	1/2 - 12 10 - 12 1/2 - 12 1/2 - 2 1 - 8	40S, 80S, 160, XXS 40S, 80S 40S, 80S, 160
410	Seamless	1/2 - 2	40S, 80S
904L	Seamless Butt-Weld Fittings	1/2 - 8 1/2 - 8	10S, 40S, 80S 10S, 40S
ALLOY 20	Seamless Welded Butt-Weld Fittings Flanges Pressure Fittings 150# Fittings Tubing Valves Bar △	1/2 - 8 3 - 12 1/2 - 8 1/2 - 12 1/8 - 2 1/8 - 2 3/8 - 1/2 1/2 - 12 1 - 8 1/2	10S, 40S, 80S 10S, 40S 10S, 40S, 80S 150#, 300# 3000# 0.035, 0.049, 0.065 150#, 300#
ALLOY 200 ⬭	Seamless Welded Butt-Weld Fittings Flanges Pressure Fittings Bar △	1/2 - 8 8 - 12 1/2 - 12 1/2 - 12 1/2 - 2 1 - 6	10S, 40S, 80S 10S, 40S 10S, 40S, 80S 150#, 300# 3000#
ALLOY 400 ⬭	Seamless Welded Butt-Weld Fittings Flanges Pressure Fittings Tubing Valves Bar △	1/2 - 8 8 - 12 1/2 - 12 1/2 - 12 1/2 - 2 1/4, 3/8, 1/2 1/2 - 8 1 - 8	10S, 40S, 80S 10S, 40S 10S, 40S, 80S 150#, 300# 3000# 0.035, 0.049, 0.065 150#, 300#

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Grade	Product	Size Range (in Inches)	Walls / Pressure
ALLOY 600 ⬭	Seamless	1/2 - 8	10S, 40S, 80S
	Welded Pipe	8 - 12	10S, 40S
	Butt-Weld Fittings	1/2 - 12	10S, 40S, 80S
	Flanges	1/2 - 12	150#, 300#
	Pressure Fittings	1/2 - 2	3000#
	Bar △	1 - 8	
ALLOY 625 ⬭	Seamless	1/2 - 8	40S, 80S, 160S
	Welded	1/2 - 8	10S, 40S
	Butt-Weld Fittings	1/2 - 8	10S, 40S, 80S
	Flanges	1/2 - 8	150#, 300#
	Pressure Fittings	1/2 - 2	3000#
	Bar △	1 - 8	
ALLOY 800/800H/800HP ⬭	Seamless	1/2 - 12	10S, 40S, 80S, 160S
	Butt-Weld Fittings	1/2 - 12	10S, 40S, 80S
	Flanges	1/2 - 12	150#, 300#
	Pressure Fittings	1/2 - 2	3000#
	Bar △	1 - 8	
ALLOY 825 ⬭	Seamless	1/2 - 8	10S, 40S, 80S
	Butt-Weld Fittings	1/2 - 12	10S, 40S, 80S
	Flanges	1/2 - 12	150#, 300#
	Pressure Fittings	1/2 - 2	3000#
	Bar △	1 - 6	
C-276 ⬭	Seamless	1/2 - 6	40S, 80S
	Welded	1/2 - 12	10S, 40S
	Butt-Weld Fittings	1/2 - 12	10S, 40S
	Tubing	1/4, 3/8, 1/2	0.035, 0.049, 0.065
	Flanges	1/2 - 12	150#, 300#
	Valves	1/2 - 8	150#, 300#
	Pressure Fittings	1/2 - 2	3000#
	Bar △	1 - 9	
Duplex 2205	Seamless	1/2 - 8	10S, 40S, 80S, 160S
	Welded	8 - 12	10S, 40S
	Butt-Weld Fittings	1/2 - 8	10S, 40S, 80S
	Flanges	1/2 - 8	150#, 300#
	Bar △	1 - 8	
254SMO	Seamless	1/2 - 2	40S, 80S
	Welded	1/2 - 12	10S, 40S
	Butt-Weld Fittings	1/2 - 8	10S, 40S
	Flanges	1/2 - 8	150#, 300#
	Bar △	1 - 8	
6061-T6 Aluminum	Seamless	1/2 - 8	10S, 40S
	Butt-Weld Fittings	1/2 - 12	10S, 40S
	Flanges	1/2 - 12	150#
P11, WP11, F11 1 – 1/4% Chrome 1/2 % Moly	Seamless	1/2 - 24	Std Thru 3,000 Wall
	Butt-Weld Fittings	2 - 24	Std Thru 160 Wall
	Flanges	1/2 - 24	150#, 300#, 600#
	Pressure Fittings	1/8 - 4	3000#, 6000#
P22, 22,F22 2 – 1/4% Chrome 1% Moly	Seamless	1/2 - 24	Std Thru 3,000 Wall
	Butt-Weld Fittings	2 - 24	Std Thru 160 Wall
	Flanges	1/8 - 24	150#, 300#, 600#
	Pressure Fittings	1/8 - 4	3000#, 6000#
P5,WP5,F5 5% Chrome 1/2% Moly	Seamless	1/2 - 24	Std Thru 160 Wall
	Butt-Weld Fittings	2 - 24	Std Thru 160 Wall
	Flanges	1/2 - 24	150#, 300#, 600#
	Pressure Fittings	1/8 - 4	3000#, 6000#
P9, WP9, F9 9% Chrome 1% Moly	Seamless	1/2 - 24	Std Thru 160 Wall
	Butt-Weld Fittings	2 - 24	Std Thru 160 Wall
	Flanges	1/2 - 24	150#, 300#, 600#
	Pressure Fittings	1/8 - 4	3000#, 6000#
P91, WP91, F91 9% Chrome 1% Moly .02% Vanadium	Seamless	1/2 - 24	Std Thru 160 Wall
	Butt-Weld Fittings	2 - 24	Std Thru 160 Wall
	Flanges	1/2 - 24	150#, 300#, 600#
	Pressure Fittings	1/8 - 4	3000#, 6000#
A-105	Flanges and Fittings	1/2 - 48	ALL Pressures
A234/WPB	Fittings	1/2 - 48	All Schedules
Select Carbon Valves	Gate, Globe, Check	1/2 - 24	All Pressure Ratings
Brass	Valves	1/2 - 2	All Pressure Ratings

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FLANGES

Types: Weld neck, slip on, threaded, blind, socket weld, and lap joints
All flanges in raised face and flat face

Pressures: All pressures

Sizes: 1/2" to 24" in stock

BUTT-WELD FITTINGS

Types: Elbows: 90° LR & SR, 45°
Tees: Straight and Reducing
Reducers: Concentric and Eccentric
Caps

Sizes: 1/2" to 24" in stock

Wall Dimensions: All walls

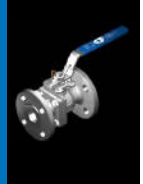
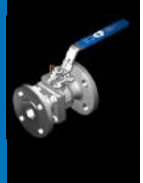
PRESSURE FITTINGS

Types: Elbows: 90°, 45°, 90° Street
Tees: Straight and Reducing
Outlets: Welded, Socket, Threaded, Crosses, Laterals, Couplings, Half Couplings, Caps, Plugs, Bushings, Inserts, and Unions

Sizes: 1/8" to 4"

End Connections: Threaded and Socket Weld

Pressures: All pressures

Valve Series		Features	Size Range
R10		• One-piece design • Reduced port • Investment cast • Blowout-proof stem • Locking device	¼" - 2" 1000 PSI WOG CWP **Stocking Body Material:** • CF8M - 316 Stainless steel
F05		• Two-piece design • Full port • Low operating torque • High cycle life • Anti-static device • Blowout-proof stem • Direct actuator mounting	¼' - 2" SS 900 PSI WOG CWP 425° F Max temperature Brass 600 PSI WOG CWP 320° F Max temperature **Stocking Body Material:** • CF8M - 316 Stainless steel • Brass - Forged brass
F11		• Two-piece design • Full port • Investment cast body • Blowout-proof stem • Locking device • ISO 5211 actuator mounting	¼' - 3" 1000 PSI WOG CWP 150 PSI Saturated steam **Stocking Body Material:** • CF8M - 316 Stainless steel • Brass - Forged brass
F15		• Two-piece design • Full Port • ANSI CL. 150 RF Flanged • Blowout-Proof Stem • Live Loaded Adjustable Stem Packing • Locking Device • ISO 5211 ACT. Mounting Pad	1/2" - 10" 1000 psi Body Rating Direct Mount ISO 5211 **Stocking Body Material:** • CF8M — 316 Stainless Steel • WCB — Carbon Steel • CN7M — Alloy 20
FZ15		• Two-piece design • Full port • Investment cast body • ANSI 150 & 300 RF flanged • Blowout-proof stem • Live-loaded adjustable stem packing • Locking device • ISO 5211 actuator mounting • Fire safe	½" - 10" Class 150 - 275 PSI WOG CWP ½" - 6" Class 300 - 500 PSI WOG CWP **Stocking Body Material:** • CF8M - 316 Stainless steel • WCB - Carbon steel • CN7M - Alloy 20
R22		• Two-piece design • Reduced port • Investment cast body • Blowout-proof stem • Locking device • ISO 5211 actuator mounting	¼" - 1 ¼" 2000 PSI WOG CWP 1 ½" - 2" 1500 PSI WOG 150 PSI Saturated steam **Stocking Body Material:** • CF8M - 316 Stainless steel

Valve Series		Features	Size Range
F12		• Three-piece design • In-line serviceable • Full port • Investment cast • Blowout-proof stem • Locking device • ISO 5211 actuator mounting	¼" - 4" 1000 PSI WOG CWP 150 PSI Saturated steam **Stocking Body Material:** • CF8M - 316 Stainless steel
F20		• In-line serviceable • Three-piece design • Full port • Investment cast body • Threaded ends NPT & socket weld • Blowout-proof stem • Live-loaded adjustable stem packing • ISO 5211 actuator mounting	2000 PSI WOG ¼" - 1" 1500 PSI WOG 1¼" - 2" 250 PSI Saturated steam 3000 PSI ¼" - 1" D-seats 2000 PSI ¼" - 1" D-seats **Stocking Body Material:** • CF8M - 316 Stainless steel • WCB - Carbon steel • CN7M - Alloy 20
MP11		• Multi-port / diverting service • End entry design • Full port • T & L port configurations • Investment cast body • Blowout-proof stem • Locking device • Screwed • ISO 5211 actuator mounting	¼" - 2" 1000 PSI WOG CWP **Stocking Body Material:** • CF8M - 316 Stainless steel • Brass - Forged brass
MP15		• Block design • 3, 4 & 5-way capable • T, L, Dual L, port configurations • Full port • Investment cast body • Blowout-proof stem • Live-loaded adjustable stem packing • Locking device • ISO 5211 actuator mounting	½" - 4" Cl 150, 300 Flanged ¼" - 2" 1000 PSI SE, SW, BW Tri-Clamp, Tube BW **Stocking Body Material:** • CF8M - 316 Stainless steel
Pneumatic		• ISO 5211 & VDI/VDE interfaces • Corrosion resistant hard anodized aluminum body • ENP pinion gear and SS fasteners • Standard external travel stops • Permanently lubricated for maintenance free operation for 2 million cycles • Many body coatings available • Eleven DA models and ten SR models 38,000 in/Lbs. • Operating Temperatures from -44° F to 212° F • Maximum working pressure to 150 PSIG	**Available Options:** • Solenoid operated spool valve • Limit switch • Position transmitter • Pneumatic positioner • Electro-pneumatic positioner • Digital positioner • De-clutch able manual override • Speed control • Exhaust muffler • Filter / regulator • Lockout / tag out device
Electric		• Simple plug-in electronics for easy upgrades and modifications • Clearly labeled terminal strip easy to user wiring & coded connections make internal mis-wiring impossible • 75% duty cycle AC motors • 100% duty cycle DC motors • Visual position indicator clearly shows valve position • Dual conduit entries • Limit switches for control & position indication • De-clutch able manual override • Hazardous location enclosure	**Available Options:** • Agency certifications • Heater & thermostat • Electro-mechanical brake • Analog control • Low voltage unit for solar power applications • Speed control for on/off applications • Single and dual relay boards • Three-position operation • Timer boards for automatic cycling • Feedback potentiometer • Optional limit switches

Alloy A 105

(UNS K03504)

Availability:
Flanges: ½" – 24"
#150,#300, #600, #900, #1500
Pressure Fittings: ½" – 4"
#150, #3000, #6000, #9000

Specifications:
ASTM A 105; ASTM A695 (B)

Description:
Alloy A105 is a carbon steel used primarily for forgings, such as flanges and fittings components. These products are suitable for welding and machining.

Typical Applications:
- Petrochemical
- Power Generation
- Refineries
- Combustible liquids and gases
- Nuclear station pipelines
- Heating system pipelines
- General--purpose pipelines
- Vessels manufacturing

Tensile Requirements:
Tensile Strength (KSI) = 70 Yield Strength (KSI) = 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition

C	Mn	P	S	Si	Cr	Cu	Mo	Ni	V	Cb
Max						Max	Max	Max	Max	Max
0.35	0.60-1.05	0.035	0.040	0.10-.35	0.30	0.40	0.12	0.40	0.08	0.02

Alloy 106

Availability:
Seamless Pipe ½" – 24"
Welded Pipe ½" – 32
Tubing ¼"; 3/8"; ½"

Specifications:
ASTM 106
A106/A53/API 5L/X 42
Quad Certified

Description:
Alloy 106 is a carbon steel pipe used for high temperature service. These pipes are suitable for welding, bending and other similar forming usage. A 106 pipe comes in three grades: Grade A, Grade B and Grade C

Typical Applications:
- Petrochemical Power
- Generation Refineries
- Combustible liquids and gases
- Nuclear station pipelines
- Heating system pipelines
- General--purpose pipelines
- Vessels manufacturing

Tensile Requirements:

Seamless			
	Grade A	Grade B	Grade C
Tensile Strength, min, psi	48,000	60,000	70,000
Yield Strength, min, psi	30,000	35,000	40,000

Chemical Composition %

Grade	C	Mn	P	S	Si	Cr	Cu	Mo	Ni	V
A	0.25	0.27 -0.93	0.035	0.035	0.10	0.40	0.40	0.15	0.40	0.08
B	0.30	0.29 -1.06	0.035	0.035	0.10	0.40	0.40	0.15	0.40	0.08
C	0.35	0.29 -1.06	0.35	0.35	0.10	0.40	0.40	0.15	0.40	0.08

Alloy A 234

Availability:
Butt Weld Fittings ½" – 42"

Specifications:
ASTM A234; ASME B16.9
ASME B16.28

Description:
Alloy A234 is a wrought carbon steel used for welded or seamless constructed fittings. These fittings are used in pressure piping and pressure vessel fabrication for use in moderate or elevated temperature conditions

Typical Applications:
- Petrochemical Power
- Generation Refineries
- Combustible liquids and gases
- Nuclear station pipelines
- Heating system pipelines
- General--purpose pipelines
- Vessels manufacturing

Tensile Requirements:
WPB: Yield Strength
Tensile Strength 35,000 psi
60,000 – 85,000 psi
WPC: Yield Strength
Tensile Strength 70,000 psi 40,000 psi

Chemical Composition %

	C	Mn	P	S	Si	Cr	Cu	Mo	Ni	V	Cb
	Max				Min	Max	Max	Max	Max	Max	Max
WPB	0.30	0.29 -1.06	0.050	0.058	0.10	0.40	0.40	0.15	0.40	0.08	0.02
WPC	0.35	0.29 -1.06	0.05	0.058	0.10	0.40	0.40	0.15	0.40	0.08	0.02

ALLOYS

304/304L

(UNS S30400/S30403)

Availability:
Seamless Pipe: 1/4" - 24"
Weld Pipe: 1/2" - 36"
Butt-Weld Fit: 1/2" - 36"
Butt-Weld Fit SMLS: 1/2" - 36"
Pressure Fittings: 1/4" - 4"
150# Fittings/Nipples: 1/4" - 6"
Valves: 1/2" - 24"
Tubing: 1/4", 3/8", 1/2", 3/4", 1"
Flanges: 1/2" - 36"
Bar: 1/8" - 12"

Specifications:
ASTM A312, A376, A358, A269
A249, A403, A182, A351
ASME SA312, SA376, SA358
SA269, SA249, SA403
SA182, SA351

Description:
304 stainless is a low-carbon (0.08% max) version of basic 18-8, also known as 302. Type 302 has 18% chromium and 8% nickel. Type 304 has a slightly lower strength than 302 due to its lower carbon content. Type 304 is used in welding applications, because the low carbon permits some exposure in the carbide precipitation range of 800° F - 1500° F without the need for post-annealing operations. However, the severity of the corrosive environments may necessitate annealing after welding or the use of 304L. Type 304L has a carbon content of 0.03% or less.

Typical Applications:
- Sanitary systems
- Dairy and food processing
- Heat exchangers, evaporators
- Feedwater heaters

Tensile Requirements:
Tensile Strength	Yield Strength
(KSI) = 70	(KSI) = 25

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Mn	Ni	P	S	Si
MAX		MAX		MAX	MAX	MAX
0.035	18.0 - 20.0	2.0	8.0 - 13.0	0.045	0.030	1.00

310S/310H

(UNS S31008)

Availability:
Seamless Pipe: 1/2" - 8"
Weld Pipe: 8" - 12"
Butt-Weld Fittings: 1/2" - 8"
Bar: 1" - 8"

Specifications:
ASTM A312, A403, A182
ASME SA312, SA403, SA182

Description:
Alloy 310S has excellent resistance to oxidation under constant temperatures up to 2000° F. Cyclic conditions reduce its oxidation resistance, and a maximum operating temperature of 1900° F is generally recommended if cycling is involved. Having a lower coefficient of expansion than most 300 stainless steels, 310S may be used in operations involving moderately sever thermal cycling, such as rapid air cooling. Its not usually recommended for liquid quenching. 310S is widely used in moderately carburizing atmospheres such as petro-chemical plants.

Typical Applications:
- Heat exchanger and heat recuperator tubing
- Molten salt applications
- Sulfur-bearing gas atmospheres

Tensile Requirements:
Tensile Strength	Yield Strength
(KSI) = 75	(KSI) = 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Mn	Mo	Ni	P	S	Si
MAX		MAX	MAX		MAX	MAX	MAX
0.08	24.0 - 26.0	2.0	0.75	19.0 - 22.0	0.045	0.03	1.00

316/316L

(UNS S31600/S31603)

Availability:
Seamless Pipe: 1/4" - 24"
Weld Pipe: 1/2" - 36"
Butt-Weld Fit: 1/2" - 36"
Butt-Weld Fit SMLS: 1/2" - 36"
Flanges: 1/2" - 24"
Pressure Fittings: 1/4" - 4"
150# Fittings/Nipples: 1/4" - 6"
Valves: 1/2" - 24"
Tubing: 1/4", 3/8", 1/2", 3/4", 1"
Bar: 1/8" - 8"

Specifications:
ASTM A312, A376, A358, A269
A249, A403, A182, A351
A479, A276
ASME SA312, SA376, SA358
SA269, SA249, SA182
SA276, SA403, SA479, SA351

Description:
Type 316 is a molybdenum steel possessing improved resistance to pitting by solutions containing chlorides and other halides. In addition, it provides excellent tensile, creep and stress-rupture strengths at elevated temperatures. Type 316 is available in low carbon (316L) and high carbon (316H) alloys.

Typical Applications:
- Nuclear, chemical processing, rubber, plastics, pulp/paper, pharmaceutical and textile industries
- Heat exchangers, condensers and evaporators

Tensile Requirements:
Tensile Strength	Yield Strength
(KSI) = 70	(KSI) = 25

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Mn	Mo	Ni	P	S	Si
MAX		MAX			MAX	MAX	MAX
0.035	16.0 - 18.0	2.00	2.0 - 3.0	10.0 - 14.0	0.045	0.030	1.00

ALLOYS

317L

(UNS S31703)

Availability:

Weld Pipe: 1/2" - 12"
Seamless Pipe: 1/2" - 8"
Butt-Weld Fittings: 1/2" - 12"
Flanges: 1/2" - 12"
Bar: 1" - 8"

Specifications:

ASTM A312, A403, A182
ASME SA312, SA403, SA182

Description:

Alloy 317L is a molybdenum-bearing, austenitic chromium nickel steel similar to type 316, except the alloy content in 317L is somewhat higher. It has superior corrosion resistance in special applications where it is desired to reduce contamination to a minimum. 317L was developed primarily to more effectively resist the attack of sulfurous acid compounds. However, its proven ability to combat corrosion has widened its use for many other industrial applications.

Typical Applications:

- Flue gas desulfurization scrubber systems
- Chemical and petro-chemical processing
- Pulp and paper plants
- Food processing equipment
- Textile equipment

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 75	(KSI) = 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Mn	Mo	Ni	P	S	Sl
MAX		MAX			MAX	MAX	MAX
0.035	18.0 - 20.0	2.0	3.0 - 4.0	11.0 - 15.0	0.04	0.03	1.00

321/321H

(UNS S32100/S32109)

Availability:

Seamless Pipe: 1/2" - 16"
Weld Pipe: 6" - 12"
Butt-Weld Fittings: 1/2" - 12"
Butt-Weld Flanges: 1/2" - 12"
Flanges: 1/2" - 8"
Bar: 1" - 12"

Specifications:

ASTM A312, A403, A182, A479, A276
ASME SA312, SA403, SA182 SA479, SA276

Description:

These titanium-bearing stainless steels are stabilized against carbide precipitation. They are designed for operation within the damaging temperature range where carbide precipitation develops. In this type of steel, the carbon combines preferentially with titanium to form a harmless titanium carbide, leaving the chromium in solution to maintain full corrosion resistance. Type 321 is basic type 304 modified by adding titanium in an amount at least 5 times the carbon-plus-nitrogen contents.

Typical Applications:

- High temperature chemical process
- Heat exchanger tubes
- Refineries
- High temperatures steam service

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 75	(KSI) = 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Mn	Ni	P	S	Sl	Ti
MAX		MAX		MAX	MAX	MAX	
0.08	17.0 - 19.0	2.0	9.0 - 12.0	0.045	0.030	1.00	Trace*

347/347H

(UNS S34700/S34709)

Availability:

Seamless Pipe: 1/2" - 12"
Weld Pipe: 8" - 12"
Butt-Weld Fittings: 1/2" - 12"
Butt-Weld Flanges: 1/2" - 12"
Bar: 1" - 12"

Specifications:

ASTM A312, A403, A182, A479, A276
ASME SA312, SA403, SA182 SA479, SA276

Description:

These stainless alloys are austenitic chromium steels containing columbium. The addition of columbium produces a stabilized type of stainless that eliminates carbide precipitation, and consequently, intergranular corrosion. They are recommended for parts fabricated by welding, that cannot be subsequently annealed. They also are used for parts,that can be intermittently heated and cooled to temperatures between 800° and 1600° F.

Typical Applications:

- High temperature chemical process
- Heat exchanger tubes
- Refineries
- High temperature steam service

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 75	(KSI) = 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Co	Cr	Mn	Ni	P	S	Sl	Ta
MAX			MAX		MAX	MAX	MAX	
0.08	Trace*	17.0 - 19.0	2.0	9.0 - 13.0	0.045	0.030	1.00	Trace*

410

(UNS S41000)

Availability:
Seamless Pipe: 1/2" - 8"

Specifications:
ASTM A268, A815, A182

Description:

410 is a martensitic stainless steel that is magnetic, resists corrosion in mild environments and has fairly good ductility. 410 pipe is used where abrasion and wear resistance is needed, combined with fair resistance to general corrosion and oxidation.

Typical Applications:

- Pipeline transportation of fluids mixed with solids like coal, sand or gravel

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 70	(KSI) = 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Mn	Ni	P	S	Si
MAX		MAX		MAX	MAX	MAX
0.15	11.5 - 13.5	1.0	0.50	0.04	0.03	1.00

904L

(UNS N08904)

Availability:
Seamless Pipe: 1/2" - 6"

Specifications:
ASTM B677, B366
ASME SB677, SB366

Description:

904L is a high-alloy austenitic stainless steel with low carbon content. The grade is intended for use under severe corrosive conditions. It was originally developed to resist corrosion in dilute sulfuric acid and has been proven effective in this application over many years. Structurally, 904L is fully austenitic and is less sensitive to precipitation ferrite and sigma phases than conventional austenitic grades with high molybdenum content. 904L has a good resistance to general corrosion, particularly in sulfuric and phosphoric conditions.

Typical Applications:

- Production and transport of sulfuric acid
- Metal pickling in sulfuric acid
- Production and concentrations of phosphoric acid
- Use in seawater, brackish water, condensers, heat exchangers and general pipe work
- Paper and allied industries
- Gas washing

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 70	(KSI) = 25

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Cu	Mn	Mo	Ni	P	S	Si
MAX			MAX			MAX	MAX	MAX
0.02	19.0 - 23.0	1.0 - 2.0	2.0	4.0 - 5.0	23.0 - 28.0	0.045	0.035	1.0

Alloy 20

(UNS N08020)

Availability:
Seamless Pipe: 1/2" - 8"
Weld Pipe: 1/2" - 12"
Butt-Weld Fittings: 1/2" - 12"
Flanges: 1/2" - 12"
Pressure Fittings: 1/2" - 2"
150# Fittings: 1/4" - 2"
Tubing: 1/4", 3/8", 1/2"
Valves: 1/2" - 12"
Bar: 1" - 8"

Specifications:
ASTM B729, B464, B366, B473, B462
ASME SB729, SB464, SB366, SB473, SB462

Description:

Alloy 20 is one of the so-called "Super" stainless steels that were designed for maximum resistance to acid attack. Its nickel, chromium, molybdenum and copper content contribute to its overall resistance to chloride stress corrosion cracking and general pitting attack. Although the alloy was designed for use in applications involving sulfuric acid, it also can be used for processing pharmaceuticals, food, gasoline, solvents, plastics, explosives, synthetics fibers and many more products.

Typical Applications:

- Chemical and allied industries
- Food and dye production
- Heat exchangers
- SO_2 scrubbers and other severe environments
- Tanks
- Pickling racks
- Valves

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 80	(KSI) = 35

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Nb + Ta	Cr	Cu	Fe	Mn	Mo	Ni	P	S	Sl
MAX	8x Carbon				MAX			MAX	MAX	MAX
0.07	1.0	19.0 - 21.0	3.0 - 4.0	BAL	2.0	2.0 - 3.0	32.0 - 38.0	.045	.035	1.0

Alloy 200

(UNS N02201t)

Availability:

Seamless Pipe: 1/2" - 8"
Weld Pipe: 8" - 12"
Butt-Weld Fittings: 1/2" - 8"
Flanges: 1/2" - 8"
Pressure Fittings: 1/2" - 2"
Bar: 1" - 6"

Specifications:

ASTM B161, B162, B366, B160 B564
ASME SB161, SB162, SB366 SB160, SB564

Description:

Alloy 200 is an unalloyed wrought nickel. It offers excellent corrosion resistance, good mechanical, magnetic and magnetostrictive properties and useful thermal and electrical conductivities.

Typical Applications:

- Food production (cool brines, fatty acids, & fruit juices)
- Vessels in which fluorine is generated and
- reacted with hydrocarbons phenol Storing & transportation of
- Manufacture handling of sodium hydroxide, production of viscose rayon & manufacture of soap
- Production of hydrochloride and chlorination of hydrocarbons

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 50	5" < (KSI) = 10
	5" > (KSI) = 12

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cu	Mn	Ni	S	Si	Fe
MAX	MAX	MAX	MIN	MAX	MAX	MAX
0.02	0.25	0.35	99.0	0.01	0.35	0.40

Alloy 400

(UNS N04400)

Availability:

Seamless Pipe: 1/2" - 8"
Weld Pipe: 8" - 12"
Butt-Weld Fittings: 1/2" - 8"
Flanges: 1/2" - 8"
Pressure Fittings: 1/2" - 2"
150# Fittings: 1/4" - 1"
Tubing: 1/4", 3/8", 1/2"
Bar: 1" - 8"

Specifications:

ASTM B165, B127, B366, B164 B564
ASME SB165, SB127, SB366 SB164, SB564

Description:

Alloy 400 is used for its excellent combination of corrosion resistance, strength, ductility and weldability. The corrosion resistance in seawater is especially good under high velocity conditions. Alloy 400 also is generally not susceptible to stress corrosion cracking.

Typical Applications:

- Feed-water and steam generator in power plants
- Brine heaters and evaporator bodies in salt plants
- Sulfuric and hydrofluoric acid alkylation plants
- Industrial heat exchangers
- Cladding for crude oil distillation columns
- Splash-zone sheathing in offshore structures
- Propeller and pump shafts for seawater service
- Monoethanolamine (MEA) reboiler tubes

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 70	5" < (KSI) = 28
	5" > (KSI) = 25

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cu	Mn	Ni	S	Si	Fe
MAX		MAX	MIN	MAX	MAX	MAX
0.30	28.0 - 34.0	2.00	63.0	0.024	0.50	2.50

Alloy 600

(UNS N06600)

Availability:

Seamless Pipe: 1/2" - 8"
Butt-Weld Fittings: 1/2" - 8"
Flanges: 1/2" - 8"
Bar: 1" - 8"

Specifications:

ASTM B167, B366, B166, B564
ASME SB167, SB366, SB564 SB166

Description:

Alloy 600 is a nickel-chromium-iron alloy used for applications which require resistance to corrosion and heat. The alloy also has excellent mechanical properties and presents the desirable combination of high strength and good workability under a wide range of temperatures.

Typical Applications:

- Steam generators
- Chemical processing
- Food processing
- Superheaters
- Jet engines
- Electronic parts

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 80 - 100	(KSI) = 30 - 50

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Cu	Fe	Mn	N	S	Si
MAX		MAX		MAX	MIN	MAX	MAX
0.15	14.0 - 17.0	0.50	6.00 - 10.00	1.00	72.0	0.015	0.50

Alloy 625

(UNS N06625)

Availability:
Welded Pipe: 1/2" - 8"
Butt-Weld Fittings: 1/2" - 8"
Flanges: 1/2" - 8"
Bar: 1" - 4 1/2"

Specifications:
ASTM B443, B705, B366, B446 B564
ASME SB443, SB705, SB366 SB446, SB564

Description:
Alloy 625 is a nickel-chromium alloy used for its high strength, excellent fabricability and outstanding corrosion resistance. Service temperatures range from cryogenic to 1800° F. Alloy 625 strength is derived from the stiffening effect of molybdenium so that precipitation-hardening treatments are not required. This combination of elements also is responsible for superior resistance to a wide range of corrosive environments of unusual severity, as well as to high temperature effects such as oxidation and carburization.

Typical Applications:
- Used for structures in contact with seawater and subject to high mechanical stress
- Flue gas scrubber components
- Chimney linings
- Superphosphoric acid production equipment
- Sour gas production tubes
- Offshore industry, marine equipment

Tensile Requirements:
Tensile Strength (KSI) = 120 - 150
Yield Strength (KSI) = 60 - 95

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Grade 1 - Chemical Composition %

C	Cr	Fe	Ni	Al	Ti	Mo	Cb + Ta	Mn	Si	P	S	Co
MAX		MAX	MIN	MAX	MAX			MAX	MAX	MAX	MAX	MAX
0.10	20.0 - 23.0	5.0	58.0	0.40	0.40	8.00 - 10.00	3.15 - 4.15	0.50	0.50	0.015	0.015	1.0

Alloy 800/800H/800HP

(UNS N08800/ N08810 N08811)

Availability:
Seamless Pipe: 1/2" - 8"
Welded Pipe: 8" - 12"
Butt-Weld Fittings: 1/2" - 8"
Flanges: 1/2" - 8"
Bar: 1" - 6"

Specifications:
ASTM B407, B514, B366, B408 B564
ASME SB407, SB514, SB366 SB408, SB564

Description:
Alloy 800 is widely used in equipment that must resist corrosion, have high strength or resist oxidation, carburization and other harmful effects of high-temperature exposure. Alloy 800HP is used for high temperature applications requiring optimum creep and rupture properties. The chromium in the alloy imparts resistance to oxidation and corrosion. The high nickel content maintains an austenitic structure so the alloy is ductile. The nickel also contributes resistance to scaling, general corrosion, and stress corrosion cracking.

Typical Applications:
- Steam/hydrocarbon reforming for components
- Ethylene pyrolosis tubing in convection and radiant sections - resistance to carburization and good mechanical properties
- Ethylene dichloride cracking tubes
- Components of heat exchangers, piping systems
- Steam generators tubing in helium coolant

Tensile Requirements:
Tensile Strength (KSI) = 65
Yield Strength (KSI) = 25

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Fe	Ni	Ai	Ti	Ai/Ti	Si	Mn	Cu	S
		MIN								
.05 - .10	19.0 - 23.0	39.5	30.0 - 35.0	.15 - .60	.15 - .60	.85 - 1.20	1.00	1.5	0.75	0.015

Alloy 825

(UNS N08825)

Availability:
Seamless Pipe: 1/2" - 8"
Welded Pipe: 8" - 12"
Butt-Weld Fittings: 1/2" - 8"
Flanges: 1/2" - 8"
Bar: 1" - 6"

Specifications:
ASTM B443, B705, B366, B425 B564
ASME SB443, SB705, SB366 SB925, SB564

Description:
Alloy 825 is a nickel-iron-chromium alloy with additions of molybdenum, copper and titanium. The alloy's chemical composition provides exceptional resistance to many corrosive environments. The nickel content is sufficient for resistance to chloride-ion stress corrosion cracking. The nickel, combined with molybdenium and copper, also gives outstanding resistance to reducing environments, such as those containing sulfuric and phosphoric acid. The molybdenium also aids resistance to pitting and crevice corrosion.

Typical Applications:
- Components for heating coils, tanks, crates
- Fuel element dissolvers (Sulfuric & nitric acids, caustic hydroxide)
- Sea water cooled heat exchangers; offshore product piping system tubes and components
- Pipelines carrying wet sulphur dioxide gas & pulp digesters in the paper making process
- Heat exchangers, evaporators, scrubbers

Tensile Requirements:
Tensile Strength (KSI) = 85
Yield Strength (KSI) = 35

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Fe	Ni	Al	Ti	Cu	Mo	Si	S
MAX		MAX		MAX			MAX	MAX	MAX
0.05	19.5 - 23.5	22.0	38.0 - 46.0	0.2	0.6 - 1.2	1.5 - 3.0	2.5 - 3.5	0.50	0.03

C-276

(UNS N10276)

Availability:

Welded Pipe: 1/2" - 12"
Seamless Pipe: 1/2" - 4"
Butt-Weld Fittings: 1/2" - 12"
Flanges: 1/2" - 12"
Valves: 1/2" - 8"
Bar: 1" - 9"

Specifications:

ASTM B619, B366, B564, B574
ASME SB619, SB366, SB564, SB574

Description:

Alloy C-276 is an improved wrought version of Alloy C. It has the same excellent corrosion resistance with greatly improved fabricability. It can be hot-worked and cold-formed by conventional procedures. It can be joined by welding methods and resists the formation of grain boundary precipitates in the weld-affected zone. Thus, it is suitable for most chemical process applications in the as-welded conditions. It resists stress-corrosion cracking and is resistant to oxidation at temperatures up to 1900° F.

Typical Applications:

- Chemical processing
- Pollution control
- Pulp and paper
- Other severe environments and/or conditions

Tensile Requirements:

Tensile Strength (KSI) = 110
Yield Strength (KSI) = 52.6

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Co	Cr	Fe	Mn	Mo	Ni	P	S	Si	V	W
MAX	MAX			MAX			MAX	MAX	MAX	MAX	
0.01	2.5	14.5 - 16.5	4.0 - 7.0	1.0	15.0 - 17.0	BAL	.04	.03	0.08	0.35	3.0 - 4.5

Duplex 2205

(UNS S31803/S32205)

Availability:

Seamless Pipe: 1/2" - 8"
Weld Pipe: 1/2" - 12"
Butt-Weld Fittings: 1/2" - 12"
Flanges: 1/2" - 12"
Bar: 1" - 8"

Specifications:

ASTM B790, B815, B182,
ASME SB790, SB815, SB182,

Description:

Avesta Sheffield 2205 is a ferritic-austenitic stainless steel which combines many of the beneficial properties of both ferritic and austenitic steels. As a result of high chromium and molybdenum contents, the steel has very good pitting and uniform corrosion resistance, as well as high mechanical strength. 2205 has good weldability and can be welded using most of the techniques for stainless steels. Due to the balanced composition, when welded correctly, the heat-affected zone contains sufficient austenite to avoid risk of localized corrosion.

Typical Applications:

- Heat exchangers, tube & pipe for gas & oil
- Heat exchangers and pipes in desalination plants
- Pressure vessels, pipes, & tanks for various chemicals and chlorides
- Rotors, fans, shafts and press rolls where high corrosion fatigue is needed

Tensile Requirements:

Tensile Strength (KSI) = 95
Yield Strength (KSI) = 65

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cb	Fe	Mn	M0	N	Ni	P	S	Sl
MAX			MAX				MAX	MAX	MAX
0.030	22.0 -23.0	BAL	2.0	3.00 - 3.50	0.14 - 0.20	4.50 - 6.50	0.030	0.020	1.0

254SMO®

(UNS S31254)

Availability:

Weld Pipe: 1/2" - 12"
Seamless Pipe: 1/2" - 8"
Butt-Weld Fittings: 3/4" - 12"
Flanges: 3/4" - 12"
Bar: 1" - 8"

Specifications:

ASTM A312, A403, A182,
ASME SA312, SA403, SA182

Description:

254SMO is an austenitic steel designed for maximum resistance to pitting and crevice corrosion. With high levels of chromium, molybdenum and nitrogen, 254SMO is especially suited for high chloride environments such as brackish water, seawater, pulp mill bleach plants and other high-chloride process streams. In new construction, 254SMO has been found in many cases to be technically adequate and much less costly substitute for nickel-based alloys and titanium. 254SMO is readily fabricated and welded.

Typical Applications:

- Seawater handling equipment
- Pulp mill bleach systems
- Tall oil distillation columns and equipment
- Chemical processing equipment
- Food processing equipment
- Desalination equipment
- Flue gas desulfurization scrubbers

Tensile Requirements:

Tensile Strength (KSI) = 94
Yield Strength (KSI) = 44

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Cr	Cu	Mn	Mo	N	Ni	P	Si	S
MAX			MAX				MAX	MAX	MAX
0.02	19.5 - 20.5	0.5 - 1.0	1.0	6.0 - 6.5	0.18 - 0.22	17.5 - 18.5	0.03	0.80	0.010

ALLOYS

6061-T6 Aluminum

(UNS A96061)

Availability:
Seamless: 1/2" - 12"
Butt-Weld Fittings: 1/2" - 12"
Flanges: 1/2" - 12"

Specifications:
ASTM B221, B361, B247

Description:
Aluminum has been proven to be the economical choice for a wide variety of applications. Its cost-effectiveness and lightweight characteristics make it a popular grade material in petroleum and petrochemical industries. The ability of aluminum to conduct heat rapidly makes it an ideal material for heat transfer processes, cryogenic applications and similar uses. Its resistance to corrosion often results in longer service life and reduced maintenance.

Typical Applications:
- General fluid transmission and process piping
- Portable and temporary piping
- Hydraulic pressure lines
- Heat transfer and cryogenic processes
- Structural, ornamental and architectural uses

Tensile Requirements:

Tensile Strength	Yield Strength
38,000 PSI	35,000 PSI

Chemical Composition %

Al	Cr	Cu	Fe	Mg	Si	Zn
			MAX		MAX	MAX
Remainder	0.04 - 0.35	0.15 - 0.40	0.7	0.8 - 1.2	0.40 - 0.8	0.25

P11

(P11, WP11, F11)
(1 - 1/4% Cr • 1/2% Mo)

Availability:
Seamless Pipe: 1/2" - 24"
Butt-Weld Fittings: 1/2" - 24" Cl. 1
Flanges: 1/2" - 24"
Pressure Fittings: 1/8" - 4"

Specifications:
ASTM/ASME A335, A182, A234

Description:
"Low alloy" refers to steel with an alloy composition of 1 to 1 1/2% chromium and molybdenum. The small amount of chromium and molybdenum differentiates the alloy from carbon steel. Alloy elements strengthen the product for use in temperatures and pressures that would cripple carbon steel. Typical temperatures applications range from -20° to 1050° F.

Typical Applications:
- Extraction steam lines
- Crude distillation units

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 60	(KSI) = 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Mn	P	S	Si	Cr	Mo
		MAX	MAX			
.05 - .15	.30 - .60	0.030	0.030	.50 - 1.00	1.00 - 1.50	.44 - .60

P22

(P22, WP22, F22)
(2 - 1/4% Cr • 1% Mo)

Availability:
Seamless Pipe: 1/2" - 24"
Butt-Weld Fittings: 1/2" - 24"
Flanges: 1/2" - 24"
Pressure Fittings: 1/8" - 4"

Specifications:
ASTM/ASME A335, A182, A234

Description:
Used primarily for their stress/rupture properties, P22 can be held at high temperatures with high pressure and can also have a strong resistance to rupturing. In addition, 2 1/4% chrome can be used for elevated temperatures, creep and corrosion resistance process and service. Typical temperatures applications range from -20° to 1100° F.

Typical Applications:
- Main steam and hot reheat systems
- Process heater tubing

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 60	(KSI) = 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Mn	P	S	Si	Cr	Mo
		MAX	MAX			
.05 - .15	.30 - .60	0.040	0.040	0.50	1.90 - 2.60	.87 - 1.13

P5

(P5, WP5, F5)
(5% Cr • 1/2% Mo)

Availability:

Seamless Pipe: 1/2" - 24"
Butt-Weld Fittings: 1/2" - 24"
Flanges: 1/2" - 24"
Pressure Fittings: 1/8" - 4"

Specifications:

ASTM/ASME A335, A182, A2344

Description:

P5 is a chromium alloy used for its strong resistance to hot sulfide corrosion cracking. 5% chromium material has a higher minimum mechanical properties than 1 1/4% and 2 1/4% chromium, which makes the material ideal for high temperature and pressure applications. In addition, 5% chromium can be used for elevated temperatures and corrosion resistant process and service. Typical temperatures applications range from -20° to 1200° F.

Typical Applications:

- Petrochemical and refinery installations
- Delayed cokers
- Hydrocrackers
- Cat reformer
- Heater drain systems

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 60	(KSI) = 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Mn	P	S	Si	Cr	Mo
MAX		MAX		MAX		
0.15	.30 - .60	0.030	0.030	0.50	4.00 - 6.00	.44 - .60

P9

(P9, WP9, F9)
(9% Cr • 1% Mo)

Availability:

Seamless Pipe: 1/2" - 24"
Butt-Weld Fittings: 1/2" - 24"
Flanges: 1/2" - 24"
Pressure Fittings: 1/8" - 4"

Specifications:

ASTM/ASME A335, A182, A234

Description:

Used primarily for Nace applications where sour environmentals under high temperature and pressure are expected. Chromium of 9% gives corrosion resistance similar to 400 series stainless steel, but provides higher tensile properties at hotter temperatures than 405 or 410 stainless. In addition, 9% chromium can be used for elevated temperatures and corrosion resistant process. Typical temperatures applications range from -20° to 1200° F.

Typical Applications:

- Fluid cat crackers
- Crude distillation units

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 60	(KSI) = 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

C	Mn	P	S	Si	Cr	Mo
MAX		MAX	MAX			
0.15	.30 - .60	0.030	0.030	.25 - 1.00	8.00 - 10.00	.90 - 1.10

P91

Availability:

Seamless Pipe: 1/2" - 24"
Butt-Weld Fittings: 1/2" - 24"
Flanges: 1/2" - 24"
Pressure Fittings: 1/8" - 4"

Specifications:

ASTM/ASME A335, A182, A234

Description:

P91 is basic P9 modified by the addition of small amounts of vanadium and columium/niobium, which greatly improves the creep strength and allows operation at higher pressure and temperature. P91 gives more flexibility and cost savings than P22 by reducing the wall thickness thanks to the improved creep properties and resistance against high-pressure hydrogen. P91 is preferred over P22 and P5 in sulfur-rich atmosphere furnaces

Typical Applications:

- Boilers, superheaters up to 1050° F steam temperature
- Distillation and cracking units
- Petrochemical and refinery installations

Tensile Requirements:

Tensile Strength	Yield Strength
(KSI) = 85	(KSI) = 60

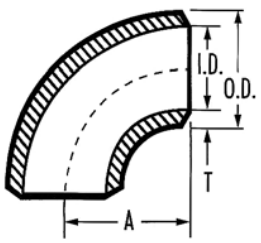
KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

Chemical Composition %

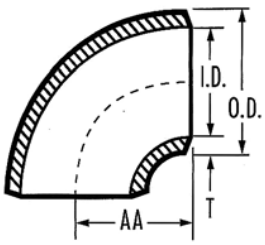
C	Mn	P	S	Si	Cr	Mo	V	Cb(Nb)	N	Al	Ni
		MAX	MAX							MAX	MAX
.08 - .12	.30 - .60	.02	.01	.20 - .50	8.00 - 9.50	.85 - 1.05	.18 - .25	.06 - .10	.03 - .07	.040	.40

Nominal Pipe Size	Outside Diameter O.D.	SCHEDULE 10S		SCHEDULE 40S		SCHEDULE 80S		90° Elbow	90° Elbow	45° Elbow	Tee
		Wall Thickness T	Inside Diameter I.D.	Wall Thickness T	Inside Diameter I.D.	Wall Thickness T	Inside Diameter I.D.	Long Radius A	Short Radius AA	Long Radius B	C
½	0.840	.083	0.674	.109	0.622	.147	0.546	1 ½	--	⅝	1
¾	1.050	.083	0.884	.113	0.824	.154	0.742	1 ½	--	7/16	1 ⅛
1	1.315	.109	1.097	.133	1.049	.179	0.957	1 ½	1	⅞	1 ½
1 ¼	1.660	.109	1.442	.140	1.380	.191	1.278	1 ⅞	1 ¼	1	1 ⅞
1 ½	1.900	.109	1.682	.145	1.610	.200	1.500	2 ¼	1 ½	1 ⅛	2 ¼
2	2.375	.109	2.157	.154	2.067	.218	1.939	3	2	1 ⅜	2 ½
3	3.500	.120	3.260	.216	3.068	.300	2.900	4 ½	3	2	3 ⅜
3 ½	4.000	.120	3.760	.226	3.548	.318	3.364	5 ¼	3 ½	2 ¼	3 ¾
4	4.500	.120	4.260	.237	4.026	.337	3.826	6	4	2 ½	4 ⅛
5	5.563	.134	5.295	.258	5.047	.375	4.813	7 ½	5	3 ⅛	4 ⅞
6	6.625	.134	6.357	.280	6.065	.432	5.761	9	6	3 ¾	5 ⅝
8	8.625	.148	8.329	.322	7.981	.500	7.625	12	8	5	7
10	10.750	.165	10.420	.365	10.020	.500	9.750	15	10	6 ¼	8 ½
12	12.750	.180	12.390	.375	12.000	.500	11.750	18	12	7 ½	10
14	14.000	.188	13.624	.375	13.250	.500	13.000	21	14	8 ¾	11
16	16.000	.188	15.624	.375	15.250	.500	15.000	24	16	10	12
18	18.000	.188	17.624	.375	17.250	.500	17.000	27	18	11 ¼	13 ½
20	20.000	.218	19.564	.375	19.250	.500	19.000	30	20	12 ½	15
24	24.000	.250	23.500	.375	23.250	.500	23.000	36	24	15	17

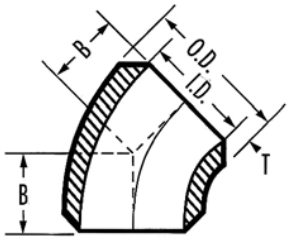
90° ELBOW LONG RADIUS



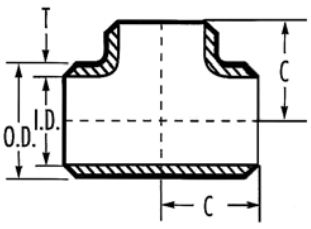
90° ELBOW SHORT RADIUS



45° ELBOW LONG RADIUS

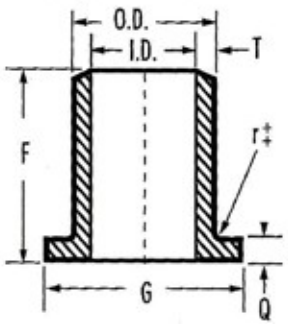


TEE

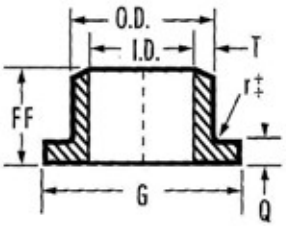


Nominal Pipe Size	Lap Joint Stud Ends - ASA Length & MSS Length							Flanged Nipple	Cap
	F Long	FF Long	Q Lap Thickness SCH. 10	Q Lap Thickness SCH. 40	Q Lap Thickness SCH. 80	G Diameter	r ‡ ‡ Radius	QQ Lap Thickness	E Tangent Length
½	3	2	.095	.109	.187	1 3/8	1/8		1
¾	3	2	.097	.113	.187	1 11/16	1/8		1
1	4	2	.120	.133	.187	2	1/8	Slightly less than nominal pipe wall thickness.	1 ½
1 ¼	4	2	.124	.140	.191	2 ½	3/16		1 ½
1 ½	4	2	.126	.145	.200	2 7/8	¼		1 ½
2	6	2 ½	.130	.154	.218	3 5/8	5/16		1 ½
2 ½	6	2 ½	.156	.203	.276	4 1/8	5/16		1 ½
3	6	2 ½	.161	.216	.300	5	3/8		2
3 ½	6	3	.165	.226	.318	5 ½	3/8		2 ½
4	6	3	.169	.237	.337	6 3/16	7/16		2 ½
5	8	3	.186	.258	.375	7 5/16	7/16		3
6	8	3 ½	.194	.280	.432	8 ½	½		3 ½
8	8	4	.218	.322	.500	10 5/8	½		4
10	10	5	.245	.365	.500	12 ¾	½		5
12	10	6	.260	.375	.500	15	½		6
14	12	6	.375	.375	.500	16 ¼	½		6 ½
16	12	6	.375	.375	.500	18 ½	½		7
18	12	6	.375	.375	.500	21	½		8
20	12	6	.375	.375	.500	23	½		9
24	12	6	.375	.375	.500	27 ¼	½		10 ½

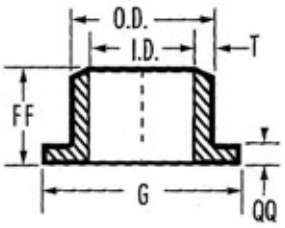
LAP JOINT STUB ENDS (ASA - TYPE A)



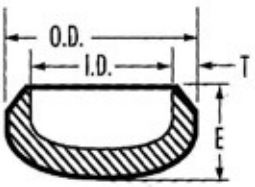
LAP JOINT STUB ENDS (MSS - TYPE A)



FLARED NIPPLE (TYPE C)



CAP

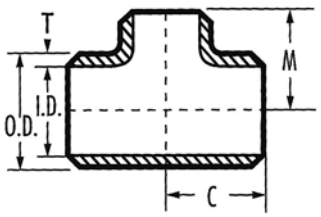


Nominal Pipe Size	Reducing Tee C RUN	Reducing Tee M OUTLET	Reducers Concentric Eccentric H LENGTH
¾x½	1 ⅛	1 ⅛	1 ½
1 x½	1 ½	1 ½	2
1 x¾	1 ½	1 ½	2
1¼ x½	1 ⅞	1 ⅞	2
1¼ x¾	1 ⅞	1 ⅞	2
1¼ x1	1 ⅞	1 ⅞	2
1½ x½	2 ¼	2 ¼	2 ½
1½ x¾	2 ¼	2 ¼	2 ½
1½ x1	2 ¼	2 ¼	2 ½
1½ x1¼	2 ¼	2 ¼	2 ½
2 x¾	2 ½	1 ¾	3
2 x1	2 ½	2	3
2 x1¼	2 ½	2 ¼	3
2 x1½	2 ½	2 ⅜	3
2½ x1	3	2 ¼	3 ½
2½ x1¼	3	2 ½	3 ½
2½ x1½	3	2 ⅝	3 ½
2½ x2	3	2 ¾	3 ½
3 x1¼	3 ⅜	2 ¾	3 ½
3 x1½	3 ⅜	2 ⅞	3 ½
3 x2	3 ⅜	3	3 ½
3 x2½	3 ⅜	3 ¼	3 ½
3½ x1¼	--	--	4
3½ x1½	3 ¾	3 ⅛	4
3½ x2	3 ¾	3 ¼	4
3½ x2½	3 ¾	3 ½	4
3½ x3	3 ¾	3 ⅝	4
4 x1½	4 ⅛	3 ⅜	4
4 x2	4 ⅛	3 ½	4
4 x2½	4 ⅛	3 ¾	4
4 x3	4 ⅛	3 ⅞	4
4 x3½	4 ⅛	4	4
5 x2	4 ⅞	4 ⅛	5
5 x2½	4 ⅞	4 ¼	5
5 x3	4 ⅞	4 ⅜	5
5 x3½	4 ⅞	4 ½	5
5 x4	4 ⅞	4 ⅝	5

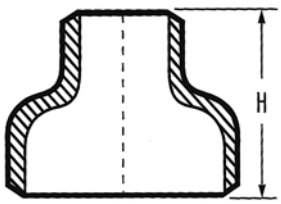
Nominal Pipe Size	Reducing Tee C RUN	Reducing Tee M OUTLET	Reducers Concentric Eccentric H LENGTH
6 x2½	5 ⅝	4 ¾	5 ½
6 x3	5 ⅝	4 ⅞	5 ½
6 x3½	5 ⅝	5	5 ½
6 x4	5 ⅝	5 ⅛	5 ½
6 x5	5 ⅝	5 ⅜	5 ½
8 x3½	7	6	6
8 x4	7	6 ⅛	6
8 x5	7	6 ⅜	6
8 x6	7	6 ⅝	6
10 x4	8 ½	7 ¼	7
10 x5	8 ½	7 ½	7
10 x6	8 ½	7 ⅝	7
10 x8	8 ½	8	7
12 x5	10	8 ½	8
12 x6	10	8 ⅝	8
12 x8	10	9	8
12 x10	10	9 ½	8
14 x8	11	9 ¾	13
14 x10	11	10 ⅛	13
14 x12	11	10 ⅝	13
16 x8	12	10 ¾	14
16 x10	12	11 ⅛	14
16 x12	12	11 ⅝	14
16 x14	12	12	14
18 x10	13 ½	12 ⅛	15
18 x12	13 ½	12 ⅝	15
18 x14	13 ½	13	15
18 x16	13 ½	13	15
20 x10	15	13 ⅛	20
20 x12	15	13 ⅝	20
20 x14	15	14	20
20 x16	15	14	20
20 x18	15	14 ½	20
20 x12	17	15 ⅝	20
20 x14	17	16	20
20 x16	17	16	20
20 x18	17	16 ½	20
20 x20	17	17	20

Nominal Pipe Size	Outside Diameter O.D.	SCHEDULE 10S Wall Thickness T	SCHEDULE 10S Inside Diameter I.D.	SCHEDULE 40S Wall Thickness T	SCHEDULE 40S Inside Diameter I.D.	SCHEDULE 80S Wall Thickness T	SCHEDULE 80S Inside Diameter I.D.
½	0.840	.083	0.674	.109	0.622	.147	0.546
¾	1.050	.083	0.884	.113	0.824	.154	0.742
1	1.315	.109	1.097	.133	1.049	.179	0.957
1¼	1.660	.109	1.442	.140	1.380	.191	1.278
1½	1.900	.109	1.682	.145	1.610	.200	1.500
2	2.375	.109	2.157	.154	2.067	.218	1.939
2½	2.875	.120	2.635	.203	2.469	.276	2.323
3	3.500	.120	3.260	.216	3.068	.300	2.900
3½	4.000	.120	3.760	.226	3.548	.318	3.364
4	4.500	.120	4.260	.237	4.026	.337	3.826
5	5.563	.134	5.295	.258	5.047	.375	4.813
6	6.625	.134	6.357	.280	6.065	.432	5.761
8	8.625	.148	8.329	.322	7.981	.500	7.625
10	10.750	.165	10.420	.365	10.020	.500	9.750
12	12.750	.180	12.390	.375	12.000	.500	11.750
14	14.000	.188	13.624	.375	13.250	.500	13.000
16	16.000	.188	15.624	.375	15.250	.500	15.000
18	18.000	.188	17.624	.375	17.250	.500	17.000
20	20.000	.218	19.564	.375	19.250	.500	19.000
24	24.000	.250	23.500	.375	23.250	.500	23.000

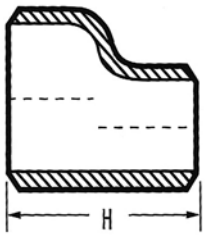
REDUCING TEE



CONCENTRIC REDUCER

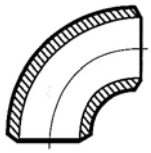


ECCENTRIC REDUCER

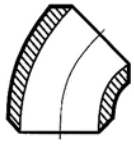


Nominal Pipe Size	90° Elbow		45° Elbow	Tee	Lap Joint Stub Ends			Cap
	Long Radius	Short Radius	Long Radius		ASA Length	MSS Length	Flared Nipple (Type C)	
SCHEDULE 10S								
½	0.13	--	0.06	0.20	--	0.17	0.12	0.03
¾	0.16	--	0.08	0.28	--	0.21	0.15	0.03
1	0.38	0.23	0.25	0.60	--	0.33	0.27	0.10
1 ¼	0.50	0.38	0.33	1.10	--	0.45	0.36	0.13
1 ½	0.75	0.49	0.47	1.50	--	0.57	0.43	0.23
2	1.10	0.81	0.60	1.80	--	0.91	0.68	0.30
2 ½	1.80	1.36	1.00	3.00	--	1.05	0.91	0.40
3	2.50	2.17	1.30	3.90	--	1.61	1.16	0.72
3 ½	3.40	3.05	1.70	4.90	--	2.07	1.55	0.83
4	4.30	3.79	2.20	5.70	--	2.52	1.79	1.16
5	7.40	6.12	3.80	12.00	--	3.44	2.50	1.61
6	11.00	9.15	5.50	17.00	--	4.79	3.42	1.93
8	21.00	17.63	11.00	25.00	--	7.62	5.57	2.78
10	36.00	35.00	18.00	37.00	--	12.10	9.32	4.66
12	57.00	40.00	29.00	54.00	--	17.90	14.80	7.05
14	78.00	52.00	39.40	59.60	--	22.30	18.60	9.20
16	102.00	68.00	51.00	75.90	--	27.50	24.90	11.50
18	129.00	86.00	64.50	94.70	--	35.20	31.40	14.50
20	185.00	143.00	92.50	130.00	--	49.80	44.50	20.50
24	306.00	202.00	153.00	200.00	--	77.40	71.90	32.90
SCHEDULE 40S								
½	0.18	--	0.09	0.35	0.30	0.25	--	0.12
¾	0.19	--	0.09	0.45	0.40	0.34	--	0.16
1	0.40	0.26	0.25	0.75	0.68	0.43	--	0.20
1 ¼	0.60	0.45	0.38	1.30	0.93	0.60	--	0.30
1 ½	0.90	0.63	0.40	2.00	1.14	0.75	--	0.40
2	1.60	1.13	0.81	3.50	2.22	1.22	--	0.60
2 ½	3.25	2.25	1.75	6.00	3.51	1.82	--	0.90
3	5.00	3.31	2.63	7.00	4.70	2.49	--	1.50
3 ½	6.75	4.54	3.50	9.00	5.65	3.36	--	2.00
4	9.00	6.88	4.50	12.00	6.81	4.12	--	2.50
5	15.50	11.63	7.50	21.00	11.80	5.69	--	4.50
6	24.50	17.50	12.00	34.00	15.30	8.28	--	6.50
8	50.50	37.60	23.00	55.00	23.10	13.60	--	12.00
10	88.00	63.40	43.00	85.00	39.90	23.00	--	20.00
12	125.00	80.00	62.00	120.00	49.20	32.70	--	30.00
14	160.00	101.00	80.40	165.00	63.80	37.60	--	36.00
16	206.00	131.00	100.00	195.00	73.90	46.30	--	40.00
18	260.00	175.00	126.50	249.00	85.20	64.00	--	54.00
20	320.00	215.00	160.50	342.00	94.70	74.20	--	75.00
24	460.00	302.00	238.00	528.00	116.00	116.00	--	96.00
SCHEDULE 80S								
½	0.25	--	0.19	0.45	0.38	--	--	0.15
¾	0.25	--	0.19	0.60	0.51	--	--	0.20
1	0.50	0.38	0.31	0.88	0.87	--	--	0.30
1 ¼	0.90	0.63	0.50	1.60	1.24	--	--	0.40
1 ½	1.15	0.88	0.69	2.25	1.51	--	--	0.50
2	2.20	1.55	1.19	4.00	3.10	--	--	0.75
2 ½	4.00	2.88	2.13	7.00	4.64	--	--	1.00
3	6.50	4.20	3.50	8.50	6.36	--	--	1.75
3 ½	8.35	5.35	4.50	12.00	7.71	--	--	2.50
4	13.50	9.06	6.10	15.70	9.37	--	--	3.00
5	22.00	16.10	10.70	26.00	16.70	--	--	5.50
6	35.00	26.00	17.50	40.00	23.00	--	--	9.00
8	71.00	54.80	35.00	75.00	34.90	--	--	16.00
10	107.00	99.80	53.00	105.00	53.60	--	--	25.00
12	160.00	125.00	84.00	160.00	64.70	--	--	36.00
14	205.00	135.00	100.00	240.00	84.00	--	--	45.00
16	276.00	175.00	135.00	280.00	97.40	--	--	54.00
18	340.00	228.00	167.00	332.00	112.00	--	--	72.00
20	420.00	285.00	206.00	480.00	126.00	--	--	86.00
24	600.00	401.00	300.00	610.00	152.00	--	--	130.00

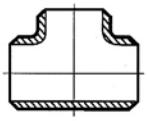
90° Elbow

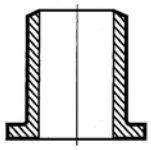


45° Elbow

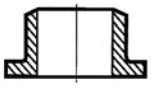


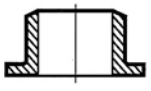
Tee



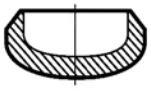


Lap Joint Stub Ends



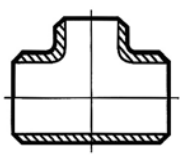


Cap

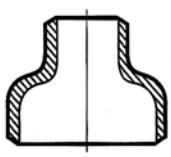


Nominal Pipe Size	SCHEDULE 10S		SCHEDULE 40S		SCHEDULE 80S	
	Reducing Tee	Reducers	Reducing Tee	Reducers	Reducing Tee	Reducers
¾ x ½	0.28	0.16	0.50	0.17	0.50	0.22
1 x ½	0.56	0.37	0.88	0.40	1.00	0.45
x ¾	0.60	0.38	0.93	0.40	1.00	0.45
x ½	1.06	0.39	1.50	0.40	1.75	0.50
1 ¼ x ¾	1.10	0.42	1.50	0.40	1.75	0.50
x 1	1.15	0.44	1.50	0.50	1.75	0.50
x ½	1.33	0.49	2.00	0.50	2.50	0.65
1 ½ x ¾	1.41	0.53	2.13	0.54	2.50	0.70
x 1	1.45	0.56	2.18	0.62	2.50	0.75
x 1 ¼	1.50	0.59	2.25	0.70	2.50	0.78
x ¾	1.37	0.71	3.25	0.70	4.00	1.00
2 x 1	1.67	0.78	3.50	0.76	4.10	1.10
x 1 ¼	1.72	0.82	3.60	0.84	4.13	1.15
x 1 ½	1.80	0.85	3.75	0.90	4.25	1.20
x 1	2.49	1.04	5.00	1.25	7.00	1.75
2 ½ x 1 ¼	2.62	1.09	5.25	1.25	7.06	1.85
x 1 ½	2.74	1.12	5.50	1.38	7.13	1.90
x 2	3.00	1.18	6.00	1.50	7.19	2.00
x 1 ¼	3.61	1.33	6.25	1.60	7.60	2.40
3 x 1 ½	3.65	1.39	6.25	1.70	7.68	2.50
x 2	3.75	1.45	6.50	1.80	8.00	2.60
x 2 ½	3.90	1.53	6.75	2.00	8.25	2.75
x 1 ½	4.20	1.73	8.00	2.50	11.5	3.25
3 ½ x 2	4.49	1.86	8.30	2.75	11.8	3.50
x 2 ½	4.73	1.96	8.50	2.88	12.2	3.50
x 3	4.90	2.12	8.80	3.15	12.6	4.00
x 1 ½	5.38	2.06	11.1	2.88	15.2	4.00
x 2	5.43	2.16	11.2	3.00	15.5	4.25
4 x 2 ½	5.45	2.22	11.3	3.25	15.5	4.38
x 3	5.60	2.28	11.6	3.38	15.6	4.50
x 3 ½	5.70	2.41	11.8	3.50	15.6	4.75
x 2	10.8	3.35	19.0	5.00	23.5	6.50
x 2 ½	11.1	3.64	19.5	5.25	24.0	7.00
5 x 3	11.4	3.90	20.0	5.50	24.5	7.50
x 3 ½	11.7	4.03	20.5	5.75	25.0	7.75
x 4	12.0	4.29	21.0	6.00	25.5	8.25

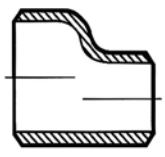
Reducing Tee



Concentric Reducer

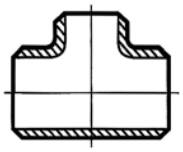


Eccentric Reducer

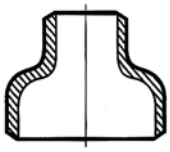


Nominal Pipe Size	SCHEDULE 10S		SCHEDULE 40S		SCHEDULE 80S	
	Reducing Tee	Reducers	Reducing Tee	Reducers	Reducing Tee	Reducers
6 x 2 ½	15.7	4.79	32.0	7.25	36.0	10.0
6 x 3	16.0	5.04	32.5	8.00	37.0	10.5
6 x 3 ½	16.2	5.28	33.0	8.25	38.2	11.0
6 x 4	16.5	5.52	33.5	8.25	39.2	11.5
6 x 5	17.0	5.76	34.5	8.50	40.0	12.0
8 x 3 ½	23.4	6.88	50.7	11.0	70.5	16.5
8 x 4	23.9	7.10	51.7	11.0	71.7	17.0
8 x 5	24.5	7.51	53.0	12.0	73.0	18.0
8 x 6	25.0	7.80	54.0	13.2	74.0	18.7
10 x 4	30.1	10.5	80.0	20.0	104.	25.5
10 x 5	32.3	12.6	81.0	21.0	106.	28.0
10 x 6	36.3	13.3	83.0	21.5	108.	29.5
10 x 8	37.0	14.0	84.5	22.0	109.	29.5
12 x 5	49.8	18.7	110.	30.0	160.	39.0
12 x 6	51.7	19.2	114.	31.0	165.	40.0
12 x 8	53.0	20.4	117.	32.0	175.	42.0
12 x 10	54.0	20.9	119.	34.0	184.	43.5
14 x 8	52.5	29.8	155.	58.5	225.	78.5
14 x 10	53.5	30.5	158.	59.2	233.	79.2
14 x 12	54.3	31.2	160.	60.0	237.	80.0
16 x 8	67.1	33.6	180.	68.5	260.	88.5
16 x 10	69.3	34.1	186.	69.5	266.	89.0
16 x 12	71.2	34.6	191.	70.0	270.	90.0
16 x 14	72.4	35.7	194.	71.0	275.	91.0
18 x 10	83.5	45.6	222.	82.0	296.	112.
18 x 12	86.5	46.6	230.	83.0	307.	113.
18 x 14	88.7	47.5	236.	84.0	315.	114.
18 x 16	90.2	48.5	241.	85.0	321.	115.
20 x 10	126.	83.2	332.	117.	466.	164.
20 x 12	126.	84.6	334.	120.	469.	167.
20 x 14	126.	85.5	336.	122.	472.	168.
20 x 16	127.	86.3	338.	124.	475.	169.
20 x 18	128.	87.6	340.	125.	477.	170.
24 x 12	191.	107.	510.	139.	592.	179.
24 x 14	192.	121.	513.	141.	595.	185.
24 x 16	193.	125.	516.	145.	598.	190.
24 x 18	194.	128.	519.	148.	601.	195.
24 x 20	195.	132.	522.	150.	604.	200.

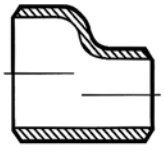
Reducing Tee



Concentric Reducer

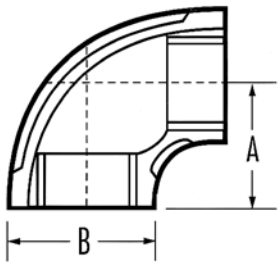


Eccentric Reducer

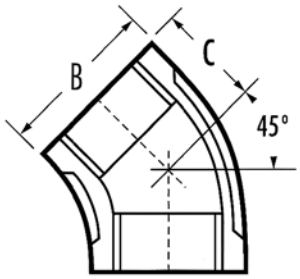


Nominal Pipe Size	90° Elbow, 45° Elbow, Tee			Cross		90° Street Elbow			King Combo
	A	B	C	A	D	E	F	G	A
⅛	11⁄16	9⁄16	11⁄16	5⁄8	9⁄16	7⁄8	11⁄16	19⁄32	1 5⁄8
¼	3⁄4	3⁄4	3⁄4	3⁄4	3⁄4	1 3⁄16	13⁄16	3⁄4	1 7⁄8
⅜	15⁄16	15⁄16	13⁄16	15⁄16	15⁄16	1 5⁄16	15⁄16	1	2 1⁄4
½	1 1⁄8	1 1⁄8	7⁄8	1 1⁄8	1 1⁄8	1 5⁄8	1 3⁄32	1 1⁄8	2 5⁄8
¾	1 1⁄4	1 5⁄16	1	1 9⁄32	1 5⁄16	1 7⁄8	1 9⁄32	1 3⁄8	2 3⁄4
1	1 9⁄16	1 11⁄16	1 1⁄8	1 1⁄2	1 11⁄16	2 1⁄8	1 5⁄16	1 3⁄4	2 15⁄16
1 ¼	1 3⁄4	2 1⁄16	1 5⁄16	1 13⁄16	2 1⁄16	2 7⁄16	1 13⁄16	2 1⁄16	3 3⁄16
1 ½	1 15⁄16	2 5⁄16	1 7⁄16	1 15⁄16	2 5⁄16	2 7⁄8	1 7⁄8	2 5⁄16	3 11⁄16
2	2 1⁄4	2 13⁄16	1 5⁄8	2 5⁄16	2 13⁄16	3 1⁄16	2 7⁄32	2 13⁄16	3 15⁄16
2 ½	2 13⁄16	3 9⁄16	1 7⁄8	2 3⁄4	3 9⁄16	4 1⁄8	2 9⁄16	3 5⁄8	4 7⁄16
3	3 1⁄8	4 3⁄16	2 3⁄16	3 1⁄16	4 1⁄2	4 5⁄16	3	4 1⁄8	4 13⁄16
4	3 7⁄8	5 1⁄8	2 5⁄8	3 13⁄16	5 11⁄16	5 11⁄16	3 13⁄16	5 13⁄32	5 15⁄16

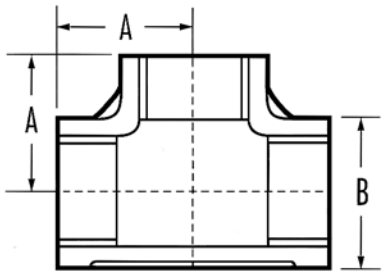
90° ELBOW



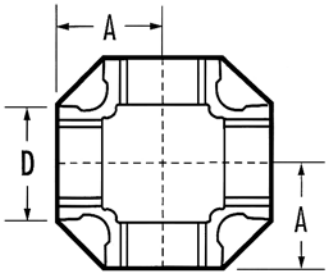
45° ELBOW



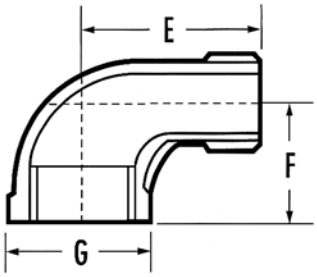
TEE



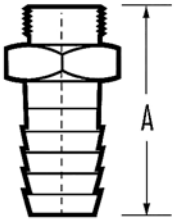
CROSS



90° STREET ELBOW

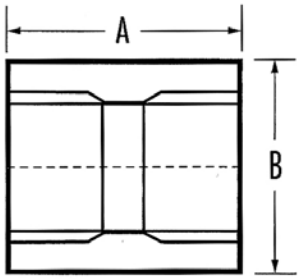


KING COMBO

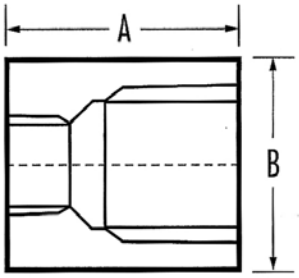


Nominal Pipe Size	Coupling & Red. Coupling		Half Coupling		Head Hex Plug		Hex Head Bushing		Square Head Plug		Counter Sunk Hex Plug		Union			Cap	
	A	B	A	B	A	B	A	B	A	B	A	B	J	K	H	A	B
1/8	1	9/16	1/2	9/16	5/8	1/2	--	--	9/32	9/32	29/32	9/32	1 5/16	13/16	1 1/8	9/16	5/8
1/4	1 1/8	3/4	9/16	3/4	11/16	11/16	11/16	11/16	5/16	3/8	5/32	13/32	1 5/16	3/4	1 1/4	9/16	11/16
3/8	1 13/16	7/8	19/32	7/8	11/16	13/16	11/16	13/16	3/8	3/8	5/32	13/32	1 1/2	7/8	1 7/16	11/16	7/8
1/2	1 1/2	1 1/16	3/4	1 1/16	7/8	1	7/8	1	3/8	1/2	3/16	9/16	1 5/8	1 1/16	1 5/8	13/16	1 1/16
3/4	1 9/16	1 5/16	25/32	1 5/16	15/16	1 1/4	15/16	1 1/4	7/16	5/8	3/16	9/16	2	1 5/16	1 15/16	15/16	1 1/4
1	1 3/4	1 5/8	7/8	1 5/8	1 1/16	1 1/2	1 1/16	1 1/2	7/16	11/16	1/4	11/16	2 1/8	1 5/8	2 5/16	1 1/8	1 1/2
1 1/4	2	1 15/16	1	1 15/16	1 1/8	1 13/16	1 1/8	1 13/16	9/16	3/4	3/8	23/32	2 3/8	1 15/16	2 11/16	1 3/16	1 7/8
1 1/2	2 1/8	2 3/16	1 1/16	2 3/16	1 9/32	2 1/16	1 9/32	2 1/16	9/16	7/8	3/8	13/16	2 5/8	2 3/16	3 1/16	1 1/4	2 1/8
2	2 1/2	2 3/4	1 1/4	2 3/4	1 3/8	2 7/16	1 3/8	2 7/16	9/16	15/16	3/8	29/32	3	2 11/16	3 5/8	1 7/16	2 19/32
2 1/2	2 7/8	3 5/8	1 7/16	3 5/8	1 11/16	3 1/8	1 11/16	3 1/8	11/16	1 3/16	1/2	1 1/16	3 1/4	3 3/8	4 3/8	1 7/16	3 1/8
3	3 3/16	4 5/16	1 19/32	4 5/16	1 3/4	3 11/16	1 3/4	3 11/16	13/16	1 5/16	1/2	1 9/64	3 5/8	3 7/8	5	1 7/16	3 11/16
4	3 11/16	5 13/32	1 27/32	5 13/32	2	4 3/4	2	4 3/4	15/16	1 9/16	1/2	1 1/4	4 7/16	5	6 1/4	1 3/4	4 3/4

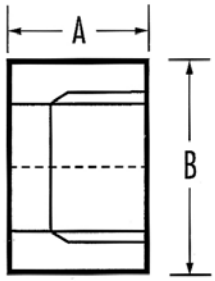
COUPLING



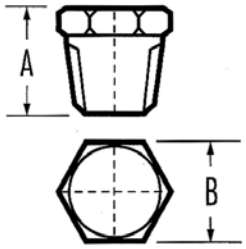
REDUCING COUPLING



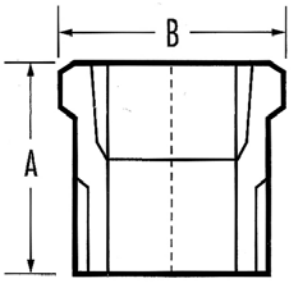
HALF COUPLING



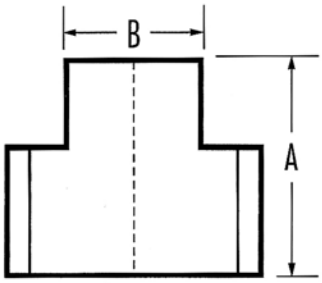
HEX HEAD PLUG



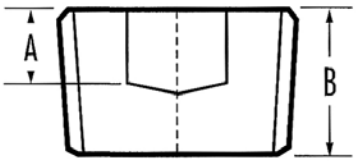
HEX HEAD BUSHING



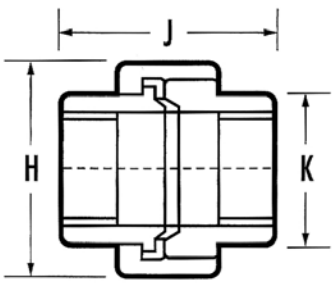
Tee



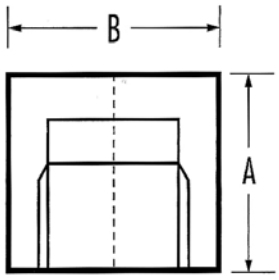
COUNTER SUNK HEX PLUG



UNION



CAP



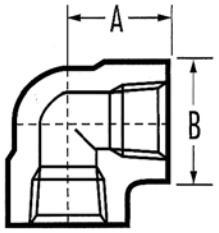
PRESSURE FITTINGS

PRESSURE FITTINGS

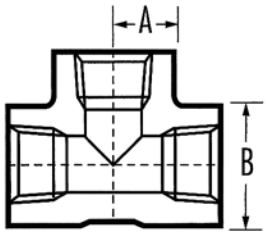
Nominal Pipe Size	90° Elbow, Cross, Tee	90° Elbow, Tee	45° Elbow	45° Elbow, Cross	90° Street Elbow		
	A	B	C	E	F	G	H
1/8	13/16	7/8	11/16	15/16	1 1/16	3/4	3/4
1/4	31/32	1	3/4	1	1 1/4	7/8	1 1/16
3/8	1 1/8	1 5/16	7/8	1 5/16	1 1/2	1	1 1/4
1/2	1 5/16	1 1/2	1	1 1/2	1 5/8	1 1/8	1 1/2
3/4	1 1/2	1 13/16	1 1/8	1 13/16	1 7/8	1 3/8	1 3/4
1	1 3/4	2 3/16	1 5/16	2 3/16	2 1/4	1 3/4	2
1 1/4	2	2 7/16	1 3/8	2 7/16	2 5/8	2	2 7/16
1 1/2	2 3/8	2 31/32	1 11/16	2 31/32	2 13/16	2 1/8	2 3/4
2	2 1/2	3 5/16	1 3/4	3 5/16	3 5/16	2 1/2	3 5/16
2 1/2	3 3/8	4 5/16	2 1/4	4	--	--	--
3	3 3/4	4 3/4	2 1/2	4 5/8	--	--	--
4	4 1/2	6	3 1/8	5 3/4	--	--	--

Nominal Pipe Size	Union			Cap	Cap, Coupling, Half Coupling, Red. Coupling	Coupling & Red. Coupling	Half Coupling
	J	K	L	Q	M	R	S
1/8	1 3/8	7/8	1 5/8	3/4	3/4	1 1/4	5/8
1/4	1 3/8	7/8	1 5/8	1	3/4	1 3/8	11/16
3/8	1 5/8	1 1/32	1 13/16	1	7/8	1 1/2	3/4
1/2	1 27/32	1 1/4	1 15/16	1 1/4	1 1/8	1 7/8	15/16
3/4	2 3/16	1 15/32	2 1/4	1 7/16	1 3/8	2	1
1	2 1/2	1 5/8	2 1/2	1 5/8	1 3/4	2 3/8	1 3/16
1 1/4	3 1/16	2 1/32	2 13/16	1 3/4	2 1/4	2 5/8	1 5/16
1 1/2	3 13/32	2 5/16	3	1 3/4	2 1/2	3 1/8	1 9/16
2	4	2 27/32	3 1/2	1 7/8	3	3 3/8	1 11/16
2 1/2	4 21/32	3 7/16	4 3/16	2 3/8	3 5/8	3 5/8	1 13/16
3	5 1/2	4	4 9/16	2 9/16	4 1/4	4 1/4	2 1/8
4	7 1/4	5 19/32	5	2 11/16	5 1/2	4 3/4	2 3/8

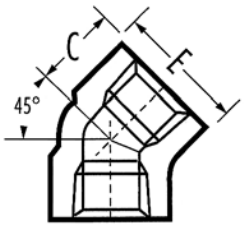
90° ELBOW



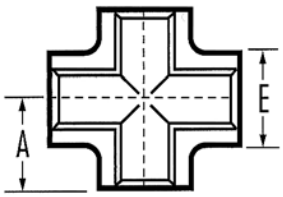
TEE



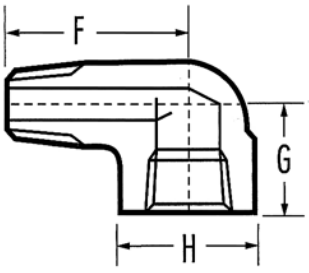
45° ELBOW



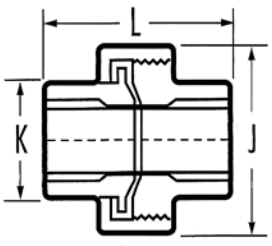
CROSS



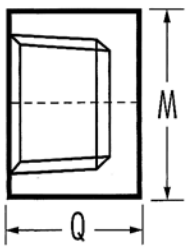
90° STREET ELBOW



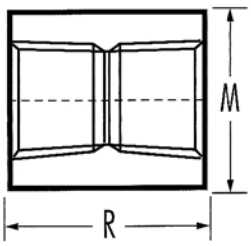
UNION



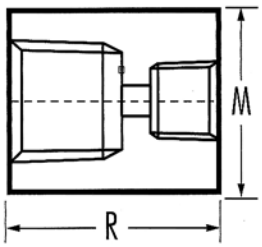
CAP



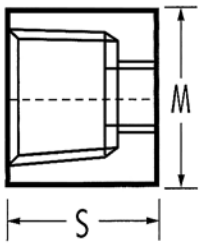
COUPLING



REDUCED COUPLING



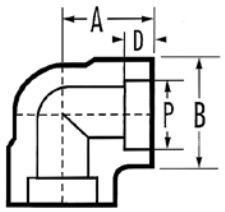
HALF COUPLING



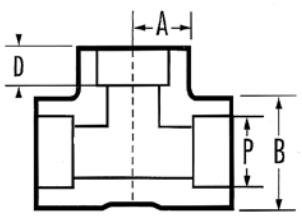
Nominal Pipe Size	Common Dimension		90° Elbow, Tee, Cross	90° Elbow Tee	45° Elbow Cross			Union		
	P	D	A	B	C	E	G	J	K	L
1/8	0.420	3/8	13/16	7/8	11/16	13/16	3/8	1 5/8	1	1 13/16
1/4	0.555	3/8	13/16	7/8	11/16	13/16	3/8	1 5/8	1	1 13/16
3/8	0.690	7/16	31/32	1	3/4	1	7/16	1 5/8	1	1 13/16
1/2	0.855	1/2	1 1/8	1 5/16	7/8	1 5/16	7/16	1 23/32	1 3/32	2
3/4	1.065	9/16	1 5/16	1 1/2	1	1 1/2	1/2	2 1/8	1 11/32	2 9/32
1	1.330	5/8	1 1/2	1 13/16	1 1/8	1 13/16	9/16	2 1/2	1 5/8	2 19/32
1 1/4	1.675	11/16	1 3/4	2 3/16	1 5/16	2 3/16	5/8	3	2	2 5/8
1 1/2	1.915	3/4	2	2 7/16	1 3/8	2 7/16	17/32	3 13/32	2 9/32	2 7/8
2	2.406	7/8	2 3/8	2 31/32	1 11/16	2 31/32	11/16	4	2 27/32	3 1/2
2 1/2	2.906	1 3/8	3	3 5/8	2 1/16	4	15/16	4 21/32	3 7/16	4 3/16
3	3.535	1 1/8	3 3/8	4 5/16	2 1/2	4 5/8	1 1/4	5 1/2	4	4 9/16
4	4.545	1 9/16	4 3/16	5 3/4	3 1/8	5 3/4	1 1/2	7 1/4	5 19/32	5

Nominal Pipe Size	Common Dimension		Cap	Cap, Coupling, Half Coupling, Red. Coupling	Cap, Coupling, Half Coupling, Red. Coupling
	P	d	Q	M	R
1/8	0.420	3/8	11/16	3/4	1
1/4	0.555	3/8	11/16	7/8	1
3/8	0.690	7/16	3/4	1 1/16	1 1/8
1/2	0.855	1/2	7/8	1 1/4	1 3/8
3/4	1.065	9/16	1	1 1/2	1 1/2
1	1.330	5/8	1 1/16	1 7/8	1 3/4
1 1/4	1.675	11/16	1 3/16	2 1/4	1 7/8
1 1/2	1.915	3/4	1 1/4	2 1/2	2
2	2.406	7/8	1 1/2	3	2 1/2
2 1/2	2.906	7/8	1 1/2	3 5/8	2 1/2
3	3.535	1	1 3/4	4 1/4	2 3/4
4	4.545	1 1/8	1 7/8	5 1/2	3

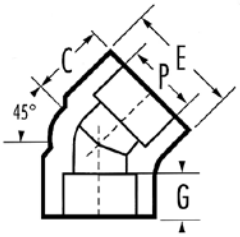
90° ELBOW



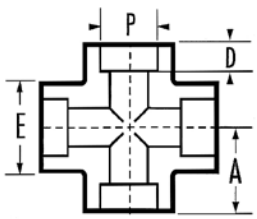
TEE



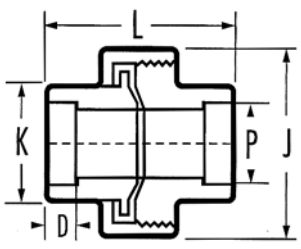
45° ELBOW



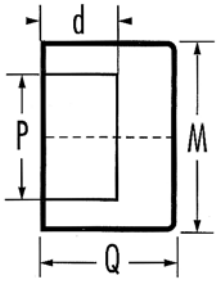
CROSS



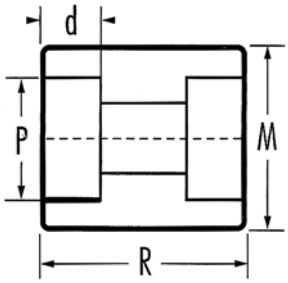
UNION



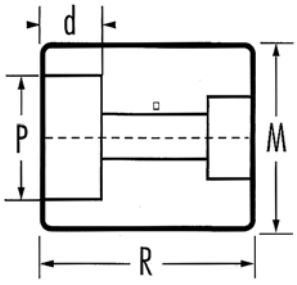
CAP



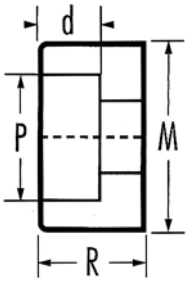
COUPLING



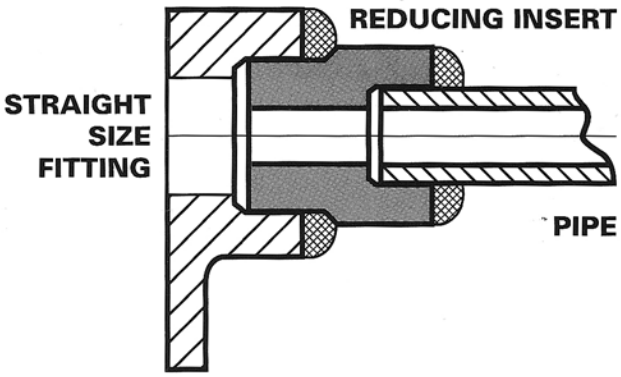
REDUCED COUPLING



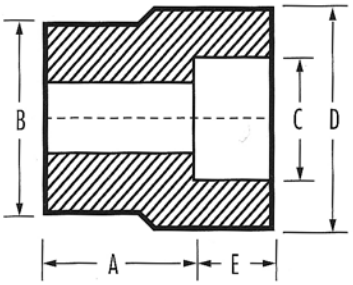
HALF COUPLING



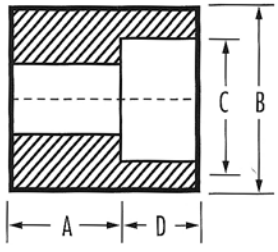
Nominal Pipe Size	A	B	C	D	E
TYPE 1 INSERTS					
3/8 x 1/4	3/4	11/16	9/16	7/8	3/8
1/2 x 3/8	13/16	7/8	11/16	1 11/16	7/16
1/2 x 1/4	13/16	7/8	9/16	7/8	3/8
3/4 x 1/2	7/8	1 1/16	55/64	1 1/4	1/2
1 x 3/4	15/16	1 5/16	1 5/64	1 1/2	9/16
1 1/4 x 1	1	1 11/16	1 1/3	1 7/8	5/8
1 1/2 x 1 1/4	1 1/8	1 7/8	1 11/16	2 1/4	11/16
2 x 1 1/2	1 1/4	2 3/8	1 59/64	2 1/2	3/4
TYPE 2 INSERTS					
3/4 x 3/8	5/8	1 1/16	11/16	7/16	--
3/4 x 1/4	11/16	1 1/16	35/64	3/8	--
1 x 1/2	5/8	1 21/64	55/64	1/2	--
1 x 3/8	11/16	1 21/64	11/16	7/16	--
1 x 1/4	3/4	1 21/64	9/16	3/8	--
1 1/4 x 3/4	11/16	43/64	1 5/64	9/16	--
1 1/4 x 1/2	3/4	1 43/64	55/64	1/2	--
1 1/4 x 3/8	13/16	1 43/64	11/16	7/16	--
1 1/4 x 1/4	7/8	1 43/64	9/16	3/8	--
1 1/2 x 1	11/16	1 7/8	1 1/3	5/8	--
1 1/2 x 3/4	3/4	1 7/8	1 5/64	9/16	--
1 1/2 x 1/2	13/16	1 7/8	55/64	1/2	--
1 1/2 x 3/8	7/8	1 7/8	11/16	7/16	--
2 x 1 1/4	13/16	2 3/8	1 11/16	11/16	--
2 x 1	7/8	2 3/8	1 1/3	5/8	--
2 x 3/4	15/16	2 3/8	1 5/64	9/16	--
2 x 1/2	1	2 3/8	55/64	1/2	--



TYPE 1 INSERT



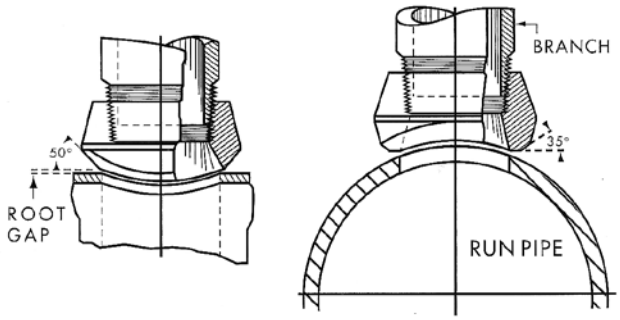
TYPE 2 INSERT



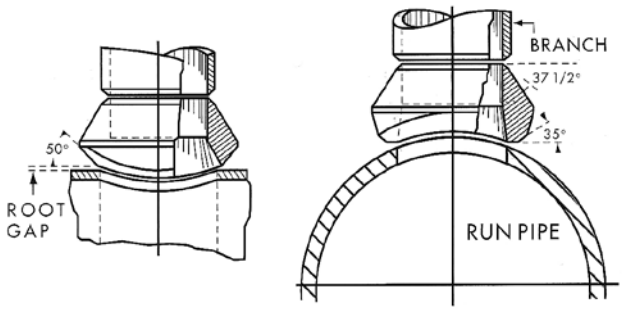
PRESSURE FITTINGS

BRANCH OUTLETS

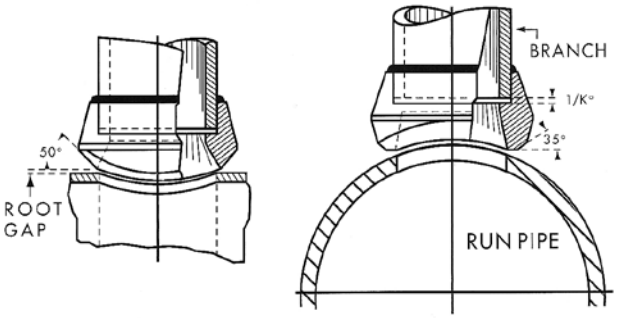
THREADED OUTLET



BUTT WELD OUTLET



SOCKET WELD OUTLET



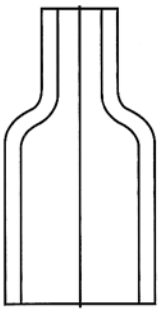
SWAGE NIPPLES

Nominal Pipe Size	Length
¼ x ⅛	2¼
⅜ x ¼	2½
½ x ⅛ ½ x ¼ ½ x ⅜	2¾
¾ x ⅛ ¾ x ¼ ¾ x ⅜ ¾ x ½	3
1 x ⅛ 1 x ¼ 1 x ⅜ 1 x ½ 1 x ¾	3½
1¼ x ½ 1¼ x ¾ 1¼ x 1	4
1½ x ½ 1½ x ¾ 1½ x 1 1½ x 1¼	4½

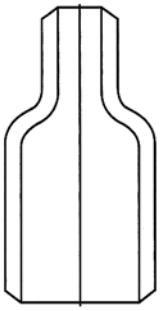
Nominal Pipe Size	Length
2 x ½ 2 x ¾ 2 x 1 2 x 1¼ 2 x 1½	6½
2½ x 1 2½ x 1¼ 2½ x 1½	7
3 x 1 3 x 1¼ 3 x 1½ 3 x 2 3 x 2½	8
4 x 1 4 x 1¼ 4 x 1½ 4 x 2 4 x 2½ 4 x 3 4 x 3½	9

THREADED

PLAIN



BEVELED

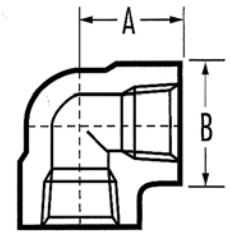


Nominal Pipe Size	90° Elbow, Cross, Tee	90° Elbow, Tee	45° Elbow	45° Elbow, Cross	90° Street Elbow		
	A	B	C	E	F	G	H
1/8	31/32	1	3/4	1 1/16	--	--	--
1/4	1 1/8	1 5/16	7/8	1 5/16	1 1/2	1	1 1/4
3/8	1 5/16	1 1/2	1	1 1/2	1 5/8	1 1/8	1 1/2
1/2	1 1/2	1 13/16	1 1/8	1 13/16	1 7/8	1 3/8	1 3/4
3/4	1 3/4	2 3/16	1 5/16	2 3/16	2 1/4	1 3/4	2
1	2	2 7/16	1 3/8	2 7/16	2 5/8	2	2 7/16
1 1/4	2 3/8	2 31/32	1 11/16	2 31/32	2 13/16	2 1/8	2 3/4
1 1/2	2 1/2	3 5/16	1 23/32	3 5/16	3 5/16	2 1/2	3 5/16
2	3 3/8	4 5/16	2 1/16	4	--	--	--

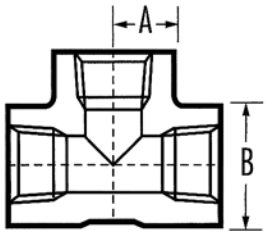
Nominal Pipe Size	Union			Cap	Cap, Coupling, Half Coupling, Red. Coupling	Coupling & Red. Coupling	Half Coupling
	J	K	L	Q	M	R	S
1/8	1 1/2	1	1 13/16	13/16	7/8	1 1/4	5/8
1/4	1 1/2	1	1 7/8	1 1/16	1	1 3/8	11/16
3/8	1 13/16	1 1/4	1 7/8	1 1/16	1 1/4	1 1/2	3/4
1/2	2 3/16	1 1/2	2 1/4	1 5/16	1 1/2	1 7/8	15/16
3/4	2 1/2	1 3/4	2 1/2	1 1/2	1 3/4	2	1
1	3	2 3/16	2 1/2	1 11/16	2 1/4	2 3/8	1 3/16
1 1/4	3 7/16	2 9/16	3	1 13/16	2 1/2	2 5/8	1 5/16
1 1/2	4	3	3 1/8	1 7/8	3	3 1/8	1 9/16
2	4 7/8	3 11/16	3 7/16	2	3 5/8	3 3/8	1 11/16

PRESSURE FITTINGS

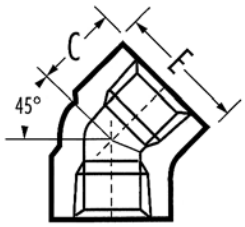
90° ELBOW



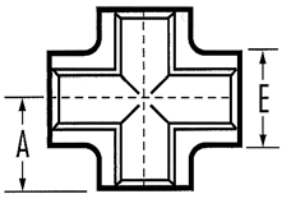
TEE



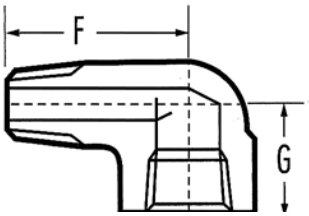
45° ELBOW



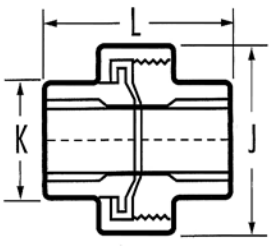
CROSS



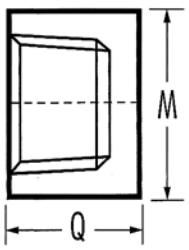
90° STREET ELBOW



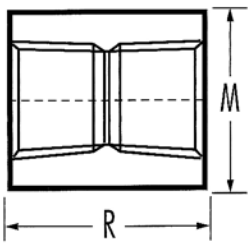
UNION



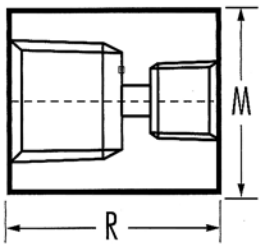
CAP



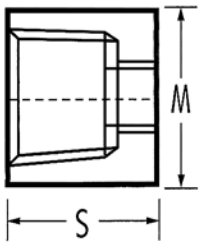
COUPLING



REDUCED COUPLING



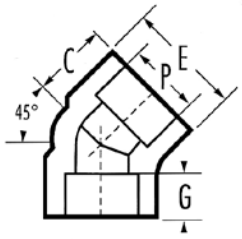
HALF COUPLING



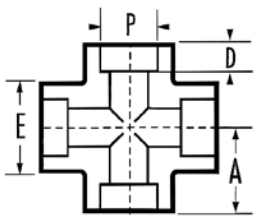
Nominal Pipe Size	Common Dimension		90° Elbow, Cross, Tee	90° Elbow, Tee	45° Elbow, Cross			Union		
	P	D	A	B	C	E	G	J	K	L
⅛	0.420	7/16	13/16	7/8	11/16	7/8	5/16	1 ½	1	1 27/32
¼	0.555	17/32	31/32	1 1/16	¾	1 1/16	5/16	1 ½	1	1 27/32
⅜	0.690	⅝	1 ⅛	1 5/16	⅞	1 5/16	7/16	1 29/32	1 ¼	2 5/32
½	0.855	¾	1 5/16	1 ½	1	1 ½	½	2 7/16	1 ½	2 3/16
¾	1.065	⅞	1 ½	1 13/16	1 ⅛	1 13/16	9/16	2 ½	1 ¾	1 ½
1	1.330	1 1/16	1 ¾	2 3/16	1 5/16	2 3/16	11/16	3	2 5/32	2 ⅞
1 ¼	1.675	1 ¼	2	2 7/16	1 ⅜	2 7/16	13/16	3 7/16	2 ½	3
1 ½	1.915	1 ½	2 ⅜	2 31/32	1 11/16	2 31/32	1	4	3	3 ½
2	2.406	1 ⅝	2 ½	3 5/16	1 23/32	3 5/16	1 ⅛	5	3 11/16	4

Nominal Pipe Size	Union		Cap	Cap, Coupling, Red. Coupling, Half Coupling	Coupling, Red. Coupling, Half Coupling
	J	d	Q	M	R
⅛	0.420	⅜	11/16	⅞	1
¼	0.555	⅜	11/16	1	1
⅜	0.690	7/16	¾	1 ¼	1 ⅛
½	0.855	½	⅞	1 ½	1 ⅜
¾	1.065	9/16	15/16	1 ¾	1 ½
1	1.330	⅝	1 ⅛	2 ¼	1 ¾
1 ¼	1.675	11/16	1 3/16	2 ½	1 ⅞
1 ½	1.915	¾	1 ⅜	3	2
2	2.406	⅞	1 ½	3 ⅝	2 ½

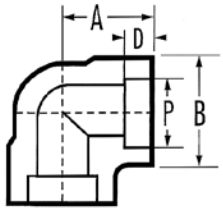
45° ELBOW



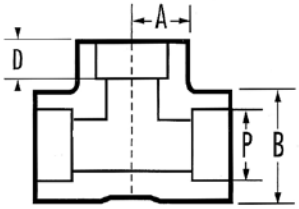
CROSS



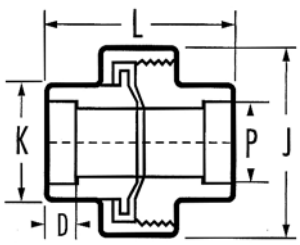
90° ELBOW



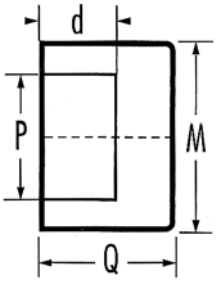
TEE



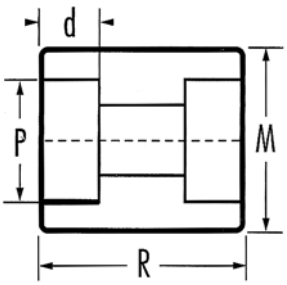
UNION



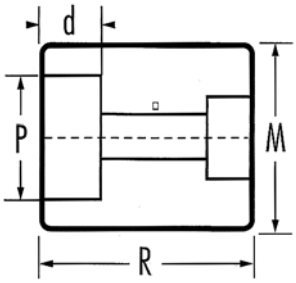
CAP



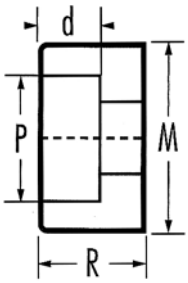
COUPLING



REDUCED COUPLING



HALF COUPLING



150 POUND THREADED FITTINGS

Nominal Pipe Size	90° Elbow	Tee	45° Elbow	Cross	Street Elbow	Union	Cap	Hex Head Bushing	Coupling	Half Coupling	Reducing Coupling	Hex Head Plug	Square Head Plug	Counter Sunk Hex Plug	Weld Spud	King Combo	Locknut
⅛	0.20	0.27	0.20	0.61	0.14	0.25	0.02	--	0.04	0.02	--	0.03	0.02	0.01	0.12	0.07	0.12
¼	0.17	0.22	0.16	0.54	0.11	0.22	0.06	0.03	0.06	0.04	0.06	0.06	0.03	0.03	0.12	0.09	0.12
⅜	0.27	0.34	0.23	0.67	0.14	0.31	0.08	0.05	0.10	0.05	0.10	0.09	0.06	0.03	0.12	0.11	0.12
½	0.41	0.53	0.33	0.82	0.29	0.63	0.12	0.09	0.15	0.10	0.15	0.16	0.11	0.06	0.12	0.20	0.12
¾	0.66	0.89	0.52	0.91	0.45	0.80	0.20	0.22	0.26	0.13	0.26	0.36	0.18	0.10	0.25	0.33	0.25
1	0.85	1.19	0.82	1.44	0.88	1.19	0.29	0.36	0.43	0.22	0.43	0.69	0.34	0.20	0.25	0.60	0.25
1 ¼	1.47	1.88	1.91	2.06	1.19	1.63	0.68	0.75	0.59	0.27	0.59	1.16	0.58	0.31	0.50	0.99	0.37
1 ½	1.56	2.31	1.69	2.63	1.69	2.13	0.75	1.06	0.78	0.34	0.78	1.61	0.81	0.45	0.62	1.37	0.50
2	3.00	3.56	2.63	4.69	2.88	3.22	1.13	1.63	1.38	0.65	1.38	2.75	1.38	0.88	0.75	2.27	0.62
2 ½	4.53	6.09	3.81	9.00	4.13	6.28	3.31	2.69	3.13	1.68	3.13	4.00	1.41	--	1.00	3.33	0.87
3	6.31	8.81	5.63	13.00	6.75	9.47	2.91	4.69	4.16	2.30	4.16	4.06	2.03	--	1.12	4.89	1.25
4	11.69	14.88	9.44	21.00	11.13	16.41	5.28	7.16	6.91	4.05	6.91	8.69	4.34	--	1.25	--	2.12

3000 POUND THREADED FITTINGS

Nominal Pipe Size	90° Elbow	Tee	45° Elbow	Cross	Street Elbow	Cap	Coupling	Half Coupling	Reducing Coupling	Union
⅛	0.25	0.25	0.25	0.44	0.25	0.03	0.13	0.06	0.13	0.34
¼	0.38	0.38	0.25	0.38	0.25	0.06	0.13	0.06	0.13	0.38
⅜	0.63	0.81	0.50	1.00	0.38	0.13	0.25	0.19	0.25	0.44
½	1.31	1.19	0.75	1.50	0.50	0.25	0.25	0.19	0.25	0.56
¾	1.38	1.88	1.19	2.50	0.88	0.31	0.44	0.25	0.44	1.09
1	2.25	2.50	1.88	3.56	1.44	0.50	0.63	0.31	0.63	1.47
1 ¼	2.75	3.13	2.13	4.13	2.25	1.00	1.56	0.75	1.56	2.50
1 ½	3.50	5.00	3.00	6.50	3.00	1.63	2.19	1.13	2.19	3.00
2	5.44	6.75	4.25	8.13	5.19	3.13	3.13	1.56	3.13	4.63
2 ½	10.69	13.13	7.75	16.75	--	5.00	4.00	2.00	4.00	8.25
3	14.44	20.38	10.50	19.75	--	8.50	6.75	3.38	6.75	11.25
4	30.38	39.50	19.13	32.69	--	14.00	16.75	8.38	16.75	26.46

3000 POUND SOCKET WELDING FITTINGS

Nominal Pipe Size	90° Elbow	Tee	45° Elbow	Cross	Coupling	Half Coupling	Reducing Coupling	Cap	Union
⅛	0.13	0.25	0.13	0.31	0.09	0.09	0.09	0.13	0.34
¼	0.13	0.25	0.13	0.31	0.11	0.11	0.11	0.13	0.38
⅜	0.25	0.31	0.19	0.31	0.16	0.16	0.16	0.19	0.44
½	0.50	0.69	0.44	0.81	0.29	0.29	0.29	0.25	0.56
¾	0.69	0.88	0.50	1.13	0.42	0.42	0.42	0.38	1.09
1	1.31	1.44	0.88	1.56	0.59	0.59	0.59	0.44	1.47
1 ¼	1.63	2.13	1.31	2.44	1.07	1.07	1.07	0.94	2.50
1 ½	2.13	2.44	1.75	3.25	1.30	1.30	1.30	1.19	3.00
2	3.56	4.44	2.88	5.50	2.13	2.13	2.13	2.00	4.63
2 ½	6.38	8.88	7.38	15.81	3.14	3.14	3.14	3.00	8.25
3	10.88	13.69	11.50	20.19	4.14	4.14	4.14	4.63	11.25
4	23.69	28.44	19.75	31.50	7.30	7.30	7.30	8.50	26.46

6000 POUND THREADED FITTINGS

Nominal Pipe Size	90° Elbow	Tee	45° Elbow	Cross	Street Elbow	Coupling	Reducing Coupling	Half Coupling	Cap	Union
⅛	0.37	0.44	0.25	0.50	--	0.09	--	0.09	0.13	0.44
¼	0.66	0.92	0.59	1.12	0.40	0.14	0.14	0.07	0.13	0.55
⅜	1.00	1.38	0.85	1.55	0.99	0.40	0.40	0.20	0.19	0.88
½	1.59	2.16	1.34	2.59	1.00	0.69	0.69	0.35	0.31	1.31
¾	2.54	3.63	2.25	4.21	1.63	0.90	0.90	0.45	0.44	1.88
1	3.56	4.83	2.59	5.64	2.75	1.88	1.88	0.94	0.75	3.25
1 ¼	5.88	7.75	4.56	9.58	3.86	2.31	2.31	1.16	1.31	3.50
1 ½	7.06	9.75	5.75	11.39	7.23	4.00	4.00	2.00	1.69	6.55
2	13.00	17.38	9.63	21.37	--	7.50	7.50	3.75	3.25	10.63

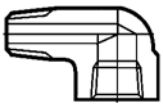
6000 POUND SOCKET WELDING FITTINGS

Nominal Pipe Size	90° Elbow	Tee	45° Elbow	Cross	Coupling	Reducing Coupling	Half Coupling	Cap	Union
⅛	0.16	0.23	0.11	1.25	0.09	--	0.09	0.07	0.44
¼	0.24	0.31	0.19	1.25	0.14	0.14	0.14	0.12	0.55
⅜	0.48	0.68	0.41	1.25	0.28	0.28	0.28	0.32	0.88
½	0.88	1.18	0.66	1.52	0.52	0.52	0.52	0.42	1.31
¾	1.38	1.95	1.26	2.31	0.72	0.72	0.72	0.58	1.88
1	2.63	3.17	1.95	3.75	1.43	1.43	1.43	1.16	3.25
1 ¼	3.00	4.07	2.45	4.73	1.65	1.65	1.65	1.40	3.50
1 ½	5.31	7.21	4.44	8.74	2.64	2.64	2.64	2.14	6.55
2	6.00	7.94	4.73	9.50	4.68	4.68	4.68	3.62	10.63

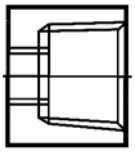
90° ELBOW

45° ELBOW

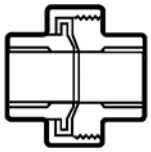
90° STREET ELBOW



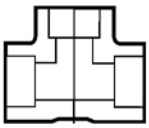
HALF COUPLING



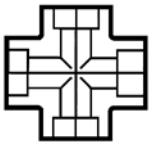
UNIO



TEE



CROSS



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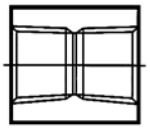
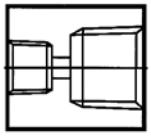
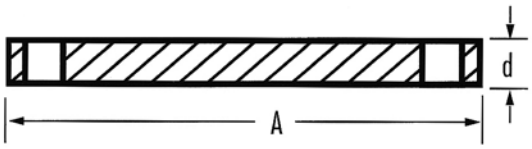


REDUCING COUPLING

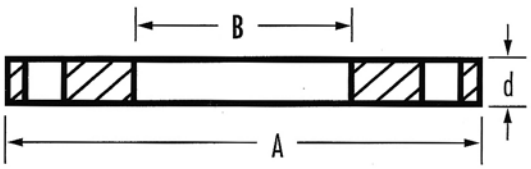


Nominal Pipe Size	Common Dimensions		No. Of Bolt Holes	Dia. Of Bolt Holes	Bolt Circle	Slip-on Tube "O.D."	Slip-on Pipe "IPS"
	A	d				B	C
½	3 ½	½	4	⅝	2 ⅜	0.53	0.88
¾	3 ⅞	½	4	⅝	2 ¾	0.78	1.09
1	4 ¼	½	4	⅝	3 ⅛	1.03	1.36
1 ¼	4 ⅝	½	4	⅝	3 ½	1.28	1.70
1 ½	5	½	4	⅝	3 ⅞	1.53	1.95
2	6	½	4	¾	4 ¾	2.03	2.44
2 ½	7	½	4	¾	5 ½	2.53	2.94
3	7 ½	½	4	¾	6	3.03	3.57
4	9	½	8	¾	7 ½	4.03	4.57
5	10	½	8	⅞	8 ½	5.03	5.66
6	11	½	8	⅞	9 ½	6.03	6.63
8	13 ½	½	8	⅞	11 ¾	8.03	8.72
10	16	½	12	1	14 ¼	10.03	10.88
12	19	½	12	1	18 ¾	12.03	12.88
14	21	½	12	1	21 ¼	14.03	14.10
16	23 ½	½	16	1	22 ¾	16.03	16.12
18	25	½	16	1	25	18.03	18.17

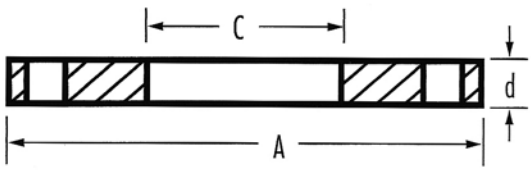
BLIND



SLIP-ON TUBE "O.D."

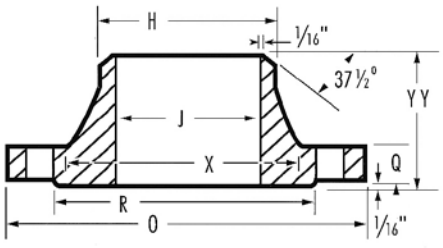


SLIP-ON PIPE "IPS"

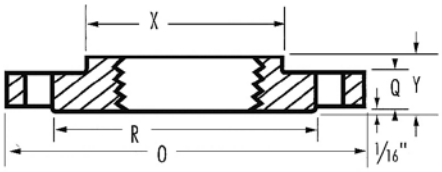


Nominal Pipe Size	Common Dimensions				No. Of Bolt Holes	Dia. Of Bolt Holes	Bolt Circle	Weld Neck			Slip-on & Threaded	Slip-on	Lap Joint		
	O	Q	R	X				YY	H	J	Y	B	r	YV	BB
½	3 ½	7/16	1 3/8	1 3/16	4	5/8	2 3/8	1 7/8	0.84	0.62	5/8	0.88	1/8	5/8	0.90
¾	3 7/8	½	1 11/16	1 ½	4	5/8	2 ¾	2 1/16	1.05	0.82	5/8	1.09	1/8	5/8	1.11
1	4 ¼	9/16	2	1 15/16	4	5/8	3 1/8	2 3/16	1.32	1.05	11/16	1.36	1/8	11/16	1.38
1 ¼	4 5/8	5/8	2 ½	2 5/16	4	5/8	3 ½	2 ¼	1.66	1.38	13/16	1.70	3/16	13/16	1.72
1 ½	5	11/16	2 7/8	2 9/16	4	5/8	3 7/8	2 7/16	1.90	1.61	7/8	1.95	¼	7/8	1.97
2	6	¾	3 5/8	3 1/16	4	¾	4 ¾	2 ½	2.38	2.07	1	2.44	5/16	1	2.46
2 ½	7	7/8	4 1/8	3 9/16	4	¾	5 ½	2 ¾	2.88	2.47	1 1/8	2.94	5/16	1 1/8	2.97
3	7 ½	15/16	5	4 ¼	4	¾	6	2 ¾	3.50	3.07	1 3/16	3.57	3/8	1 3/16	3.60
3 ½	8 ½	15/16	5 ½	4 13/16	8	¾	7	2 13/16	4.00	3.55	1 ¼	4.07	3/8	1 ¼	4.10
4	9	15/16	6 3/16	5 5/16	8	¾	7 ½	3	4.50	4.03	1 5/16	4.57	7/16	1 5/16	4.60
5	10	15/16	7 5/16	6 7/16	8	7/8	8 ½	3 ½	5.56	5.05	1 7/16	5.66	7/16	1 7/16	5.69
6	11	1	8 ½	7 9/16	8	7/8	9 ½	3 ½	6.63	6.07	1 9/16	6.72	½	1 9/16	6.75
8	13 ½	1 1/8	10 5/8	9 11/16	8	7/8	11 ¾	4	8.63	7.98	1 ¾	8.72	½	1 ¾	8.75
10	16	1 3/16	12 ¾	12	12	1	14 ¼	4	10.75	10.02	1 15/16	10.88	½	1 15/16	10.92
12	19	1 ¼	15	14 3/8	12	1	17	4 ½	12.75	12.00	2 3/16	12.88	½	2 3/16	12.92
14	21	1 3/8	16 ¼	15 ¾	12	1 1/8	18 ¾	5	14.00	As Specified by Purchaser	2 ¼	14.14	½	3 1/8	14.18
16	23 ½	1 7/16	18 ½	18	16	1 1/8	21 ¼	5	16.00		2 ½	16.16	½	3 7/16	16.19
18	25	1 9/16	21	19 7/8	16	1 ¼	22 ¾	5 ½	18.00		2 11/16	18.18	½	3 13/16	18.20
20	27 ½	1 11/16	23	22	20	1 ¼	25	5 11/16	20.00		2 7/8	20.20	½	4 1/16	20.25
24	32	1 7/8	27 ¼	26 1/8	20	1 3/8	29 ½	6	24.00		3 ¼	24.25	½	4 3/8	24.25

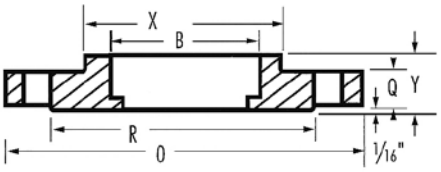
WELD NECK



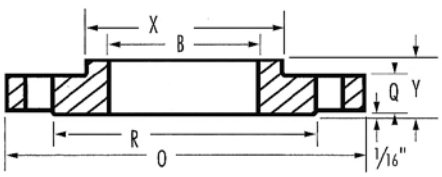
THREADED



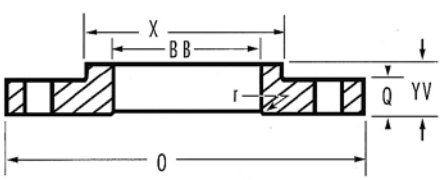
SOCKET-WELD



SLIP-ON



LAP JOINT



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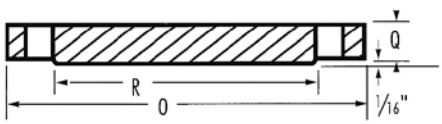
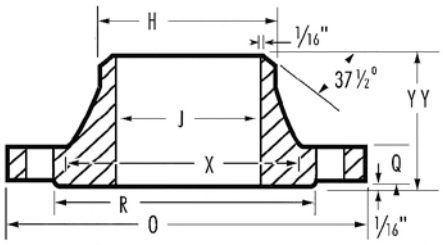


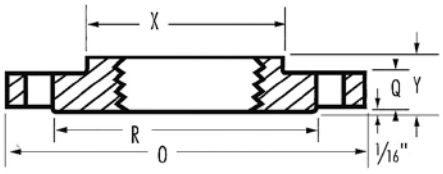
Nominal Pipe Size	Common Dimensions				No. Of Bolt Holes	DIA. Of Bolt Holes	Bolt Circle	Weld Neck			Slip-on & Threaded	Slip-on	Lap Joint		
	O	Q	R	X				YY	H	J	Y	B	r	YV	BB
½	3 ¾	9/16	1 ⅜	1 ½	4	⅝	2 ⅝	2 1/16	0.84	0.62	⅞	0.88	⅛	⅞	0.90
¾	4 ⅝	⅝	1 11/16	1 ⅞	4	¾	3 ¼	2 ¼	1.05	0.82	1	1.09	⅛	1	1.11
1	4 ⅞	11/16	2	2 ⅛	4	¾	3 ½	2 7/16	1.32	1.05	1 1/16	1.36	⅛	1 1/16	1.38
1 ¼	5 ¼	¾	2 ½	2 ½	4	¾	3 ⅞	2 9/16	1.66	1.38	1 1/16	1.70	3/16	1 1/16	1.72
1 ½	6 ⅛	13/16	2 ⅞	2 ¾	4	⅞	4 ½	2 11/16	1.90	1.61	1 3/16	1.95	¼	1 3/16	1.97
2	6 ½	⅞	3 ⅝	3 5/16	8	¾	5	2 ¾	2.38	2.07	1 5/16	2.44	5/16	1 5/16	2.46
2 ½	7 ½	1	4 ⅛	3 15/16	8	⅞	5 ⅞	3	2.88	2.47	1 ½	2.94	5/16	1 ½	2.97
3	8 ¼	1 ⅛	5	4 ⅝	8	⅞	6 ⅝	3 ⅛	3.50	3.07	1 11/16	3.57	⅜	1 11/16	3.60
3 ½	9	1 3/16	5 ½	5 ¼	8	⅞	7 ¼	3 3/16	4.00	3.55	1 ¾	4.07	⅜	1 ¾	4.10
4	10	1 ¼	6 3/16	5 ¾	8	⅞	7 ⅞	3 ⅜	4.50	4.03	1 ⅞	4.57	7/16	1 ⅞	4.60
5	11	1 ⅜	7 5/16	7	8	⅞	9 ¼	3 ⅞	5.56	5.05	2	5.66	7/16	2	5.69
6	12 ½	1 7/16	8 ½	8 ⅛	12	⅞	10 ⅝	3 ⅞	6.63	6.07	2 1/16	6.72	½	2 1/16	6.75
8	15	1 ⅝	10 ⅝	10 ¼	12	1	13	4 ⅜	8.63	7.98	2 7/16	8.72	½	2 7/16	8.75
10	17 ½	1 ⅞	12 ¾	12 ⅝	16	1 ⅛	15 ¼	4 ⅝	10.75	10.02	2 ⅝	10.88	½	3 ¾	10.92
12	20 ½	2	15	14 ¾	16	1 ¼	17 ¾	5 ⅛	12.75	12.00	2 ⅞	12.88	½	4	12.92
14	23	2 ⅛	16 ¼	16 ¾	20	1 ¼	20 ¼	5 ⅝	14.00	As Specified by Purchaser	3	14.14	½	4 ⅜	14.18
16	25 ½	2 ¼	18 ½	19	20	1 ⅜	22 ½	5 ¾	16.00		3 ¼	16.16	½	4 ¾	16.19
18	28	2 ⅜	21	21	24	1 ⅜	24 ¾	6 ¼	18.00		3 ½	18.18	½	5 ⅛	18.20
20	30 ½	2 ½	23	23 ⅛	24	1 ⅜	27	6 ⅜	20.00		3 ¾	20.20	½	5 ½	20.25
24	36	2 ¾	27 ¼	27 ⅝	24	1 ⅝	32	6 ⅝	24.00		4 3/16	24.25	½	6	24.25

FLANGES

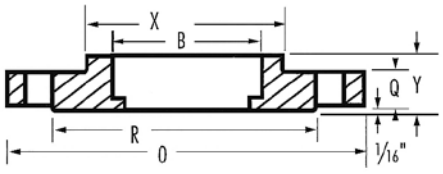
WELD NECK



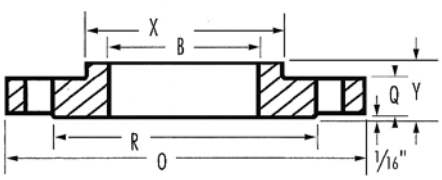
THREADED



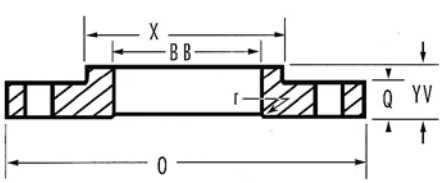
SOCKET-WELD



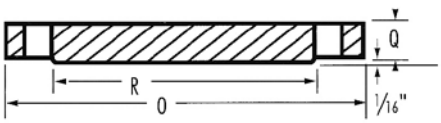
SLIP-ON



LAP JOINT

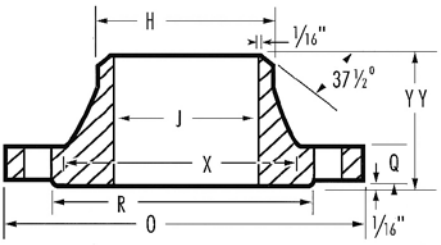


BLIND

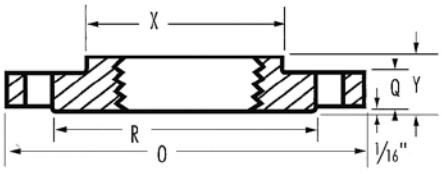


Nominal Pipe Size	Common Dimensions				No. Of Bolt Holes	DIA. Of Bolt Holes	Bolt Circle	Weld Neck			Slip-on & Threaded	Slip-on	Lap Joint		
	O	Q	R	X				YY	H	J	Y	B	r	YV	BB
½	3 ¾	9/16	1 3/8	1 ½	4	5/8	2 5/8	2 1/16	0.84	0.55	7/8	0.88	1/8	7/8	0.90
¾	4 5/8	5/8	1 11/16	1 7/8	4	¾	3 ¼	2 ¼	1.05	0.74	1	1.09	1/8	1	1.11
1	4 7/8	11/16	2	2 1/8	4	¾	3 ½	2 7/16	1.32	0.96	1 1/16	1.36	1/8	1 1/16	1.38
1 ¼	5 ¼	13/16	2 ½	2 ½	4	¾	3 7/8	2 5/8	1.66	1.28	1 1/8	1.70	3/16	1 1/8	1.72
1 ½	6 1/8	7/8	2 7/8	2 ¾	4	7/8	4 ½	2 ¾	1.90	1.50	1 ¼	1.95	¼	1 ¼	1.97
2	6 ½	1	3 5/8	3 5/16	8	¾	5	2 7/8	2.38	1.94	1 7/16	2.44	5/16	1 7/16	2.46
2 ½	7 ½	1 1/8	4 1/8	3 15/16	8	7/8	5 7/8	3 1/8	2.88	2.32	1 5/8	2.94	5/16	1 5/8	2.97
3	8 ¼	1 ¼	5	4 5/8	8	7/8	6 5/8	3 ¼	3.50	2.90	1 13/16	3.57	3/8	1 13/16	3.60
3 ½	9	1 3/8	5 ½	5 ¼	8	1	7 ¼	3 3/8	4.00	3.36	1 15/16	4.07	3/8	1 15/16	4.10
4	10 ¾	1 ½	6 3/16	6	8	1	8 ½	4	4.50	3.83	2 1/8	4.57	7/16	2 1/8	4.60
5	13	1 ¾	7 5/16	7 7/16	8	1 1/8	10 ½	4 ½	5.56	4.81	2 3/8	5.66	7/16	2 3/8	5.69
6	14	1 7/8	8 ½	8 ¾	12	1 1/8	11 ½	4 5/8	6.63	5.76	2 5/8	6.72	½	2 5/8	6.75
8	16 ½	2 3/16	10 5/8	10 ¾	12	1 ¼	13 ¾	5 ¼	8.63	7.63	3	8.72	½	3	8.75
10	20	2 ½	12 ¾	13 ½	16	1 3/8	17	6	10.75	9.75	3 3/8	10.88	½	4 3/8	10.92
12	22	2 5/8	15	15 ¾	20	1 3/8	19 ¼	6 1/8	12.75	11.75	3 5/8	12.88	½	4 5/8	12.92
14	23 ¾	2 ¾	16 ¼	17	20	1 ½	20 ¾	6 ½	14.00	As Specified by Purchaser	3 11/16	14.14	½	5	14.18
16	27	3	18 ½	19 ½	20	1 5/8	23 ¾	7	16.00		4 3/16	16.16	½	5 ½	16.19
18	29 ¼	3 ¼	21	21 ½	20	1 ¾	25 ¾	7 ¼	18.00		4 5/8	18.18	½	6	18.20
20	32	3 ½	23	24	24	1 ¾	28 ½	7 ½	20.00		5	20.20	½	6 ½	20.25
24	37	4	27 ¼	28 ¼	24	2	33	8	24.00		5 ½	24.25	½	7 ¼	24.25

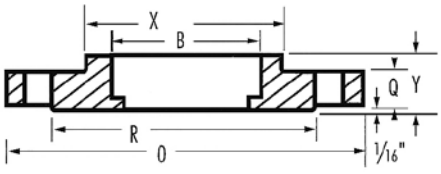
WELD NECK



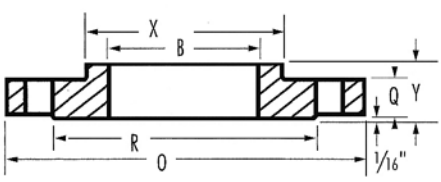
THREADED



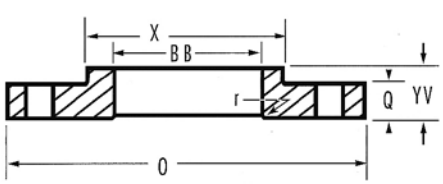
SOCKET-WELD



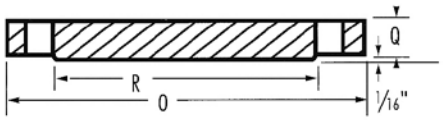
SLIP-ON



LAP JOINT



BLIND



½" Thick Flanges

Nominal Pipe Size	Blind	Slip-On Tube "O.D."	Slip-On Pipe "IPS"
½	1	1	--
¾	2	1.35	--
1	2	1.6	1.6
1 ¼	3	2	1.85
1 ½	3	2.15	2
2	4	3	2.80
2 ½	--	4.3	3.85
3	6	4.8	4.15
4	7	6.2	6.10
5	--	6.55	6.65
6	11	7.65	8.2
8	18	10.75	9.80
10	25	12.15	11.90
12	39	20.10	18.80
14	49	25	26
16	50	28.30	28
18	64	29.75	30

150 Pound Forged ANSI Flanges

Nominal Pipe Size	Weld Neck	Socket Weld & Slip on	Threaded	Lap Joint	Blind
½	2	1	1	1	2
¾	2	1.5	1.5	1.5	2
1	2.5	2	2	2	2
1 ¼	2.5	2.5	2.5	2.5	3
1 ½	4	3	3	3	3
2	6	5	5	5	4
2 ½	10	8	8	8	7
3	11.5	9	10	9	9
3 ½	12	11	12	11	13
4	16.5	13	13	12	17
5	21	15	15	13	20
6	26	17	19.5	18	27
8	42	28	30	28	47
10	54	40	41	36	67
12	88	61	65	60	123
14	114	83	85	77	139
16	142	95	93	104	187
18	165	120	120	146	217
20	197	148	155	159	283
24	268	204	210	195	415

300 Pound Forged ANSI Flanges

Nominal Pipe Size	Weld Neck	Socket Weld & Slip on	Threaded	Lap Joint	Blind
½	2	1.5	1.5	1.5	2
¾	3	2.5	2.5	2.5	3
1	4	3	3	3	4
1 ¼	5	4.5	4.5	4.5	6
1 ½	7	6.5	6.5	6.5	7
2	8	7	7	7	8
2 ½	12	10	10	10	12
3	18	13	14	14.5	16
3 ½	20	16	16	16	21
4	26.5	23.5	24	24	28
5	36	29	31	26	37
6	45	36	36	38	48
8	69	56	56	55	79
10	100	77	80	88	122
12	142	113	110	139	183
14	206	159	164	184	241
16	249	210	220	234	315
18	306	253	280	305	414
20	369	307	325	375	515
24	519	490	490	530	800

600 Pound Forged ANSI Flanges

Nominal Pipe Size	Weld Neck	Socket Weld & Slip on	Threaded	Lap Joint	Blind
½	3	2	2	2	2
¾	3.5	3	3	3	3
1	4	3.5	3.5	3.5	4
1 ¼	5.5	4.5	4.5	4.5	6
1 ½	8	6.5	6.5	6.5	8
2	10	8	8	8	10
2 ½	14	12	12	11	15
3	18	15	15	14	20
3 ½	26	21	21	20	29
4	37	33	33	31	41
5	68	63	63	63	68
6	73	80	80	78	86
8	112	97	97	112	139
10	189	177	177	195	231
12	226	215	215	240	295
14	347	259	259	290	378
16	481	366	366	400	527
18	555	476	476	469	665
20	690	612	612	604	855
24	977	876	876	866	1175

ROUND BAR

SIZE	LB/FT
1/8	0.042
.129/.131	0.045
5/32	0.065
.160/.162	0.070
11/64	0.081
3/16	0.094
.191/.193	0.100
7/32	0.128
1/4	0.167
.254/.256	0.174
9/32	0.211
5/16	0.261
.316/.319	0.280
11/32	0.316
3/8	0.376
.379/.382	0.039
13/32	0.441
7/16	0.511
.442/.445	0.530
15/32	0.587
1/2	0.668
.505/.509	0.690
9/16	0.845
19/32	0.942
5/8	1.043
.628/.632	1.062
11/16	1.262
3/4	1.502
.754/.758	1.640
13/16	1.763
7/8	2.044
15/16	2.347
1	2.670
1.006/1.010	2.750
1 1/16	3.014
1 1/8	3.379
1 3/16	3.766
1 1/4	4.173
1 5/16	4.600
1 3/8	5.049
1 7/16	5.518
1 1/2	6.008
1 9/16	6.520
1 5/8	7.051
1 11/16	7.604
1 3/4	8.178
1 13/16	8.773
1 7/8	9.388
1 15/16	10.022
2	10.685
2 1/16	11.362
2 1/8	12.064
2 3/16	12.780
2 1/4	13.520

SIZE	LB/FT
2 5/16	14.28
2 3/8	15.06
2 7/16	15.87
2 1/2	16.69
2 9/16	17.53
2 5/8	18.40
2 11/16	19.29
2 3/4	20.20
2 13/16	21.12
2 7/8	22.07
2 15/16	23.04
3	24.03
3 1/8	26.08
3 1/4	28.21
3 3/8	30.42
3 1/2	32.71
3 5/8	35.09
3 3/4	37.55
3 7/8	40.10
4	42.73
4 1/4	48.23
4 1/2	54.08
4 3/4	60.25
5	66.76
5 1/4	73.60
5 1/2	80.78
5 3/4	88.29
6	96.13
6 1/4	104.36
6 1/2	112.85
6 3/4	121.74
7	130.96
7 1/4	140.45
7 1/2	150.24
7 3/4	160.54
8	170.95
8 1/4	181.92
8 1/2	192.94
8 3/4	204.64
9	216.33
9 1/4	228.70
9 1/2	241.22
9 3/4	254.08
10	267.00
10 1/4	280.81
10 1/2	294.68
10 3/4	308.88
11	323.42
11 1/4	338.42
11 1/2	353.48
12	384.50

FLAT BAR (HARP)

SIZE	LB/FT
1/8 x 1/2	0.213
1/8 x 5/8	0.266
1/8 x 3/4	0.319
1/8 x 1	0.425
1/8 x 1 1/4	0.531
1/8 x 1 1/2	0.638
1/8 x 1 3/4	0.744
1/8 x 2	0.850
3/16 x 1/2	0.319
3/16 x 5/8	0.398
3/16 x 3/4	0.478
3/16 x 1	0.638
3/16 x 1 1/4	0.797
3/16 x 1 1/2	0.956
3/16 x 1 3/4	1.115
3/16 x 2	1.275
3/16 x 2 1/2	1.159
3/16 x 3	1.913
3/16 x 4	2.550
1/4 x 1/2	0.425
1/4 x 5/8	0.531
1/4 x 3/4	0.638
1/4 x 1	0.850
1/4 x 1 1/4	1.063
1/4 x 1 1/2	1.275
1/4 x 1 3/4	1.487
1/4 x 2	1.700
1/4 x 2 1/2	2.125
1/4 x 3	2.550
1/4 x 3 1/2	2.975
1/4 x 4	3.400
1/4 x 5	4.250
1/4 x 6	5.100
5/16 x 3/4	0.797
5/16 x 1	1.063
5/16 x 1 1/4	1.328
5/16 x 1 1/2	1.594
5/16 x 2	2.125
5/16 x 2 1/2	2.656
5/16 x 3	3.188
5/16 x 3 1/2	3.719
5/16 x 4	4.250
3/8 x 1/2	0.638
3/8 x 5/8	0.797
3/8 x 3/4	0.956
3/8 x 1	1.275
3/8 x 1 1/4	1.594
3/8 x 1 1/2	1.913
3/8 x 1 3/4	2.231
3/8 x 2	2.550
3/8 x 2 1/2	3.188
3/8 x 3	3.825
3/8 x 3 1/2	4.463
3/8 x 4	5.100
3/8 x 5	6.375
3/8 x 6	7.650

SIZE	LB/FT
1/2 x 5/8	1.062
1/2 x 3/4	1.275
1/2 x 1	1.700
1/2 x 1 1/4	2.125
1/2 x 1 1/2	2.550
1/2 x 1 3/4	2.975
1/2 x 2	3.400
1/2 x 2 1/2	4.250
1/2 x 3	5.100
1/2 x 3 1/2	5.950
1/2 x 4	6.800
1/2 x 5	8.500
1/2 x 6	10.200
5/8 x 1	2.125
5/8 x 1 1/4	2.656
5/8 x 1 1/2	3.188
5/8 x 2	4.250
5/8 x 2 1/2	5.313
5/8 x 3	6.375
5/8 x 3 1/2	7.438
5/8 x 4	8.500
5/8 x 5	10.625
5/8 x 6	12.750
3/4 x 1	2.550
3/4 x 1 1/4	3.188
3/4 x 1 1/2	3.825
3/4 x 1 3/4	4.463
3/4 x 2	5.100
3/4 x 2 1/2	6.375
3/4 x 3	7.650
3/4 x 3 1/2	8.925
3/4 x 4	10.200
3/4 x 5	12.750
3/4 x 6	15.300
1 x 1 1/4	4.250
1 x 1 1/2	5.100
1 x 1 3/4	5.950
1 x 2	6.800
1 x 2 1/2	8.500
1 x 3	10.200
1 x 3 1/2	11.900
1 x 4	13.600
1 x 5	17.000
1 x 6	20.400
1 1/4 x 1 1/2	6.375
1 1/4 x 2	8.500
1 1/4 x 3	12.750
1 1/4 x 4	17.000
1 1/4 x 6	25.200
1 1/2 x 2	10.200
1 1/2 x 2 1/2	12.750
1 1/2 x 3	15.300
1 1/2 x 4	20.400
1 1/2 x 5	20.500
1 1/2 x 6	30.600
2 x 3	20.400
2 x 4	27.200

1. Annealing — The heating and cooling of steel to remove stresses, alter physical, mechanical and metallurgical properties, increase corrosion resistance, or to thermally treat steel prior to age hardening.

2. Bright Annealing — Annealing carried out in a controlled, furnace atmosphere so that surface oxidation is reduced to a minimum and the surface remains relatively bright.

3. As-welded — Tubular products not subject to thermal treatment after welding.

4. Butt Welding — Joining two edges or ends by placing one against the other and welding them.

5. Cold Drawn — Refers to tubing drawn in the cold state through a hardened steel or carboloy die, either with or without a mandrel on the inside. The purpose of cold drawing is to reduce the O.D. or wall, or both, to produce smooth surface finishes, obtain closer tolerances and to promote weld area recrystallization during subsequent annealing.

6. Concentricity — The center of the inside diameter (of a tubular product) is consistent with the center of the outside diameter.

7. Full Finished — Refers to tubular products in which the weld has been processed to produce uniform strength and dimensions, and subsequently annealed to obtain proper corrosion resistance.

8. Fusion Welding — A term which refers to the union of metals by fusion, using acetylene blow-pipe, electric current or the thermite reaction.

9. Passivating — Exposure of stainless steel to a dilute solution of nitric or other oxidizing acid to remove free iron from the surfaces and improve corrosion resistance.

10. Pickle — Chemical or electrochemical removal of surface oxides.

11. Quenching — A process of rapid cooling from an elevated temperature by contact with liquids, gases, or solids.

12. Resistance Welding — A welding process in which the work pieces are heated by passage of an electric current through the contact.

13. Stress Relieving — A process of reducing residual stresses in a metal object by heating the object to a suitable temperature and holding for a sufficient time. This treatment may be applied to relieve stresses induced by casting, quenching, normalizing, machining, cold working or welding.

14. Weld Bead — The built-up portion of a fusion weld, formed either from the filler metal or from the melting of the parent metal.

Fitting Specification Summary and Comparison

CLASS	WP-S	WP-W	WP-WX	CR
Applicable Standards	Ansi B16.9, B16.11, Or B16.28	Ansi B16.9 Or B16.28	Ansi B16.9 Or B16.28	Mss Sp-43
Pressure Ratings	Same As Pipe With Which Used	Same As Pipe With Which Used	Same As Pipe With Which Used	Same As Pipe With Which Used
X-Rays of Welds	None Required	None Required	All Per UW-51	None Required
Welding Procedures	N/A	N/A	ASME section IX	N/A
Cleaning	Free From Scale And Passivated	Free From Scale And Passivated	Free From Scale And Passivated	Free From Scale And Passivated

DIMENSIONS & WEIGHTS OF SEAMLESS AND WELDED PIPE

Pipe Size (In.)	O.D. In Inches	5S	5	10S	10	20	30	40	40S STD.	60	80	80S XH	100	120	140	160	DBL XXH
1/8	0.405		0.035	0.049	0.049			0.068	0.068		0.095	0.095					
			0.1383	0.1863	0.1863			0.2447	0.2447		0.3145	0.3145					
1/4	0.54		0.049	0.065	0.065			0.088	0.088		0.119	0.119					
			0.257	0.3297	0.3297			0.4248	0.4248		0.5351	0.5351					
3/8	0.675		0.049	0.065	0.065			0.091	0.091		0.126	0.126					
			0.3276	0.4235	0.4235			0.5676	0.5676		0.7388	0.7388					
1/2	0.84	0.065	0.065	0.083	0.083			0.109	0.109		0.147	0.147				0.187	0.294
		0.5383	0.5383	0.671	0.671			0.851	0.851		1.088	1.088				1.304	1.714
3/4	1.05	0.065	0.065	0.083	0.083			0.113	0.113		0.154	0.154				0.218	0.308
		0.6838	0.6838	0.8572	0.8572			1.131	1.131		1.474	1.474				1.937	2.441
1	1.315	0.065	0.065	0.109	0.109			0.133	0.133		0.179	0.179				0.25	0.358
		0.8678	0.8678	1.404	1.404			1.679	1.679		2.172	2.172				2.844	3.659
1-1/4	1.66	0.065	0.065	0.109	0.109			0.14	0.14		0.191	0.191				0.25	0.382
		1.107	1.107	1.806	1.806			2.273	2.273		2.997	2.997				3.765	5.214
1-1/2	1.9	0.065	0.065	0.109	0.109			0.145	0.145		0.2	0.2				0.281	0.4
		1.274	1.274	2.085	2.085			2.718	2.718		3.361	3.361				4.859	6.408
2	2.375	0.065	0.065	0.109	0.109			0.154	0.154		0.218	0.218				0.343	0.436
		1.604	1.604	2.638	2.638			3.653	3.653		5.022	5.022				7.444	9.029
2-1/2	2.875	0.083	0.083	0.12	0.12			0.203	0.203		0.276	0.276				0.375	0.552
		2.475	2.475	3.531	3.531			5.793	5.793		7.661	7.661				10.01	13.7
3	3.5	0.083	0.083	0.12	0.12			0.216	0.216		0.3	0.3				0.438	0.6
		3.029	3.029	4.332	4.332			7.576	7.576		10.25	10.25				14.32	18.58
3-1/2	4	0.083	0.083	0.12	0.12			0.226	0.226		0.318	0.318					0.636
		3.472	3.472	4.973	4.973			9.109	9.109		12.51	12.51					22.85
4	4.5	0.083	0.083	0.12	0.12			0.237	0.237	0.281	0.337	0.337		0.438		0.531	0.674
		3.915	3.915	5.613	5.613			10.79	10.79	12.66	14.98	14.98		19.01		22.51	27.54
4-1/2	5								0.247			0.355					0.71
																	32.53
5	5.563	0.109	0.109	0.134	0.134			0.258	0.258		0.375	0.375		0.5		0.625	0.75
		6.349	6.349	7.77	7.77			14.62	14.62		20.78	20.78		27.04		32.96	38.55
6	6.625	0.109	0.109	0.134	0.134			0.28	0.28		0.432	0.432		0.562		0.719	0.864
		7.585	7.585	9.29	9.289			18.97	18.97		28.57	28.57		36.39		45.3	73.882
7	7.625								0.301			0.5					
									23.57			38.05					
8	8.625	0.109	0.109	0.148	0.148	0.25	0.277	0.322	0.322	0.406	0.5	0.5	0.594	0.719	0.812	0.906	0.875
		9.914	9.914	13.4	13.4	22.36	24.7	28.55	28.55	35.64	43.39	43.39	50.87	60.63	67.76	74.69	73.88
9	9.625								0.342			0.5					
									33.9			48.72					
10	10.75	0.134	0.134	0.165	0.165	0.25	0.307	0.365	0.365	0.5	0.593	0.5	0.719	0.844	1	1.125	1
		15.19	15.19	18.85	18.7	28.04	34.24	40.48	40.48	54.74	64.33	54.74	76.93	89.2	104.1	115.7	104.1
11	11.75								0.375			0.5					
									45.55			60.07					
12	12.75	0.156	0.165	0.18	0.18	0.25	0.33	0.406	0.375	0.562	0.687	0.5	0.844	1	1.125	1.312	1
		21.07	22.18	24.2	24.2	33.38	43.77	53.53	49.56	73.16	88.5	65.42	107.2	125.5	139.7	160.3	125.5
14	14	0.156		0.188	0.25	0.312	0.375	0.438	0.375	0.594	0.75	0.5	0.938	1.094	1.25	1.406	
		23.07		27.73	36.71	45.68	54.57	63.37	54.57	84.91	106.1	72.09	130.7	150.7	170.2	189.1	
16	16	0.165		0.188	0.25	0.312	0.375	0.5	0.375	0.656	0.843	0.5	1.031	1.219	1.438	1.594	
		27.9		31.75	42.05	52.36	62.58	82.77	62.58	107.5	136.5	82.77	164.8	192.3	223.5		
18	18	0.165		0.188	0.25	0.312	0.437	0.562	0.375	0.75	0.937	0.5	1.156	1.375	1.562	1.781	
		31.43		35.76	47.39	59.03	82.15	104.8	70.59	138.2	170.8	93.45	208	244.1	274.2	308.5	
20	20	0.188		0.218	0.25	0.375	0.5	0.594	0.375	0.812	1.031	0.5	1.28	1.5	1.75	1.969	
		39.78		46.05	52.73	78.6	104.13	122.9	78.6	166.4	208.9	104.1	256.1	296.4	341.1	379.17	
24	24	0.218		0.25	0.25	0.375	0.562	0.687	0.375	0.968	1.218	0.5	1.531	1.812	2.062	2.344	
		55.37		63.41	63.41	94.62	140.8	171.2	94.62	238.1	296.4	125.5	367.4	429.4	483.1	542.13	
26	26				0.312	0.5			0.375			0.5					
					85.6	136.2			102.6			136.2					
28	28				0.312	0.5	0.625		0.375			0.5					
					92.26	146.85	182.7		110.6			146.8					
30	30	0.25			0.312	0.5	0.625		0.375			0.5					
		81.03			98.93	157.53	196.1		118.6			157.5					
32	32				0.312	0.5	0.625	0.688	0.375			0.5					
					105.6	168.2	209.4	230.1	126.7			168.2					
34	34				0.312	0.5	0.625	0.688	0.375			0.5					
					112.25	178.9	222.8	244.8	134.7			178.9					
36	36				0.312		0.625	0.75	0.375			0.5					
					118.9		236.1	282.3	142.7			189.6					
40	40								0.375			0.5					
									158.7			210.93					
44	44								0.375			0.5					
									174.72			232.29					
48	48								0.375			0.5					
									190.74			253.65					

52" & LARGER - WALL THICKNESS / LBS. PER FT.

52	WT	0.375	0.5	0.625	0.75	0.875
	LBS/FT	206.76	275.01	342.93	410.51	477.76
56	WT	0.375	0.5	0.625	0.75	0.875
	LBS/FT	222.78	296.37	369.93	442.55	515.14
60	WT	0.375	0.5	0.625	0.75	0.875
	LBS/FT	238.8	317.73	396.33	474.59	552.52

Please Note:

Wall Thickness

Weight

WEIGHT FACTORS FOR NICKEL AND OTHER ALLOYS

Titanium	0.582
Carbon Steel	0.993
Alloy 2205	0.997
Alloy 800	1.025
Alloy 825	1.039
Alloy 625	1.068
Alloy 600	1.074
Alloy C-276	1.129
Alloy 400	1.139
Nickel	1.146
Cu-Nickel 70/300	1.18

WALL THICKNESS IN INCHES
STEEL WEIGHT IN LBS. PER FT.

To calculate the theoretical weight of various metals: multiply the weight of an equivalent piece of steel by the appropriate factor (see chart above).

To calculate weight per ft. for round steel tubing: (Diameter - wall) x (wall x 10.68) = LBS. per ft.

DIMENSIONS & WEIGHTS OF SEAMLESS AND WELDED PIPE UP TO 24”

Pipe Size (In.)	O.D. In Inches	5S	5	10S	10	20	30	40	40S STD.	60	80	80S XH	100	120	140	160	DBL XXH
1/8	0.405		0.035	0.049	0.049			0.068	0.068		0.095	0.095					
			0.1383	0.1863	0.1863			0.2447	0.2447		0.3145	0.3145					
1/4	0.54		0.049	0.065	0.065			0.088	0.088		0.119	0.119					
			0.257	0.3297	0.3297			0.4248	0.4248		0.5351	0.5351					
3/8	0.675		0.049	0.065	0.065			0.091	0.091		0.126	0.126					
			0.3276	0.4235	0.4235			0.5676	0.5676		0.7388	0.7388					
1/2	0.84	0.065	0.065	0.083	0.083			0.109	0.109		0.147	0.147				0.187	0.294
		0.5383	0.5383	0.671	0.671			0.851	0.851		1.088	1.088				1.304	1.714
3/4	1.05	0.065	0.065	0.083	0.083			0.113	0.113		0.154	0.154				0.218	0.308
		0.6838	0.6838	0.8572	0.8572			1.131	1.131		1.474	1.474				1.937	2.441
1	1.315	0.065	0.065	0.109	0.109			0.133	0.133		0.179	0.179				0.25	0.358
		0.8678	0.8678	1.404	1.404			1.679	1.679		2.172	2.172				2.844	3.659
1-1/4	1.66	0.065	0.065	0.109	0.109			0.14	0.14		0.191	0.191				0.25	0.382
		1.107	1.107	1.806	1.806			2.273	2.273		2.997	2.997				3.765	5.214
1-1/2	1.9	0.065	0.065	0.109	0.109			0.145	0.145		0.2	0.2				0.281	0.4
		1.274	1.274	2.085	2.085			2.718	2.718		3.361	3.361				4.859	6.408
2	2.375	0.065	0.065	0.109	0.109			0.154	0.154		0.218	0.218				0.343	0.436
		1.604	1.604	2.638	2.638			3.653	3.653		5.022	5.022				7.444	9.029
2-1/2	2.875	0.083	0.083	0.12	0.12			0.203	0.203		0.276	0.276				0.375	0.552
		2.475	2.475	3.531	3.531			5.793	5.793		7.661	7.661				10.01	13.7
3	3.5	0.083	0.083	0.12	0.12			0.216	0.216		0.3	0.3				0.438	0.6
		3.029	3.029	4.332	4.332			7.576	7.576		10.25	10.25				14.32	18.58
3-1/2	4	0.083	0.083	0.12	0.12			0.226	0.226		0.318	0.318					0.636
		3.472	3.472	4.973	4.973			9.109	9.109		12.51	12.51					22.85
4	4.5	0.083	0.083	0.12	0.12			0.237	0.237	0.281	0.337	0.337		0.438		0.531	0.674
		3.915	3.915	5.613	5.613			10.79	10.79	12.66	14.98	14.98		19.01		22.51	27.54
4-1/2	5								0.247			0.355					0.71
																	32.53
5	5.563	0.109	0.109	0.134	0.134			0.258	0.258		0.375	0.375		0.5		0.625	0.75
		6.349	6.349	7.77	7.77			14.62	14.62		20.78	20.78		27.04		32.96	38.55
6	6.625	0.109	0.109	0.134	0.134			0.28	0.28		0.432	0.432		0.562		0.719	0.864
		7.585	7.585	9.29	9.289			18.97	18.97		28.57	28.57		36.39		45.3	73.882
7	7.625								0.301			0.5					
									23.57			38.05					
8	8.625	0.109	0.109	0.148	0.148	0.25	0.277	0.322	0.322	0.406	0.5	0.5	0.594	0.719	0.812	0.906	0.875
		9.914	9.914	13.4	13.4	22.36	24.7	28.55	28.55	35.64	43.39	43.39	50.87	60.63	67.76	74.69	73.88
9	9.625								0.342			0.5					
									33.9			48.72					
10	10.75	0.134	0.134	0.165	0.165	0.25	0.307	0.365	0.365	0.5	0.593	0.5	0.719	0.844	1	1.125	1
		15.19	15.19	18.85	18.7	28.04	34.24	40.48	40.48	54.74	64.33	54.74	76.93	89.2	104.1	115.7	104.1
11	11.75								0.375			0.5					
									45.55			60.07					
12	12.75	0.156	0.165	0.18	0.18	0.25	0.33	0.406	0.375	0.562	0.687	0.5	0.844	1	1.125	1.312	1
		21.07	22.18	24.2	24.2	33.38	43.77	53.53	49.56	73.16	88.5	65.42	107.2	125.5	139.7	160.3	125.5
14	14	0.156		0.188	0.25	0.312	0.375	0.438	0.375	0.594	0.75	0.5	0.938	1.094	1.25	1.406	
		23.07		27.73	36.71	45.68	54.57	63.37	54.57	84.91	106.1	72.09	130.7	150.7	170.2	189.1	
16	16	0.165		0.188	0.25	0.312	0.375	0.5	0.375	0.656	0.843	0.5	1.031	1.219	1.438	1.594	
		27.9		31.75	42.05	52.36	62.58	82.77	62.58	107.5	136.5	82.77	164.8	192.3	223.5		
18	18	0.165		0.188	0.25	0.312	0.437	0.562	0.375	0.75	0.937	0.5	1.156	1.375	1.562	1.781	
		31.43		35.76	47.39	59.03	82.15	104.8	70.59	138.2	170.8	93.45	208	244.1	274.2	308.5	
20	20	0.188		0.218	0.25	0.375	0.5	0.594	0.375	0.812	1.031	0.5	1.28	1.5	1.75	1.969	
		39.78		46.05	52.73	78.6	104.13	122.9	78.6	166.4	208.9	104.1	256.1	296.4	341.1	379.17	
24	24	0.218		0.25	0.25	0.375	0.562	0.687	0.375	0.968	1.218	0.5	1.531	1.812	2.062	2.344	
		55.37		63.41	63.41	94.62	140.8	171.2	94.62	238.1	296.4	125.5	367.4	429.4	483.1	542.13	

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Titanium	0.582
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Alloy 400	1.139
Nickel	1.146
Cu-Nickel 70/300	1.18

Please Note:

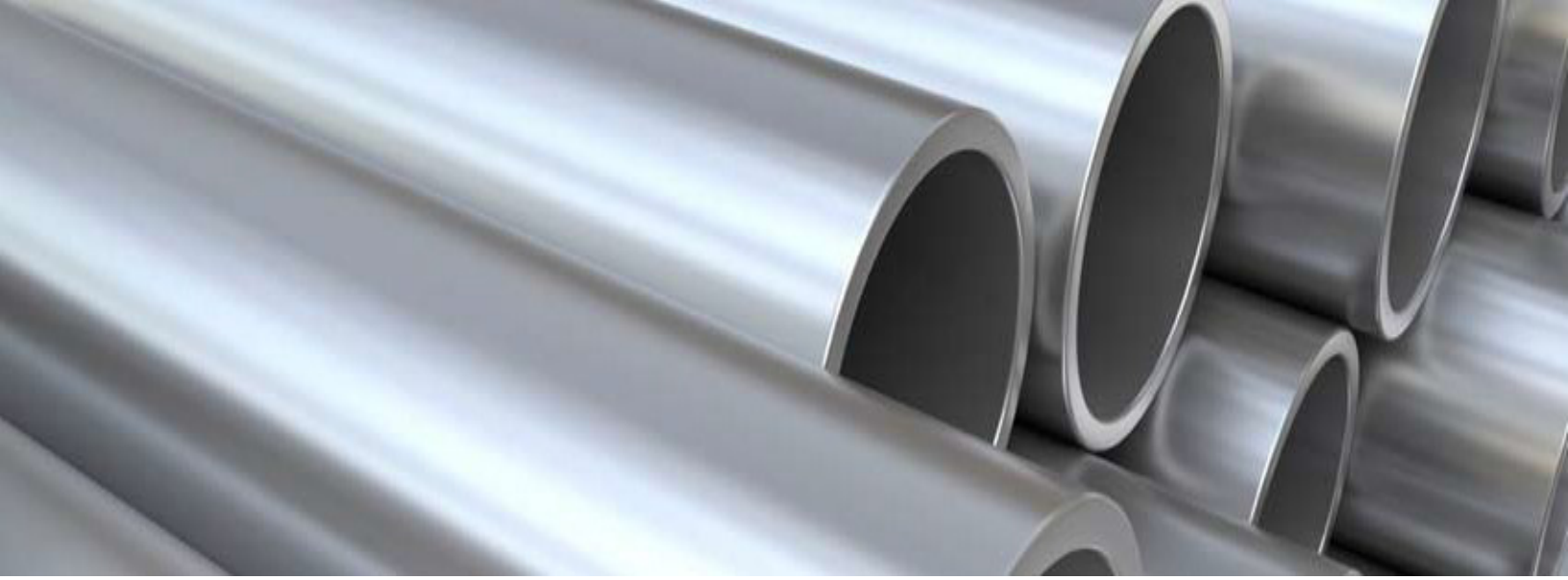
Wall Thickness

Weight

WALL THICKNESS IN INCHES
STEEL WEIGHT IN LBS. PER FT.

To calculate the theoretical weight of various metals: multiply the weight of an equivalent piece of steel by the appropriate factor (see chart above).

To calculate weight per ft. for round steel tubing: (Diameter - wall) x (wall x 10.68) = LBS. per ft.



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