



# **NEXUS FORGE INDUSTRIES**

**ISO 9001:2008 Certified company**

## **Nexus Forge Industries**

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**Stainless Steel**

**Alloy Steel**

**Carbon Steel**



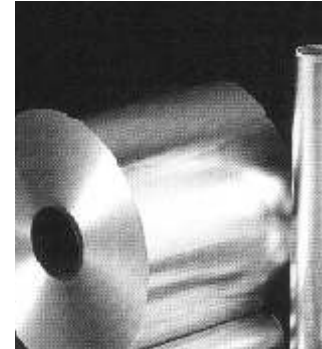
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## **CUSTOMER SATISFACTION THROUGH EFFICIENT LOGISTICS**





We are a professionally managed company started by a team of dynamic young Entrepreneurs. We are in the business of Manufacturing, Importing & Exporting & Stocking of all Ferrous & Non-ferrous metals/products used in various core industries.



We are one of the leading manufacturers, exporters & suppliers of Stainless Steel, Carbon Steel, Alloy Steel, Copper, Brass, Monel, Inconel, Aluminium, Hastalloy, Lead in the shape of Pipes, Tubes, Rods, Sheets, Plates, Wires, Angles, Coils, Strips and the entire range of Pipes Fittings such as BW/SW/Screwed/ Forged & Compression Type with Ferrules such as Elbows, Tees, Reducers, Stubends, Flanges, Unions, Caps, Nipples, Couplings, Elbowlets, Weldolets, Nuts, Bolts, Studs, Washers, Valves & Gaskets etc.



Right product for the right requirement at the right price, i.e. rather than a mere supplier of the product we take utmost efforts in understanding the client's requirement, identifying the need product at the right price.



Over a decade of successful growth has prompted us to look into other export markets with renewed vigour. Today we are exporting to various countries like US, European, African, Far East etc. What makes us tick and what is our common hallmark is an eye for quality & a true sense of service.



We will be glad if you could register us in your list of your approved vendors & send us your regular enquiries.

## SUMMARY OF THE MAIN ASTM STANDARDS GENERALLY USED FOR PIPING

| ASTM   | Grade     | Chemical requirement percent (%) |           |       |           |           |           |           |           |         |        |                           |                         |  | Mechanical requirements   |           |            |           |  |
|--------|-----------|----------------------------------|-----------|-------|-----------|-----------|-----------|-----------|-----------|---------|--------|---------------------------|-------------------------|--|---|-----------|------------|-----------|--|
|        |           | C Max                            | MN max    | P max | S max     | Si max    | Ni        | Cr        | Mo        | Cu      | Others | Tensile Strength mini-Mpa | Yield Strength mini-MPa | Elong. mini %                            | Impact test at C<br>F   |           |            |           |  |
| A53    | A         | 0.25                             | 0.95      | 0.05  | 0.06      |           | 0.40max   | 0.40max   | 0.15max   | 0.40max |        |                           |                         |  | 330   | 205       | 36         |           |  |
|        | B         | 0.30                             | 1.20      | 0.05  | 0.06      |           | 0.40max   | 0.40max   | 0.15max   | 0.40max |        |                           |                         |  | 415   | 240       | 29.5       |           |  |
| A106   | A         | 0.25                             | 0.27-0.93 | 0.035 | 0.035     | 0.10min   | 0.40max   | 0.40max   | 0.15max   | 0.40max |        |                           |                         |  | 330   | 205       | L35-T25    |           |  |
|        | B         | 0.30                             | 0.29-1.06 | 0.035 | 0.035     | 0.10min   | 0.40max   | 0.40max   | 0.15max   | 0.40max |        |                           |                         |  | 415   | 240       | L30-T16.5  |           |  |
|        | C         | 0.35                             | 0.29-1.06 | 0.035 | 0.035     | 0.10min   | 0.40max   | 0.40max   | 0.15max   | 0.40max |        |                           |                         |  | 485   | 275       | L30-T16.5  |           |  |
| A312   | TP 304    | 0.08                             | 2.00      | 0.040 | 0.030     | 0.75      | 8.00-11.0 | 18.0-20.0 |           |         |        |                           |                         |  | 515   | 205       | L35-T25    |           |  |
|        | TP 304L   | 0.035                            | 2.00      | 0.040 | 0.030     | 0.75      | 8.00-13.0 | 18.0-20.0 |           |         |        |                           |                         |  | 485   | 170       | L35-T25    |           |  |
|        | TP 310S   | 0.08                             | 2.00      | 0.045 | 0.030     | 0.75      | 19.0-22.0 | 24.0-26.0 | 0.75 max  |         |        |                           |                         |  | 515   | 205       | L35-T25    |           |  |
|        | TP 316    | 0.08                             | 2.00      | 0.040 | 0.030     | 0.75      | 11.0-14.0 | 16.0-18.0 | 2.00-3.00 |         |        |                           |                         |  | 515   | 205       | L35-T25    |           |  |
|        | TP316L    | 0.035                            | 2.00      | 0.040 | 0.030     | 0.75      | 10.0-15.0 | 16.0-18.0 | 2.00-3.00 |         |        |                           |                         |  | 485   | 170       | L35-T25    |           |  |
|        | TP317L    | 0.035                            | 2.00      | 0.040 | 0.030     | 0.75      | 11.0-15.0 | 18.0-20.0 | 3.00-4.00 |         |        |                           |                         |  | 515   | 205       | L35-T25    |           |  |
|        | TP 321    | 0.08                             | 2.00      | 0.040 | 0.030     | 0.75      | 9.00-13.0 | 17.0-20.0 |           |         |        |                           |                         |  | 515   | 205       | L35-T25    |           |  |
|        | TP 347    | 0.08                             | 2.00      | 0.040 | 0.030     | 0.75      | 9.00-13.0 | 17.0-20.0 |           |         |        |                           |                         |  | 515   | 205       | L35-T25    |           |  |
|        | 3         | 0.19                             | 0.31-0.64 | 0.025 | 0.025     | 0.18-0.37 | 3.18-3.82 |           |           |         |        |                           |                         |  | 450   | 240       | L30-T20    | -100 -150 |  |
| A333   | 4         | 0.12                             | 0.50-1.05 | 0.025 | 0.025     | 0.08-0.37 | 0.47-0.98 | 0.44-1.01 |           |         |        |                           |                         |  | 415   | 240       | L30-T16.5  | -100 -150 |  |
|        | 6         | 0.30                             | 0.29-1.06 | 0.025 | 0.025     | 0.10 min  |           |           |           |         |        |                           |                         | 415                                      | 240   | L30-T16.5 | - 45 - 50  |           |  |
| A335   | 7         | 0.19                             | 0.90      | 0.025 | 0.025     | 0.13-0.32 | 2.03-2.57 |           |           |         |        |                           |                         | 450                                      | 240   | L30-T22   | - 75 - 100 |           |  |
|        | 8         | 0.13                             | 0.90      | 0.025 | 0.025     | 0.13-0.32 | 8.40-9.60 |           |           |         |        |                           |                         | 690                                      | 515   | L22       | -195 -320  |           |  |
|        | 9         | 0.20                             | 0.40-1.06 | 0.025 | 0.025     | 1.60-2.24 |           |           |           |         |        |                           |                         | 435                                      | 315   | L28       | - 75 - 100 |           |  |
|        | P1        | 0.10-0.20                        | 0.30-0.80 | 0.025 | 0.025     | 0.10-0.05 |           |           | 0.44-0.65 |         |        |                           |                         |  | 380   | 205       | L30-T20    |           |  |
|        | P2        | 0.10-0.20                        | 0.30-0.61 | 0.025 | 0.025     | 0.10-0.30 |           |           | 0.50-0.81 |         |        |                           |                         |  | 380   | 205       | L30-T20    |           |  |
|        | P5        | 0.15                             | 0.30-0.60 | 0.025 | 0.025     | 0.50      |           |           | 4.00-6.00 |         |        |                           |                         |  | 415   | 205       | L30-T20    |           |  |
|        | P9        | 0.15                             | 0.30-0.60 | 0.025 | 0.025     | 0.25-1.00 |           |           | 8.00-10.0 |         |        |                           |                         |  | 415   | 205       | L30-T20    |           |  |
|        | P11       | 0.05-0.15                        | 0.30-0.60 | 0.025 | 0.025     | 0.50-1.00 |           |           | 1.00-1.50 |         |        |                           |                         |  | 415   | 205       | L30-T20    |           |  |
|        | P12       | 0.05-0.15                        | 0.30-0.61 | 0.025 | 0.025     | 0.50      |           |           | 0.80-1.25 |         |        |                           |                         |  | 415   | 220       | L30-T20    |           |  |
| P15    | 0.05-0.15 | 0.30-0.60                        | 0.025     | 0.025 | 1.15-1.65 |           |           | 0.44-0.65 |           |         |        |                           |                         | 415                                      | 205   | L30-T20   |            |           |  |
| P21    | 0.05-0.15 | 0.30-0.60                        | 0.025     | 0.025 | 0.50      |           |           | 2.65-3.35 |           |         |        |                           |                         | 415                                      | 205   | L30-T20   |            |           |  |
| P22    | 0.05-0.15 | 0.30-0.60                        | 0.025     | 0.025 | 0.50      |           |           | 1.90-2.60 |           |         |        |                           |                         | 415                                      | 205   | L30-T20   |            |           |  |
| P91    | 0.08-0.12 | 0.30-0.60                        | 0.025     | 0.025 | 0.20-0.50 | 0.40max   | 8.00-9.50 | 0.85-1.05 |           |         |        |                           |                         | 585                                      | 415   | L20       |            |           |  |
| A358   | TP304     | 0.08                             | 2.00      | 0.045 | 0.030     | 0.75      | 8.0-10.50 | 18.0-20.0 | -         |         |        |                           |                         |  | Class 1 : Double welded pipes & full Radiography                              |           |            |           |  |
|        | TP310     | 0.08                             | 2.00      | 0.045 | 0.030     | 0.50      | 19.0-22.0 | 24.0-26.0 | -         |         |        |                           |                         |  | Class 2 : Double welded no Radiography  |           |            |           |  |
|        | TP316     | 0.08                             | 2.00      | 0.045 | 0.030     | 0.75      | 10.0-14.0 | 16.0-18.0 | 2.0-3.0   |         |        |                           |                         |  | Class 3 : Single welded full Radiography                                      |           |            |           |  |
|        | TP316L    | 0.08                             | 2.00      | 0.045 | 0.030     | 0.75      | 10.0-14.0 | 16.0-18.0 | 2.0-3.0   |         |        |                           |                         |  | Class 4 : Single welded full Radiography root pass without addition of filler |           |            |           |  |
|        | TP317L    | 0.030                            | 2.00      | 0.045 | 0.030     | 0.75      | 11.0-15.0 | 18.0-20.0 | 3.0-4.0   |         |        |                           |                         |  | Class 5 : Double Welded spot Radiography                                      |           |            |           |  |
|        | TP321     | 0.08                             | 2.00      | 0.045 | 0.030     | 0.75      | 9.0-12.0  | 17.0-19.0 | -         |         |        |                           |                         |  | Class 5 : Double Welded spot Radiography                                      |           |            |           |  |
| TP 347 | 0.08      | 2.00                             | 0.045     | 0.030 | 0.75      | 9.0-13.0  | 17.0-19.0 | -         |           |         |        |                           |                         | Class 5 : Double Welded spot Radiography |   |           |            |           |  |

Formula - Sheet Width Required for Rolled & Welded Pipes - O. D. (mm) - Thickness (mm) x 3.14 = Sheet Width.

L-Longitudinal  
T- Transverse

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

| ASTM                       |         | Chemical requirements percent (%) |           |        |       |           |           |            |           |    |                       |         | Mechanical requirements   |                         |              |          |                   |  |
|----------------------------|---------|-----------------------------------|-----------|--------|-------|-----------|-----------|------------|-----------|----|-----------------------|---------|---------------------------|-------------------------|--------------|----------|-------------------|--|
|                            |         | Grade                             | C max     | Mn max | P max | S max     | Si max    | Ni         | Cr.       | Mo | Cu                    | Others  | Tensile Strength mini-MPa | Yield Strength mini-MPa | Elong mini % | Brinell  | Hardness Rockwell |  |
|                            | 304     | 0.08                              | 2.00      | 0.045  | 0.030 | 0.75      | 8.00-10.5 | 18.00-20.0 |           |    |                       | 515     | 205                       | 40                      | 201          | 92       |                   |  |
|                            | 304L    | 0.03                              | 2.00      | 0.045  | 0.030 | 0.75      | 8.00-12.0 | 18.00-20.0 |           |    |                       | 485     | 170                       | 40                      | 201          | 92       |                   |  |
|                            | 310     | 0.08                              | 2.00      | 0.045  | 0.030 | 1.50      | 19.0-22.0 | 24.0-26.0  |           |    |                       | 515     | 205                       | 40                      | 217          | 95       |                   |  |
|                            | 316     | 0.08                              | 2.00      | 0.045  | 0.030 | 0.75      | 10.0-14.0 | 16.0-18.0  | 2.00-3.00 |    |                       | 515     | 205                       | 40                      | 217          | 95       |                   |  |
|                            | 316L    | 0.03                              | 2.00      | 0.045  | 0.030 | 0.75      | 10.0-14.0 | 16.0-18.0  | 2.00-3.00 |    |                       | 485     | 170                       | 40                      | 217          | 95       |                   |  |
| <b>A240</b>                | 317L    | 0.03                              | 2.00      | 0.045  | 0.030 | 0.75      | 11.0-15.0 | 18.0-20.0  | 3.00-4.00 |    |                       | 515     | 205                       | 40                      | 217          | 95       |                   |  |
|                            | 321     | 0.08                              | 2.00      | 0.045  | 0.030 | 0.75      | 9.00-12.0 | 17.0-19.0  |           |    | Ti>5%C<0.70           | 515     | 205                       | 40                      | 217          | 95       |                   |  |
|                            | 347     | 0.08                              | 2.00      | 0.045  | 0.030 | 0.75      | 9.00-13.0 | 17.0-19.0  |           |    | Cu + Nb > 100C < 1.10 | 515     | 205                       | 40                      | 201          | 92       |                   |  |
|                            | 2       | 0.05-0.21                         | 0.55-0.80 | 0.035  | 0.040 | 0.15-0.40 |           | 0.50-0.80  | 0.45-0.60 |    |                       | Class 1 | Class 2                   |                         |              |          |                   |  |
|                            | 5       | 0.15                              | 0.30-0.60 | 0.04   | 0.030 | 0.050     |           | 4.00-6.00  | 0.45-0.65 |    |                       | 380     | 486                       | 230                     | 310          | max201HB | max92HRB          |  |
| <b>A 387 Class1 Class2</b> | 7       | 0.15                              | 0.30-0.60 | 0.030  | 0.030 | 1.00      |           | 6.00-8.00  | 0.45-0.65 |    |                       | 415     | 515                       | 205                     | 310          | max202HB | max92HRB          |  |
|                            | 9       | 0.15                              | 0.30-0.60 | 0.030  | 0.030 | 1.00      |           | 8.00-10.0  | 0.90-1.10 |    |                       | 415     | 515                       | 205                     | 310          | max217HB | max95HRB          |  |
|                            | 11      | 0.04-0.17                         | 0.40-0.65 | 0.035  | 0.04  | 0.50-0.80 |           | 1.00-1.50  | 0.45-0.65 |    |                       | 415     | 515                       | 205                     | 310          | max217HB | max95HRB          |  |
|                            | 12      | 0.04-0.17                         | 0.40-0.65 | 0.035  | 0.04  | 0.15-0.40 |           | 0.80-1.15  | 0.45-0.60 |    |                       | 380     | 450                       | 230                     | 275          | max217HB | max95HRB          |  |
|                            | 21      | 0.04-0.17                         | 0.30-0.60 | 0.035  | 0.035 | 0.50      |           | 2.75-3.25  | 0.90-1.10 |    |                       | 415     | 515                       | 205                     | 310          | max217HB | max95HRB          |  |
| <b>A 515</b>               | 22      | 0.05-0.17                         | 0.30-0.60 | 0.035  | 0.035 | 0.50      |           | 2.00-2.50  | 0.90-1.10 |    |                       | 415     | 515                       | 205                     | 310          | max201HB | max92HRB          |  |
|                            | 55      | 0.22                              | 0.90      | 0.035  | 0.04  | 0.15-0.40 |           |            |           |    |                       | 380-515 | 205                       | 27                      |              |          |                   |  |
|                            | 60      | 0.27                              | 0.90      | 0.035  | 0.04  | 0.15-0.40 |           |            |           |    |                       | 415-550 | 220                       | 25                      |              |          |                   |  |
|                            | 65      | 0.31                              | 0.90      | 0.035  | 0.04  | 0.15-0.40 |           |            |           |    |                       | 450-585 | 240                       | 23                      |              |          |                   |  |
|                            | 70      | 0.33                              | 1.20      | 0.035  | 0.04  | 0.15-0.40 |           |            |           |    |                       | 485-620 | 260                       | 21                      |              |          |                   |  |
| <b>A 516</b>               | 55      | 0.20                              | 0.60-1.20 | 0.035  | 0.04  | 0.15-0.40 |           |            |           |    |                       | 380-515 | 205                       | 27                      |              |          |                   |  |
|                            | 60      | 0.23                              | 0.85-1.20 | 0.035  | 0.04  | 0.15-0.40 |           |            |           |    |                       | 415-550 | 202                       | 25                      |              |          |                   |  |
|                            | 65      | 0.26                              | 0.85-1.20 | 0.035  | 0.04  | 0.15-0.40 |           |            |           |    |                       | 450-585 | 240                       | 23                      |              |          |                   |  |
|                            | 70      | 0.28                              | 0.85-1.20 | 0.035  | 0.04  | 0.15-0.40 |           |            |           |    |                       | 485-620 | 260                       | 21                      |              |          |                   |  |
|                            | Class 1 | 0.24                              | 0.70-1.35 | 0.035  | 0.040 | 0.15-0.40 | 0.25 max  | 0.80 max   | 0.35 max  |    |                       | 485-620 | 345                       | 22                      |              |          |                   |  |
| <b>A 537</b>               | Class 2 | 0.24                              | 0.70-1.35 | 0.035  | 0.040 | 0.15-0.40 | 0.25 max  | 0.80 max   | 0.35 max  |    |                       | 550-690 | 415                       | 22                      |              |          |                   |  |

## IS-2062-92 STEEL FOR GENERAL STRUCTURAL PURPOSES

| Grade/Designation | % Chemical Composition |        |       |       | Tensile strength (Min) | Yield Strength (Min) | %Elin gauge length 5.660So | Bend Test | Std.test Piece charpy V Notch Impact Energy Joule min |
|-------------------|------------------------|--------|-------|-------|------------------------|----------------------|----------------------------|-----------|---|
|                   | C max                  | MN max | S max | P max |                        |                      |                            |           |   |
| A FE410 WA        | 0.23                   | 1.5    | 0.050 | 0.050 | 41.8                   | 250                  | 230                        | 3t        | -   |
| B FE410 WB        | 0.22                   | 1.5    | 0.045 | 0.045 | 41.8                   | 250                  | 230                        | t<25mm    | 2t for 27<br>3t for t>25mm                            |
| C FE410 WC        | 0.20                   | 1.5    | 0.040 | 0.040 | 41.8                   | 250                  | 230                        | 2t        | 27  |

## IS-2002-62 STEEL PLATES FOR BOILERS

| Designation | c max | Chemical Composition |       |       | Tensile Test         |                    |                 | Elongation |  |
|-------------|-------|----------------------|-------|-------|----------------------|--------------------|-----------------|------------|--|
|             |       | Si max               | P max | S max | Tensile strength Mpa | Yield Strength Mpa | Test Piece      | %min       |  |
| IS 2002-1   | 0.18  | 0.10-0.35            | 0.040 | 0.040 | 362-442              | 540                | 5.65oSo<br>4oSo | 26<br>30   |  |
| IS 2002-2A  | 0.20  | 0.10-0.35            | 0.050 | 00.50 | 412-491              | 491                | 5.60oSo<br>4oSo | 25<br>29   |  |
| IS 2002-2B  | 0.22  | 0.10-0.35            | 0.050 | 0.050 | 510-608              | 491                | 5.65oSo<br>4oSo | 20<br>24   |  |

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

## TOLERANCE

### DIMENSIONAL VARIATION AS PER ASTM SPECIFICATIONS FOR TUBES

| Tube Specification<br>ASTM  | Out Side Diameter<br>(mm) | Permissible variations in Outside Diameter (mm) |                |       |                | Permissible variations in Wall Thickness (mm) |     |     |                  |     |     |               |     |     |      |     |     | Under All THK. HFS/ CFS/ WLD |     |     |
|---|---------------------------|---|----------------|-------|----------------|---|-----|-----|------------------|-----|-----|---------------|-----|-----|------|-----|-----|------------------------------|-----|-----|
|   |                           | Over  |                | Under |                | Over  |     |     |                  |     |     |               |     |     |      |     |     |                              |     |     |
|   |                           |   |                |       |                | 2.4 Wt.                                       |     |     | >2.4 to 3.8 Ind. |     |     | >3.8-4.6 Ind. |     |     | >4.6 |     |     |                              |     |     |
|   |                           | HF Seamless                                     | CFS and Welded | HFS   | CFS and Welded | HFS   | CFS | WLD | HFS              | CFS | WLD | HFS           | CFS | WLD | HFS  | CFS | WLD |                              |     |     |
| A-213 Seamless Ferritic & Austenitic Tube<br><br>A 249 Welded Heat Ex. & Condenser Tube<br><br>A 269 Seamless & Welded Austenitic S. S. Tubes | Under 25.4                |   | 0.10           |       | 0.10           |   | 20% |     |                  |     |     |               |     |     |      |     |     |                              |     |     |
|   | 25.4 to 38.1 Incl.        |   | 0.15           |       | 0.15           |   |     |     |                  |     |     |               |     |     |      |     |     |                              |     |     |
|   | Over 38.1 to 50.8 Excl.   |   | 0.20           |       | 0.20           | 40%   |     | 18% | 35%              |     | 18% | 33%           |     | 18% | 28%  |     |     |                              | 18% |     |
|   | Over 50.8 to 63.5 Excl.   | 0.4   | 0.25           | 0.8   | 0.25           |   |     |     |                  |     |     |               |     |     |      |     |     |                              |     |     |
|   | Over 63.5 to 76.2 Excl.   |   | 0.30           |       | 0.30           |   | 22% |     |                  |     |     | 22%           |     |     |      | 22% |     |                              |     | 22% |
|   | Over 76.2 to 101.6 Incl.  |   | 0.38           |       | 0.38           |   |     |     |                  |     |     |               |     |     |      |     |     |                              |     |     |
|   | Over 101.6 to 190.5 Incl. |   | 0.38           | 1.2   | 0.64           |   |     |     |                  |     |     |               |     |     |      |     |     |                              |     |     |

### DIMENSIONAL VARIATION AS PER ASTM SPECIFICATIONS FOR PIPES

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

# CARBON STEEL & STAINLESS STEEL WEIGHT PER KG/MTR.

| Nominal pipe size | O, D mm |                |                 |                 |                |                 |                 |                 |                 |                 |                 |                  |                 |                 | Nominal pipe size | FIGURES BASED ON AUSTENITIC STEEL |                |               |                | SHIPPING Vol/m <sup>3</sup> |
|-------------------|---------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|-----------------|-----------------|-------------------|-----------------------------------|----------------|---------------|----------------|-----------------------------|
|                   |         | 10             | 20              | 30              | STD            | 40              | 60              | XS              | 80              | 100             | 120             | 140              | 160             | XXS             |                   | 5S                                | 10S            | 40S           | 80S            |                             |
| 1/8               | 10,30   |                |                 |                 | 1,73<br>0,37   | 1,73<br>0,37    |                 | 2,41<br>0,47    | 2,41<br>0,47    |                 |                 |                  |                 |                 | 1/8               |                                   | 1,24<br>0,28   | 1,73<br>0,36  | 2,41<br>0,48   | 0,0001                      |
| 1/4               | 13,70   |                |                 |                 | 2,24<br>0,63   | 2,24<br>0,63    |                 | 3,02<br>0,80    | 3,02<br>0,80    |                 |                 |                  |                 |                 | 1/4               |                                   | 1,65<br>0,51   | 2,24<br>0,64  | 3,02<br>0,82   | 0,0002                      |
| 3/8               | 17,10   |                |                 |                 | 2,31<br>0,84   | 2,31<br>0,84    |                 | 3,20<br>1,10    | 3,20<br>1,10    |                 |                 |                  |                 |                 | 3/8               |                                   | 1,65<br>0,64   | 2,31<br>0,86  | 3,20<br>1,12   | 0,0003                      |
| 1/2               | 21,30   |                |                 |                 | 2,77<br>1,27   | 2,77<br>1,27    |                 | 3,73<br>1,62    | 3,73<br>1,62    |                 |                 |                  | 4,78<br>1,95    | 7,47<br>2,55    | 1/2               | 1,65<br>0,82                      | 2,11<br>1,01   | 2,77<br>1,30  | 3,73<br>1,65   | 0,0004                      |
| 3/4               | 26,70   |                |                 |                 | 2,87<br>1,69   | 2,87<br>1,69    |                 | 3,91<br>2,20    | 3,91<br>2,20    |                 |                 |                  | 5,56<br>2,90    | 7,82<br>3,64    | 3/4               | 1,65<br>1,04                      | 2,11<br>1,31   | 2,87<br>1,71  | 3,91<br>2,24   | 0,0007                      |
| 1                 | 33,40   |                |                 |                 | 3,38<br>2,50   | 3,38<br>2,50    |                 | 4,55<br>3,24    | 4,55<br>3,24    |                 |                 |                  | 6,35<br>4,24    | 9,09<br>5,45    | 1                 | 1,65<br>1,33                      | 2,77<br>2,13   | 3,38<br>2,55  | 4,55<br>3,29   | 0,0011                      |
| 1 1/4             | 42,20   |                |                 |                 | 3,56<br>3,39   | 3,56<br>3,39    |                 | 4,85<br>4,47    | 4,85<br>4,47    |                 |                 |                  | 6,35<br>5,61    | 9,70<br>7,77    | 1 1/4             | 1,65<br>1,68                      | 2,77<br>2,76   | 3,56<br>3,46  | 4,85<br>4,56   | 0,0018                      |
| 1 1/2             | 48,30   |                |                 |                 | 3,68<br>4,05   | 3,68<br>4,05    |                 | 5,08<br>5,41    | 5,08<br>5,41    |                 |                 |                  | 7,14<br>7,25    | 10,15<br>9,56   | 1 1/2             | 1,65<br>1,95                      | 2,77<br>3,17   | 3,68<br>4,13  | 5,08<br>5,51   | 0,0023                      |
| 2                 | 60,30   |                |                 |                 | 3,91<br>5,44   | 3,91<br>5,44    |                 | 5,54<br>7,48    | 5,54<br>7,48    |                 |                 |                  | 8,74<br>11,11   | 11,07<br>13,44  | 2                 | 1,65<br>2,24                      | 2,77<br>4,01   | 3,91<br>5,54  | 5,54<br>7,63   | 0,0036                      |
| 2 1/2             | 73,00   |                |                 |                 | 5,16<br>8,63   | 5,16<br>8,63    |                 | 7,01<br>11,41   | 7,01<br>11,41   |                 |                 |                  | 9,53<br>14,92   | 14,02<br>20,39  | 2 1/2             | 2,11<br>3,77                      | 3,05<br>5,36   | 5,16<br>8,81  | 7,01<br>11,64  | 0,0053                      |
| 3                 | 88,90   |                |                 |                 | 5,49<br>11,29  | 5,49<br>11,29   |                 | 7,62<br>15,27   | 7,62<br>15,27   |                 |                 |                  | 11,13<br>21,35  | 15,24<br>27,68  | 3                 | 2,11<br>4,60                      | 3,05<br>6,59   | 5,49<br>11,52 | 7,62<br>15,59  | 0,0079                      |
| 3 1/2             | 101,60  |                |                 |                 | 5,74<br>13,57  | 5,74<br>13,57   |                 | 8,08<br>18,63   | 8,08<br>18,63   |                 |                 |                  | -               | -               | 3 1/2             | 2,11<br>5,29                      | 3,05<br>7,55   | 5,74<br>13,84 | 8,08<br>19,01  | 0,0103                      |
| 4                 | 114,30  |                |                 |                 | 6,02<br>16,07  | 6,02<br>16,07   |                 | 8,56<br>22,32   | 8,56<br>22,32   |                 | 11,13<br>28,32  |                  | 13,49<br>33,54  | 17,12<br>41,03  | 4                 | 2,11<br>5,96                      | 3,05<br>8,52   | 6,02<br>16,40 | 8,56<br>22,77  | 0,0130                      |
| 5                 | 141,30  |                |                 |                 | 6,55<br>21,77  | 6,55<br>21,77   |                 | 9,53<br>30,97   | 9,53<br>30,97   |                 | 12,70<br>40,28  |                  | 15,88<br>49,11  | 19,05<br>57,43  | 5                 | 2,77<br>9,67                      | 3,40<br>11,82  | 6,55<br>22,20 | 9,53<br>31,59  | 0,0199                      |
| 6                 | 168,30  |                |                 |                 | 7,11<br>28,26  | 7,11<br>28,26   |                 | 10,97<br>42,56  | 10,97<br>42,56  |                 | 14,27<br>54,20  |                  | 18,26<br>67,56  | 21,95<br>79,22  | 6                 | 2,77<br>11,55                     | 3,40<br>14,13  | 7,11<br>28,83 | 10,97<br>43,42 | 0,028                       |
| 8                 | 219,10  |                | 6,35<br>33,31   | 7,04<br>36,81   | 8,18<br>42,55  | 8,18<br>42,55   | 10,30<br>53,10  | 12,70<br>64,64  | 12,70<br>64,64  | 15,09<br>75,92  | 18,26<br>90,44  | 20,62<br>100,92  | 23,01<br>111,27 | 22,23<br>107,92 | 8                 | 2,77<br>15,09                     | 3,76<br>20,37  | 8,18<br>43,39 | 12,70<br>65,95 | 0,048                       |
| 10                | 273,10  |                | 6,35<br>41,77   | 7,80<br>51,03   | 9,27<br>60,31  | 9,27<br>60,31   | 12,70<br>81,50  | 12,70<br>81,55  | 15,09<br>96,01  | 18,26<br>114,75 | 21,44<br>133,06 | 25,40<br>155,15  | 28,58<br>172,33 | 25,40<br>155,15 | 10                | 3,40<br>23,08                     | 4,19<br>28,34  | 9,27<br>61,52 | 12,70<br>83,19 | 0,074                       |
| 12                | 323,90  |                | 6,35<br>49,73   | 8,38<br>65,20   | 9,53<br>73,88  | 10,31<br>79,73  | 14,30<br>109,00 | 12,70<br>97,46  | 17,48<br>132,08 | 21,44<br>159,91 | 25,40<br>186,97 | 28,58<br>208,14  | 33,32<br>238,76 | 25,40<br>186,97 | 12                | 3,96<br>31,89                     | 4,57<br>36,73  | 9,53<br>75,32 | 12,70<br>99,43 | 0,104                       |
| 14                | 355,60  | 6,35<br>54,69  | 7,92<br>67,90   | 9,53<br>81,33   | 9,53<br>81,33  | 11,13<br>94,55  | 15,10<br>126,40 | 12,70<br>107,39 | 19,05<br>158,10 | 23,83<br>194,96 | 27,79<br>224,65 | 31,75<br>253,56  | 35,71<br>281,70 |                 | 14                | 3,96<br>35,06                     | 4,78<br>42,14  |               |                | 0,126                       |
| 16                | 406,40  | 6,35<br>62,64  | 7,92<br>77,83   | 9,53<br>93,27   | 9,53<br>93,27  | 12,70<br>123,30 | 16,70<br>160,00 | 12,70<br>123,30 | 21,44<br>203,53 | 26,19<br>245,56 | 30,96<br>286,64 | 363,53<br>333,19 | 40,49<br>365,35 |                 | 16                | 4,19<br>42,41                     | 4,78<br>48,26  |               |                | 0,165                       |
| 18                | 457,00  | 6,35<br>70,57  | 7,92<br>87,71   | 11,13<br>122,38 | 9,53<br>155,80 | 14,27<br>183,42 | 19,00<br>206,00 | 12,70<br>139,15 | 23,83<br>254,55 | 29,36<br>309,62 | 34,93<br>363,56 | 39,67<br>408,26  | 45,24<br>459,37 |                 | 18                | 4,19<br>47,77                     | 4,78<br>54,36  |               |                | 0,208                       |
| 20                | 508,00  | 6,35<br>78,55  | 9,53<br>117,15  | 12,70<br>155,12 | 9,53<br>117,15 | 15,09<br>183,42 | 20,60<br>248,5  | 12,70<br>155,12 | 26,19<br>311,17 | 32,54<br>381,53 | 38,10<br>441,49 | 44,45<br>508,11  | 50,01<br>564,81 |                 | 20                | 4,78<br>60,46                     | 5,54<br>70,00  |               |                | 0,258                       |
| 22                | 559,00  | 6,35<br>86,54  | 9,53<br>129,13  | 12,70<br>171,09 | 9,53<br>129,13 | -               | 22,20<br>294,00 | 12,70<br>171,09 | 28,58<br>373,83 | 34,93<br>451,42 | 41,28<br>527,02 | 47,63<br>600,63  | 53,98<br>672,26 |                 | 22                | 4,78<br>66,57                     | 5,54<br>77,06  |               |                | 0,312                       |
| 24                | 610,00  | 6,35<br>94,53  | 9,53<br>141,12  | 14,27<br>209,64 | 9,53<br>141,12 | 17,48<br>255,41 | 24,60<br>355,00 | 12,70<br>187,06 | 30,96<br>442,08 | 38,89<br>547,71 | 46,02<br>640,03 | 52,37<br>720,15  | 59,54<br>808,22 |                 | 24                | 5,54<br>84,16                     | 6,35<br>96,37  |               |                | 0,372                       |
| 26                | 660,00  | 7,92<br>127,36 | 12,70<br>202,72 | -               | 9,53<br>152,87 | -               |                 | 12,70<br>202,72 |                 |                 |                 |                  |                 |                 | 26                |                                   |                |               |                | 0,435                       |
| 28                | 711,00  | 7,92<br>137,32 | 12,70<br>218,69 | 15,88<br>271,21 | 9,53<br>164,85 | -               |                 | 12,70<br>218,69 |                 |                 |                 |                  |                 |                 | 28                |                                   |                |               |                | 0,505                       |
| 30                | 762,00  | 7,92<br>147,28 | 12,70<br>234,67 | 15,88<br>292,18 | 9,53<br>176,84 | -               |                 | 12,70<br>234,67 |                 |                 |                 |                  |                 |                 | 30                | 6,35<br>120,72                    | 7,92<br>150,36 |               |                | 0,580                       |
| 32                | 813,00  | 7,92<br>157,24 | 12,70<br>250,64 | 15,88<br>312,15 | 9,53<br>188,82 | 17,48<br>342,91 |                 | 12,70<br>250,64 |                 |                 |                 |                  |                 |                 | 32                |                                   |                |               |                | 0,660                       |
| 34                | 864,00  | 7,92<br>167,20 | 12,70<br>266,61 | 15,88<br>332,12 | 9,53<br>200,31 | 17,48<br>364,90 |                 | 12,70<br>266,61 |                 |                 |                 |                  |                 |                 | 34                |                                   |                |               |                | 0,746                       |
| 36                | 914,00  | 7,92<br>176,96 | 12,70<br>282,27 | 15,88<br>351,70 | 9,53<br>212,56 | 19,05<br>420,42 |                 | 12,70<br>282,27 |                 |                 |                 |                  |                 |                 | 36                |                                   |                |               |                | 0,835                       |
| 38                | 965,00  |                |                 |                 | 9,53<br>224,54 |                 |                 | 12,70<br>298,24 |                 |                 |                 |                  |                 |                 | 38                |                                   |                |               |                | 0,931                       |
| 40                | 1016,00 |                |                 |                 | 9,53<br>236,53 |                 |                 | 12,70<br>314,22 |                 |                 |                 |                  |                 |                 | 40                |                                   |                |               |                | 1,032                       |
| 42                | 1067,00 |                |                 |                 | 9,53<br>248,52 |                 |                 | 12,70<br>330,19 |                 |                 |                 |                  |                 |                 | 42                |                                   |                |               |                | 1,138                       |
| 44                | 1118,00 |                |                 |                 | 9,53<br>260,50 |                 |                 | 12,70<br>346,16 |                 |                 |                 |                  |                 |                 | 44                |                                   |                |               |                | 1,249                       |
| 46                | 1168,00 |                |                 |                 | 9,53<br>272,25 |                 |                 | 12,70<br>351,82 |                 |                 |                 |                  |                 |                 | 46                |                                   |                |               |                | 1,364                       |
| 48                | 1219,00 |                |                 |                 | 9,53<br>284,24 |                 |                 | 12,70<br>377,79 |                 |                 |                 |                  |                 |                 | 48                |                                   |                |               |                | 1,485                       |

Value for information only



**CHEMICAL & PHYSICAL PROPERTIES OF C.S,S.S. & A.S,S.W. FORGED FITTINGS**

**ASTM A105/A105 M FORGED SOCKET WELD, SCREWED, CARBON STEEL PIPE FITTINGS**

| ASTM GRADE | C        | Mn           | Si       | S        | P         | Cr | Ni | Mo | Other                               | Tensile (MPa) | Psi Yield (MPa) | Elongation % | Hardness   | Redu % |
|------------|----------|--------------|----------|----------|-----------|----|----|----|-------------------------------------|---------------|-----------------|--------------|------------|--------|
| A 105/105M | 0.35 max | 0.60<br>1.05 | 0.35 max | 0.50 max | 0.040 max | -  | -  | -  | C4 - 0.40<br>Vn - 0.03<br>Cu - 0.02 | 485           | (250)           | 22-          | 187 HB max | 30     |

**ASTM A182 / A18M AUSTENITIC, STAINLESS STEEL FORGED (S.W), SCREWED, FLANGES, FOR HIGH TEMPS, SERVICES**

|                   |              |          |          |          |           |              |              |             |                           |     |     |          |     |          |
|-------------------|--------------|----------|----------|----------|-----------|--------------|--------------|-------------|---------------------------|-----|-----|----------|-----|----------|
| A 182/182M F 304  | 0.08 max     | 2.00 max | 1.00 max | 0.03 max | 0.04 max  | 18.0<br>20.0 | 8.0<br>11.0  | -           | -                         | 515 | 205 | 30       | -   | 50       |
| A 182/182M F 304L | 0.035 max    | 2.00 max | 1.00 max | 0.03 max | 0.04 max  | 18.0<br>20.0 | 8.0<br>13.0  | -           | -                         | 485 | 170 | 30       | 223 | 50       |
| A 182/182M F 316  | 0.08 max     | 2.00 max | 1.00 max | 0.03 max | 0.04 max  | 16.0<br>18.0 | 10.0<br>14.0 | 2.0<br>3.0  | -                         | 515 | 205 | 30<br>25 | -   | 50<br>45 |
| A 182/182M F 316L | 0.35 max     | 2.00 max | 1.00 max | 0.03 max | 0.04 max  | 16.0<br>18.0 | 10.0<br>15.0 | 2.0<br>3.0  | -                         | 485 | 170 | 30       | -   | 50       |
| A182/182M F316H   | 0.04<br>0.10 | 2.00 max | 1.00 max | 0.03 max | 0.04 max  | 16.0<br>18.0 | 10.0<br>14.0 | 2.0<br>3.0  | -                         | 515 | 205 | 30       | -   | 50       |
| A 182/182M F 321  | 0.08 max     | 2.00 max | 1.00 max | 0.03 max | 0.04 max  | 17.0 min     | 9.0<br>12.0  | -           | Ti >5xC<br>< 0.70         | 515 | 205 | 30       | -   | 50       |
| A 182/182M F 310  | 0.15 max     | 2.00 max | 1.00 max | 0.03 max | 0.04 max  | 24.0<br>26.0 | 19.0<br>22.0 | -           | -                         | 515 | 205 | 30       | -   | 50       |
| A 182/182M F 317L | 0.030 max    | 2.00 max | 1.00 max | 0.03 max | 0.045 max | 18.0<br>20.0 | 11.0<br>15.0 | 3.00<br>4.0 | -                         | 485 | 170 | 30       | -   | 50       |
| A 182/182M F 347H | 0.04<br>0.10 | 2.00 max | 1.00 max | 0.03 max | 0.04 max  | 17.0<br>20.0 | 9.0<br>13.0  | -           | Cb + Ta > 10<br>xC < 1.10 | 515 | 205 | 30       | -   | 50       |

**ASMA A182/A182M FORGED ALLOY STEEL, (S.W), SCREWED, FLANGES, FOR HIGH TEMPERATURE SERVICES**

|                        |              |              |              |           |           |              |          |              |   |     |     |    |         |    |
|------------------------|--------------|--------------|--------------|-----------|-----------|--------------|----------|--------------|---|-----|-----|----|---------|----|
| A 182/182M F1          | 0.28 max     | 0.60<br>0.90 | 0.15<br>0.35 | 0.045 max | 0.045 max | -            | -        | 0.44<br>0.65 | - | 485 | 275 | 20 | 143-192 | 30 |
| A 182/182M F12 class2  | 0.10<br>0.20 | 0.30<br>0.80 | 0.10<br>0.60 | 0.04 max  | 0.04 max  | 0.80<br>1.25 | -        | 0.44<br>0.65 | - | 485 | 275 | 20 | 143-207 | 30 |
| A 182/182M F11 class 2 | 0.10<br>0.20 | 0.30<br>0.80 | 0.50<br>1.00 | 0.04 max  | 0.04 max  | 1.0<br>1.50  | -        | 0.44<br>0.65 | - | 485 | 275 | 20 | 143-207 | 30 |
| A 182/182M F22 class 3 | 0.05<br>0.15 | 0.30<br>0.80 | 0.5 max      | 0.04 max  | 0.04 max  | 2.00<br>2.50 | 0.5 max. | 0.90<br>1.10 | - | 515 | 310 | 20 | 156-207 | 30 |
| A 182/182M F5          | 0.15 max     | 0.30<br>0.60 | 0.50 max     | 0.03 max  | 0.03 max  | 4.0<br>6.0   | 0.5 max  | 0.44<br>0.65 | - | 485 | 275 | 20 | 143-217 | 35 |
| A 182/182M F9          | 0.05 max     | 0.30<br>0.60 | 0.50 max     | 0.03 max  | 0.03 max  | 8.0<br>10.0  | -        | 0.90<br>1.10 | - | 585 | 386 | 20 | 179-217 | 40 |

**ASTM A234/234M PIPING FITTINGS OR WROUGHT CARBON STEEL FOR MODERATE AND ELEVATED TEMPERATURES**

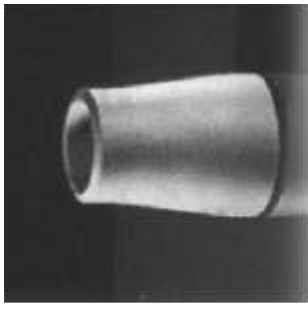
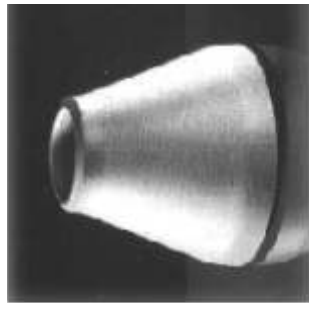
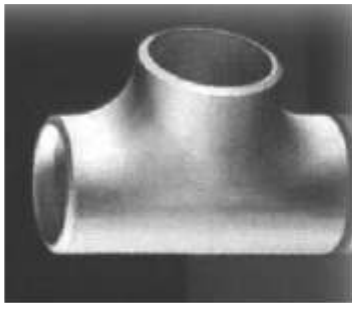
| ASTM GRADE | C         | Mn           | Si        | S         | P         | Cr | Ni | Mo | Other | Tensile P <sub>s</sub> (MPa) | Yield | Elongation % | Hardness HB |
|------------|-----------|--------------|-----------|-----------|-----------|----|----|----|-------|------------------------------|-------|--------------|-------------|
| A 234 WPB  | 0.30 max. | 0.29<br>1.06 | 0.10 min. | 0.058 max | 0.050 max | -  | -  | -  | -     | 415-585                      | 240   | 22           | 197         |
| A 234 WPC  | 0.35 max  | 0.29<br>1.06 | 0.10 min  | 0.058 max | 0.050 max | -  | -  | -  | -     | 485-655                      | 275   | 22           | 197         |

**ASTM A234 / 234M PIPE FITTINGS OF WROUGHT ALLOY STEEL FOR MODERATE AND ELEVATED TEMPERATURES**

|                      |              |              |              |              |              |               |   |              |   |         |     |    |     |
|----------------------|--------------|--------------|--------------|--------------|--------------|---------------|---|--------------|---|---------|-----|----|-----|
| A 234/234M WP12 CL-1 | 0.05<br>0.20 | 0.30<br>0.80 | 0.60<br>max  | 0.045<br>max | 0.035<br>max | 0.80-1.25     | - | 0.44<br>0.65 | - | 415-58) | 220 | 22 | 197 |
| A 234/234M WP12 CL-2 | 0.05<br>0.20 | 0.30<br>0.80 | 0.60<br>max  | 0.045<br>max | 0.045<br>max | 0.80-1.25     | - | 0.44<br>0.65 | - | 485-655 | 275 | 22 | 197 |
| A 234/234M WP11CL-1  | 0.05<br>0.15 | 0.30<br>0.60 | 0.50<br>1.00 | 0.030<br>max | 0.030<br>max | 1.00<br>1.50  | - | 0.44<br>0.65 | - | 415-585 | 205 | 22 | 197 |
| A 234/234M WP11 CL-2 | 0.05<br>0.20 | 0.30<br>0.60 | 0.50<br>1.00 | 0.040<br>max | 0.040<br>max | 1.00<br>1.50  | - | 0.44<br>0.65 | - | 485-655 | 275 | 22 | 197 |
| A 234/234M WP11CL-3  | 0.05<br>0.20 | 0.30<br>0.60 | 0.50<br>1.00 | 0.040<br>max | 0.040<br>max | 1.00<br>1.50  | - | 0.44<br>0.65 | - | 520-690 | 310 | 22 | 197 |
| A 234/234M WP22 CL-1 | 0.05<br>0.15 | 0.30<br>0.60 | 0.50<br>max  | 0.040<br>max | 0.040<br>max | 1.90<br>2.60  | - | 0.87<br>1.13 | - | 415-585 | 205 | 22 | 197 |
| A 234/234M WP22 CL-3 | 0.05<br>0.15 | 0.30<br>0.60 | 0.50<br>max  | 0.040<br>max | 0.040<br>max | 1.90<br>2.60  | - | 0.87<br>1.13 | - | 520-690 | 310 | 22 | 197 |
| A 234/234M WP 5      | 0.15<br>max  | 0.30<br>0.60 | 0.50<br>max  | 0.030<br>max | 0.040<br>max | 4.00<br>6.00  | - | 0.44<br>0.65 | - | 415-585 | 205 | 22 | 217 |
| A 234/234M WP 9      | 0.15<br>max  | 0.30<br>0.60 | 0.25<br>1.00 | 0.030<br>max | 0.030<br>max | 8.00<br>10.00 | - | 0.90<br>1.10 | - | 415-585 | 205 | 22 | 217 |

**ASTM A 403 / A 403M WROUGHT AUSTENITIC STAINLESS STEEL PIPE FITTINGS**

|                       |           |      |      |       |       |                |                |              |                       |     |     |    |   |
|-----------------------|-----------|------|------|-------|-------|----------------|----------------|--------------|-----------------------|-----|-----|----|---|
| A 403/403M WP 304     | 0.08 max  | 2.00 | 1.00 | 0.030 | 0.045 | 18.00<br>20.00 | 8.00<br>11.00  | -            | -                     | 515 | 205 | 20 | - |
| A 403/403M WP 304L    | 0.035 max | 2.00 | 1.00 | 0.030 | 0.045 | 18.00<br>20.00 | 8.00<br>13.00  | -            | -                     | 485 | 170 | 20 | - |
| A 403/403M WP 309     | 0.015 max | 2.00 | 1.00 | 0.030 | 0.045 | 22.00<br>24.00 | 12.00<br>15.00 | -            | -                     | 515 | 205 | 20 | - |
| A 403/403M WP 310     | 0.015 max | 2.00 | 1.50 | 0.030 | 0.045 | 24.00<br>26.00 | 19.00<br>22.00 | -            | -                     | 515 | 205 | 20 | - |
| A 403/403M WP 316     | 0.08 max  | 2.00 | 1.00 | 0.030 | 0.045 | 16.00<br>18.00 | 10.00<br>14.00 | 2.00<br>3.00 | -                     | 515 | 205 | 20 | - |
| A 403/403M WP 316 L N | 0.030 max | 2.00 | 0.75 | 0.030 | 0.040 | 16.00<br>18.00 | 11.00<br>14.00 | 2.00<br>3.00 | N 0.1-0.16            | 515 | 205 | 20 | - |
| A 403/403M WP 316L    | 0.035 max | 2.00 | 1.00 | 0.030 | 0.045 | 16.00<br>18.00 | 10.00<br>15.00 | 2.00<br>3.00 | -                     | 485 | 170 | 20 | - |
| A 403/403M WP 317L    | 0.030 max | 2.00 | 1.00 | 0.030 | 0.045 | 18.00<br>20.00 | 11.00<br>15.00 | 3.00<br>4.00 | -                     | 515 | 205 | 20 | - |
| A 403/403M WP 321     | 0.08 max  | 2.00 | 1.00 | 0.030 | 0.045 | 17.00<br>20.00 | 9.00<br>13.00  | -            | Ti > 5xC < 0.70       | 515 | 205 | 20 | - |
| A 403/403M WP 347H    | 0.04-0.10 | 2.00 | 1.00 | 0.030 | 0.045 | 17.00<br>20.00 | 9.00<br>13.00  | -            | Cb + Ta > 10xC < 1.10 | 515 | 205 | 20 | - |



**ASTM A 815/A 815M WROUGHT FERRITIC /AUSTENITIC & MARTENSITIC STAINLESS STEEL PIPE FITTINGS**

| ASTM GRADE   | C     | Mn   | Si   | S     | P     | Cr        | Ni   | Mo        | Other      | Tensile (Mpa) | Yield Strip/Round | Elongation % | Hardness Brinell | Matl.       |
|--------------|-------|------|------|-------|-------|-----------|------|-----------|------------|---------------|-------------------|--------------|------------------|-------------|
| A 815 WP 27  | 0.010 | 0.75 | 0.40 | 0.020 | 0.020 | 25-27.5   | 0.50 | 0.75-1.50 | Cu- 0.20   | 450-600       | 40<br>275         | 20.0         | 190              | FERRITIC    |
| A 815 WP430  | 0.12  | 1.00 | 1.0  | 0.030 | 0.040 | 16-18     | 0.50 | -         | -          | 450-620       | 35<br>240         | 20.0         | 190              | FERRITIC    |
| A 185 WP 446 | 0.20  | 1.5  | 0.75 | 0.030 | 0.040 | 23-30     | 0.50 | -         | Ni-10-0.25 | 425-655       | 40<br>275         | 18.0         | 207              | FERRITIC    |
| A 815 WP 410 | 0.15  | 1.00 | 1.0  | 0.030 | 0.040 | 11.5-13.5 | 0.50 | -         | -          | 425-655       | 30<br>205         | 20.0         | 207              | MARTENSITIC |
| A 815 WP 429 | 0.12  | 1.00 | 0.75 | 0.03  | 0.04  | 14-16     | 0.50 | -         | -          | 620-795       | 65<br>450         | 25.0         | 190              | FERRITIC    |

**ASTM A 350/ A350M FORGED SOCKET WELD, SCREWED , CARBON STEEL LOW-TEMPARATURE SERVICE PIPE FITTINGS**

| ASTM GRADE | C        | Mn           | Si           | S         | P         | Cr       | Ni           | Mo       | Other   | Tensile (Mpa)                | Yield (Mpa)          | Elongation Strip/Round | Jutos.Av.MI  | Redu. in Area.(%)  |
|------------|----------|--------------|--------------|-----------|-----------|----------|--------------|----------|---|------------------------------|----------------------|------------------------|--|--------------------|
| A350 LF1   | 0.30 max | 1.35 max     | 0.15<br>0.30 | 0.040 max | 0.035 max | 0.30 max | 0.40 max     | 0.12 max | Cu-0.4 max<br>Cb-0.02 max<br>Va-0.3 max                   | 415-585                      | 205                  | 25                     | 18/14<br>(-28.9 <sup>o</sup> )                         | 38                 |
| A LF2      | 0.30 max | 1.35 max     | 0.15<br>0.30 | 0.040 max | 0.035 max | 0.30 max | 0.40 max     | 0.12 max | Cu-0.4 max<br>Cb-0.02 max<br>Va-0.03 max                  | 485-655                      | 250                  | 30                     | 20/16<br>(-45.6 <sup>o</sup> )                         | 30                 |
| A LF3      | 0.20 max | 0.90 max     | 0.20<br>0.35 | 0.040 max | 0.035 max | 0.30 max | 3.25<br>3.75 | 0.12 max | Cu-0.4 max<br>Cb-0.02 max<br>Va-0.03 max                  | 485-655                      | 260                  | 30                     | 20/16<br>(-101.1 <sup>o</sup> )                        | 35                 |
| A LF5      | 0.30 max | 1.35 max     | 0.20<br>0.35 | 0.040 max | 0.035 max | 0.30 max | 1.0<br>2.0   | 0.12 max | Cu-0.4 max<br>Cb-0.02 max<br>Va-0.03 max                  | CL-1 415-585<br>CL-2 485-655 | CL-1 205<br>CL-2 260 | CL-1 25<br>CL-2 30     | 20/16<br>(CL1&2-59.4 <sup>o</sup> )                    | CL 1.38<br>CL 2.35 |
| A LF6      | 0.22 max | 1.15<br>1.50 | 0.15<br>0.30 | 0.025 max | 0.025 max | 0.30 max | 0.40 max     | 0.12 max | Cu-0.4 max<br>Cb-0.02 max<br>Va-0.4-0.11<br>Nit-0.01-0.03 | CL-1 455-495<br>CL-2 515-655 | CL1 360<br>CL2 415   | CL-1 30<br>CL-2 28     | CL.1 -20/16<br>CL.2 27/20<br>(CL.1&2-50 <sup>o</sup> ) | 40                 |
| A LF9      | 0.20 max | 0.40<br>1.06 | -            | 0.040 max | 0.035 max | 0.30 max | 1.60<br>2.24 | 0.12 max | Cu-0.75-1.25<br>Cb-0.02 max<br>Va-0.03                    | (435-605)                    | 315                  | 28                     | 18/14<br>(-73.3 <sup>o</sup> )                         | 38                 |

**ASTM A 420/A 420M WROUGHT CARBON STEEL LOW-TEMPARATURE SERVICE PIPE FITTINGS**

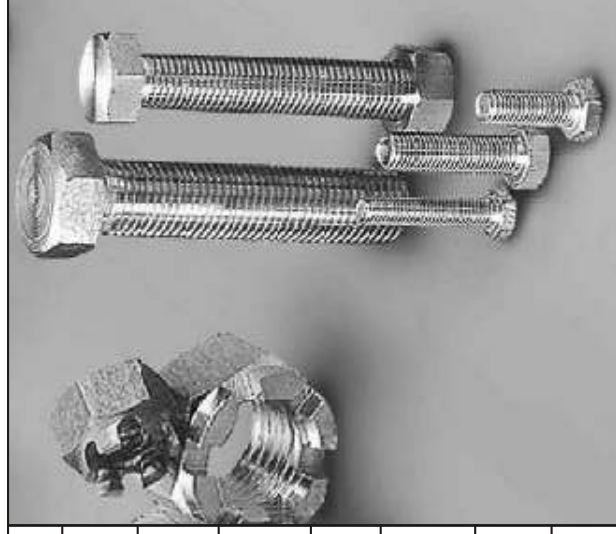
|             |          |          |      |              |           |           |   |              |   |         |     |    |                                   |
|-------------|----------|----------|------|--------------|-----------|-----------|---|--------------|---|---------|-----|----|-----------------------------------|
| A 420 WPL-6 | 0.30 max | 0.39 max | 1.06 | 0.10 min     | 0.030 max | 0.030 max | - | -            | - | 415-585 | 240 | 22 | 17.6/13.6<br>(-45 <sup>o</sup> )  |
| A WPL9      | 0.20 max | 0.40 max | 1.06 | -            | 0.030     | 0.030     | - | 1.60<br>2.24 | - | 435-610 | 315 | 20 | 17.6/13.6<br>(-75 <sup>o</sup> )  |
| A WPL 3     | 0.20 max | 0.31 max | 0.64 | 0.13<br>0.37 | 0.05      | 0.05      | - | 3.18<br>3.82 | - | 450-620 | 240 | 22 | 17.6/13.6<br>(-100 <sup>o</sup> ) |
| A WPL 8     | 0.13 max | 0.90 max | 0.37 | 0.13<br>0.37 | 0.030     | 0.030     | - | 8.40<br>9.60 | - | 690-865 | 515 | 16 | 33.9/27.1<br>(-195 <sup>o</sup> ) |

### ASTM A 193/A 193M ALLOY STEEL, CARBON STEEL & STAINLESS STEEL BOLTING FOR HIGH TEMPERATURE SERVICE

| ASTM GRADE                         | C            | Mn           | Si           | S           | P            | Cr             | Ni             | Mo           | Other               | Hardness       | Tensile (MPa) | Yield (MPa) | Elongation in Area % | Redu |
|------------------------------------|--------------|--------------|--------------|-------------|--------------|----------------|----------------|--------------|---------------------|----------------|---------------|-------------|----------------------|------|
| A193 B8-B8A<br>AISI Type 304       | 0.08         | 2.00<br>max  | 1.00<br>max  | 0.03<br>max | 0.045<br>max | 18.00<br>20.00 | 8.00<br>10.50  | -<br>-       | -<br>-              | 223HB          | 515           | 205         | 30                   | 50   |
| A193B8-B8MA<br>AISI Type 316       | 0.08<br>max  | 2.00<br>max  | 1.00<br>max  | 0.03<br>max | 0.045<br>max | 16.00<br>18.00 | 10.00<br>14.00 | 2.00<br>3.00 | -<br>-              | 223HB<br>223HB | 515           | 205         | 30                   | 50   |
| A193B8T-B8TA<br>AISI Type 321      | 0.08<br>max  | 2.00<br>max  | 1.00<br>max  | 0.03<br>max | 0.045<br>max | 17.00<br>19.00 | 9.00<br>12.00  | -<br>-       | Ti>5xC<br><0.70     | 223HB          | 515           | 205         | 30                   | 50   |
| A193 B8C-B8CA<br>AISI Type 347     | 0.08<br>max  | 2.00<br>max  | 1.00<br>max  | 0.03<br>max | 0.045<br>max | 17.00<br>19.00 | 9.00<br>13.00  | -<br>-       | Cb+Ta>10<br>xC<1.10 | 192HB          | 515           | 205         | 30                   | 50   |
| A193B6-B6X<br>AISI Type 410        | 0.15<br>max  | 1.00<br>-    | 1.00<br>max  | 0.03<br>max | 0.040<br>max | 11.50<br>13.50 | -              | -            | -                   | -              | 760           | 585         | 15                   | 50   |
| A193 B7-B7M<br>Alloy Steel (Cr.Mo) | 0.37<br>0.49 | 0.65<br>1.10 | 0.15<br>0.35 | 0.04<br>max | 0.035<br>max | 0.75<br>1.20   | -<br>-         | 0.15<br>0.25 | -<br>-              | -<br>-         | 860           | 720         | 16                   | 50   |
| A193B5<br>A S-5% Cr.AISI50 1       | 0.10<br>min  | 1.00<br>max  | 1.00<br>max  | 0.03<br>max | 0.040<br>max | 4.00<br>6.00   | -              | 0.40         | -                   | -              | 690           | 550         | 16                   | 50   |

### ASTM A 194/ 194 M CARBON STEEL, ALLOY STEEL & STAINLESS STEEL NUTS BOLTS FOR HIGH PRESSURE & HIGH TEMPERATURE SERVICE

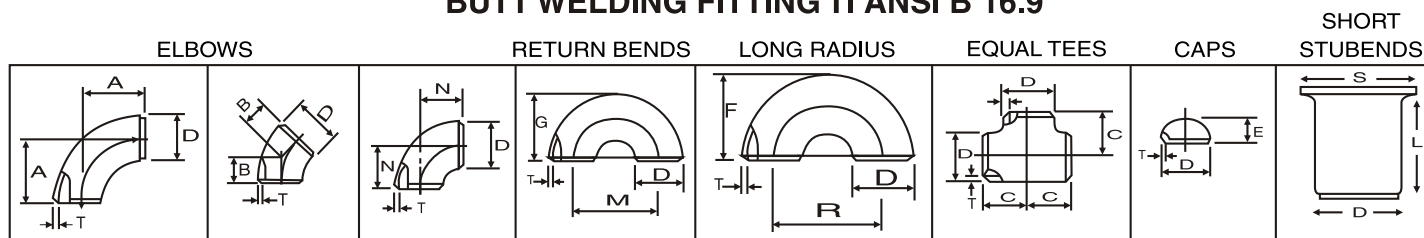
|                                 |              |              |              |              |              |                |                |              |                           |  |  |  |  |  |
|---------------------------------|--------------|--------------|--------------|--------------|--------------|----------------|----------------|--------------|---------------------------|--|--|--|--|--|
| A194/8A<br>AISI Type 304        | 0.08<br>max  | 2.00<br>max  | 1.00<br>max  | 0.030<br>max | 0.045<br>max | 18.00<br>20.00 | 8.00<br>10.50  | -            | -                         | 126 - 300 Grade 8<br>126 - 192 Grade 8 A     |  |  |  |  |
| A 194 8M/8MA<br>AISI Type 316   | 0.08<br>max  | 2.00<br>max  | 1.00<br>max  | 0.030<br>max | 0.045<br>max | 16.00<br>18.00 | 10.00<br>14.00 | 2.00<br>3.00 | -                         | 126 - 300 Grade 8m<br>126 - 192 Grade 8 MA   |  |  |  |  |
| A194/ 8T/8TA<br>AISI Type 321   | 0.08<br>max  | 2.00<br>max  | 1.00<br>max  | 0.030<br>max | 0.045<br>max | 17.00<br>19.00 | 9.00<br>12.00  | -<br>-       | Ti >5xC<br>< 0.70         | 126 - 300 Grade 8T                           |  |  |  |  |
| A194/ 8C/8CA<br>AISI Type 347   | 0.08<br>max  | 2.00<br>max  | 1.00<br>max  | 0.030<br>max | 0.045<br>max | 17.00<br>19.00 | 9.00<br>13.00  | -<br>-       | Cb + Ta > 10<br>xC < 1.10 | 126 - 300 Grade 8C<br>126 - 192 Grade 8 CA   |  |  |  |  |
| A194-6<br>AISI Type 410         | 0.15<br>max  | 1.00<br>max  | 1.00<br>max  | 0.030<br>max | 0.040<br>max | 11.50<br>13.50 | -              | -            | -                         | 228 - 271                                    |  |  |  |  |
| A194 2 2HM & 2H<br>Carbon Steel | 0.40<br>min  | 1.00<br>max  | 0.40<br>max  | 0.050<br>max | 0.040<br>max | -<br>-         | -<br>-         | -<br>-       | -<br>-                    | 159-352Gr.2<br>248-352Gr.2H<br>159-237Gr.2HM |  |  |  |  |
| A194-7/7M<br>Alloy Steel        | 0.37<br>0.49 | 0.65<br>1.10 | 0.15<br>0.35 | 0.04<br>max  | 0.40<br>max  | 0.75<br>1.20   | -<br>-         | 0.15<br>0.25 | -<br>-                    | 248-352Gr.7<br>159-237Gr.7M                  |  |  |  |  |
| A194-B-5<br>AISI501             | 0.10<br>max  | 1.00<br>max  | 1.00<br>max  | 0.030<br>max | 0.040<br>max | 4.00<br>6.00   | -<br>-         | 0.40<br>0.65 | -<br>-                    | 248-352<br>(HRC-24-38)                       |  |  |  |  |



## ASTM SPECIFICATION - NICKEL ALLOYS

| UNS No. | Corrosion Resistant Fittings | Asme Pressure Fittings | Pipe / Tubes Seamless | Pipe Welded | Tube Welded | Plate Sheet Strips | Round Bar / Wires | Forging Stock |
|---------|------------------------------|------------------------|-----------------------|-------------|-------------|--------------------|-------------------|---------------|
| 2200    | CRN                          | WPN                    | B 161                 | *           | *           | B 162              | B 160             | B 564         |
| 2201    | CRNL                         | WPNL                   | B 161                 | *           | *           | B 162              | B 160             | *             |
| 4400    | CRNL                         | WPNC                   | B 165                 |             |             | B 127              | B 164             | B 564         |
| 6002    | CR HX                        | WPHX                   | B 622                 | B 619       | B 626       | B 435              | B 572             | *             |
| 6007    | CR HG                        | WPHG                   | B 622                 | B 619       | B 626       | B 582              | B 581             |               |
| 6022    | CR HC 22                     | WPHC 22                | B 622                 | B 619       | B 626       | B 575              | B 574             | B 564         |
| 6025    | CRV 602                      | WPV 602                | B 163 / B167          | *           | *           | B 168              | B 166             | *             |
| 6030    | CRHG 30                      | WPHG 30                | B 622                 | B 619       | B 626       | B 582              | B 581             | *             |
| 6045    | CRV 45TM                     | WPV 45TM               | B163 / B167           | *           | *           | B168               | B166              | *             |
| 6058    | CR 2120                      | WP 2120                | B 622                 | B 619       | B 626       | B 575              | B 574             | B 564         |
| 6059    | CR 5923                      | WP 5923                | B 622                 | B 629       | B 626       | B 575              | B 574             | B 564         |
| 6200    | CRHC 2000                    | WPHC 2000              | B 622                 | B 619       | B 626       | B 575              | B 574             | B 564         |
| 6210    | CRM 21                       | WPM 21                 | B 622                 | B 619       | B 626       | B 575              | B 574             | B 564         |
| 6230    | CRH 230                      | WPH 230                | B 622                 | B 619       | B 626       | B 435              | B 572             | B 564         |
| 6455    | CR HC 4                      | WPHC 4                 | B 622                 | B 619       | B 626       | B 575              | B 574             | *             |
| 6600    | CRNCI                        | WPNCI                  | B 167                 | B 517       | B 516       | B 168              | B166              | B 564         |
| 6603    | CR 603 GT                    | WP 603GT               | B163 / B 167          | B 517       | B 516       | B 168              | B 166             | B 564         |
| 6625    | CRN CMC                      | WPNCMC                 | B 444                 | B 705       | B 704       | B 443              | B 446             | B 564         |
| 6686    | CRIN 686                     | WPIN 686               | B163 / B 622          | B 619       | B 626       | B 575              | B 574             | B 564         |
| 6219    | CR 626SI                     | WP 626SI               | B 444                 | B 705       | B 704       | B 443              | B 446             | B 564         |
| 6985    | CR HG3                       | WPHG 3                 | B 622                 | B 619       | B 626       | B 582              | B 581             | *             |
| 8020    | CR 20 CB                     | WP 20 CB               | B 729                 | B 464       | B 468       | B 463              | B 473             | B 462         |
| 8031    | CR 3127                      | WP 3127                | B 622                 | B 619       | B 626       | B 625              | B 649             | B 564         |
| 8120    | CRH 120                      | WPH 120                | B 407                 | B 514       | B 515       | B 409              | B 408             | B 564         |
| 8330    | CR 330                       | WP 330                 | B 535                 | B 710       | *           | B 536              | B 512             | B 511         |
| 8367    | CR 6XN                       | WP 6XN                 | B 690                 | B 675       | B 676       | B 688              | B 691             | B 564 / B 462 |
| 8800    | CRNIC                        | WPNIC                  | B 407                 | B 514       | B 515       | B 409              | B 408             | B 564         |
| 8810    | CRNIC 10                     | WPNIC 10               | B 407                 | B 514       | B 515       | B 409              | B 408             | B 564         |
| 8811    | CRNIC 11                     | WPNIC 11               | B 407                 | *           | *           | B 409              | B 408             | B 564         |
| 8825    | CRNICMC                      | WPNICMC                | B 423                 | B 705       | B 704       | B 424              | B 425             | B 564         |
| 8904    | CR 904L                      | WP 904L                | B 677                 | B 673       | B 674       | B 625              | B 649             | *             |
| 8925    | CR 1925                      | WP 1925                | B 677                 | B 673       | B 674       | B 625              | B 649             | *             |
| 8926    | CR 1925N                     | WP 1925N               | B 677                 | B 673       | B 674       | B 625              | B 649             | *             |
| 10001   | CR HB                        | WPHB                   | B 622                 | B 619       | B 626       | B 333              | B 335             | *             |
| 10003   | CR HN                        | WPHN                   | *                     | *           | *           | B 434              | B 573             | *             |
| 10242   | CR H242                      | WP H242                | B 622                 | B 619       | B 626       | B 434              | B 573             | B 564         |
| 10276   | CR HC 276                    | WPHC 276               | B 622                 | B 619       | B 626       | B 575              | B 574             | B 564         |
| 10624   | CRB 10                       | WPB 10                 | B 622                 | B 619       | B 626       | B 333              | B 335             | B 564         |
| 10629   | CRVB 4                       | WPVB 4                 | B 622                 | B 619       | B 626       | B 333              | B 335             | B 564         |
| 10665   | CR HB2                       | WPHB 2                 | B 622                 | B 619       | B 626       | B 333              | B 335             | B 564         |
| 10675   | CR HB3                       | WPHB 3                 | B 622                 | B 619       | B 626       | B 333              | B 335             | B 564         |
| 12160   | CRH 160                      | WPH 160                | B 622                 | B 619       | B 626       | B 435              | B 572             | B 564         |
| 20033   | CR 3033                      | WP 3033                | B 622                 | B 619       | B 626       | B 625              | B 649             | B 564 / B 472 |
| 30556   | CRH 556                      | WPH 556                | B 622                 | B 619       | B 626       | B 435              | B 572             | *             |

# BUTT WELDING FITTING TI ANSI B 16.9

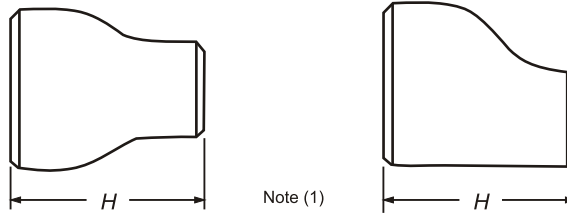


## BUTT WELDING PIPE FITTING DIMENSIONAL STANDARD ANSI B-16.9, B-16.28 & MSS SP 43

| Nominal Pipe Size |      | Outside Diameter | Center to Face |        |        |       | Back to Face |        |        | Center to Center |        |        | Length 'L' |       |
|-------------------|------|------------------|----------------|--------|--------|-------|--------------|--------|--------|------------------|--------|--------|------------|-------|
|                   |      |                  | A              | B      | C      | N     | E            | F      | G      | R                | M      | S      | MSSSP43    | B16.9 |
| Inch.             | mm   | D                | A              | B      | C      | N     | E            | F      | G      | R                | M      | S      | L          | L     |
| 1/2               | 15   | 21.3             | 19.05          | 7.94   | 25.4   | —     | 25.4         | 47.63  | —      | 76.2             |        | 34.93  | 50.8       | 76.2  |
| 3/4               | 20   | 26.7             | 28.58          | 14.29  | 28.58  | —     | 25.4         | 42.86  | —      | 57.15            |        | 42.86  | 50.8       | 76.2  |
| 1                 | 25   | 33.4             | 38.1           | 22.23  | 38.1   | 25.4  | 38.1         | 55.56  | 41.28  | 76.2             | 50.8   | 50.8   | 50.8       | 101.6 |
| 1.1/4             | 32   | 42.2             | 47.63          | 25.4   | 47.63  | 31.75 | 38.1         | 69.85  | 52.39  | 95.25            | 63.5   | 63.5   | 50.8       | 101.6 |
| 1.1/2             | 40   | 48.3             | 57.15          | 28.53  | 57.15  | 38.1  | 38.1         | 82.55  | 61.91  | 114.3            | 76.2   | 73.2   | 50.8       | 101.6 |
| 2                 | 50   | 60.3             | 76.2           | 34.93  | 63.5   | 50.8  | 38.1         | 106.36 | 80.96  | 152.4            | 101.6  | 92.08  | 63.5       | 152.4 |
| 2.1/2             | 65   | 73               | 95.25          | 44.45  | 76.2   | 63.5  | 38.1         | 131.76 | 100.01 | 190.5            | 127    | 104.78 | 63.5       | 152.4 |
| 3                 | 80   | 88.9             | 114.3          | 50.8   | 85.73  | 76.2  | 50.8         | 158.75 | 120.65 | 228.6            | 152.4  | 127    | 63.5       | 152.4 |
| 3.1/2             | 90   | 101.6            | 133.35         | 57.15  | 95.25  | 88.9  | 63.5         | 184.15 | 139.7  | 266.7            | 177.8  | 139.7  | 76.2       | 152.4 |
| 4                 | 100  | 114.3            | 152.4          | 63.5   | 104.78 | 101.6 | 63.5         | 209.55 | 158.75 | 304.8            | 203.2  | 157.16 | 76.2       | 152.4 |
| 5                 | 125  | 141.3            | 190.5          | 79.37  | 123.83 | 127   | 76.2         | 261.94 | 196.85 | 381              | 254    | 185.74 | 76.2       | 203.2 |
| 6                 | 150  | 168.3            | 228.6          | 95.25  | 142.88 | 152.4 | 88.9         | 312.74 | 236.54 | 457.2            | 304.8  | 215.9  | 88.9       | 203.2 |
| 8                 | 200  | 219.1            | 304.8          | 127    | 177.8  | 203.2 | 101          | 414.34 | 312.74 | 609.6            | 406.4  | 269.88 | 101.6      | 203.2 |
| 10                | 250  | 273.1            | 381            | 158.7  | 215.9  | 254   | 127          | 514.53 | 390.53 | 762              | 508    | 323.85 | 127        | 254   |
| 12                | 300  | 323.9            | 457.2          | 190.5  | 254    | 304.8 | 152.4        | 619.13 | 466.73 | 914.4            | 609.5  | 381    | 152.4      | 254   |
| 14                | 350  | 355.6            | 533.4          | 222.25 | 279.4  | 355.6 | 165.1        | 711.2  | 533.4  | 1066.8           | 711.2  | 412.75 | 152.4      | 304.8 |
| 16                | 400  | 406.4            | 609.6          | 254    | 304.8  | 406.4 | 177.8        | 812.8  | 609.8  | 1219.2           | 812.8  | 469.9  | 152.4      | 304.8 |
| 18                | 450  | 457.2            | 685.8          | 285.75 | 342.9  | 457.2 | 203.2        | 914.4  | 685.8  | 1371.6           | 914.4  | 533.4  | 152.4      | 304.8 |
| 20                | 500  | 508              | 762            | 317.5  | 381    | 508   | 228.6        | 1016   | 762    | 1524             | 1016   | 584.2  | 152.4      | 304.8 |
| 22                | 550  | 559              | 838.2          | 342.9  | 419.1  | 558.8 | 254          | 1117.6 | 838.2  | 1676.4           | 1117   | 692.15 | 152.4      | 304.8 |
| 24                | 600  | 610              | 914.4          | 381    | 431.8  | 609.6 | 266.7        | 1219.2 | 914.4  | 1828.8           | 1219.2 | 692.15 | 152.4      | 304.8 |
| 26                | 650  | 660              | 990.6          | 406.4  | 495.3  | —     | 266.7        |        |        |                  |        |        |            |       |
| 28                | 700  | 711              | 1066.8         | 438.15 | 520.7  | —     | 266.7        |        |        |                  |        |        |            |       |
| 30                | 750  | 762              | 1143           | 469.9  | 588.8  | —     | 266.7        |        |        |                  |        |        |            |       |
| 32                | 800  | 813              | 1219.2         | 501.65 | 596.9  | —     | 266.7        |        |        |                  |        |        |            |       |
| 34                | 850  | 864              | 1295.4         | 533.4  | 635    | —     | 266.7        |        |        |                  |        |        |            |       |
| 36                | 900  | 914              | 1371.6         | 565.15 | 673.1  | —     | 266.7        |        |        |                  |        |        |            |       |
| 38                | 950  | 965              | 1447.8         | 600.08 | 711.2  | —     | 304.8        |        |        |                  |        |        |            |       |
| 40                | 1000 | 1016             | 1524           | 631.83 | 749.3  | —     | 304.8        |        |        |                  |        |        |            |       |
| 42                | 1050 | 1067             | 1600.2         | 660.4  | 762    | —     | 304.8        |        |        |                  |        |        |            |       |
| 44                | 1100 | 1118             | 1676.4         | 695.33 | 812.8  | —     | 342.9        |        |        |                  |        |        |            |       |
| 46                | 1150 | 1168             | 1752.6         | 727.09 | 850.9  | —     | 342.9        |        |        |                  |        |        |            |       |
| 48                | 1200 | 1219             | 1828.8         | 758.83 | 889    | —     | 342.9        |        |        |                  |        |        |            |       |



# DIMENSIONS OF REDUCERS



Note (1)

| Nominal Pipe Size (NPS) | DN        | Outside Diameter at Bevel |           | End-to-End H | Nominal Pipe Size (NPS) | DN        | Outside Diameter at Bevel |           | End-to-End H | Nominal Pipe Size (NPS) | DN          | Outside Diameter at Bevel |           | End-to-End H |
|-------------------------|-----------|---------------------------|-----------|--------------|-------------------------|-----------|---------------------------|-----------|--------------|-------------------------|-------------|---------------------------|-----------|--------------|
|                         |           | Large End                 | Small End |              |                         |           | Large End                 | Small End |              |                         |             | Large End                 | Small End |              |
| 3/4 x 1/2               | 20 x 10   | 26.7                      | 21.3      | 38           | 10 x 8                  | 250 x 200 | 273.0                     | 219.1     | 178          | 32 x 30                 | 800 x 750   | 813.0                     | 762.0     | 610          |
| 3/4 x 3/8               | 20 x 10   | 26.7                      | 17.3      | 38           | 10 x 6                  | 250 x 150 | 273.0                     | 168.3     | 178          | 32 x 28                 | 800 x 700   | 813.0                     | 711.0     | 610          |
| 1 x 3/4                 | 25 x 20   | 33.4                      | 26.7      | 51           | 10 x 5                  | 250 x 125 | 273.0                     | 141.3     | 178          | 32 x 26                 | 800 x 650   | 813.0                     | 660.0     | 610          |
| 1 x 1/2                 | 25 x 15   | 33.4                      | 21.3      | 51           | 10 x 4                  | 250 x 100 | 273.0                     | 114.3     | 178          | 32 x 24                 | 800 x 600   | 813.0                     | 610.0     | 610          |
| 1 1/4 x 1               | 32 x 25   | 42.2                      | 33.4      | 51           | 12 x 10                 | 300 x 250 | 323.8                     | 273.0     | 203          | 34 x 32                 | 850 x 800   | 864.0                     | 813.0     | 610          |
| 1 1/4 x 3/4             | 32 x 20   | 42.2                      | 26.7      | 51           | 12 x 8                  | 300 x 200 | 323.8                     | 219.1     | 203          | 34 x 30                 | 850 x 750   | 864.0                     | 762.0     | 610          |
| 1 1/4 x 1/2             | 32 x 15   | 42.2                      | 21.3      | 51           | 12 x 6                  | 300 x 150 | 323.8                     | 168.3     | 203          | 34 x 28                 | 850 x 700   | 864.0                     | 660.0     | 610          |
| 1 1/2 x 1 1/4           | 40 x 32   | 48.3                      | 42.2      | 64           | 12 x 5                  | 300 x 125 | 323.8                     | 141.3     | 203          | 34 x 26                 | 850 x 650   | 864.0                     | 610.0     | 610          |
| 1 1/2 x 1               | 40 x 25   | 48.3                      | 33.4      | 64           | 14 x 12                 | 350 x 300 | 355.6                     | 323.8     | 330          | 36 x 34                 | 900 x 850   | 914.0                     | 864.0     | 610          |
| 1 1/2 x 3/4             | 40 x 20   | 48.3                      | 26.7      | 64           | 14 x 10                 | 350 x 250 | 355.6                     | 273.0     | 330          | 36 x 32                 | 900 x 800   | 914.0                     | 813.0     | 610          |
| 1 1/2 x 1/2             | 40 x 15   | 48.3                      | 21.3      | 64           | 14 x 8                  | 350 x 200 | 355.6                     | 219.1     | 330          | 36 x 30                 | 900 x 750   | 914.0                     | 762.0     | 610          |
| 2 x 1 1/2               | 50 x 40   | 60.3                      | 48.2      | 76           | 14 x 6                  | 350 x 150 | 355.6                     | 168.3     | 330          | 36 x 28                 | 900 x 700   | 914.0                     | 660.0     | 610          |
| 2 x 1 1/4               | 50 x 32   | 60.3                      | 42.2      | 76           | 16 x 14                 | 400 x 350 | 406.4                     | 355.6     | 356          | 36 x 26                 | 900 x 650   | 914.0                     | 610.0     | 610          |
| 2 x 1                   | 50 x 25   | 60.3                      | 33.4      | 76           | 16 x 12                 | 400 x 300 | 406.4                     | 323.8     | 356          | 38 x 36                 | 950 x 900   | 965.0                     | 914.0     | 610          |
| 2 x 3/4                 | 50 x 20   | 60.3                      | 26.7      | 76           | 16 x 10                 | 400 x 250 | 406.4                     | 273.0     | 356          | 38 x 34                 | 950 x 850   | 965.0                     | 864.0     | 610          |
| 2 1/2 x 2               | 65 x 50   | 73.0                      | 60.3      | 89           | 16 x 8                  | 400 x 200 | 406.4                     | 219.1     | 356          | 38 x 32                 | 950 x 800   | 965.0                     | 813.0     | 610          |
| 2 1/2 x 1 1/2           | 65 x 40   | 73.0                      | 48.3      | 89           | 18 x 16                 | 450 x 400 | 457.0                     | 406.4     | 381          | 38 x 30                 | 950 x 750   | 965.0                     | 762.0     | 610          |
| 2 1/2 x 1 1/4           | 65 x 32   | 73.0                      | 42.2      | 89           | 18 x 14                 | 450 x 350 | 457.0                     | 355.6     | 381          | 38 x 28                 | 950 x 700   | 965.0                     | 711.0     | 610          |
| 2 1/2 x 1               | 65 x 25   | 73.0                      | 33.4      | 89           | 18 x 12                 | 450 x 300 | 457.0                     | 323.8     | 381          | 38 x 26                 | 950 x 650   | 965.0                     | 660.0     | 610          |
| 3 x 2 1/2               | 80 x 65   | 88.9                      | 73.0      | 89           | 18 x 10                 | 450 x 250 | 457.0                     | 273.0     | 381          | 40 x 38                 | 1000 x 950  | 1016.0                    | 965.0     | 610          |
| 3 x 2                   | 80 x 50   | 88.9                      | 60.3      | 89           | 20 x 18                 | 500 x 450 | 508.0                     | 457.0     | 508          | 40 x 36                 | 1000 x 900  | 1016.0                    | 914.0     | 610          |
| 3 x 1 1/2               | 80 x 40   | 88.9                      | 48.3      | 89           | 20 x 16                 | 500 x 400 | 508.0                     | 406.4     | 508          | 40 x 34                 | 1000 x 850  | 1016.0                    | 864.0     | 610          |
| 3 x 1 1/4               | 80 x 32   | 88.9                      | 42.2      | 89           | 20 x 14                 | 500 x 350 | 508.0                     | 355.6     | 508          | 40 x 32                 | 1000 x 800  | 1016.0                    | 813.0     | 610          |
| 3 1/2 X 3               | 90 x 80   | 101.6                     | 88.9      | 102          | 20 x 12                 | 500 x 300 | 508.0                     | 323.9     | 508          | 40 x 30                 | 1000 x 750  | 1016.0                    | 762.0     | 610          |
| 3 1/2 X 2 1/2           | 90 x 65   | 101.6                     | 73.0      | 102          | 22 x 20                 | 550 x 500 | 559.0                     | 508.0     | 508          | 42 x 40                 | 1050 x 1000 | 1067.0                    | 1016.0    | 610          |
| 3 1/2 X 2               | 90 x 50   | 101.6                     | 60.3      | 102          | 22 x 18                 | 550 x 450 | 559.0                     | 457.0     | 508          | 42 x 38                 | 1050 x 950  | 1067.0                    | 965.0     | 610          |
| 3 1/2 X 1 1/2           | 90 x 40   | 101.6                     | 48.3      | 102          | 22 x 16                 | 550 x 400 | 559.0                     | 406.4     | 508          | 42 x 36                 | 1050 x 900  | 1067.0                    | 914.0     | 610          |
| 3 1/2 X 1 1/4           | 90 x 32   | 101.6                     | 42.2      | 102          | 22 x 14                 | 550 x 350 | 559.0                     | 355.4     | 508          | 42 x 34                 | 1050 x 850  | 1067.0                    | 864.0     | 610          |
| 4 x 3 1/2               | 100 x 90  | 114.3                     | 101.6     | 102          | 24 x 22                 | 600 x 550 | 610.0                     | 559.0     | 508          | 42 x 32                 | 1050 x 800  | 1067.0                    | 813.0     | 610          |
| 4 x 3                   | 100 x 80  | 114.3                     | 88.9      | 102          | 24 x 20                 | 600 x 500 | 610.0                     | 508.0     | 508          | 42 x 30                 | 1050 x 750  | 1067.0                    | 762.0     | 610          |
| 4 x 2 1/2               | 100 x 65  | 114.3                     | 73.0      | 102          | 24 x 18                 | 600 x 450 | 610.0                     | 457.0     | 508          | 44 x 42                 | 1100 x 1050 | 1118.0                    | 1067.0    | 610          |
| 4 x 2                   | 100 x 50  | 114.3                     | 60.3      | 102          | 24 x 16                 | 600 x 400 | 610.0                     | 406.4     | 508          | 44 x 40                 | 1100 x 1000 | 1118.0                    | 1016.0    | 610          |
| 4 x 1 1/2               | 100 x 40  | 114.3                     | 48.3      | 102          | 26 x 24                 | 650 x 600 | 660.0                     | 610.0     | 610          | 44 x 38                 | 1100 x 950  | 1118.0                    | 965.0     | 610          |
| 5 x 4                   | 125 x 100 | 141.3                     | 114.3     | 127          | 26 x 22                 | 650 x 550 | 660.0                     | 559.0     | 610          | 44 x 36                 | 1100 x 900  | 1118.0                    | 914.0     | 610          |
| 5 x 3 1/2               | 125 x 90  | 141.3                     | 101.6     | 127          | 26 x 20                 | 650 x 500 | 660.0                     | 508.0     | 610          | 46 x 44                 | 1150 x 1100 | 1168.0                    | 1118.0    | 711          |
| 5 x 3                   | 125 x 80  | 141.3                     | 88.9      | 127          | 26 x 18                 | 650 x 450 | 660.0                     | 457.0     | 610          | 46 x 42                 | 1150 x 1050 | 1168.0                    | 1067.0    | 711          |
| 5 x 2 1/2               | 125 x 65  | 141.3                     | 73.0      | 127          | 28 x 26                 | 700 x 650 | 711.0                     | 660.0     | 610          | 46 x 40                 | 1150 x 1000 | 1168.0                    | 1016.0    | 711          |
| 5 x 2                   | 125 x 50  | 141.3                     | 60.3      | 127          | 28 x 24                 | 700 x 600 | 711.0                     | 610.0     | 610          | 46 x 38                 | 1150 x 950  | 1168.0                    | 965.0     | 711          |
| 6 x 5                   | 150 x 125 | 168.3                     | 141.3     | 140          | 28 x 22                 | 700 x 550 | 711.0                     | 508.0     | 610          | 48 x 46                 | 1200 x 1150 | 1219.0                    | 1168.0    | 711          |
| 6 x 4                   | 150 x 100 | 168.3                     | 114.3     | 140          | 28 x 20                 | 700 x 500 | 711.0                     | 457.0     | 610          | 48 x 44                 | 1200 x 1100 | 1219.0                    | 1118.0    | 711          |
| 6 x 3 1/2               | 150 x 90  | 168.3                     | 101.6     | 140          | 30 x 28                 | 750 x 700 | 762.0                     | 711.0     | 610          | 48 x 42                 | 1200 x 1050 | 1219.0                    | 1067.0    | 711          |
| 6 x 3                   | 150 x 80  | 168.3                     | 88.9      | 140          | 30 x 26                 | 750 x 650 | 762.0                     | 660.0     | 610          | 48 x 40                 | 1200 x 1000 | 1219.0                    | 1016.0    | 711          |
| 6 x 2 1/2               | 150 x 65  | 168.3                     | 73.0      | 140          | 30 x 24                 | 750 x 600 | 762.0                     | 610.0     | 610          |                         |             |                           |           |              |
|                         |           |                           |           |              | 30 x 22                 | 750 x 550 | 762.0                     | 508.0     | 610          |                         |             |                           |           |              |

**GENERAL NOTE :**

All dimensions are in millimeters.

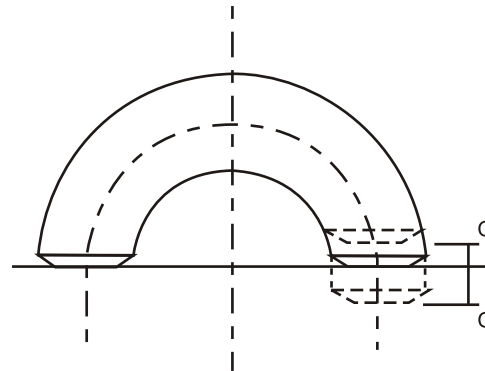
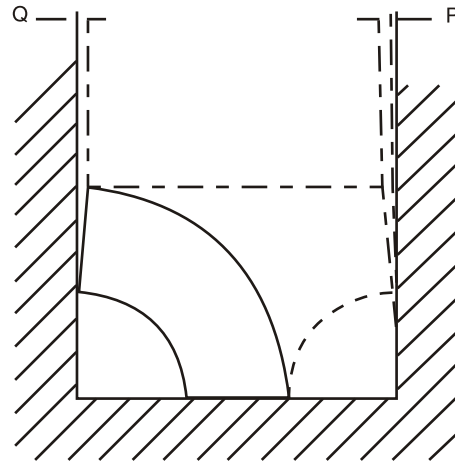
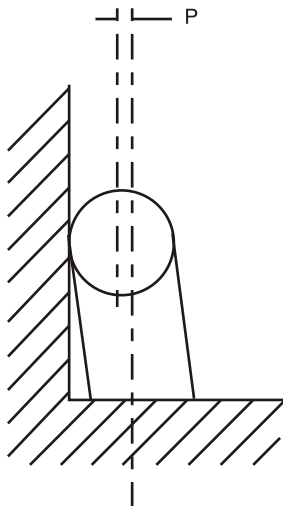
**NOTE :**

(1) White the figure illustrates a "bell shaped" reducer, the use of conical reducer is not prohibited.

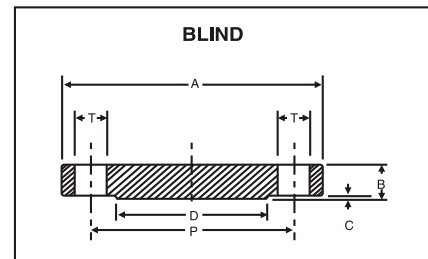
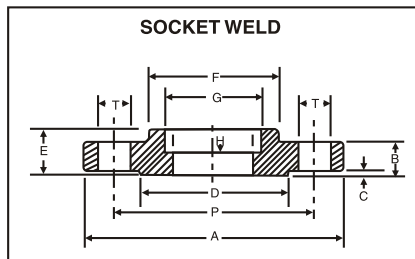
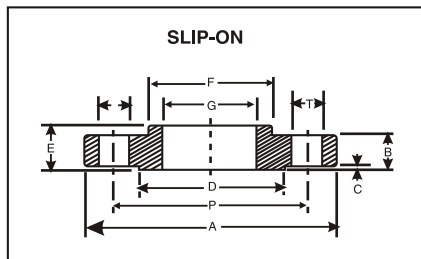
## DIMENSIONAL TOLERANCES AS PER ANSI B 16.9/ 16.28 & MSS-SP 43 BUTT WELD PIPE FITTINGS

| ALL FITTINGS         |                                 |                              |  | 90° / 45°<br>ELBOWS<br>& TEES | Reducers<br>and<br>Lap-joint<br>Stub-Ends | CAPS              | 180° RETURNS                      |                              |                      | LAP-JOINT<br>STUB ENDS   |                |                |
|----------------------|---------------------------------|------------------------------|--|-------------------------------|---|-------------------|-----------------------------------|------------------------------|----------------------|--------------------------|----------------|----------------|
| Nominal<br>Pipe Size | Outside<br>Diameter<br>at Bevel | Inside<br>Diameter<br>at End | Wall<br>Thickness                                      | Center<br>to End<br>Dimension | Overall<br>Length                         | Overall<br>Length | Center to<br>Center<br>Dimensions | Back to<br>Face<br>Dimension | Alignment<br>of Ends | Fillet**Radius<br>of Lap | O. D<br>of Lap | Thk of<br>Laps |
| 15-65                | +1.59<br>-0.80                  | ±0.80                        | Not<br>Less Than<br>87½%<br>of<br>Nominal<br>Thickness | ±1.59                         | ±1.59                                     | ±3.17             | ±6.35                             | ±6.35                        | ±0.80                | +0<br>-0.79              | +0<br>-0.79    | +1.59<br>-0    |
| 80-90                | ±1.59                           | ±1.59                        |  | ±1.59                         | ±1.59                                     | ±3.17             | ±6.35                             | ±6.35                        | ±0.80                | +0<br>-0.79              | +0<br>-0.79    | +1.59<br>-0    |
| 100                  | ±1.59                           | ±1.59                        |  | ±1.59                         | ±1.59                                     | ±3.17             | ±6.35                             | ±6.35                        | ±0.80                | +0<br>-1.59              | +0<br>-0.79    | +1.59<br>-0    |
| 125-200              | +2.38<br>-1.59                  | ±1.59                        |  | ±1.59                         | ±1.59                                     | ±6.35             | ±6.35                             | ±6.35                        | ±0.80                | +0<br>-1.59              | +0<br>-0.79    | +1.59<br>-0    |
| 250-450              | +3.97<br>-3.17                  | ±3.17                        |  | ±2.38                         | ±2.38                                     | ±6.35             | ±9.53                             | ±6.35                        | ±1.59                | +0<br>-1.59              | +0<br>-1.59    | +1.59<br>-0    |
| 500-600              | +6.35<br>-4.76                  | ±4.76                        |  | ±2.38                         | ±2.38                                     | ±6.35             | ±9.53                             | ±6.35                        | ±1.59                | +0<br>-1.59              | +0<br>-1.59    | +1.59<br>-0    |
| 650-750              | +6.35<br>-4.76                  | ±4.76                        |  | ±3.17                         | ±4.76                                     | ±9.53             |                                   |                              |                      |                          |                |                |
| 800-1200             | +6.35<br>-4.76                  | ±4.76                        |  | ±4.76                         | ±4.76                                     | ±9.53             |                                   |                              |                      |                          |                |                |

| Nominal<br>Pipe<br>Size | Angularity Tol.   |                   |
|-------------------------|-------------------|-------------------|
|                         | Off<br>Angle<br>Q | Off<br>Plane<br>P |
| 15-100                  | 0.80              | 1.59              |
| 125-200                 | 1.5               | 3.17              |
| 250-300                 | 2.38              | 4.76              |
| 350-450                 | 2.38              | 6.35              |
| 450-600                 | 3.17              | 9.53              |
| 650-750                 | 4.76              | 9.53              |
| 800-1050                | 4.76              | 12.70             |
| 100-1200                | 4.76              | 19.05             |







### DIMENSIONS OF CLASS 150 FLANGES AS PER ANSI B 16.5

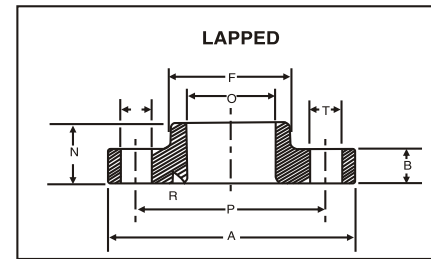
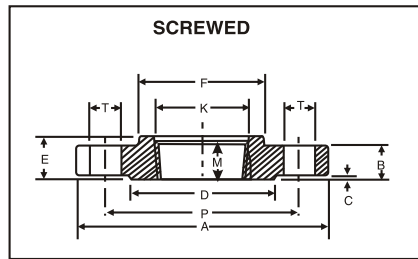
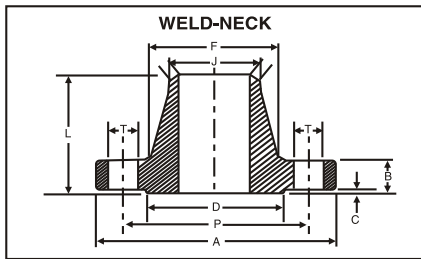
| N.B. | A   | B    | C   | D   | E  | F   | G     | H    | J     | K | L   | M  | N   | O     | P     | R    | T    | No. of Holes |
|------|-----|------|-----|-----|----|-----|-------|------|-------|---|-----|----|-----|-------|-------|------|------|--------------|
| 15   | 89  | 11.1 | 1.6 | 35  | 16 | 30  | 22.4  | 9.5  | 21.3  | - | 48  | 16 | 16  | 23.0  | 60.3  | 3.0  | 15.9 | 4            |
| 20   | 98  | 12.7 | 1.6 | 43  | 16 | 38  | 27.7  | 11.0 | 26.7  | - | 52  | 16 | 16  | 28.0  | 69.8  | 3.0  | 15.9 | 4            |
| 25   | 108 | 14.3 | 1.6 | 51  | 17 | 49  | 34.5  | 12.5 | 33.4  | - | 56  | 17 | 17  | 35.0  | 79.4  | 3.0  | 15.9 | 4            |
| 32   | 117 | 15.9 | 1.6 | 64  | 21 | 59  | 43.2  | 14.5 | 42.2  | - | 57  | 21 | 21  | 43.5  | 88.9  | 5.0  | 15.9 | 4            |
| 40   | 127 | 17.5 | 1.6 | 73  | 22 | 65  | 49.5  | 16.0 | 48.3  | - | 62  | 22 | 22  | 50.0  | 98.4  | 6.5  | 15.9 | 4            |
| 50   | 152 | 19.0 | 1.6 | 92  | 25 | 78  | 62.0  | 17.5 | 60.3  | - | 64  | 25 | 25  | 62.5  | 120.6 | 8.0  | 19.0 | 4            |
| 65   | 178 | 22.2 | 1.6 | 105 | 29 | 90  | 74.7  | 19.0 | 73.0  | - | 70  | 29 | 29  | 75.5  | 139.7 | 8.0  | 19.0 | 4            |
| 80   | 190 | 23.8 | 1.6 | 127 | 30 | 108 | 90.7  | 20.5 | 88.9  | - | 70  | 30 | 30  | 91.5  | 152.4 | 9.5  | 19.0 | 4            |
| 90   | 216 | 23.8 | 1.6 | 140 | 32 | 122 | 103.4 | -    | 101.6 | - | 71  | 32 | 32  | 104.0 | 177.8 | 9.5  | 19.0 | 8            |
| 100  | 229 | 23.8 | 1.6 | 157 | 33 | 135 | 116.1 | -    | 114.3 | - | 76  | 33 | 33  | 117.0 | 190.5 | 11.0 | 19.0 | 8            |
| 125  | 254 | 23.8 | 1.6 | 186 | 37 | 164 | 143.8 | -    | 141.3 | - | 89  | 37 | 37  | 145.0 | 215.9 | 11.0 | 22.2 | 8            |
| 150  | 279 | 25.4 | 1.6 | 216 | 40 | 192 | 170.7 | -    | 168.3 | - | 89  | 40 | 40  | 171.0 | 241.3 | 12.5 | 22.2 | 8            |
| 200  | 343 | 28.6 | 1.6 | 270 | 44 | 246 | 221.5 | -    | 219.1 | - | 102 | 44 | 44  | 222.0 | 293.4 | 12.5 | 22.2 | 8            |
| 250  | 406 | 30.2 | 1.6 | 324 | 49 | 305 | 276.4 | -    | 273.0 | - | 102 | 49 | 49  | 277.0 | 362.0 | 12.5 | 25.4 | 12           |
| 300  | 483 | 31.8 | 1.6 | 381 | 56 | 365 | 327.2 | -    | 323.9 | - | 114 | 56 | 56  | 328.0 | 431.8 | 12.5 | 25.4 | 12           |
| 350  | 533 | 34.9 | 1.6 | 413 | 57 | 400 | 359.2 | -    | 355.6 | - | 127 | 57 | 79  | 360.0 | 476.2 | 12.5 | 28.6 | 12           |
| 400  | 597 | 36.5 | 1.6 | 470 | 64 | 457 | 410.5 | -    | 406.4 | - | 127 | 64 | 87  | 411.0 | 539.8 | 12.5 | 28.6 | 16           |
| 450  | 635 | 39.7 | 1.6 | 533 | 68 | 505 | 461.8 | -    | 457.2 | - | 140 | 68 | 97  | 462.0 | 577.8 | 12.5 | 31.8 | 16           |
| 500  | 698 | 42.9 | 1.6 | 584 | 73 | 559 | 513.1 | -    | 508.0 | - | 144 | 73 | 103 | 514.0 | 635.0 | 12.5 | 31.8 | 20           |
| 600  | 813 | 47.6 | 1.6 | 692 | 83 | 664 | 616.0 | -    | 609.6 | - | 152 | 83 | 111 | 616.0 | 749.3 | 12.5 | 34.9 | 20           |

### DIMENSIONS OF CLASS 300 FLANGES AS PER ANSI B 16.5

| N.B. | A   | B    | C   | D   | E   | F   | G     | H    | J     | K     | L   | M  | N   | O     | P     | R    | T    | No. of Holes |
|------|-----|------|-----|-----|-----|-----|-------|------|-------|-------|-----|----|-----|-------|-------|------|------|--------------|
| 15   | 95  | 14.3 | 1.6 | 35  | 22  | 38  | 22.4  | 9.5  | 21.3  | 23.5  | 52  | 16 | 22  | 23.0  | 66.7  | 3.0  | 15.9 | 4            |
| 20   | 117 | 15.9 | 1.6 | 43  | 25  | 48  | 27.7  | 11.0 | 26.7  | 29.0  | 57  | 16 | 25  | 28.0  | 82.6  | 3.0  | 19.0 | 4            |
| 25   | 124 | 17.5 | 1.6 | 51  | 27  | 54  | 34.5  | 12.5 | 33.4  | 36.0  | 62  | 17 | 27  | 35.0  | 88.9  | 3.0  | 19.0 | 4            |
| 32   | 133 | 19.0 | 1.6 | 64  | 27  | 64  | 43.2  | 14.5 | 42.2  | 44.5  | 65  | 21 | 27  | 43.5  | 98.4  | 5.0  | 19.0 | 4            |
| 40   | 156 | 20.6 | 1.6 | 73  | 30  | 70  | 49.5  | 16.0 | 48.3  | 50.5  | 68  | 22 | 30  | 50.0  | 114.3 | 6.5  | 22.2 | 4            |
| 50   | 165 | 22.2 | 1.6 | 92  | 33  | 84  | 62.0  | 17.5 | 60.3  | 63.5  | 70  | 29 | 33  | 62.5  | 127.0 | 8.0  | 19.0 | 8            |
| 65   | 190 | 25.4 | 1.6 | 105 | 38  | 100 | 74.7  | 19.0 | 73.0  | 76.0  | 76  | 32 | 38  | 75.5  | 149.2 | 8.0  | 22.2 | 8            |
| 80   | 210 | 28.6 | 1.6 | 127 | 43  | 117 | 90.7  | 20.5 | 88.9  | 92.0  | 79  | 32 | 43  | 91.5  | 168.3 | 9.5  | 22.2 | 8            |
| 90   | 229 | 30.2 | 1.6 | 140 | 44  | 133 | 103.4 | -    | 101.6 | 105.0 | 81  | 37 | 44  | 104.0 | 184.2 | 9.5  | 22.2 | 8            |
| 100  | 254 | 31.8 | 1.6 | 157 | 48  | 146 | 116.1 | -    | 114.3 | 118.0 | 86  | 37 | 48  | 117.0 | 200.0 | 11.0 | 22.2 | 8            |
| 125  | 279 | 34.9 | 1.6 | 186 | 51  | 178 | 143.8 | -    | 141.3 | 145.0 | 98  | 43 | 51  | 145.0 | 235.0 | 11.0 | 22.2 | 8            |
| 150  | 318 | 36.5 | 1.6 | 216 | 52  | 206 | 170.7 | -    | 168.3 | 171.0 | 98  | 46 | 52  | 171.0 | 269.9 | 12.5 | 22.2 | 12           |
| 200  | 381 | 41.3 | 1.6 | 270 | 62  | 260 | 221.5 | -    | 219.1 | 222.0 | 111 | 51 | 62  | 222.0 | 330.2 | 12.5 | 25.4 | 12           |
| 250  | 444 | 47.6 | 1.6 | 324 | 67  | 321 | 276.4 | -    | 273.0 | 276.0 | 117 | 56 | 95  | 277.0 | 387.4 | 12.5 | 28.6 | 16           |
| 300  | 521 | 50.8 | 1.6 | 381 | 73  | 375 | 327.2 | -    | 323.9 | 329.0 | 130 | 60 | 102 | 328.0 | 450.8 | 12.5 | 31.8 | 16           |
| 350  | 584 | 54.0 | 1.6 | 413 | 76  | 425 | 359.2 | -    | 355.6 | 360.0 | 143 | 64 | 111 | 360.0 | 514.4 | 12.5 | 31.8 | 20           |
| 400  | 648 | 57.2 | 1.6 | 470 | 83  | 483 | 410.5 | -    | 406.4 | 411.0 | 146 | 68 | 121 | 411.0 | 571.5 | 12.5 | 34.9 | 20           |
| 450  | 711 | 60.3 | 1.6 | 533 | 89  | 533 | 461.8 | -    | 457.2 | 462.0 | 159 | 70 | 130 | 462.0 | 628.6 | 12.5 | 34.9 | 24           |
| 500  | 775 | 63.5 | 1.6 | 584 | 95  | 587 | 513.1 | -    | 508.0 | 513.0 | 162 | 73 | 140 | 514.0 | 685.8 | 12.5 | 34.9 | 24           |
| 600  | 914 | 69.8 | 1.6 | 692 | 106 | 702 | 616.0 | -    | 609.6 | 614.0 | 168 | 83 | 152 | 616.0 | 812.8 | 12.5 | 41.3 | 24           |

1) All dimensions are in Millimeters

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



### DIMENSIONS OF CLASS 600 FLANGES AS PER ANSI B 16.5

| N.B. | A   | B     | C   | D   | E   | F   | G     | H    | J     | K     | L   | M  | N   | O     | P     | R    | T    | No.of Holes |
|------|-----|-------|-----|-----|-----|-----|-------|------|-------|-------|-----|----|-----|-------|-------|------|------|-------------|
| 15   | 95  | 14.3  | 6.4 | 35  | 22  | 38  | 22.4  | 9.5  | 21.3  | 23.5  | 52  | 16 | 22  | 23.0  | 66.7  | 3.0  | 15.9 | 4           |
| 20   | 117 | 15.9  | 6.4 | 43  | 25  | 48  | 27.7  | 11.0 | 26.7  | 29.0  | 57  | 16 | 25  | 28.0  | 82.6  | 3.0  | 19.0 | 4           |
| 25   | 124 | 17.5  | 6.4 | 51  | 27  | 54  | 34.5  | 12.5 | 33.4  | 36.0  | 62  | 17 | 27  | 35.0  | 88.9  | 3.0  | 19.0 | 4           |
| 32   | 133 | 20.6  | 6.4 | 64  | 29  | 64  | 43.2  | 14.5 | 42.2  | 44.5  | 67  | 21 | 29  | 43.5  | 98.4  | 5.0  | 19.0 | 4           |
| 40   | 156 | 22.2  | 6.4 | 73  | 32  | 70  | 49.5  | 16.0 | 48.3  | 50.5  | 70  | 22 | 32  | 50.0  | 114.3 | 6.5  | 22.2 | 4           |
| 50   | 165 | 25.4  | 6.4 | 92  | 37  | 84  | 62.0  | 17.5 | 60.3  | 63.5  | 73  | 29 | 37  | 62.5  | 127.0 | 8.0  | 19.0 | 8           |
| 65   | 190 | 28.6  | 6.4 | 105 | 41  | 100 | 74.7  | 19.0 | 73.0  | 76.0  | 79  | 32 | 41  | 75.5  | 149.2 | 8.0  | 22.2 | 8           |
| 80   | 210 | 31.8  | 6.4 | 127 | 46  | 117 | 90.7  | 20.5 | 88.9  | 92.0  | 83  | 35 | 46  | 91.5  | 168.3 | 9.5  | 22.2 | 8           |
| 90   | 229 | 34.9  | 6.4 | 140 | 49  | 133 | 103.4 | -    | 101.6 | 105.0 | 86  | 40 | 49  | 104.0 | 184.2 | 9.5  | 25.4 | 8           |
| 100  | 273 | 38.1  | 6.4 | 157 | 54  | 152 | 116.1 | -    | 114.3 | 118.0 | 102 | 41 | 54  | 117.0 | 215.9 | 11.0 | 25.4 | 8           |
| 125  | 330 | 44.4  | 6.4 | 186 | 60  | 189 | 143.8 | -    | 141.3 | 145.0 | 114 | 48 | 60  | 145.0 | 266.7 | 11.0 | 28.6 | 8           |
| 150  | 356 | 47.6  | 6.4 | 216 | 67  | 222 | 170.7 | -    | 168.3 | 171.0 | 117 | 51 | 67  | 171.0 | 292.1 | 12.5 | 28.6 | 12          |
| 200  | 419 | 55.6  | 6.4 | 270 | 76  | 273 | 221.5 | -    | 219.1 | 222.0 | 133 | 57 | 76  | 222.0 | 349.2 | 12.5 | 31.8 | 12          |
| 250  | 508 | 63.5  | 6.4 | 324 | 86  | 343 | 276.4 | -    | 273.0 | 276.0 | 152 | 65 | 111 | 277.0 | 431.8 | 12.5 | 34.9 | 16          |
| 300  | 559 | 66.7  | 6.4 | 381 | 92  | 400 | 327.2 | -    | 323.9 | 329.0 | 156 | 70 | 117 | 328.0 | 489.0 | 12.5 | 34.9 | 20          |
| 350  | 603 | 69.8  | 6.4 | 413 | 94  | 432 | 359.2 | -    | 355.6 | 360.0 | 165 | 73 | 127 | 360.0 | 527.0 | 12.5 | 38.1 | 20          |
| 400  | 686 | 76.2  | 6.4 | 470 | 106 | 495 | 410.5 | -    | 406.4 | 411.0 | 178 | 78 | 140 | 411.0 | 603.2 | 12.5 | 41.3 | 20          |
| 450  | 743 | 82.6  | 6.4 | 533 | 117 | 546 | 461.8 | -    | 457.2 | 462.0 | 184 | 79 | 152 | 462.0 | 654.0 | 12.5 | 44.4 | 20          |
| 500  | 813 | 88.9  | 6.4 | 584 | 122 | 610 | 513.1 | -    | 508.0 | 513.0 | 190 | 83 | 165 | 514.0 | 723.9 | 12.5 | 44.4 | 24          |
| 600  | 940 | 101.6 | 6.4 | 692 | 140 | 718 | 616.0 | -    | 609.6 | 614.0 | 203 | 92 | 184 | 616.0 | 838.2 | 12.5 | 50.8 | 24          |

### DIMENSIONS OF CLASS 1500 FLANGES AS PER ANSI B 16.5

| N.B. | A    | B     | C   | D   | E   | F   | G    | H    | J     | K     | L   | M  | N   | O     | P     | R    | T    | No.of Holes |
|------|------|-------|-----|-----|-----|-----|------|------|-------|-------|-----|----|-----|-------|-------|------|------|-------------|
| 15   | 121  | 22.2  | 6.4 | 35  | 32  | 38  | 22.4 | 9.5  | 21.3  | 23.5  | 60  | 22 | 32  | 23.0  | 82.6  | 3.0  | 22.2 | 4           |
| 20   | 130  | 25.4  | 6.4 | 43  | 35  | 44  | 27.7 | 11.0 | 26.7  | 29.0  | 70  | 25 | 35  | 28.0  | 88.9  | 3.0  | 22.2 | 4           |
| 25   | 149  | 28.6  | 6.4 | 51  | 41  | 52  | 34.5 | 12.5 | 33.4  | 36.0  | 73  | 29 | 41  | 35.0  | 101.6 | 3.0  | 25.4 | 4           |
| 32   | 159  | 28.6  | 6.4 | 64  | 41  | 64  | 43.2 | 14.5 | 42.2  | 44.5  | 73  | 30 | 41  | 43.5  | 111.1 | 5.0  | 25.4 | 4           |
| 40   | 178  | 31.8  | 6.4 | 73  | 44  | 70  | 49.5 | 16.0 | 48.3  | 50.5  | 83  | 32 | 44  | 50.0  | 123.8 | 6.5  | 28.6 | 4           |
| 50   | 216  | 38.1  | 6.4 | 92  | 57  | 105 | 62.0 | 17.5 | 60.3  | 63.5  | 102 | 38 | 57  | 62.5  | 165.1 | 8.0  | 25.4 | 8           |
| 65   | 244  | 41.3  | 6.4 | 105 | 64  | 124 | 74.7 | 19.0 | 73.0  | 76.0  | 105 | 48 | 64  | 75.5  | 190.5 | 8.0  | 28.6 | 8           |
| 80   | 267  | 47.6  | 6.4 | 127 | 73  | 133 | -    | -    | 88.9  | 92.0  | 117 | 51 | 73  | 91.5  | 203.2 | 9.5  | 31.8 | 8           |
| 100  | 311  | 54.0  | 6.4 | 157 | 91  | 162 | -    | -    | 114.3 | 118.0 | 124 | 57 | 91  | 117.0 | 241.3 | 11.0 | 34.9 | 8           |
| 125  | 325  | 73.0  | 6.4 | 186 | 105 | 197 | -    | -    | 141.3 | 145.0 | 156 | 64 | 105 | 145.0 | 292.1 | 11.0 | 41.3 | 8           |
| 150  | 394  | 82.6  | 6.4 | 216 | 119 | 229 | -    | -    | 168.3 | 171.0 | 171 | 70 | 119 | 171.0 | 317.5 | 12.5 | 38.1 | 12          |
| 200  | 483  | 92.1  | 6.4 | 270 | 143 | 292 | -    | -    | 219.1 | 222.0 | 213 | 75 | 143 | 222.0 | 393.7 | 12.5 | 44.4 | 12          |
| 250  | 584  | 108.0 | 6.4 | 324 | 159 | 368 | -    | -    | 273.0 | 276.0 | 254 | 84 | 178 | 277.0 | 482.6 | 12.5 | 50.8 | 12          |
| 300  | 673  | 123.8 | 6.4 | 381 | 181 | 451 | -    | -    | 323.9 | 329.0 | 283 | 92 | 219 | 328.0 | 571.5 | 12.5 | 54.0 | 16          |
| 350  | 749  | 133.4 | 6.4 | 413 | -   | 495 | -    | -    | 356.6 | -     | 298 | -  | 241 | 360.0 | 635.0 | 12.5 | 60.3 | 16          |
| 400  | 826  | 146.1 | 6.4 | 470 | -   | 552 | -    | -    | 406.4 | -     | 311 | -  | 260 | 411.0 | 704.8 | 12.5 | 66.7 | 16          |
| 450  | 914  | 161.9 | 6.4 | 533 | -   | 597 | -    | -    | 457.2 | -     | 327 | -  | 276 | 462.0 | 774.7 | 12.5 | 73.0 | 16          |
| 500  | 984  | 178.0 | 6.4 | 584 | -   | 641 | -    | -    | 508.0 | -     | 356 | -  | 292 | 514.0 | 831.8 | 12.5 | 79.4 | 16          |
| 600  | 1168 | 203.0 | 6.4 | 692 | -   | 762 | -    | -    | 609.6 | -     | 406 | -  | 330 | 616.0 | 990.6 | 12.5 | 92.0 | 16          |

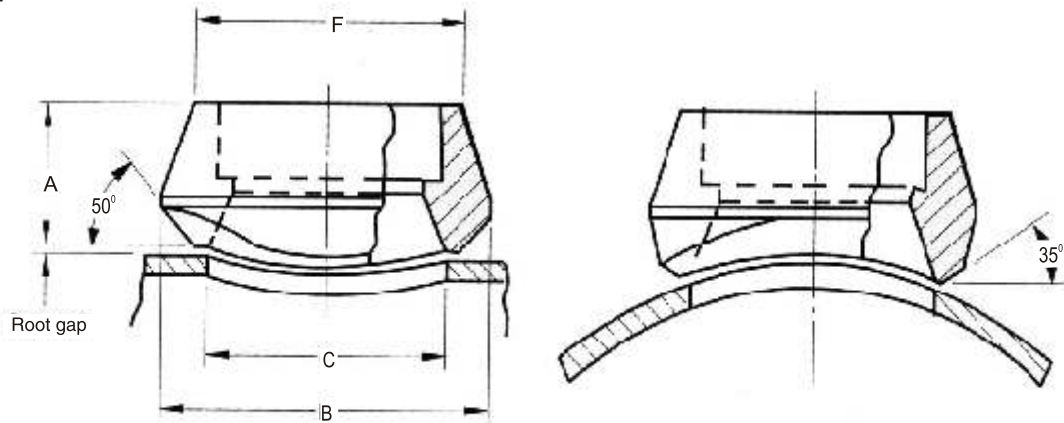
1) All dimensions are in Millimeters

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

# FORGE STEEL OUTLET FITTINGS

## Sockolets

3000# 6000#



| Outlet Size | A     |       | B     |       | C     |       |
|-------------|-------|-------|-------|-------|-------|-------|
|             | 3000# | 6000# | 3000# | 6000# | 3000# | 6000# |
| 1/2         | 25.4  | 31.8  | 34.9  | 44.5  | 23.8  | 19.1  |
| 3/4         | 27.0  | 36.5  | 44.5  | 50.8  | 30.2  | 25.4  |
| 1           | 33.3  | 39.7  | 54.0  | 61.9  | 36.5  | 33.3  |
| 1 1/4       | 33.3  | 41.3  | 65.1  | 69.9  | 44.5  | 38.1  |
| 1 1/2       | 34.9  | 42.9  | 73.0  | 82.6  | 50.8  | 49.2  |
| 2           | 38.1  | 58.7  | 88.9  | 103.2 | 65.1  | 58.7  |
| 2 1/2       | 46.0  | -     | 103.2 | -     | 76.2  | -     |
| 3           | 50.8  | -     | 122.2 | -     | 93.7  | -     |
| 4           | 57.2  | -     | 152.4 | -     | 120.7 | -     |

Applicable Run Pipe Sizes are From out-Let to 36"

For the 3000# and 6000# Sockolets and Thredolets, Inside Bore, Thread, Socket Bore and Socket depth Dimensions are According to ANSI B16.11

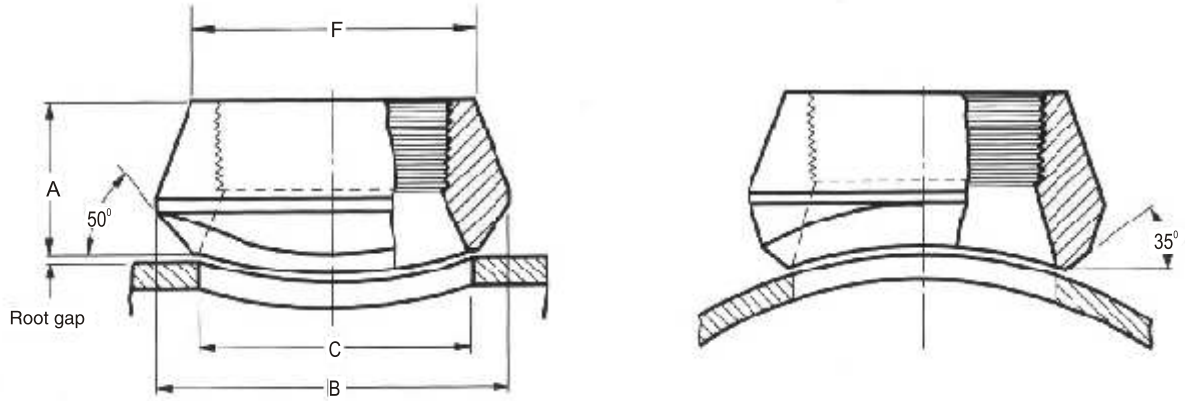
Pipe Schedule Numbers and Weight Designation are in Accordance With ANSI B36.10

When Ordering Sockolets and Thredolets, Include The Quantity, Run and Out-Let Size, Item And Rating(or Schedule Number)and Material

# FORGE STEEL OUTLET FITTINGS

## Thredolets

3000# 6000#



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

Applicable Run Pipe Sizes are From out-Let to 36"

For the 3000# and 6000# Socklets and Thredolets, Inside Bore, Thread, Socket Bore and Socket depth Dimensions are According to ANSI B16.11

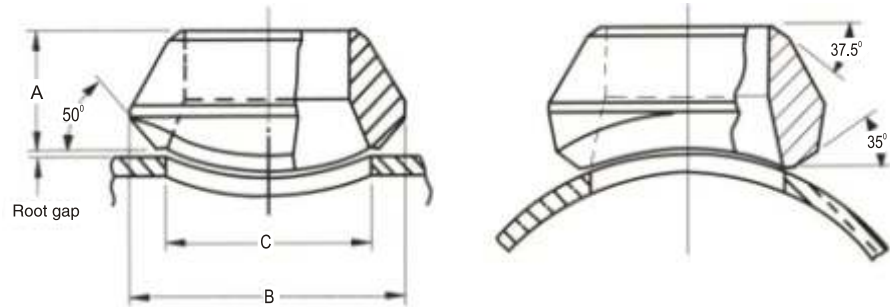
Pipe Schedule Numbers and Weight Designation are in Accordance With ANSI B36.10

When Ordering Socklets and Thredolets, Include The Quantity, Run and Out-Let Size, Item And Rating(or Schedule Number)and Material

# FORGED STEEL OUTLET FITTINGS

## Weldolets

STD(Sch40), XS(Sch 80)



| Outlet Size | A     |       | B     |       | C     |       |
|-------------|-------|-------|-------|-------|-------|-------|
|             | STD   | XS    | STD   | XS    | STD   | XS    |
| 1/2         | 19.1  | 19.1  | 34.9  | 34.9  | 23.8  | 23.8  |
| 3/4         | 22.2  | 22.2  | 44.5  | 44.5  | 30.2  | 30.2  |
| 1           | 27.0  | 27.0  | 54.0  | 54.0  | 36.5  | 36.5  |
| 1 1/4       | 31.8  | 31.8  | 65.1  | 65.1  | 44.5  | 44.5  |
| 1 1/2       | 33.3  | 33.3  | 73.0  | 73.0  | 50.8  | 50.8  |
| 2           | 38.1  | 38.1  | 88.9  | 88.9  | 65.1  | 65.1  |
| 2 1/2       | 41.3  | 41.3  | 103.2 | 103.2 | 76.2  | 76.2  |
| 3           | 44.5  | 44.5  | 122.2 | 122.2 | 93.7  | 93.7  |
| 4           | 50.8  | 50.8  | 152.4 | 152.4 | 120.7 | 120.7 |
| 5           | 57.2  | 57.2  | 179.4 | 179.4 | 141.3 | 141.3 |
| 6           | 60.3  | 77.8  | 215.9 | 225.4 | 169.9 | 169.9 |
| 8           | 69.9  | 98.5  | 263.5 | 292.1 | 220.7 | 220.7 |
| 10          | 77.8  | 93.7  | 322.3 | 323.9 | 274.7 | 265.1 |
| 12          | 85.7  | 103.2 | 377.8 | 379.4 | 325.4 | 317.5 |
| 14          | 88.9  | 100.0 | 409.6 | 431.8 | 357.2 | 350.8 |
| 16          | 93.7  | 106.4 | 463.6 | 466.7 | 408.0 | 403.2 |
| 18          | 96.8  | 111.1 | 520.7 | 523.9 | 458.8 | 455.6 |
| 20          | 101.6 | 119.1 | 571.5 | 582.6 | 508.0 | 509.6 |
| 24          | 115.9 | 139.7 | 689.0 | 708.0 | 614.4 | 638.2 |
| 26          | 119.1 | 146.1 | 738.2 | 765.2 | 666.8 | 692.2 |

Applicable Run Pipe Sizes are From out-Let to 36"

Standard Weight Fittings are the Same as Schedule 40 Fittings Until 10" and Extra Strong Fittings are the Same as Schedule 80 Until 8"

Pipe Schedule Numbers and Weight Designations are in Accordance With ANSI B36.10

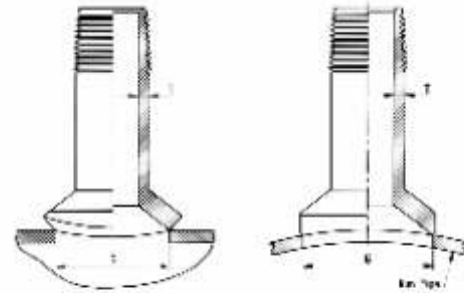
When Ordering Weldolet, Include The Quantity, Size (Run and Out-Let) Description (Weldolets, Schedule Number) And Material

# FORGED STEEL OUTLET FITTINGS

## Nipple Outlets 3000#

(in millimeters)

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

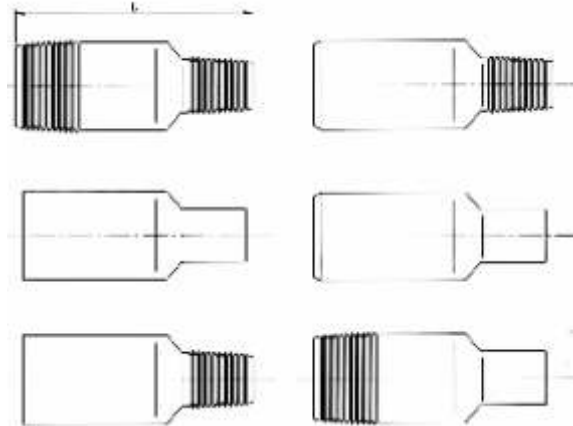


MSS SP- 97

## Swaged Nipple

(in millimeters)

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

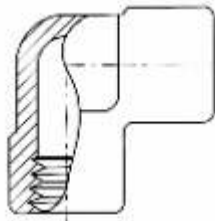


MSS SP- 95

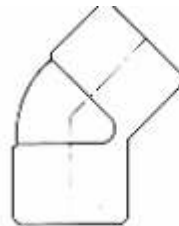
TBE Threaded both end  
 PBE Plain both end  
 PLE/TSE Plain large end-Threaded small end  
 BLE/TSE Beveled large end -Threaded small end  
 BLE/PSE Beveled large end -Plain small end  
 TLE/PSE Threaded large end-Plain small end

**FORGED STEEL THREADED FITTINGS**  
**90 Elbow, 90 Elbow, Tee, Cross, Coupling, Half Coupling,**  
**Cap 2000# 3000# 6000#**

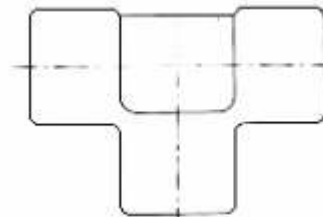
| Nom. Pipe size | Minimum Wall Thickness |       |       | Approx. Weight(kg)         |           |       |       |          |               |      |           |           |       |       |          |               |      |
|----------------|------------------------|-------|-------|----------------------------|-----------|-------|-------|----------|---------------|------|-----------|-----------|-------|-------|----------|---------------|------|
|                |                        |       |       | Pressure Class Designation |           |       |       |          |               |      |           |           |       |       |          |               |      |
|                | T                      |       |       | 6000                       |           |       |       |          |               |      | 6000      |           |       |       |          |               |      |
|                | 2000                   | 3000  | 6000  | 90° Elbow                  | 45° Elbow | Tee   | Cross | Coupling | Half Coupling | Cap  | 90° Elbow | 45° Elbow | Tee   | Cross | Coupling | Half Coupling | Cap  |
| 1/8            | 3.18                   | 3.18  | 6.35  | 0.14                       | 0.11      | 0.14  | 0.23  | 0.05     | 0.02          | 0.03 | 0.17      | 0.11      | 0.17  | 0.17  | 0.08     | 0.05          | 0.07 |
| 1/4            | 3.18                   | 3.30  | 6.60  | 0.14                       | 0.11      | 0.14  | 0.23  | 0.05     | 0.02          | 0.04 | 0.17      | 0.11      | 0.17  | 0.17  | 0.10     | 0.05          | 0.08 |
| 3/8            | 3.18                   | 3.51  | 6.98  | 0.14                       | 0.11      | 0.14  | 0.23  | 0.06     | 0.03          | 0.06 | 0.29      | 0.24      | 0.37  | 0.45  | 0.18     | 0.08          | 0.11 |
| 1/2            | 3.18                   | 4.09  | 8.15  | 0.23                       | 0.20      | 0.31  | 0.40  | 0.13     | 0.06          | 0.11 | 0.40      | 0.31      | 0.54  | 0.68  | 0.31     | 0.15          | 0.25 |
| 3/4            | 3.18                   | 4.32  | 8.53  | 0.31                       | 0.29      | 0.43  | 0.51  | 0.19     | 0.08          | 0.19 | 0.63      | 0.54      | 0.85  | 1.13  | 0.43     | 0.20          | 0.34 |
| 1              | 3.68                   | 4.98  | 9.93  | 0.51                       | 0.43      | 0.65  | 0.77  | 0.38     | 0.17          | 0.34 | 1.02      | 0.85      | 1.41  | 1.61  | 0.87     | 0.39          | 0.64 |
| 1 1/4          | 3.89                   | 5.28  | 10.59 | 0.72                       | 0.63      | 0.91  | 1.13  | 0.71     | 0.33          | 0.57 | 1.18      | 0.97      | 1.59  | 1.87  | 1.04     | 0.50          | 1.00 |
| 1 1/2          | 4.01                   | 5.56  | 11.07 | 0.91                       | 0.74      | 1.25  | 1.45  | 0.96     | 0.45          | 0.68 | 2.22      | 1.81      | 2.90  | 2.95  | 1.70     | 0.82          | 1.32 |
| 2              | 4.27                   | 7.14  | 12.09 | 1.59                       | 1.22      | 2.10  | 2.38  | 1.36     | 0.63          | 1.18 | 2.35      | 2.00      | 3.11  | 3.69  | 2.44     | 1.18          | 2.36 |
| 2 1/2          | 5.61                   | 7.65  | 15.29 | 2.95                       | 3.52      | 3.94  | 7.46  | 2.09     | 0.98          | 2.27 | 4.76      | 3.35      | 5.96  | 7.60  | 4.04     | 1.95          | 2.99 |
| 3              | 5.99                   | 8.84  | 16.64 | 4.99                       | 5.13      | 5.98  | 8.85  | 2.95     | 1.39          | 3.86 | 6.55      | 5.34      | 9.24  | 8.96  | 6.10     | 2.95          | 4.35 |
| 4              | 6.55                   | 11.18 | 18.67 | 1.03                       | 8.68      | 12.36 | 14.83 | 5.56     | 2.63          | 5.90 | 13.78     | 8.65      | 17.92 | 14.51 | 11.00    | 5.35          | 7.71 |



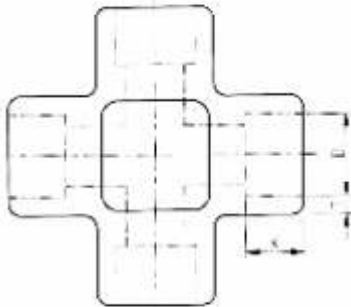
90 Elbow



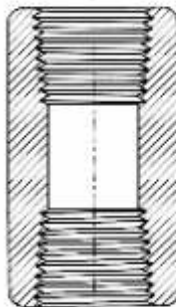
45 Elbow



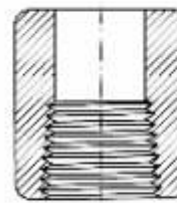
Tee



Cross



Coupling



Half Coupling



Cap

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**ISO 9001:2008 Certified company**