

**ENGINEERING DESIGN SEMINAR**

**SEPTEMBER 6, 1994 – NOVEMBER 11, 1994**

**FLANGE RATINGS**

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### **Codes**

The primary codes that cover the materials we will be dealing with are the following:

Chemical Plant and Petroleum Refinery Piping Code (ANSI B31.3), a section of the American National Standards Code for Pressure Piping

Steel Pipe Flanges and Flanged Fittings (ANSI B16.5 - Latest edition that has been approved by ANSI B31.3)

ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

### **Ratings**

Primary service pressure ratings are for Class 150, 300, 400, 600, 900, 1500, or 2500. Pressure ratings are shown in ANSI B16.5. These ratings are for the maximum allowable non-shock pressures at the temperatures shown, and the allowable temperature may be interpolated between the temperatures.

### **Temperature**

The temperature shown is the temperature of the pressure-containing shell of the component. In general, the temperature is the same temperature as the contained fluid.

## **Marking**

**Name** - This will be the manufacturer's name or trade mark.

**Materials** -

Cast carbon steel flanges will be marked with the word "STEEL".

Cast alloy steel (except austenitic) shall be marked with the word "Steel" and the symbols designated in the ASTM Specifications to indicated the grade of steel.

Similar rules apply to forged steel flanges.

A manufacturer may supplement these markings with his own designations.

**Pressure** - The primary service pressure must be indicated.

**Temperature** - Not required.

**Size** - Nominal pipe size in inches shall be given, but may be omitted from reducing flanges and reducing flanged fittings.

**Ring Joint Flanges** - The edge of each flange of this type shall be marked with the letter "R" and the corresponding ring-groove number.

**Omission of Markings** - Because of its size, a flange may be too small to include all the markings. The markings may be omitted in the following order: Size, temperature, pressure, material, manufacturer's name or trademark.

## **TYPICAL FLANGE FACINGS**

### **Raised Face**

Flanges with raised face are extensively used because of their simplicity of design and they are adequate for average service. For severe service involving high pressure, temperature, thermal shock, or cyclic operations, this type may not be satisfactory. Class 150 and Class 300 have 1/16 inch raised face and the others have 1/4 inch raised face.

### **Male And Female**

Male and female facings have the advantage of confining the gaskets therefore minimizing blowout. The disadvantage is that the mating flanges are not identical. They are not used extensively on pipelines but more so on heat exchangers, manholes and end flanges. They also offer no protection toward inward gasket movement. The female recess is usually 3/16 inch deep and the male part is 1/4 inch high.

### **Tongue And Groove**

Tongue and groove have advantages and disadvantages similar to male and female. An advantage they have over male and female is that they can contain a gasket from being forced inside the interior of a line or vessel. Also, the gasket is less subject to **erosive** or **corrosive** contact with the fluid of the vessel. In service, the tongue is more likely to be damaged than the groove; therefore the tongue should be placed on the part most easily removed from the vessel. The small area of the tongue and groove provides minimum area that is advisable with flat gaskets and therefore minimizes bolt load for gasket compression.

## **Ring Joint**

One advantage of the ring joint type of facing is that it offers the greatest protection under severe service conditions or with use of hazardous fluids. Another advantage is that the internal pressure acts on the ring to increase the sealing force on the joint. The flanges are identical. The gasket contact surfaces being below the flange precludes gasket contact face damage. The disadvantage of this type is its cost.

## **Lap Joints**

Similar to raised face but the advantage is that the bolt holes may be lined up during assembly and not fabrication of joints. A disadvantage is flange rotation possibility during gasket seating.

## **GASKET SELECTION**

Leakproof metal to metal surfaces in which gaskets are not used are difficult to fabricate even by use of very accurate machine surfaces. The function of a gasket is to interpose a semiplastic material between the flange facings, which material thru deformation under load seals the minute surface irregularities to prevent leakage of the fluid. The amount of force that must be applied to the gasket to cause the gasket to flow and seal the surface irregularities is known as the "yield" or "seating" force. The yield stress represents the minimum load that must be applied to the gasket to seat it even though low pressures may be used.

Leakage will occur under pressure if the hydrostatic end force is sufficiently great that the difference between it and the bolt-load forces reduces the gasket load below a critical value. Also, with a too low contact pressure the gasket may be blown out. The ratio of the gasket stress, when the vessel is under pressure, to the internal pressure is termed the "gasket factor". The gasket factor is a property of the gasket material and the construction and is independent of the internal pressure over a wide range of pressures.

## **TYPES OF GASKETS**

### **Flat Ring**

Flat ring gaskets are widely used wherever service conditions permit because of ease with which they may be cut from flat sheets and installed. Materials consist of rubber, paper, cloth, asbestos, plastics, copper, lead, aluminum, nickel, monel and soft iron. Thicknesses range from 1/64 in to 1/8 in .

### **Laminated**

Laminated gaskets are fabricated with a metal jacket and a soft filler, usually of asbestos.

### **Serrated Metal**

Serrated metal gaskets are fabricated of solid metal and have concentric grooves machined into the faces. This greatly reduces the contact area on initial tightening, thereby reducing bolt load. Smooth face flanges should be used.

### **Corrugated With Asbestos Filler**

Corrugated gaskets with asbestos filling are similar to laminated gaskets except that the surface is rigid with concentric rings as in the case of serrated gaskets. Corrugated gaskets require less seating force than laminated or serrated gaskets and are extensively used in low pressure liquid and gas service. Corrugated metal gaskets without asbestos may be used to higher temperatures than those with asbestos filling and are extensively used in sealing water, steam, gas, oil, acid and other chemicals.

### **Ring Joint**

Two standard types of ring-joint gaskets are available for high-pressure service. One type has an oval cross section and the other has an octagonal cross section. These rings are fabricated of solid metal, usually soft iron, soft steel, monel, 4-6 pct chrome, and stainless steels. The alloy-steel rings should be heat treated to soften them.

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**TABLE 1A LIST OF MATERIAL SPECIFICATIONS**  
**Applicable ASTM Specifications**

| Material Groups    |                           | Product Forms |       |        |           |       |        |           |         |        |
|--------------------|---------------------------|---------------|-------|--------|-----------|-------|--------|-----------|---------|--------|
| Material Group No. | Nominal Designation Steel | Forgings      |       |        | Castings  |       |        | Plates    |         |        |
|                    |                           | Spec. No.     | Grade | Notes  | Spec. No. | Grade | Notes  | Spec. No. | Grade   | Notes  |
| 1.1                | Carbon                    | A 105         | ...   | (1)(2) | A 216     | WCB   | (1)    | A 515     | 70      | (1)    |
|                    |                           | A 350         | LF2   | ...    | ...       | ...   | ...    | A 516     | 70      | (1)    |
|                    | C-Mn-Si                   | ...           | ...   | ...    | ...       | ...   | ...    | A 537     | Cl.1    | ...    |
| 1.2                | Carbon                    | ...           | ...   | ...    | A 216     | WCC   | (1)    | ...       | ...     | ...    |
|                    |                           | ...           | ...   | ...    | A 352     | LCC   | ...    | ...       | ...     | ...    |
|                    | 2½Ni                      | ...           | ...   | ...    | A 352     | LC2   | ...    | A 203     | B       | ...    |
|                    | 3½Ni                      | A 350         | LF3   | ...    | A 352     | LC3   | ...    | A 203     | E       | ...    |
| 1.3                | Carbon                    | ...           | ...   | ...    | A 352     | LCB   | (1)    | A 515     | 65      | (1)    |
|                    |                           | ...           | ...   | ...    | ...       | ...   | ...    | A 516     | 65      | (1)    |
|                    | 2½Ni                      | ...           | ...   | ...    | ...       | ...   | ...    | A 203     | A       | ...    |
|                    | 3½Ni                      | ...           | ...   | ...    | ...       | ...   | ...    | A 203     | D       | ...    |
| 1.4                | Carbon                    | A 350         | LF1   | ...    | ...       | ...   | ...    | A 515     | 60      | (1)    |
|                    |                           | ...           | ...   | ...    | ...       | ...   | ...    | A 516     | 60      | ...    |
| 1.5                | C-½Mo                     | A 182         | F1    | (3)    | A 217     | WC1   | (3)(4) | A 204     | A       | (3)    |
|                    |                           | ...           | ...   | ...    | A 352     | LC1   | ...    | A 204     | B       | (3)    |
| 1.7                | C-½Mo                     | ...           | ...   | ...    | ...       | ...   | ...    | A 204     | C       | (3)    |
|                    | ½Cr-½Mo                   | A 182         | F2    | ...    | ...       | ...   | ...    | ...       | ...     | ...    |
|                    | Ni-Cr-½Mo                 | ...           | ...   | ...    | A 217     | WC4   | (4)    | ...       | ...     | ...    |
|                    | Ni-Cr-1Mo                 | ...           | ...   | ...    | A 217     | WC5   | (4)    | ...       | ...     | ...    |
| 1.9                | 1Cr-½Mo                   | A 182         | F12   | (4)    | ...       | ...   | ...    | ...       | ...     | ...    |
|                    | 1¼Cr-½Mo                  | A 182         | F11   | (4)    | A 217     | WC6   | (4)    | A 387     | 11 Cl.2 | ...    |
| 1.10               | 2¼Cr-1Mo                  | A 182         | F22   | ...    | A 217     | WC9   | (4)    | A 387     | 22 Cl.2 | ...    |
| 1.13               | 5Cr-½Mo                   | A 182         | F5    | ...    | A 217     | C5    | (4)    | ...       | ...     | ...    |
|                    |                           | A 182         | F5a   | ...    | ...       | ...   | ...    | ...       | ...     | ...    |
| 1.14               | 9Cr-1Mo                   | A 182         | F9    | ...    | A 217     | C12   | (4)    | ...       | ...     | ...    |
| 2.1                | 18Cr-8Ni                  | A 182         | F304  | (5)    | A 351     | CF3   | ...    | A 240     | 304     | (5)(6) |
|                    |                           | A 182         | F304H | ...    | A 351     | CF8   | (5)    | A 240     | 304H    | ...    |
| 2.2                | 16Cr-12Ni-2Mo             | A 182         | F316  | (5)    | ...       | ...   | ...    | A 240     | 316     | (5)(6) |
|                    |                           | A 182         | F316H | ...    | ...       | ...   | ...    | A 240     | 316H    | ...    |
|                    | 18Cr-13Ni-3Mo             | ...           | ...   | ...    | ...       | ...   | ...    | A 240     | 317     | (5)(6) |
|                    | 18Cr-9Ni-2Mo              | ...           | ...   | ...    | A 351     | CF3M  | ...    | ...       | ...     | ...    |
|                    |                           | ...           | ...   | ...    | A 351     | CF8M  | (5)    | ...       | ...     | ...    |

**TABLE 1A LIST OF MATERIAL SPECIFICATIONS (CONT'D)**  
**Applicable ASTM Specifications**

| Material Groups    |                           | Product Forms |       |        |           |       |       |           |       |           |
|--------------------|---------------------------|---------------|-------|--------|-----------|-------|-------|-----------|-------|-----------|
| Material Group No. | Nominal Designation Steel | Forgings      |       |        | Castings  |       |       | Plates    |       |           |
|                    |                           | Spec. No.     | Grade | Notes  | Spec. No. | Grade | Notes | Spec. No. | Grade | Notes     |
| 2.3                | 18Cr-8Ni                  | A 182         | F304L | ...    | ...       | ...   | ...   | A 240     | 304L  | ...       |
|                    | 16Cr-12Ni-2Mo             | A 182         | F316L | ...    | ...       | ...   | ...   | A 240     | 316L  | ...       |
| 2.4                | 18Cr-10Ni-Ti              | A 182         | F321  | (5)    | ...       | ...   | ...   | A 240     | 321   | (5)(6)    |
|                    |                           | A 182         | F321H | ...    | ...       | ...   | ...   | A 240     | 321H  | ...       |
| 2.5                | 18Cr-10Ni-Cb              | A 182         | F347  | (5)    | A 351     | CF8C  | (5)   | A 240     | 347   | (5)(6)    |
|                    |                           | A 182         | F347H | ...    | ...       | ...   | ...   | A 240     | 347H  | ...       |
|                    |                           | A 182         | F348  | (5)    | ...       | ...   | ...   | A 240     | 348   | (5)(6)    |
|                    |                           | A 182         | F348H | ...    | ...       | ...   | ...   | A 240     | 348H  | ...       |
| 2.6                | 25Cr-12Ni                 | ...           | ...   | ...    | A 351     | CH8   | (5)   | ...       | ...   | ...       |
|                    |                           | ...           | ...   | ...    | A 351     | CH20  | (5)   | ...       | ...   | ...       |
|                    | 23Cr-12Ni                 | ...           | ...   | ...    | ...       | ...   | ...   | A 240     | 309S  | (5)(6)    |
| 2.7                | 25Cr-20Ni                 | A182          | F310  | (5)(7) | A 351     | CK20  | (5)   | A 240     | 310S  | (5)(6)(7) |

| Material Groups    |                              | Product Forms |        |         |           |       |       |           |        |       |
|--------------------|------------------------------|---------------|--------|---------|-----------|-------|-------|-----------|--------|-------|
| Material Group No. | Nominal Designation          | Forgings      |        |         | Castings  |       |       | Plates    |        |       |
|                    |                              | Spec. No.     | Grade  | Notes   | Spec. No. | Grade | Notes | Spec. No. | Grade  | Notes |
| 3.1                | Cr-Ni-Fe-Mo-Cu-Cb Alloy 20Cb | B 462         | N08020 | (8)     | A 351     | CN7M  | (9)   | B 463     | N08020 | (8)   |
| 3.2                | Ni Alloy 200                 | B 160         | N02200 | (8)(10) | ...       | ...   | ...   | B 162     | N02201 | (8)   |
| 3.3                | Ni-Low C Alloy 201           | B 160         | N02201 | (8)(10) | ...       | ...   | ...   | B 162     | N02200 | (8)   |
| 3.4                | Ni-Cu Alloy 400              | B 564         | N04400 | (8)     | ...       | ...   | ...   | B 127     | N04400 | (8)   |
|                    | Alloy 405                    | B 164         | N04405 | (8)(10) | ...       | ...   | ...   | ...       | ...    | ...   |
| 3.5                | Ni-Cr-Fe Alloy 600           | B 564         | N06600 | (8)     | ...       | ...   | ...   | B 168     | N06600 | (8)   |
| 3.6                | Ni-Fe-Cr Alloy 800           | B 564         | N08800 | (8)     | ...       | ...   | ...   | B 409     | N08800 | (8)   |
| 3.7                | Ni-Mo Alloy B2               | B 335         | N10665 | (9)(10) | ...       | ...   | ...   | B 333     | N10665 | (9)   |
| 3.8                | Ni-Mo-Cr Alloy C276          | B 574         | N10276 | (9)(10) | ...       | ...   | ...   | B 575     | N10276 | (9)   |

(Table 1A continues on next page; Notes follow at end of Table)

**TABLE 1A LIST OF MATERIAL SPECIFICATIONS (CONT'D)**  
**Applicable ASTM Specifications**

| Material Groups    |                                 | Product Forms |        |         |           |       |       |           |        |       |
|--------------------|---------------------------------|---------------|--------|---------|-----------|-------|-------|-----------|--------|-------|
| Material Group No. | Nominal Designation             | Forgings      |        |         | Castings  |       |       | Plates    |        |       |
|                    |                                 | Spec. No.     | Grade  | Notes   | Spec. No. | Grade | Notes | Spec. No. | Grade  | Notes |
| 3.8<br>(cont'd)    | Ni-Cr-Mo-Cb Alloy 625           | B 564         | N06625 | (8)     | ...       | ...   | ...   | B 443     | N06625 | (8)   |
|                    | Ni-Mo Alloy B                   | B 335         | N10001 | (9)(10) | ...       | ...   | ...   | B 333     | N10001 | (9)   |
|                    | Ni-Cr-Mo-Fe Alloy N             | B 573         | N10003 | (8)(10) | ...       | ...   | ...   | B 434     | N10003 | (8)   |
|                    | Ni-Mo-Cr Alloy C4               | B 574         | N06455 | (9)(10) | ...       | ...   | ...   | B 575     | N06455 | (9)   |
|                    | Ni-Fe-Cr-Mo-Cu Alloy 825        | B 425         | N08825 | (8)(10) | ...       | ...   | ...   | B 424     | N08825 | (8)   |
| 3.9                | Ni-Cr-Mo-Fe Alloy X             | B 572         | N06002 | (8)(10) | ...       | ...   | ...   | B 435     | N06002 | (8)   |
| 3.10               | Ni-Fe-Cr-Mo-Cd Alloy 700        | B 672         | N08700 | (9)(10) | ...       | ...   | ...   | B 599     | N08700 | (9)   |
| 3.11               | Ni-Fe-Cr-Mo-Cu-Low C Alloy 904L | B 649         | N08904 | (8)(10) | ...       | ...   | ...   | B 625     | N08904 | (8)   |
| 3.12               | Ni-Fe-Cr-Mo Alloy 20 Mod.       | B 621         | N08320 | (9)(10) | ...       | ...   | ...   | B 620     | N08320 | (9)   |
|                    | Ni-Cr-Fe-Mo-Cu Alloy G-3        | B 581         | N06985 | (9)(10) | ...       | ...   | ...   | B 582     | N06985 | (9)   |
| 3.13               | Ni-Cr-Fe-Mo-Cu Alloy G-2        | B 581         | N06975 | (9)(10) | ...       | ...   | ...   | B 582     | N06975 | (9)   |
| 3.14               | Ni-Cr-Fe-Mo-Cu Alloy G          | B 581         | N06007 | (9)(10) | ...       | ...   | ...   | B 582     | N06007 | (9)   |
| 3.15               | Ni-Fe-Cr Alloy 800H             | B 564         | N08810 | (8)     | ...       | ...   | ...   | B 409     | N08810 | (8)   |
| 3.16               | Ni-Fe-Cr-Si Alloy 330           | B 511         | N08330 | (8)(10) | ...       | ...   | ...   | B 536     | N08330 | (8)   |

TABLE 1A (CONT'D)

## GENERAL NOTES:

- (a) For temperature limitations, see Notes in Table 2.
- (b) Plate materials are listed only for use as blind flanges (see para. 5.1). Additional plate materials listed in ANSI B16.34 may also be used with corresponding B16.34 Standard Class ratings.
- (c) Material Groups not listed in Table 1A are intended for use in valves. See ANSI B16.34.

## NOTES:

- (1) Upon prolonged exposure to temperatures above about 800°F, the carbide phase of carbon steel may be converted to graphite.
- (2) Only killed steel shall be used above 850°F.
- (3) Upon prolonged exposure to temperatures above about 875°F, the carbide phase of carbon-molybdenum steel may be converted to graphite.
- (4) Use normalized and tempered material only.
- (5) At temperatures over 1000°F, use only when the carbon content is 0.04% or higher.
- (6) For temperatures above 1000°F, use only if the material is heat treated by heating it to a temperature of at least 1900°F and quenching in water or rapidly cooling by other means.
- (7) Service temperatures of 1050°F and above should be used only when assurance is provided that grain size is not finer than ASTM No. 6.
- (8) Use annealed material only.
- (9) Use solution annealed material only.
- (10) The chemical composition, mechanical properties, heat treating requirements, and grain size requirements shall conform to the applicable ASTM specification. The manufacturing procedures, tolerances, tests, certification, and markings shall be in accordance with ASTM B 564.

**TABLE 1B LIST OF BOLTING SPECIFICATIONS**  
**Applicable ASTM Specifications**

| Bolting Materials [Note (1)] |       |       |                                     |          |       |                            |          |       |                                        |        |           |
|------------------------------|-------|-------|-------------------------------------|----------|-------|----------------------------|----------|-------|----------------------------------------|--------|-----------|
| High Strength<br>[Note (2)]  |       |       | Intermediate Strength<br>[Note (3)] |          |       | Low Strength<br>[Note (4)] |          |       | Nickel and Special Alloy<br>[Note (5)] |        |           |
| Spec.<br>No.                 | Grade | Notes | Spec.<br>No.                        | Grade    | Notes | Spec.<br>No.               | Grade    | Notes | Spec.<br>No.                           | Grade  | Notes     |
| A 193                        | B7    | ...   | A 193                               | B5       | ...   | A 193                      | B8 Cl.1  | (6)   | B 164                                  | ...    | (7)(8)(9) |
| A 193                        | B16   | ...   | A 193                               | B6       | ...   | A 193                      | B8C Cl.1 | (6)   |                                        |        |           |
|                              |       |       | A 193                               | B6X      | ...   | A 193                      | B8M Cl.1 | (6)   | B 166                                  | ...    | (7)(8)(9) |
| A 320                        | L7    | (10)  | A 193                               | B7M      | ...   | A 193                      | B8T Cl.1 | (6)   |                                        |        |           |
| A 320                        | L7A   | (10)  | A 193                               | B8 Cl.2  | (11)  | A 193                      | B8A      | (6)   | B 335                                  | N10665 | (7)       |
| A 320                        | L7B   | (10)  | A 193                               | B8C Cl.2 | (11)  | A 193                      | B8CA     | (6)   |                                        |        |           |
| A 320                        | L7C   | (10)  | A 193                               | B8M Cl.2 | (11)  | A 193                      | B8MA     | (6)   | B 408                                  | ...    | (7)(8)(9) |
| A 320                        | L43   | (10)  | A 193                               | B8T Cl.2 | (11)  | A 193                      | B8TA     | (6)   |                                        |        |           |
|                              |       |       |                                     |          |       |                            |          |       | B 473                                  | ...    | (7)       |
| A 354                        | BC    | ...   | A 320                               | B8 Cl.2  | (11)  | A 307                      | B        | (12)  |                                        |        |           |
| A 354                        | BD    | ...   | A 320                               | B8C Cl.2 | (11)  |                            |          |       | B 574                                  | N10276 | (7)       |
|                              |       |       | A 320                               | B8F Cl.2 | (11)  | A 320                      | B8 Cl.1  | (6)   |                                        |        |           |
| A 540                        | B21   | ...   | A 320                               | B8M Cl.2 | (11)  | A 320                      | B8C Cl.1 | (6)   |                                        |        |           |
| A 540                        | B22   | ...   | A 320                               | B8T Cl.2 | (11)  | A 320                      | B8M Cl.1 | (6)   |                                        |        |           |
| A 540                        | B23   | ...   |                                     |          |       | A 320                      | B8T Cl.1 | (6)   |                                        |        |           |
| A 540                        | B24   | ...   | A 449                               | ...      | (13)  |                            |          |       |                                        |        |           |
|                              |       |       | A 453                               | 651      | (14)  |                            |          |       |                                        |        |           |
|                              |       |       | A 453                               | 660      | (14)  |                            |          |       |                                        |        |           |

GENERAL NOTE: Bolting material shall not be used beyond temperature limits specified in the governing code.

**NOTES:**

- (1) Repair welding of bolting material is prohibited.
- (2) These bolting materials may be used with all listed materials and gaskets.
- (3) These bolting materials may be used with all listed materials and gaskets, provided it has been verified that a sealed joint can be maintained under rated working pressure and temperature.
- (4) These bolting materials may be used with all listed materials but are limited to Classes 150 and 300 joints. See para. 5.4.1 for required gasket practices.
- (5) These materials may be used as bolting with comparable nickel and special alloy parts.
- (6) This austenitic stainless material has been carbide solution treated but not strain hardened. Use A 194 nuts of corresponding material.
- (7) Nuts may be machined from the same material or may be of a compatible grade of ASTM A 194.
- (8) Maximum operating temperature is arbitrarily set at 500°F, unless material has been annealed, solution annealed, or hot finished, because hard temper adversely affects design stress in the creep rupture range.
- (9) Forging quality not permitted unless the producer last heating or working these parts tests them as required for other permitted conditions in the same specification and certifies their final tensile, yield, and elongation properties to equal or exceed the requirements for one of the other permitted conditions.
- (10) This ferritic material is intended for low temperature service. Use A 194 Grade 4 or Grade 7 nuts.
- (11) This austenitic stainless material has been carbide solution treated and strain hardened. Use A 194 nuts of corresponding material.
- (12) This carbon steel fastener shall not be used above 400°F or below -20°F. See also Note (4). Bolts with drilled or undersized heads shall not be used.
- (13) Acceptable nuts for use with quenched and tempered bolts are A 194 Grades 2 and 2H. Mechanical property requirements for studs shall be the same as those for bolts.
- (14) This special alloy is intended for high temperature service with austenitic stainless steel.

**TABLE 1C FLANGE BOLTING DIMENSIONAL RECOMMENDATIONS**

| Product                                         | Carbon Steel                           | Alloy Steel                                                                            |
|-------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------------------|
| Stud bolts                                      | ANSI B18.2.1                           | ANSI B18.2.1                                                                           |
| Bolts smaller than $\frac{3}{4}$ in.            | ANSI B18.2.1, square or heavy hex head | ANSI B18.2.1, heavy hex head                                                           |
| Bolts equal to or larger than $\frac{3}{4}$ in. | ANSI B18.2.1, square or hex head       | ANSI B18.2.1, heavy hex head                                                           |
| Nuts smaller than $\frac{3}{4}$ in.             | ANSI B18.2.2, heavy hex                | ANSI B18.2.2, heavy hex                                                                |
| Nuts equal to or larger than $\frac{3}{4}$ in.  | ANSI B18.2.2, hex or heavy hex         | ANSI B18.2.2, heavy hex                                                                |
| Male threads                                    | ANSI B1.1, Cl. 2A course series        | ANSI B1.1, Cl. 2A course series up through 1 in.; eight thread series for larger bolts |
| Female threads                                  | ANSI B1.1, Cl. 2B course series        | ANSI B1.1, Cl. 2B course series up through 1 in.; eight thread series for larger bolts |

**TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup>**  
 Pressures Are in psig  
 Class 150

| Material Group No. | 1.1          | 1.2 | 1.3 | 1.4 | 1.5          | 1.7                          | 1.9                          | 1.10         | 1.13        | 1.14        | 2.1               | 2.2         | 2.3                          | 2.4         | 2.5                  | 2.6         | 2.7         |
|--------------------|--------------|-----|-----|-----|--------------|------------------------------|------------------------------|--------------|-------------|-------------|-------------------|-------------|------------------------------|-------------|----------------------|-------------|-------------|
|                    |              |     |     |     | Alloy Steels |                              |                              |              |             |             | Austenitic Steels |             |                              |             |                      |             |             |
| Temp., °F          | Carbon Steel |     |     |     | C-<br>½Mo    | ½Cr-<br>½Mo,<br>Ni-Cr-<br>Mo | 1Cr-<br>½Mo,<br>1¼Cr-<br>½Mo | 2¼Cr-<br>1Mo | 5Cr-<br>½Mo | 9Cr-<br>1Mo | Type<br>304       | Type<br>316 | Type<br>304L<br>Type<br>316L | Type<br>321 | Types<br>347,<br>348 | Type<br>309 | Type<br>310 |
| - 20 to            |              |     |     |     |              |                              |                              |              |             |             |                   |             |                              |             |                      |             |             |
| 100                | 285          | 290 | 265 | 235 | 265          | 290                          | 290                          | 290          | 290         | 290         | 275               | 275         | 230                          | 275         | 275                  | 260         | 260         |
| 200                | 260          | 260 | 250 | 215 | 260          | 260                          | 260                          | 260          | 260         | 260         | 235               | 240         | 195                          | 235         | 245                  | 230         | 230         |
| 300                | 230          | 230 | 230 | 210 | 230          | 230                          | 230                          | 230          | 230         | 230         | 205               | 215         | 175                          | 210         | 225                  | 220         | 220         |
| 400                | 200          | 200 | 200 | 200 | 200          | 200                          | 200                          | 200          | 200         | 200         | 180               | 195         | 160                          | 190         | 200                  | 200         | 200         |
| 500                | 170          | 170 | 170 | 170 | 170          | 170                          | 170                          | 170          | 170         | 170         | 170               | 170         | 145                          | 170         | 170                  | 170         | 170         |
| 600                | 140          | 140 | 140 | 140 | 140          | 140                          | 140                          | 140          | 140         | 140         | 140               | 140         | 140                          | 140         | 140                  | 140         | 140         |
| 650                | 125          | 125 | 125 | 125 | 125          | 125                          | 125                          | 125          | 125         | 125         | 125               | 125         | 125                          | 125         | 125                  | 125         | 125         |
| 700                | 110          | 110 | 110 | 110 | 110          | 110                          | 110                          | 110          | 110         | 110         | 110               | 110         | 110                          | 110         | 110                  | 110         | 110         |
| 750                | 95           | 95  | 95  | 95  | 95           | 95                           | 95                           | 95           | 95          | 95          | 95                | 95          | 95                           | 95          | 95                   | 95          | 95          |
| 800                | 80           | 80  | 80  | 80  | 80           | 80                           | 80                           | 80           | 80          | 80          | 80                | 80          | 80                           | 80          | 80                   | 80          | 80          |
| 850                | 65           | 65  | 65  | 65  | 65           | 65                           | 65                           | 65           | 65          | 65          | 65                | 65          | 65                           | 65          | 65                   | 65          | 65          |
| 900                | 50           | 50  | 50  | 50  | 50           | 50                           | 50                           | 50           | 50          | 50          | 50                | 50          | ...                          | 50          | 50                   | 50          | 50          |
| 950                | 35           | 35  | 35  | 35  | 35           | 35                           | 35                           | 35           | 35          | 35          | 35                | 35          | ...                          | 35          | 35                   | 35          | 35          |
| 1000               | 20           | 20  | 20  | 20  | 20           | 20                           | 20                           | 20           | 20          | 20          | 20                | 20          | ...                          | 20          | 20                   | 20          | 20          |

TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup>Pressures Are in psig  
Class 150

| 3.1                                                    | 3.2                | 3.3                             | 3.4                                | 3.5                              | 3.6                              | 3.7                      | 3.8               | 3.9                                   | 3.10                                           | 3.11                                                         | 3.12                             | 3.13                                           | 3.14                                         | 3.15                              | 3.16                                    | Material<br>Group<br>No. |
|--------------------------------------------------------|--------------------|---------------------------------|------------------------------------|----------------------------------|----------------------------------|--------------------------|-------------------|---------------------------------------|------------------------------------------------|--------------------------------------------------------------|----------------------------------|------------------------------------------------|----------------------------------------------|-----------------------------------|-----------------------------------------|--------------------------|
| Nickel and Nickel Alloys                               |                    |                                 |                                    |                                  |                                  |                          |                   |                                       |                                                |                                                              |                                  |                                                |                                              |                                   |                                         | Temp.,<br>°F             |
| Cr-<br>Ni-<br>Fe-<br>Mo,<br>Cu-<br>Cb<br>Alloy<br>20Cb | Ni<br>Alloy<br>200 | Ni-<br>Low<br>C<br>Alloy<br>201 | Ni-<br>Cu<br>Alloys<br>400,<br>405 | Ni-<br>Cr-<br>Fe<br>Alloy<br>600 | Ni-<br>Fe-<br>Cr<br>Alloy<br>800 | Ni-<br>Mo<br>Alloy<br>B2 | Ni<br>Al-<br>loys | Ni-<br>Cr-<br>Mo-<br>Fe<br>Alloy<br>X | Ni-<br>Fe-<br>Cr-<br>Mo-<br>Cd<br>Alloy<br>700 | Ni-<br>Fe-<br>Cr-<br>Mo-<br>Cu-<br>Low<br>C<br>Alloy<br>904L | Alloys<br>20<br>Mod.<br>&<br>G-3 | Ni-<br>Cr-<br>Fe-<br>Mo-<br>Cu<br>Alloy<br>G-2 | Ni-<br>Cr-<br>Fe-<br>Mo-<br>Cu<br>Alloy<br>G | Ni-<br>Fe-<br>Cr<br>Alloy<br>800H | Ni-<br>Fe-<br>Cr-<br>Si<br>Alloy<br>330 |                          |
| 230                                                    | 140                | 90                              | 230                                | 275                              | 275                              | 290                      | 290               | 290                                   | 275                                            | 245                                                          | 260                              | 290                                            | 275                                          | 230                               | 275                                     | -20 to                   |
| 215                                                    | 140                | 85                              | 200                                | 260                              | 255                              | 260                      | 260               | 260                                   | 260                                            | 230                                                          | 240                              | 260                                            | 245                                          | 205                               | 245                                     | 100                      |
| 200                                                    | 140                | 85                              | 190                                | 230                              | 230                              | 230                      | 230               | 230                                   | 230                                            | 210                                                          | 225                              | 230                                            | 230                                          | 195                               | 225                                     | 200                      |
| 185                                                    | 140                | 85                              | 185                                | 200                              | 200                              | 200                      | 200               | 200                                   | 200                                            | 190                                                          | 200                              | 200                                            | 200                                          | 185                               | 200                                     | 300                      |
| 170                                                    | 140                | 85                              | 170                                | 170                              | 170                              | 170                      | 170               | 170                                   | 170                                            | 170                                                          | 170                              | 170                                            | 170                                          | 170                               | 170                                     | 400                      |
| 140                                                    | 140                | 85                              | 140                                | 140                              | 140                              | 140                      | 140               | 140                                   | 140                                            | 140                                                          | 140                              | 140                                            | 140                                          | 140                               | 140                                     | 500                      |
| 125                                                    | ...                | 85                              | 125                                | 125                              | 125                              | 125                      | 125               | 125                                   | 125                                            | 125                                                          | 125                              | 125                                            | 125                                          | 125                               | 125                                     | 600                      |
| 110                                                    | ...                | 85                              | 110                                | 110                              | 110                              | 110                      | 110               | 110                                   | ...                                            | 110                                                          | 110                              | 110                                            | 110                                          | 110                               | 110                                     | 650                      |
| 95                                                     | ...                | 80                              | 95                                 | 95                               | 95                               | 95                       | 95                | 95                                    | ...                                            | ...                                                          | 95                               | 95                                             | 95                                           | 95                                | 95                                      | 700                      |
| 80                                                     | ...                | 80                              | 80                                 | 80                               | 80                               | 80                       | 80                | 80                                    | ...                                            | ...                                                          | 80                               | 80                                             | 80                                           | 80                                | 80                                      | 750                      |
| ...                                                    | ...                | 65                              | 65                                 | 65                               | 65                               | ...                      | 65                | 65                                    | ...                                            | ...                                                          | ...                              | ...                                            | 65                                           | 65                                | 65                                      | 800                      |
| ...                                                    | ...                | 50                              | 50                                 | 50                               | 50                               | ...                      | 50                | 50                                    | ...                                            | ...                                                          | ...                              | ...                                            | 50                                           | 50                                | 50                                      | 850                      |
| ...                                                    | ...                | 35                              | ...                                | 35                               | 35                               | ...                      | 35                | 35                                    | ...                                            | ...                                                          | ...                              | ...                                            | 35                                           | 35                                | 35                                      | 900                      |
| ...                                                    | ...                | 20                              | ...                                | 20                               | 20                               | ...                      | 20                | 20                                    | ...                                            | ...                                                          | ...                              | ...                                            | 20                                           | 20                                | 20                                      | 950                      |
|                                                        |                    |                                 |                                    |                                  |                                  |                          |                   |                                       |                                                |                                                              |                                  |                                                |                                              |                                   |                                         | 1000                     |

(Table 2 continues on next page; Notes follow at end of Table)

**TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)**  
 Pressures Are in psig  
 Class 300

| Material<br>Group<br>No. | 1.1          | 1.2 | 1.3 | 1.4 | 1.5          | 1.7                          | 1.9                          | 1.10         | 1.13        | 1.14        | 2.1               | 2.2         | 2.3                          | 2.4         | 2.5                  | 2.6         | 2.7         |
|--------------------------|--------------|-----|-----|-----|--------------|------------------------------|------------------------------|--------------|-------------|-------------|-------------------|-------------|------------------------------|-------------|----------------------|-------------|-------------|
| Temp.,<br>°F             | Carbon Steel |     |     |     | Alloy Steels |                              |                              |              |             |             | Austenitic Steels |             |                              |             |                      |             |             |
|                          |              |     |     |     | C-<br>½Mo    | ½Cr-<br>½Mo,<br>Ni-Cr-<br>Mo | 1Cr-<br>½Mo,<br>1¼Cr-<br>½Mo | 2¼Cr-<br>1Mo | 5Cr-<br>½Mo | 9Cr-<br>1Mo | Type<br>304       | Type<br>316 | Type<br>304L<br>Type<br>316L | Type<br>321 | Types<br>347,<br>348 | Type<br>309 | Type<br>310 |
| - 20 to                  |              |     |     |     |              |                              |                              |              |             |             |                   |             |                              |             |                      |             |             |
| 100                      | 740          | 750 | 695 | 620 | 695          | 750                          | 750                          | 750          | 750         | 750         | 720               | 720         | 600                          | 720         | 720                  | 670         | 670         |
| 200                      | 675          | 750 | 655 | 560 | 680          | 750                          | 710                          | 715          | 750         | 750         | 600               | 620         | 505                          | 610         | 635                  | 605         | 605         |
| 300                      | 655          | 730 | 640 | 550 | 655          | 730                          | 675                          | 675          | 730         | 730         | 530               | 560         | 455                          | 545         | 590                  | 570         | 570         |
| 400                      | 635          | 705 | 620 | 530 | 640          | 705                          | 660                          | 650          | 705         | 705         | 470               | 515         | 415                          | 495         | 555                  | 535         | 535         |
| 500                      | 600          | 665 | 585 | 500 | 620          | 665                          | 640                          | 640          | 665         | 665         | 435               | 480         | 380                          | 460         | 520                  | 505         | 505         |
| 600                      | 550          | 605 | 535 | 455 | 605          | 605                          | 605                          | 605          | 605         | 605         | 415               | 450         | 360                          | 435         | 490                  | 480         | 480         |
| 650                      | 535          | 590 | 525 | 450 | 590          | 590                          | 590                          | 590          | 590         | 590         | 410               | 445         | 350                          | 430         | 480                  | 465         | 465         |
| 700                      | 535          | 570 | 520 | 450 | 570          | 570                          | 570                          | 570          | 570         | 570         | 405               | 430         | 345                          | 420         | 470                  | 455         | 455         |
| 750                      | 505          | 505 | 475 | 445 | 530          | 530                          | 530                          | 530          | 530         | 530         | 400               | 425         | 335                          | 415         | 460                  | 445         | 445         |
| 800                      | 410          | 410 | 390 | 370 | 510          | 510                          | 510                          | 510          | 500         | 510         | 395               | 415         | 330                          | 415         | 455                  | 435         | 435         |
| 850                      | 270          | 270 | 270 | 270 | 485          | 485                          | 485                          | 485          | 440         | 485         | 390               | 405         | 320                          | 410         | 445                  | 425         | 425         |
| 900                      | 170          | 170 | 170 | 170 | 450          | 450                          | 450                          | 450          | 355         | 450         | 385               | 395         | ...                          | 405         | 430                  | 415         | 415         |
| 950                      | 105          | 105 | 105 | 105 | 280          | 345                          | 380                          | 380          | 260         | 370         | 375               | 385         | ...                          | 385         | 385                  | 385         | 385         |
| 1000                     | 50           | 50  | 50  | 50  | 165          | 215                          | 225                          | 270          | 190         | 290         | 325               | 365         | ...                          | 355         | 365                  | 335         | 350         |
| 1050                     | ...          | ... | ... | ... | ...          | 190                          | 140                          | 200          | 140         | 190         | 310               | 360         | ...                          | 345         | 360                  | 290         | 335         |
| 1100                     | ...          | ... | ... | ... | ...          | ...                          | 95                           | 115          | 105         | 115         | 260               | 325         | ...                          | 300         | 325                  | 225         | 290         |
| 1150                     | ...          | ... | ... | ... | ...          | ...                          | 50                           | 105          | 70          | 75          | 195               | 275         | ...                          | 235         | 275                  | 170         | 245         |
| 1200                     | ...          | ... | ... | ... | ...          | ...                          | 35                           | 55           | 45          | 50          | 155               | 205         | ...                          | 180         | 170                  | 130         | 205         |
| 1250                     | ...          | ... | ... | ... | ...          | ...                          | ...                          | ...          | ...         | ...         | 110               | 180         | ...                          | 140         | 125                  | 100         | 160         |
| 1300                     | ...          | ... | ... | ... | ...          | ...                          | ...                          | ...          | ...         | ...         | 85                | 140         | ...                          | 105         | 95                   | 80          | 120         |
| 1350                     | ...          | ... | ... | ... | ...          | ...                          | ...                          | ...          | ...         | ...         | 60                | 105         | ...                          | 80          | 70                   | 60          | 80          |
| 1400                     | ...          | ... | ... | ... | ...          | ...                          | ...                          | ...          | ...         | ...         | 50                | 75          | ...                          | 60          | 50                   | 45          | 55          |
| 1450                     | ...          | ... | ... | ... | ...          | ...                          | ...                          | ...          | ...         | ...         | 35                | 60          | ...                          | 50          | 40                   | 30          | 40          |
| 1500                     | ...          | ... | ... | ... | ...          | ...                          | ...                          | ...          | ...         | ...         | 25                | 40          | ...                          | 40          | 35                   | 25          | 25          |

**TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)**  
**Pressures Are in psig**  
**Class 300**

| 3.1                                                    | 3.2                | 3.3                             | 3.4                                | 3.5                              | 3.6                              | 3.7                      | 3.8               | 3.9                                   | 3.10                                           | 3.11                                                         | 3.12                             | 3.13                                           | 3.14                                         | 3.15                              | 3.16                                    | Material<br>Group<br>No. |
|--------------------------------------------------------|--------------------|---------------------------------|------------------------------------|----------------------------------|----------------------------------|--------------------------|-------------------|---------------------------------------|------------------------------------------------|--------------------------------------------------------------|----------------------------------|------------------------------------------------|----------------------------------------------|-----------------------------------|-----------------------------------------|--------------------------|
| Nickel and Nickel Alloys                               |                    |                                 |                                    |                                  |                                  |                          |                   |                                       |                                                |                                                              |                                  |                                                |                                              |                                   |                                         | Temp.,<br>°F             |
| Cr-<br>Ni-<br>Fe-<br>Mo,<br>Cu-<br>Cb<br>Alloy<br>20Cb | Ni<br>Alloy<br>200 | Ni-<br>Low<br>C<br>Alloy<br>201 | Ni-<br>Cu<br>Alloys<br>400,<br>405 | Ni-<br>Cr-<br>Fe<br>Alloy<br>600 | Ni-<br>Fe-<br>Cr<br>Alloy<br>800 | Ni-<br>Mo<br>Alloy<br>B2 | Ni<br>Al-<br>loys | Ni-<br>Cr-<br>Mo-<br>Fe<br>Alloy<br>X | Ni-<br>Fe-<br>Cr-<br>Mo-<br>Cd<br>Alloy<br>700 | Ni-<br>Fe-<br>Cr-<br>Mo-<br>Cu-<br>Low<br>C<br>Alloy<br>904L | Alloys<br>20<br>Mod.<br>&<br>G-3 | Ni-<br>Cr-<br>Fe-<br>Mo-<br>Cu<br>Alloy<br>G-2 | Ni-<br>Cr-<br>Fe-<br>Mo-<br>Cu<br>Alloy<br>G | Ni-<br>Fe-<br>Cr<br>Alloy<br>800H | Ni-<br>Fe-<br>Cr-<br>Si<br>Alloy<br>330 |                          |
| 600                                                    | 360                | 240                             | 600                                | 720                              | 720                              | 750                      | 750               | 750                                   | 720                                            | 640                                                          | 670                              | 750                                            | 720                                          | 600                               | 720                                     | -20 to                   |
| 555                                                    | 360                | 230                             | 530                                | 670                              | 660                              | 750                      | 750               | 750                                   | 720                                            | 600                                                          | 625                              | 705                                            | 645                                          | 540                               | 635                                     | 100                      |
| 525                                                    | 360                | 225                             | 495                                | 640                              | 625                              | 730                      | 730               | 680                                   | 680                                            | 545                                                          | 585                              | 660                                            | 600                                          | 505                               | 590                                     | 200                      |
| 480                                                    | 360                | 215                             | 480                                | 615                              | 600                              | 705                      | 705               | 600                                   | 640                                            | 495                                                          | 535                              | 635                                            | 560                                          | 480                               | 550                                     | 300                      |
| 470                                                    | 360                | 215                             | 475                                | 595                              | 580                              | 665                      | 665               | 575                                   | 610                                            | 455                                                          | 500                              | 595                                            | 535                                          | 455                               | 525                                     | 500                      |
| 455                                                    | 360                | 215                             | 475                                | 575                              | 575                              | 605                      | 605               | 560                                   | 595                                            | 430                                                          | 475                              | 560                                            | 520                                          | 440                               | 500                                     | 600                      |
| 450                                                    | ...                | 215                             | 475                                | 565                              | 570                              | 590                      | 590               | 560                                   | 570                                            | 420                                                          | 465                              | 555                                            | 510                                          | 425                               | 490                                     | 650                      |
| 445                                                    | ...                | 215                             | 475                                | 555                              | 565                              | 570                      | 570               | 560                                   | ...                                            | 410                                                          | 450                              | 545                                            | 505                                          | 420                               | 480                                     | 700                      |
| 440                                                    | ...                | 210                             | 470                                | 530                              | 530                              | 530                      | 530               | 530                                   | ...                                            | ...                                                          | 445                              | 530                                            | 500                                          | 415                               | 470                                     | 750                      |
| 430                                                    | ...                | 205                             | 460                                | 510                              | 505                              | 510                      | 510               | 510                                   | ...                                            | ...                                                          | 430                              | 510                                            | 495                                          | 410                               | 465                                     | 800                      |
| ...                                                    | ...                | 205                             | 340                                | 485                              | 485                              | ...                      | 485               | 485                                   | ...                                            | ...                                                          | ...                              | ...                                            | 485                                          | 400                               | 455                                     | 850                      |
| ...                                                    | ...                | 140                             | 245                                | 450                              | 450                              | ...                      | 450               | 450                                   | ...                                            | ...                                                          | ...                              | ...                                            | 450                                          | 395                               | 445                                     | 900                      |
| ...                                                    | ...                | 115                             | ...                                | 325                              | 385                              | ...                      | 385               | 385                                   | ...                                            | ...                                                          | ...                              | ...                                            | 385                                          | 385                               | 385                                     | 950                      |
| ...                                                    | ...                | 95                              | ...                                | 215                              | 365                              | ...                      | 365               | 365                                   | ...                                            | ...                                                          | ...                              | ...                                            | 365                                          | 365                               | 365                                     | 1000                     |
| ...                                                    | ...                | 75                              | ...                                | 140                              | 360                              | ...                      | 360               | 360                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 325                               | 310                                     | 1050                     |
| ...                                                    | ...                | 60                              | ...                                | 95                               | 325                              | ...                      | 325               | 325                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 320                               | 240                                     | 1100                     |
| ...                                                    | ...                | 45                              | ...                                | 70                               | 275                              | ...                      | 275               | 275                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 275                               | 185                                     | 1150                     |
| ...                                                    | ...                | 35                              | ...                                | 60                               | 205                              | ...                      | 185               | 205                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 205                               | 145                                     | 1200                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 130                              | ...                      | 145               | 180                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 180                               | 115                                     | 1250                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 60                               | ...                      | 110               | 140                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 140                               | 95                                      | 1300                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 50                               | ...                      | ...               | 105                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 105                               | 75                                      | 1350                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 35                               | ...                      | ...               | 75                                    | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 75                                | 55                                      | 1400                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 30                               | ...                      | ...               | 60                                    | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 60                                | 45                                      | 1450                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 25                               | ...                      | ...               | 40                                    | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 40                                | 35                                      | 1500                     |

(Table 2 continues on next page; Notes follow at end of Table)

**TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)**  
**Pressures Are in psig**  
**Class 400**

| Material Group No. | 1.1          | 1.2  | 1.3 | 1.4 | 1.5          | 1.7                              | 1.9                                 | 1.10            | 1.13          | 1.14        | 2.1               | 2.2         | 2.3                          | 2.4         | 2.5                  | 2.6         | 2.7         |
|--------------------|--------------|------|-----|-----|--------------|----------------------------------|-------------------------------------|-----------------|---------------|-------------|-------------------|-------------|------------------------------|-------------|----------------------|-------------|-------------|
| Temp., °F          | Carbon Steel |      |     |     | Alloy Steels |                                  |                                     |                 |               |             | Austenitic Steels |             |                              |             |                      |             |             |
|                    |              |      |     |     | C-<br>1/2Mo  | 1/2Cr-<br>1/2Mo,<br>Ni-Cr-<br>Mo | 1Cr-<br>1/2Mo,<br>1 1/4Cr-<br>1/2Mo | 2 1/4Cr-<br>1Mo | 5Cr-<br>1/2Mo | 9Cr-<br>1Mo | Type<br>304       | Type<br>316 | Type<br>304L<br>Type<br>316L | Type<br>321 | Types<br>347,<br>348 | Type<br>309 | Type<br>310 |
| - 20 to            |              |      |     |     |              |                                  |                                     |                 |               |             |                   |             |                              |             |                      |             |             |
| 100                | 990          | 1000 | 925 | 825 | 925          | 1000                             | 1000                                | 1000            | 1000          | 1000        | 960               | 960         | 800                          | 960         | 960                  | 895         | 895         |
| 200                | 900          | 1000 | 875 | 750 | 905          | 1000                             | 950                                 | 955             | 1000          | 1000        | 800               | 825         | 675                          | 815         | 850                  | 805         | 805         |
| 300                | 875          | 970  | 850 | 730 | 870          | 970                              | 895                                 | 905             | 970           | 970         | 705               | 745         | 605                          | 725         | 785                  | 760         | 760         |
| 400                | 845          | 940  | 825 | 705 | 855          | 940                              | 880                                 | 865             | 940           | 940         | 630               | 685         | 550                          | 660         | 740                  | 710         | 710         |
| 500                | 800          | 885  | 775 | 665 | 830          | 885                              | 855                                 | 855             | 885           | 885         | 585               | 635         | 510                          | 610         | 690                  | 670         | 670         |
| 600                | 730          | 805  | 710 | 610 | 805          | 805                              | 805                                 | 805             | 805           | 805         | 555               | 600         | 480                          | 585         | 655                  | 635         | 635         |
| 650                | 715          | 785  | 695 | 600 | 785          | 785                              | 785                                 | 785             | 785           | 785         | 545               | 590         | 470                          | 570         | 640                  | 620         | 620         |
| 700                | 710          | 755  | 690 | 600 | 755          | 755                              | 755                                 | 755             | 755           | 755         | 540               | 575         | 460                          | 560         | 625                  | 610         | 610         |
| 750                | 670          | 670  | 630 | 590 | 710          | 710                              | 710                                 | 710             | 710           | 710         | 530               | 565         | 450                          | 555         | 615                  | 595         | 595         |
| 800                | 550          | 550  | 520 | 495 | 675          | 675                              | 675                                 | 675             | 665           | 675         | 525               | 555         | 440                          | 550         | 610                  | 580         | 580         |
| 850                | 355          | 355  | 355 | 355 | 650          | 650                              | 650                                 | 650             | 585           | 650         | 520               | 540         | 430                          | 545         | 590                  | 565         | 565         |
| 900                | 230          | 230  | 230 | 230 | 600          | 600                              | 600                                 | 600             | 470           | 600         | 510               | 525         | ...                          | 540         | 575                  | 555         | 555         |
| 950                | 140          | 140  | 140 | 140 | 375          | 460                              | 505                                 | 505             | 350           | 495         | 500               | 515         | ...                          | 515         | 515                  | 515         | 515         |
| 1000               | 70           | 70   | 70  | 70  | 220          | 285                              | 300                                 | 355             | 255           | 390         | 430               | 485         | ...                          | 475         | 485                  | 450         | 465         |
| 1050               | ...          | ...  | ... | ... | ...          | 250                              | 185                                 | 265             | 190           | 250         | 410               | 480         | ...                          | 460         | 480                  | 390         | 445         |
| 1100               | ...          | ...  | ... | ... | ...          | ...                              | 130                                 | 150             | 140           | 150         | 345               | 430         | ...                          | 400         | 430                  | 300         | 390         |
| 1150               | ...          | ...  | ... | ... | ...          | ...                              | 70                                  | 140             | 90            | 100         | 260               | 365         | ...                          | 315         | 365                  | 230         | 330         |
| 1200               | ...          | ...  | ... | ... | ...          | ...                              | 45                                  | 75              | 60            | 70          | 205               | 275         | ...                          | 240         | 230                  | 175         | 275         |
| 1250               | ...          | ...  | ... | ... | ...          | ...                              | ...                                 | ...             | ...           | ...         | 145               | 245         | ...                          | 185         | 165                  | 135         | 215         |
| 1300               | ...          | ...  | ... | ... | ...          | ...                              | ...                                 | ...             | ...           | ...         | 110               | 185         | ...                          | 140         | 125                  | 105         | 160         |
| 1350               | ...          | ...  | ... | ... | ...          | ...                              | ...                                 | ...             | ...           | ...         | 85                | 140         | ...                          | 110         | 90                   | 80          | 105         |
| 1400               | ...          | ...  | ... | ... | ...          | ...                              | ...                                 | ...             | ...           | ...         | 65                | 100         | ...                          | 80          | 70                   | 60          | 75          |
| 1450               | ...          | ...  | ... | ... | ...          | ...                              | ...                                 | ...             | ...           | ...         | 45                | 80          | ...                          | 65          | 55                   | 40          | 50          |
| 1500               | ...          | ...  | ... | ... | ...          | ...                              | ...                                 | ...             | ...           | ...         | 30                | 65          | ...                          | 50          | 45                   | 30          | 30          |

**TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)**  
**Pressures Are in psig**  
**Class 400**

| 3.1                                                    | 3.2                | 3.3                             | 3.4                                | 3.5                              | 3.6                              | 3.7                      | 3.8               | 3.9                                   | 3.10                                           | 3.11                                                         | 3.12                             | 3.13                                           | 3.14                                         | 3.15                              | 3.16                                    | Material<br>Group<br>No. |
|--------------------------------------------------------|--------------------|---------------------------------|------------------------------------|----------------------------------|----------------------------------|--------------------------|-------------------|---------------------------------------|------------------------------------------------|--------------------------------------------------------------|----------------------------------|------------------------------------------------|----------------------------------------------|-----------------------------------|-----------------------------------------|--------------------------|
| Nickel and Nickel Alloys                               |                    |                                 |                                    |                                  |                                  |                          |                   |                                       |                                                |                                                              |                                  |                                                |                                              |                                   |                                         | Temp.,<br>°F             |
| Cr-<br>Ni-<br>Fe-<br>Mo,<br>Cu-<br>Cb<br>Alloy<br>20Cb | Ni<br>Alloy<br>200 | Ni-<br>Low<br>C<br>Alloy<br>201 | Ni-<br>Cu<br>Alloys<br>400,<br>405 | Ni-<br>Cr-<br>Fe<br>Alloy<br>600 | Ni-<br>Fe-<br>Cr<br>Alloy<br>800 | Ni-<br>Mo<br>Alloy<br>B2 | Ni<br>Al-<br>loys | Ni-<br>Cr-<br>Mo-<br>Fe<br>Alloy<br>X | Ni-<br>Fe-<br>Cr-<br>Mo-<br>Cd<br>Alloy<br>700 | Ni-<br>Fe-<br>Cr-<br>Mo-<br>Cu-<br>Low<br>C<br>Alloy<br>904L | Alloys<br>20<br>Mod.<br>&<br>G-3 | Ni-<br>Cr-<br>Fe-<br>Mo-<br>Cu<br>Alloy<br>G-2 | Ni-<br>Cr-<br>Fe-<br>Mo-<br>Cu<br>Alloy<br>G | Ni-<br>Fe-<br>Cr<br>Alloy<br>800H | Ni-<br>Fe-<br>Cr-<br>Si<br>Alloy<br>330 |                          |
| 800                                                    | 480                | 320                             | 800                                | 960                              | 960                              | 1000                     | 1000              | 1000                                  | 960                                            | 855                                                          | 895                              | 1000                                           | 960                                          | 800                               | 960                                     | - 20 to                  |
| 740                                                    | 480                | 305                             | 705                                | 895                              | 885                              | 1000                     | 1000              | 1000                                  | 960                                            | 800                                                          | 830                              | 940                                            | 860                                          | 720                               | 850                                     | 100                      |
| 700                                                    | 480                | 300                             | 660                                | 850                              | 830                              | 970                      | 970               | 905                                   | 905                                            | 725                                                          | 780                              | 885                                            | 795                                          | 675                               | 785                                     | 200                      |
| 640                                                    | 480                | 290                             | 635                                | 820                              | 800                              | 940                      | 940               | 795                                   | 855                                            | 660                                                          | 715                              | 845                                            | 750                                          | 640                               | 735                                     | 300                      |
| 625                                                    | 480                | 290                             | 635                                | 790                              | 770                              | 885                      | 885               | 770                                   | 815                                            | 610                                                          | 665                              | 790                                            | 715                                          | 610                               | 700                                     | 400                      |
| 605                                                    | 480                | 290                             | 635                                | 765                              | 765                              | 805                      | 805               | 745                                   | 790                                            | 575                                                          | 635                              | 750                                            | 690                                          | 585                               | 670                                     | 500                      |
| 600                                                    | ...                | 290                             | 635                                | 750                              | 760                              | 785                      | 785               | 745                                   | 760                                            | 560                                                          | 620                              | 735                                            | 680                                          | 565                               | 655                                     | 600                      |
| 595                                                    | ...                | 290                             | 635                                | 740                              | 750                              | 755                      | 755               | 745                                   | ...                                            | 545                                                          | 600                              | 725                                            | 675                                          | 560                               | 645                                     | 650                      |
| 585                                                    | ...                | 280                             | 625                                | 710                              | 710                              | 710                      | 710               | 710                                   | ...                                            | ...                                                          | 590                              | 710                                            | 670                                          | 550                               | 625                                     | 700                      |
| 575                                                    | ...                | 270                             | 610                                | 675                              | 675                              | 675                      | 675               | 675                                   | ...                                            | ...                                                          | 575                              | 675                                            | 660                                          | 545                               | 620                                     | 500                      |
| ...                                                    | ...                | 270                             | 455                                | 650                              | 650                              | ...                      | 650               | 650                                   | ...                                            | ...                                                          | ...                              | ...                                            | 650                                          | 530                               | 605                                     | 600                      |
| ...                                                    | ...                | 185                             | 430                                | 600                              | 600                              | ...                      | 600               | 600                                   | ...                                            | ...                                                          | ...                              | ...                                            | 600                                          | 530                               | 590                                     | 700                      |
| ...                                                    | ...                | 150                             | ...                                | 435                              | 515                              | ...                      | 515               | 515                                   | ...                                            | ...                                                          | ...                              | ...                                            | 515                                          | 515                               | 515                                     | 750                      |
| ...                                                    | ...                | 125                             | ...                                | 290                              | 485                              | ...                      | 485               | 485                                   | ...                                            | ...                                                          | ...                              | ...                                            | 485                                          | 485                               | 485                                     | 800                      |
| ...                                                    | ...                | 100                             | ...                                | 185                              | 480                              | ...                      | 480               | 480                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 435                               | 410                                     | 850                      |
| ...                                                    | ...                | 80                              | ...                                | 125                              | 430                              | ...                      | 430               | 430                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 430                               | 320                                     | 900                      |
| ...                                                    | ...                | 60                              | ...                                | 90                               | 365                              | ...                      | 365               | 365                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 365                               | 245                                     | 950                      |
| ...                                                    | ...                | 50                              | ...                                | 80                               | 270                              | ...                      | 245               | 275                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 275                               | 195                                     | 1000                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 175                              | ...                      | 195               | 245                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 245                               | 155                                     | 1050                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 80                               | ...                      | 145               | 185                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 185                               | 130                                     | 1100                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 65                               | ...                      | ...               | 140                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 140                               | 100                                     | 1350                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 45                               | ...                      | ...               | 100                                   | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 100                               | 75                                      | 1400                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 40                               | ...                      | ...               | 80                                    | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 80                                | 60                                      | 1450                     |
| ...                                                    | ...                | ...                             | ...                                | ...                              | 35                               | ...                      | ...               | 55                                    | ...                                            | ...                                                          | ...                              | ...                                            | ...                                          | 55                                | 45                                      | 1500                     |

(Table 2 continues on next page; Notes follow at end of Table)

**TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)**  
 Pressures Are in psig  
 Class 600

| Material Group No. | 1.1          | 1.2  | 1.3  | 1.4  | 1.5          | 1.7                          | 1.9                          | 1.10         | 1.13        | 1.14        | 2.1               | 2.2         | 2.3                          | 2.4         | 2.5                  | 2.6         | 2.7         |
|--------------------|--------------|------|------|------|--------------|------------------------------|------------------------------|--------------|-------------|-------------|-------------------|-------------|------------------------------|-------------|----------------------|-------------|-------------|
| Temp., °F          | Carbon Steel |      |      |      | Alloy Steels |                              |                              |              |             |             | Austenitic Steels |             |                              |             |                      |             |             |
|                    |              |      |      |      | C-<br>½Mo    | ½Cr-<br>½Mo,<br>Ni-Cr-<br>Mo | 1Cr-<br>½Mo,<br>1¼Cr-<br>½Mo | 2¼Cr-<br>1Mo | 5Cr-<br>½Mo | 9Cr-<br>1Mo | Type<br>304       | Type<br>316 | Type<br>304L<br>Type<br>316L | Type<br>321 | Types<br>347,<br>348 | Type<br>309 | Type<br>310 |
| - 20 to            |              |      |      |      |              |                              |                              |              |             |             |                   |             |                              |             |                      |             |             |
| 100                | 1480         | 1500 | 1390 | 1235 | 1390         | 1500                         | 1500                         | 1500         | 1500        | 1500        | 1440              | 1440        | 1200                         | 1440        | 1440                 | 1345        | 1345        |
| 200                | 1350         | 1500 | 1315 | 1125 | 1360         | 1500                         | 1425                         | 1430         | 1500        | 1500        | 1200              | 1240        | 1015                         | 1220        | 1270                 | 1210        | 1210        |
| 300                | 1315         | 1455 | 1275 | 1095 | 1305         | 1455                         | 1345                         | 1355         | 1455        | 1455        | 1055              | 1120        | 910                          | 1090        | 1175                 | 1140        | 1140        |
| 400                | 1270         | 1410 | 1235 | 1060 | 1280         | 1410                         | 1315                         | 1295         | 1410        | 1410        | 940               | 1030        | 825                          | 990         | 1110                 | 1065        | 1065        |
| 500                | 1200         | 1330 | 1165 | 995  | 1245         | 1330                         | 1285                         | 1280         | 1330        | 1330        | 875               | 955         | 765                          | 915         | 1035                 | 1010        | 1010        |
| 600                | 1095         | 1210 | 1065 | 915  | 1210         | 1210                         | 1210                         | 1210         | 1210        | 1210        | 830               | 905         | 720                          | 875         | 985                  | 955         | 955         |
| 650                | 1075         | 1175 | 1045 | 895  | 1175         | 1175                         | 1175                         | 1175         | 1175        | 1175        | 815               | 890         | 700                          | 855         | 960                  | 930         | 930         |
| 700                | 1065         | 1135 | 1035 | 895  | 1135         | 1135                         | 1135                         | 1135         | 1135        | 1135        | 805               | 865         | 685                          | 840         | 935                  | 910         | 910         |
| 750                | 1010         | 1010 | 945  | 885  | 1065         | 1065                         | 1065                         | 1065         | 1065        | 1065        | 795               | 845         | 670                          | 830         | 920                  | 895         | 895         |
| 800                | 825          | 825  | 780  | 740  | 1015         | 1015                         | 1015                         | 1015         | 995         | 1015        | 790               | 830         | 660                          | 825         | 910                  | 870         | 870         |
| 850                | 535          | 535  | 535  | 535  | 975          | 975                          | 975                          | 975          | 880         | 975         | 780               | 810         | 645                          | 815         | 890                  | 850         | 850         |
| 900                | 345          | 345  | 345  | 345  | 900          | 900                          | 900                          | 900          | 705         | 900         | 770               | 790         | ...                          | 810         | 865                  | 830         | 830         |
| 950                | 205          | 205  | 205  | 205  | 560          | 685                          | 755                          | 755          | 520         | 740         | 750               | 775         | ...                          | 775         | 775                  | 775         | 775         |
| 1000               | 105          | 105  | 105  | 105  | 330          | 425                          | 445                          | 535          | 385         | 585         | 645               | 725         | ...                          | 715         | 725                  | 670         | 700         |
| 1050               | ...          | ...  | ...  | ...  | ...          | 380                          | 275                          | 400          | 280         | 380         | 620               | 720         | ...                          | 695         | 720                  | 585         | 665         |
| 1100               | ...          | ...  | ...  | ...  | ...          | ...                          | 190                          | 225          | 205         | 225         | 515               | 645         | ...                          | 605         | 645                  | 445         | 585         |
| 1150               | ...          | ...  | ...  | ...  | ...          | ...                          | 105                          | 205          | 140         | 150         | 390               | 550         | ...                          | 475         | 550                  | 345         | 495         |
| 1200               | ...          | ...  | ...  | ...  | ...          | ...                          | 70                           | 110          | 90          | 105         | 310               | 410         | ...                          | 365         | 345                  | 260         | 410         |
| 1250               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 220               | 365         | ...                          | 280         | 245                  | 200         | 325         |
| 1300               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 165               | 275         | ...                          | 210         | 185                  | 160         | 240         |
| 1350               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 125               | 205         | ...                          | 165         | 135                  | 115         | 160         |
| 1400               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 90                | 150         | ...                          | 125         | 105                  | 90          | 110         |
| 1450               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 70                | 115         | ...                          | 95          | 80                   | 60          | 75          |
| 1500               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 50                | 85          | ...                          | 75          | 70                   | 50          | 55          |

TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)Pressures Are in psig  
Class 600

| 3.1                           | 3.2          | 3.3                | 3.4                   | 3.5                | 3.6                | 3.7            | 3.8       | 3.9                 | 3.10                     | 3.11                         | 3.12                 | 3.13                     | 3.14                   | 3.15                | 3.16                  | Material<br>Group<br>No. |
|-------------------------------|--------------|--------------------|-----------------------|--------------------|--------------------|----------------|-----------|---------------------|--------------------------|------------------------------|----------------------|--------------------------|------------------------|---------------------|-----------------------|--------------------------|
| Nickel and Nickel Alloys      |              |                    |                       |                    |                    |                |           |                     |                          |                              |                      |                          |                        |                     |                       | Temp.,<br>°F             |
| Cr-Ni-Fe-Mo, Cu-Cb Alloy 20Cb | Ni Alloy 200 | Ni-Low C Alloy 201 | Ni-Cu Alloys 400, 405 | Ni-Cr-Fe Alloy 600 | Ni-Fe-Cr Alloy 800 | Ni-Mo Alloy B2 | Ni Alloys | Ni-Cr-Mo-Fe Alloy X | Ni-Fe-Cr-Mo-Cd Alloy 700 | Ni-Fe-Cr-Mo-Low C Alloy 904L | Alloys 20 Mod. & G-3 | Ni-Cr-Fe-Mo-Cu Alloy G-2 | Ni-Cr-Fe-Mo-Cu Alloy G | Ni-Fe-Cr Alloy 800H | Ni-Fe-Cr-Si Alloy 330 |                          |
| 1200                          | 720          | 480                | 1200                  | 1440               | 1440               | 1500           | 1500      | 1500                | 1440                     | 1280                         | 1345                 | 1500                     | 1440                   | 1200                | 1440                  | - 20 to 100              |
| 1115                          | 720          | 455                | 1055                  | 1345               | 1325               | 1500           | 1500      | 1500                | 1440                     | 1200                         | 1245                 | 1410                     | 1290                   | 1080                | 1270                  | 200                      |
| 1045                          | 720          | 445                | 990                   | 1275               | 1250               | 1455           | 1455      | 1360                | 1360                     | 1085                         | 1175                 | 1325                     | 1195                   | 1015                | 1175                  | 300                      |
| 960                           | 720          | 430                | 955                   | 1230               | 1200               | 1410           | 1410      | 1195                | 1280                     | 995                          | 1075                 | 1265                     | 1125                   | 960                 | 1105                  | 400                      |
| 935                           | 720          | 430                | 950                   | 1185               | 1155               | 1330           | 1330      | 1150                | 1225                     | 915                          | 1000                 | 1190                     | 1070                   | 910                 | 1050                  | 500                      |
| 910                           | 720          | 430                | 950                   | 1145               | 1145               | 1210           | 1210      | 1120                | 1190                     | 865                          | 950                  | 1125                     | 1035                   | 880                 | 1005                  | 600                      |
| 900                           | ...          | 430                | 950                   | 1130               | 1140               | 1175           | 1175      | 1120                | 1140                     | 840                          | 930                  | 1105                     | 1020                   | 850                 | 980                   | 650                      |
| 890                           | ...          | 430                | 950                   | 1115               | 1130               | 1135           | 1135      | 1120                | ...                      | 820                          | 900                  | 1085                     | 1015                   | 840                 | 965                   | 700                      |
| 880                           | ...          | 420                | 935                   | 1065               | 1065               | 1065           | 1065      | 1065                | ...                      | ...                          | 885                  | 1065                     | 1005                   | 825                 | 940                   | 750                      |
| 865                           | ...          | 410                | 915                   | 1015               | 1015               | 1015           | 1015      | 1015                | ...                      | ...                          | 865                  | 1015                     | 995                    | 815                 | 925                   | 800                      |
| ...                           | ...          | 410                | 680                   | 975                | 975                | ...            | 975       | 975                 | ...                      | ...                          | ...                  | ...                      | 975                    | 795                 | 905                   | 850                      |
| ...                           | ...          | 380                | 495                   | 900                | 900                | ...            | 900       | 900                 | ...                      | ...                          | ...                  | ...                      | 900                    | 790                 | 885                   | 900                      |
| ...                           | ...          | 230                | ...                   | 655                | 775                | ...            | 775       | 775                 | ...                      | ...                          | ...                  | ...                      | 775                    | 775                 | 775                   | 950                      |
| ...                           | ...          | 185                | ...                   | 430                | 725                | ...            | 725       | 725                 | ...                      | ...                          | ...                  | ...                      | 725                    | 725                 | 725                   | 1000                     |
| ...                           | ...          | 150                | ...                   | 280                | 720                | ...            | 720       | 720                 | ...                      | ...                          | ...                  | ...                      | ...                    | 650                 | 615                   | 1050                     |
| ...                           | ...          | 125                | ...                   | 185                | 645                | ...            | 645       | 645                 | ...                      | ...                          | ...                  | ...                      | ...                    | 640                 | 480                   | 1100                     |
| ...                           | ...          | 95                 | ...                   | 135                | 550                | ...            | 550       | 550                 | ...                      | ...                          | ...                  | ...                      | ...                    | 550                 | 370                   | 1150                     |
| ...                           | ...          | 75                 | ...                   | 125                | 405                | ...            | 370       | 410                 | ...                      | ...                          | ...                  | ...                      | ...                    | 410                 | 290                   | 1200                     |
| ...                           | ...          | ...                | ...                   | ...                | 260                | ...            | 295       | 365                 | ...                      | ...                          | ...                  | ...                      | ...                    | 365                 | 235                   | 1250                     |
| ...                           | ...          | ...                | ...                   | ...                | 125                | ...            | 215       | 275                 | ...                      | ...                          | ...                  | ...                      | ...                    | 275                 | 190                   | 1300                     |
| ...                           | ...          | ...                | ...                   | ...                | 100                | ...            | ...       | 205                 | ...                      | ...                          | ...                  | ...                      | ...                    | 205                 | 150                   | 1350                     |
| ...                           | ...          | ...                | ...                   | ...                | 70                 | ...            | ...       | 150                 | ...                      | ...                          | ...                  | ...                      | ...                    | 150                 | 110                   | 1400                     |
| ...                           | ...          | ...                | ...                   | ...                | 60                 | ...            | ...       | 115                 | ...                      | ...                          | ...                  | ...                      | ...                    | 115                 | 95                    | 1450                     |
| ...                           | ...          | ...                | ...                   | ...                | 50                 | ...            | ...       | 85                  | ...                      | ...                          | ...                  | ...                      | ...                    | 85                  | 70                    | 1500                     |

(Table 2 continues on next page; Notes follow at end of Table)

TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)Pressures Are in psig  
Class 900

| Material<br>Group<br>No. | 1.1          | 1.2  | 1.3  | 1.4  | 1.5          | 1.7                          | 1.9                          | 1.10         | 1.13        | 1.14        | 2.1               | 2.2         | 2.3                          | 2.4         | 2.5                  | 2.6         | 2.7         |
|--------------------------|--------------|------|------|------|--------------|------------------------------|------------------------------|--------------|-------------|-------------|-------------------|-------------|------------------------------|-------------|----------------------|-------------|-------------|
| Temp.,<br>°F             | Carbon Steel |      |      |      | Alloy Steels |                              |                              |              |             |             | Austenitic Steels |             |                              |             |                      |             |             |
|                          |              |      |      |      | C-<br>½Mo    | ½Cr-<br>½Mo,<br>Ni-Cr-<br>Mo | 1Cr-<br>½Mo,<br>1¼Cr-<br>½Mo | 2¼Cr-<br>1Mo | 5Cr-<br>½Mo | 9Cr-<br>1Mo | Type<br>304       | Type<br>316 | Type<br>304L<br>Type<br>316L | Type<br>321 | Types<br>347,<br>348 | Type<br>309 | Type<br>310 |
| - 20 to                  | 2220         | 2250 | 2085 | 1850 | 2085         | 2250                         | 2250                         | 2250         | 2250        | 2250        | 2160              | 2160        | 1800                         | 2160        | 2160                 | 2015        | 2015        |
| 100                      | 2025         | 2250 | 1970 | 1685 | 2035         | 2250                         | 2135                         | 2150         | 2250        | 2250        | 1800              | 1860        | 1520                         | 1830        | 1910                 | 1815        | 1815        |
| 200                      | 1970         | 2185 | 1915 | 1640 | 1955         | 2185                         | 2020                         | 2030         | 2185        | 2185        | 1585              | 1680        | 1360                         | 1635        | 1765                 | 1705        | 1705        |
| 300                      | 1900         | 2115 | 1850 | 1585 | 1920         | 2115                         | 1975                         | 1945         | 2115        | 2115        | 1410              | 1540        | 1240                         | 1485        | 1665                 | 1600        | 1600        |
| 400                      | 1795         | 1995 | 1745 | 1495 | 1865         | 1995                         | 1925                         | 1920         | 1995        | 1995        | 1310              | 1435        | 1145                         | 1375        | 1555                 | 1510        | 1510        |
| 500                      | 1640         | 1815 | 1600 | 1370 | 1815         | 1815                         | 1815                         | 1815         | 1815        | 1815        | 1245              | 1355        | 1080                         | 1310        | 1475                 | 1435        | 1435        |
| 600                      | 1610         | 1765 | 1570 | 1345 | 1765         | 1765                         | 1765                         | 1765         | 1765        | 1765        | 1225              | 1330        | 1050                         | 1280        | 1440                 | 1395        | 1395        |
| 650                      | 1600         | 1705 | 1555 | 1345 | 1705         | 1705                         | 1705                         | 1705         | 1705        | 1705        | 1210              | 1295        | 1030                         | 1260        | 1405                 | 1370        | 1370        |
| 700                      | 1510         | 1510 | 1420 | 1325 | 1595         | 1595                         | 1595                         | 1595         | 1595        | 1595        | 1195              | 1270        | 1010                         | 1245        | 1385                 | 1340        | 1340        |
| 750                      | 1235         | 1235 | 1175 | 1110 | 1525         | 1525                         | 1525                         | 1525         | 1490        | 1525        | 1180              | 1245        | 985                          | 1240        | 1370                 | 1305        | 1305        |
| 800                      | 805          | 805  | 805  | 805  | 1460         | 1460                         | 1460                         | 1460         | 1315        | 1460        | 1165              | 1215        | 965                          | 1225        | 1330                 | 1275        | 1275        |
| 850                      | 515          | 515  | 515  | 515  | 1350         | 1350                         | 1350                         | 1350         | 1060        | 1350        | 1150              | 1180        | ...                          | 1215        | 1295                 | 1245        | 1245        |
| 900                      | 310          | 310  | 310  | 310  | 845          | 1030                         | 1130                         | 1130         | 780         | 1110        | 1125              | 1160        | ...                          | 1160        | 1160                 | 1160        | 1160        |
| 950                      | 155          | 155  | 155  | 155  | 495          | 640                          | 670                          | 805          | 575         | 875         | 965               | 1090        | ...                          | 1070        | 1090                 | 1010        | 1050        |
| 1000                     | ...          | ...  | ...  | ...  | ...          | 565                          | 410                          | 595          | 420         | 565         | 925               | 1080        | ...                          | 1040        | 1080                 | 875         | 1000        |
| 1050                     | ...          | ...  | ...  | ...  | ...          | ...                          | 290                          | 340          | 310         | 340         | 770               | 965         | ...                          | 905         | 965                  | 670         | 875         |
| 1100                     | ...          | ...  | ...  | ...  | ...          | ...                          | 155                          | 310          | 205         | 225         | 585               | 825         | ...                          | 710         | 825                  | 515         | 740         |
| 1150                     | ...          | ...  | ...  | ...  | ...          | ...                          | 105                          | 165          | 135         | 155         | 465               | 620         | ...                          | 545         | 515                  | 390         | 620         |
| 1200                     | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 330               | 545         | ...                          | 420         | 370                  | 300         | 485         |
| 1250                     | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 245               | 410         | ...                          | 320         | 280                  | 235         | 360         |
| 1300                     | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 185               | 310         | ...                          | 245         | 205                  | 175         | 235         |
| 1350                     | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 145               | 225         | ...                          | 185         | 155                  | 135         | 165         |
| 1400                     | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 105               | 175         | ...                          | 145         | 125                  | 95          | 115         |
| 1450                     | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 70                | 125         | ...                          | 115         | 105                  | 70          | 70          |
| 1500                     | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | ...               | ...         | ...                          | ...         | ...                  | ...         | ...         |

**TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)**  
**Pressures Are in psig**  
**Class 900**

| 3.1                           | 3.2          | 3.3                | 3.4                   | 3.5                | 3.6                | 3.7            | 3.8       | 3.9                 | 3.10                     | 3.11                            | 3.12                 | 3.13                     | 3.14                   | 3.15                | 3.16                  | Material Group No. |
|-------------------------------|--------------|--------------------|-----------------------|--------------------|--------------------|----------------|-----------|---------------------|--------------------------|---------------------------------|----------------------|--------------------------|------------------------|---------------------|-----------------------|--------------------|
| Nickel and Nickel Alloys      |              |                    |                       |                    |                    |                |           |                     |                          |                                 |                      |                          |                        |                     |                       | Temp., °F          |
| Cr-Ni-Fe-Mo, Cu-Cb Alloy 20Cb | Ni Alloy 200 | Ni-Low C Alloy 201 | Ni-Cu Alloys 400, 405 | Ni-Cr-Fe Alloy 600 | Ni-Fe-Cr Alloy 800 | Ni-Mo Alloy B2 | Ni Alloys | Ni-Cr-Mo-Fe Alloy X | Ni-Fe-Cr-Mo-Cd Alloy 700 | Ni-Fe-Cr-Mo-Cu Low C Alloy 904L | Alloys 20 Mod. & G-3 | Ni-Cr-Fe-Mo-Cu Alloy G-2 | Ni-Cr-Fe-Mo-Cu Alloy G | Ni-Fe-Cr Alloy 800H | Ni-Fe-Cr-Si Alloy 330 |                    |
| 1800                          | 1080         | 720                | 1800                  | 2160               | 2160               | 2250           | 2250      | 2250                | 2160                     | 1920                            | 2015                 | 2250                     | 2160                   | 1800                | 2160                  | -20 to 100         |
| 1670                          | 1080         | 685                | 1585                  | 2015               | 1990               | 2250           | 2250      | 2250                | 2160                     | 1805                            | 1870                 | 2115                     | 1935                   | 1620                | 1910                  | 200                |
| 1570                          | 1080         | 670                | 1485                  | 1915               | 1870               | 2185           | 2185      | 2040                | 2040                     | 1630                            | 1760                 | 1985                     | 1795                   | 1520                | 1765                  | 300                |
| 1445                          | 1080         | 650                | 1435                  | 1845               | 1800               | 2115           | 2115      | 1795                | 1920                     | 1490                            | 1610                 | 1900                     | 1685                   | 1440                | 1655                  | 400                |
| 1405                          | 1080         | 650                | 1435                  | 1780               | 1735               | 1995           | 1995      | 1730                | 1835                     | 1370                            | 1500                 | 1780                     | 1605                   | 1370                | 1575                  | 500                |
| 1365                          | 1080         | 650                | 1435                  | 1720               | 1720               | 1815           | 1815      | 1680                | 1780                     | 1295                            | 1425                 | 1685                     | 1555                   | 1320                | 1505                  | 600                |
| 1350                          | ...          | 650                | 1435                  | 1690               | 1705               | 1765           | 1765      | 1680                | 1705                     | 1265                            | 1395                 | 1660                     | 1535                   | 1275                | 1470                  | 650                |
| 1335                          | ...          | 650                | 1435                  | 1670               | 1690               | 1705           | 1705      | 1680                | ...                      | 1230                            | 1350                 | 1630                     | 1520                   | 1260                | 1445                  | 700                |
| 1320                          | ...          | 635                | 1405                  | 1595               | 1595               | 1595           | 1595      | 1595                | ...                      | ...                             | 1330                 | 1595                     | 1505                   | 1240                | 1410                  | 750                |
| 1295                          | ...          | 610                | 1375                  | 1520               | 1520               | 1520           | 1520      | 1525                | ...                      | ...                             | 1295                 | 1525                     | 1490                   | 1225                | 1390                  | 800                |
| ...                           | ...          | 610                | 1020                  | 1460               | 1460               | ...            | 1460      | 1460                | ...                      | ...                             | ...                  | ...                      | 1460                   | 1195                | 1360                  | 850                |
| ...                           | ...          | 415                | 740                   | 1350               | 1350               | ...            | 1350      | 1350                | ...                      | ...                             | ...                  | ...                      | 1350                   | 1190                | 1330                  | 900                |
| ...                           | ...          | 345                | ...                   | 980                | 1160               | ...            | 1160      | 1160                | ...                      | ...                             | ...                  | ...                      | 1160                   | 1160                | 1160                  | 950                |
| ...                           | ...          | 280                | ...                   | 650                | 1090               | ...            | 1090      | 1090                | ...                      | ...                             | ...                  | ...                      | 1090                   | 1090                | 1090                  | 1000               |
| ...                           | ...          | 220                | ...                   | 415                | 1080               | ...            | 1080      | 1080                | ...                      | ...                             | ...                  | ...                      | ...                    | 975                 | 925                   | 1050               |
| ...                           | ...          | 185                | ...                   | 280                | 965                | ...            | 965       | 965                 | ...                      | ...                             | ...                  | ...                      | ...                    | 965                 | 720                   | 1100               |
| ...                           | ...          | 140                | ...                   | 205                | 825                | ...            | 825       | 825                 | ...                      | ...                             | ...                  | ...                      | ...                    | 825                 | 555                   | 1150               |
| ...                           | ...          | 110                | ...                   | 185                | 610                | ...            | 555       | 620                 | ...                      | ...                             | ...                  | ...                      | ...                    | 620                 | 435                   | 1200               |
| ...                           | ...          | ...                | ...                   | ...                | 390                | ...            | 440       | 545                 | ...                      | ...                             | ...                  | ...                      | ...                    | 545                 | 350                   | 1250               |
| ...                           | ...          | ...                | ...                   | ...                | 185                | ...            | 325       | 410                 | ...                      | ...                             | ...                  | ...                      | ...                    | 410                 | 285                   | 1300               |
| ...                           | ...          | ...                | ...                   | ...                | 150                | ...            | ...       | 310                 | ...                      | ...                             | ...                  | ...                      | ...                    | 310                 | 220                   | 1350               |
| ...                           | ...          | ...                | ...                   | ...                | 100                | ...            | ...       | 225                 | ...                      | ...                             | ...                  | ...                      | ...                    | 225                 | 165                   | 1400               |
| ...                           | ...          | ...                | ...                   | ...                | 95                 | ...            | ...       | 175                 | ...                      | ...                             | ...                  | ...                      | ...                    | 175                 | 140                   | 1450               |
| ...                           | ...          | ...                | ...                   | ...                | 75                 | ...            | ...       | 125                 | ...                      | ...                             | ...                  | ...                      | ...                    | 125                 | 100                   | 1500               |

(Table 2 continues on next page; Notes follow at end of Table)

TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)Pressures Are in psig  
Class 1500

| Material Group No. | 1.1          | 1.2  | 1.3  | 1.4  | 1.5          | 1.7                          | 1.9                          | 1.10         | 1.13        | 1.14        | 2.1               | 2.2         | 2.3                          | 2.4         | 2.5                  | 2.6         | 2.7         |
|--------------------|--------------|------|------|------|--------------|------------------------------|------------------------------|--------------|-------------|-------------|-------------------|-------------|------------------------------|-------------|----------------------|-------------|-------------|
| Temp., °F          | Carbon Steel |      |      |      | Alloy Steels |                              |                              |              |             |             | Austenitic Steels |             |                              |             |                      |             |             |
|                    |              |      |      |      | C-<br>½Mo    | ½Cr-<br>½Mo,<br>Ni-Cr-<br>Mo | 1Cr-<br>½Mo,<br>1¼Cr-<br>½Mo | 2¼Cr-<br>1Mo | 5Cr-<br>½Mo | 9Cr-<br>1Mo | Type<br>304       | Type<br>316 | Type<br>304L<br>Type<br>316L | Type<br>321 | Types<br>347,<br>348 | Type<br>309 | Type<br>310 |
| - 20 to            |              |      |      |      |              |                              |                              |              |             |             |                   |             |                              |             |                      |             |             |
| 100                | 3705         | 3750 | 3470 | 3085 | 3470         | 3750                         | 3750                         | 3750         | 3750        | 3750        | 3600              | 3600        | 3000                         | 3600        | 3600                 | 3360        | 3360        |
| 200                | 3375         | 3750 | 3280 | 2810 | 3395         | 3750                         | 3560                         | 3580         | 3750        | 3750        | 3000              | 3095        | 2530                         | 3050        | 3180                 | 3025        | 3025        |
| 300                | 3280         | 3640 | 3190 | 2735 | 3260         | 3640                         | 3365                         | 3385         | 3640        | 3640        | 2640              | 2795        | 2270                         | 2725        | 2940                 | 2845        | 2845        |
| 400                | 3170         | 3530 | 3085 | 2645 | 3200         | 3530                         | 3290                         | 3240         | 3530        | 3530        | 2350              | 2570        | 2065                         | 2470        | 2770                 | 2665        | 2665        |
| 500                | 2995         | 3325 | 2910 | 2490 | 3105         | 3325                         | 3210                         | 3200         | 3325        | 3325        | 2185              | 2390        | 1910                         | 2290        | 2590                 | 2520        | 2520        |
| 600                | 2735         | 3025 | 2665 | 2285 | 3025         | 3025                         | 3025                         | 3025         | 3025        | 3025        | 2075              | 2255        | 1800                         | 2185        | 2460                 | 2390        | 2390        |
| 650                | 2685         | 2940 | 2615 | 2245 | 2940         | 2940                         | 2940                         | 2940         | 2940        | 2940        | 2040              | 2220        | 1750                         | 2135        | 2400                 | 2330        | 2330        |
| 700                | 2665         | 2840 | 2590 | 2245 | 2840         | 2840                         | 2840                         | 2840         | 2840        | 2840        | 2015              | 2160        | 1715                         | 2100        | 2340                 | 2280        | 2280        |
| 750                | 2520         | 2520 | 2365 | 2210 | 2660         | 2660                         | 2660                         | 2660         | 2660        | 2660        | 1990              | 2110        | 1680                         | 2075        | 2305                 | 2230        | 2230        |
| 800                | 2060         | 2060 | 1955 | 1850 | 2540         | 2540                         | 2540                         | 2540         | 2485        | 2540        | 1970              | 2075        | 1645                         | 2065        | 2280                 | 2170        | 2170        |
| 850                | 1340         | 1340 | 1340 | 1340 | 2435         | 2435                         | 2435                         | 2435         | 2195        | 2435        | 1945              | 2030        | 1610                         | 2040        | 2220                 | 2125        | 2125        |
| 900                | 860          | 860  | 860  | 860  | 2245         | 2245                         | 2245                         | 2245         | 1765        | 2245        | 1920              | 1970        | ...                          | 2030        | 2160                 | 2075        | 2075        |
| 950                | 515          | 515  | 515  | 515  | 1405         | 1715                         | 1885                         | 1885         | 1305        | 1850        | 1870              | 1930        | ...                          | 1930        | 1930                 | 1930        | 1930        |
| 1000               | 260          | 260  | 260  | 260  | 825          | 1065                         | 1115                         | 1340         | 960         | 1460        | 1610              | 1820        | ...                          | 1785        | 1820                 | 1680        | 1750        |
| 1050               | ...          | ...  | ...  | ...  | ...          | 945                          | 685                          | 995          | 705         | 945         | 1545              | 1800        | ...                          | 1730        | 1800                 | 1460        | 1665        |
| 1100               | ...          | ...  | ...  | ...  | ...          | ...                          | 480                          | 565          | 515         | 565         | 1285              | 1610        | ...                          | 1510        | 1610                 | 1115        | 1460        |
| 1150               | ...          | ...  | ...  | ...  | ...          | ...                          | 260                          | 515          | 345         | 380         | 980               | 1370        | ...                          | 1185        | 1370                 | 860         | 1235        |
| 1200               | ...          | ...  | ...  | ...  | ...          | ...                          | 170                          | 275          | 225         | 260         | 770               | 1030        | ...                          | 910         | 855                  | 650         | 1030        |
| 1250               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 550               | 910         | ...                          | 705         | 615                  | 495         | 805         |
| 1300               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 410               | 685         | ...                          | 530         | 465                  | 395         | 600         |
| 1350               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 310               | 515         | ...                          | 410         | 345                  | 290         | 395         |
| 1400               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 240               | 380         | ...                          | 310         | 255                  | 225         | 275         |
| 1450               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 170               | 290         | ...                          | 240         | 205                  | 155         | 190         |
| 1500               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 120               | 205         | ...                          | 190         | 170                  | 120         | 120         |

TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)Pressures Are in psig  
Class 1500

| 3.1                           | 3.2          | 3.3                | 3.4                   | 3.5                | 3.6                | 3.7            | 3.8       | 3.9                 | 3.10                     | 3.11                            | 3.12                 | 3.13                     | 3.14                   | 3.15                | 3.16                  | Material Group No. |
|-------------------------------|--------------|--------------------|-----------------------|--------------------|--------------------|----------------|-----------|---------------------|--------------------------|---------------------------------|----------------------|--------------------------|------------------------|---------------------|-----------------------|--------------------|
| Nickel and Nickel Alloys      |              |                    |                       |                    |                    |                |           |                     |                          |                                 |                      |                          |                        |                     |                       | Temp., °F          |
| Cr-Ni-Fe-Mo, Cu-Cb Alloy 20Cb | Ni Alloy 200 | Ni-Low C Alloy 201 | Ni-Cu Alloys 400, 405 | Ni-Cr-Fe Alloy 600 | Ni-Fe-Cr Alloy 800 | Ni-Mo Alloy B2 | Ni Alloys | Ni-Cr-Mo-Fe Alloy X | Ni-Fe-Cr-Mo-Cd Alloy 700 | Ni-Fe-Cr-Mo-Cu-Low C Alloy 904L | Alloys 20 Mod. & G-3 | Ni-Cr-Fe-Mo-Cu Alloy G-2 | Ni-Cr-Fe-Mo-Cu Alloy G | Ni-Fe-Cr Alloy 800H | Ni-Fe-Cr-Si Alloy 330 |                    |
| 3000                          | 1800         | 1200               | 3000                  | 3600               | 3600               | 3750           | 3750      | 3750                | 3600                     | 3205                            | 3360                 | 3750                     | 3600                   | 3000                | 3600                  | - 20 to            |
| 2785                          | 1800         | 1140               | 2640                  | 3360               | 3310               | 3750           | 3750      | 3750                | 3600                     | 3005                            | 3115                 | 3530                     | 3230                   | 2700                | 3180                  | 100                |
| 2615                          | 1800         | 1115               | 2470                  | 3190               | 3120               | 3640           | 3640      | 3395                | 3400                     | 2720                            | 2935                 | 3310                     | 2990                   | 2530                | 2940                  | 200                |
| 2405                          | 1800         | 1080               | 2390                  | 3070               | 3000               | 3530           | 3530      | 2990                | 3205                     | 2485                            | 2680                 | 3170                     | 2810                   | 2400                | 2760                  | 300                |
| 2340                          | 1800         | 1080               | 2375                  | 2965               | 2890               | 3325           | 3325      | 2880                | 3060                     | 2285                            | 2500                 | 2970                     | 2675                   | 2280                | 2630                  | 400                |
| 2275                          | 1800         | 1080               | 2375                  | 2870               | 2870               | 3025           | 3025      | 2795                | 2970                     | 2160                            | 2375                 | 2810                     | 2590                   | 2195                | 2510                  | 500                |
| 2250                          | ...          | 1080               | 2375                  | 2820               | 2845               | 2940           | 2940      | 2795                | 2845                     | 2105                            | 2320                 | 2765                     | 2555                   | 2125                | 2450                  | 600                |
| 2225                          | ...          | 1080               | 2375                  | 2785               | 2820               | 2840           | 2840      | 2795                | ...                      | 2050                            | 2250                 | 2720                     | 2530                   | 2100                | 2410                  | 650                |
| 2200                          | ...          | 1055               | 2340                  | 2660               | 2650               | 2660           | 2660      | 2660                | ...                      | ...                             | 2215                 | 2660                     | 2510                   | 2065                | 2350                  | 700                |
| 2160                          | ...          | 1020               | 2290                  | 2540               | 2535               | 2540           | 2540      | 2540                | ...                      | ...                             | 2160                 | 2540                     | 2485                   | 2040                | 2315                  | 750                |
| ...                           | ...          | 1020               | 1695                  | 2435               | 2435               | ...            | 2435      | 2435                | ...                      | ...                             | ...                  | ...                      | 2435                   | 1990                | 2270                  | 800                |
| ...                           | ...          | 695                | 1235                  | 2245               | 2245               | ...            | 2245      | 2245                | ...                      | ...                             | ...                  | ...                      | 2245                   | 1980                | 2215                  | 850                |
| ...                           | ...          | 570                | ...                   | 1635               | 1930               | ...            | 1930      | 1930                | ...                      | ...                             | ...                  | ...                      | 1930                   | 1930                | 1930                  | 900                |
| ...                           | ...          | 465                | ...                   | 1080               | 1820               | ...            | 1820      | 1820                | ...                      | ...                             | ...                  | ...                      | 1820                   | 1820                | 1820                  | 950                |
| ...                           | ...          | 370                | ...                   | 695                | 1800               | ...            | 1800      | 1800                | ...                      | ...                             | ...                  | ...                      | ...                    | 1625                | 1545                  | 1000               |
| ...                           | ...          | 310                | ...                   | 465                | 1610               | ...            | 1610      | 1610                | ...                      | ...                             | ...                  | ...                      | ...                    | 1605                | 1205                  | 1050               |
| ...                           | ...          | 230                | ...                   | 340                | 1370               | ...            | 1370      | 1370                | ...                      | ...                             | ...                  | ...                      | ...                    | 1370                | 925                   | 1100               |
| ...                           | ...          | 185                | ...                   | 310                | 1020               | ...            | 925       | 1030                | ...                      | ...                             | ...                  | ...                      | ...                    | 1030                | 725                   | 1150               |
| ...                           | ...          | ...                | ...                   | ...                | 650                | ...            | 735       | 910                 | ...                      | ...                             | ...                  | ...                      | ...                    | 910                 | 585                   | 1200               |
| ...                           | ...          | ...                | ...                   | ...                | 310                | ...            | 540       | 685                 | ...                      | ...                             | ...                  | ...                      | ...                    | 685                 | 480                   | 1250               |
| ...                           | ...          | ...                | ...                   | ...                | 245                | ...            | ...       | 515                 | ...                      | ...                             | ...                  | ...                      | ...                    | 515                 | 370                   | 1300               |
| ...                           | ...          | ...                | ...                   | ...                | 170                | ...            | ...       | 380                 | ...                      | ...                             | ...                  | ...                      | ...                    | 380                 | 280                   | 1350               |
| ...                           | ...          | ...                | ...                   | ...                | 155                | ...            | ...       | 290                 | ...                      | ...                             | ...                  | ...                      | ...                    | 290                 | 230                   | 1400               |
| ...                           | ...          | ...                | ...                   | ...                | 125                | ...            | ...       | 205                 | ...                      | ...                             | ...                  | ...                      | ...                    | 205                 | 170                   | 1450               |
| ...                           | ...          | ...                | ...                   | ...                | ...                | ...            | ...       | ...                 | ...                      | ...                             | ...                  | ...                      | ...                    | ...                 | ...                   | 1500               |

(Table 2 continues on next page; Notes follow at end of Table)

**TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)**  
 Pressures Are in psig  
 Class 2500

| Material Group No. | 1.1          | 1.2  | 1.3  | 1.4  | 1.5          | 1.7                          | 1.9                          | 1.10         | 1.13        | 1.14        | 2.1               | 2.2         | 2.3                          | 2.4         | 2.5                  | 2.6         | 2.7         |
|--------------------|--------------|------|------|------|--------------|------------------------------|------------------------------|--------------|-------------|-------------|-------------------|-------------|------------------------------|-------------|----------------------|-------------|-------------|
| Temp., °F          | Carbon Steel |      |      |      | Alloy Steels |                              |                              |              |             |             | Austenitic Steels |             |                              |             |                      |             |             |
|                    |              |      |      |      | C-<br>½Mo    | ½Cr-<br>½Mo,<br>Ni-Cr-<br>Mo | 1Cr-<br>½Mo,<br>1¼Cr-<br>½Mo | 2¼Cr-<br>1Mo | 5Cr-<br>½Mo | 9Cr-<br>1Mo | Type<br>304       | Type<br>316 | Type<br>304L<br>Type<br>316L | Type<br>321 | Types<br>347,<br>348 | Type<br>309 | Type<br>310 |
| - 20 to            |              |      |      |      |              |                              |                              |              |             |             |                   |             |                              |             |                      |             |             |
| 100                | 6170         | 6250 | 5785 | 5145 | 5785         | 6250                         | 6250                         | 6250         | 6250        | 6250        | 6000              | 6000        | 5000                         | 6000        | 6000                 | 5600        | 5600        |
| 200                | 5625         | 6250 | 5470 | 4680 | 5660         | 6250                         | 5930                         | 5965         | 6250        | 6250        | 5000              | 5160        | 4220                         | 5080        | 5300                 | 5040        | 5040        |
| 300                | 5470         | 6070 | 5315 | 4560 | 5435         | 6070                         | 5605                         | 5640         | 6070        | 6070        | 4400              | 4660        | 3780                         | 4540        | 4900                 | 4740        | 4740        |
| 400                | 5280         | 5880 | 5145 | 4405 | 5330         | 5880                         | 5485                         | 5400         | 5880        | 5880        | 3920              | 4280        | 3440                         | 4120        | 4620                 | 4440        | 4440        |
| 500                | 4990         | 5540 | 4850 | 4150 | 5180         | 5540                         | 5350                         | 5330         | 5540        | 5540        | 3640              | 3980        | 3180                         | 3820        | 4320                 | 4200        | 4200        |
| 600                | 4560         | 5040 | 4440 | 3805 | 5040         | 5040                         | 5040                         | 5040         | 5040        | 5040        | 3460              | 3760        | 3000                         | 3640        | 4100                 | 3980        | 3980        |
| 650                | 4475         | 4905 | 4355 | 3740 | 4905         | 4905                         | 4905                         | 4905         | 4905        | 4905        | 3400              | 3700        | 2920                         | 3560        | 4000                 | 3880        | 3880        |
| 700                | 4440         | 4730 | 4320 | 3740 | 4730         | 4730                         | 4730                         | 4730         | 4730        | 4730        | 3380              | 3600        | 2860                         | 3500        | 3900                 | 3800        | 3800        |
| 750                | 4200         | 4200 | 3945 | 3685 | 4430         | 4430                         | 4430                         | 4430         | 4430        | 4430        | 3320              | 3520        | 2800                         | 3460        | 3840                 | 3720        | 3720        |
| 800                | 3430         | 3430 | 3260 | 3085 | 4230         | 4230                         | 4230                         | 4230         | 4145        | 4230        | 3280              | 3460        | 2740                         | 3440        | 3800                 | 3620        | 3620        |
| 850                | 2230         | 2230 | 2230 | 2230 | 4060         | 4060                         | 4060                         | 4060         | 3660        | 4060        | 3240              | 3380        | 2680                         | 3400        | 3700                 | 3540        | 3540        |
| 900                | 1430         | 1430 | 1430 | 1430 | 3745         | 3745                         | 3745                         | 3745         | 2945        | 3745        | 3200              | 3280        | ...                          | 3380        | 3600                 | 3460        | 3460        |
| 950                | 860          | 860  | 860  | 860  | 2345         | 2860                         | 3145                         | 3145         | 2170        | 3085        | 3120              | 3220        | ...                          | 3220        | 3220                 | 3220        | 3220        |
| 1000               | 430          | 430  | 430  | 430  | 1370         | 1770                         | 1860                         | 2230         | 1600        | 2430        | 2685              | 3030        | ...                          | 2970        | 3030                 | 2800        | 2915        |
| 1050               | ...          | ...  | ...  | ...  | ...          | 1570                         | 1145                         | 1660         | 1170        | 1570        | 2570              | 3000        | ...                          | 2885        | 3000                 | 2430        | 2770        |
| 1100               | ...          | ...  | ...  | ...  | ...          | ...                          | 800                          | 945          | 860         | 945         | 2145              | 2685        | ...                          | 2515        | 2685                 | 1860        | 2430        |
| 1150               | ...          | ...  | ...  | ...  | ...          | ...                          | 430                          | 860          | 570         | 630         | 1630              | 2285        | ...                          | 1970        | 2285                 | 1430        | 2060        |
| 1200               | ...          | ...  | ...  | ...  | ...          | ...                          | 285                          | 460          | 370         | 430         | 1285              | 1715        | ...                          | 1515        | 1430                 | 1085        | 1715        |
| 1250               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 915               | 1515        | ...                          | 1170        | 1030                 | 830         | 1345        |
| 1300               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 685               | 1145        | ...                          | 885         | 770                  | 660         | 1000        |
| 1350               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 515               | 860         | ...                          | 685         | 570                  | 485         | 660         |
| 1400               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 400               | 630         | ...                          | 515         | 430                  | 370         | 460         |
| 1450               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 285               | 485         | ...                          | 400         | 345                  | 260         | 315         |
| 1500               | ...          | ...  | ...  | ...  | ...          | ...                          | ...                          | ...          | ...         | ...         | 200               | 345         | ...                          | 315         | 285                  | 200         | 200         |

TABLE 2 PRESSURE-TEMPERATURE RATINGS<sup>1,2</sup> (CONT'D)

Pressures Are in psig

Class 2500

| 3.1                           | 3.2          | 3.3                | 3.4                   | 3.5                | 3.6                | 3.7            | 3.8       | 3.9                 | 3.10                     | 3.11                            | 3.12                 | 3.13                     | 3.14                   | 3.15                | 3.16                  | Material<br>Group<br>No. |
|-------------------------------|--------------|--------------------|-----------------------|--------------------|--------------------|----------------|-----------|---------------------|--------------------------|---------------------------------|----------------------|--------------------------|------------------------|---------------------|-----------------------|--------------------------|
| Nickel and Nickel Alloys      |              |                    |                       |                    |                    |                |           |                     |                          |                                 |                      |                          |                        |                     |                       | Temp.,<br>°F             |
| Cr-Ni-Fe-Mo, Cu-Cb Alloy 20Cb | Ni Alloy 200 | Ni-Low C Alloy 201 | Ni-Cu Alloys 400, 405 | Ni-Cr-Fe Alloy 600 | Ni-Fe-Cr Alloy 800 | Ni-Mo Alloy B2 | Ni Alloys | Ni-Cr-Mo-Fe Alloy X | Ni-Fe-Cr-Mo-Cd Alloy 700 | Ni-Fe-Cr-Mo-Cu-Low C Alloy 904L | Alloys 20 Mod. & G-3 | Ni-Cr-Fe-Mo-Cu Alloy G-2 | Ni-Cr-Fe-Mo-Cu Alloy G | Ni-Fe-Cr Alloy 800H | Ni-Fe-Cr-Si Alloy 330 |                          |
| 5000                          | 3000         | 2000               | 5000                  | 6000               | 6000               | 6250           | 6250      | 6250                | 6000                     | 5340                            | 5600                 | 6250                     | 6000                   | 5000                | 6000                  | -20 to                   |
| 4640                          | 3000         | 1900               | 4400                  | 5600               | 5520               | 6250           | 6250      | 6250                | 6000                     | 5010                            | 5190                 | 5880                     | 5380                   | 4500                | 5300                  | 100                      |
| 4360                          | 3000         | 1860               | 4120                  | 5320               | 5200               | 6070           | 6070      | 5660                | 5670                     | 4530                            | 4890                 | 5520                     | 4980                   | 4220                | 4900                  | 200                      |
| 4010                          | 3000         | 1800               | 3980                  | 5120               | 5000               | 5880           | 5880      | 4980                | 5340                     | 4140                            | 4470                 | 5280                     | 4680                   | 4000                | 4600                  | 300                      |
| 3900                          | 3000         | 1800               | 3960                  | 4940               | 4820               | 5540           | 5540      | 4800                | 5100                     | 3810                            | 4170                 | 4950                     | 4460                   | 3800                | 4380                  | 400                      |
| 3790                          | 3000         | 1800               | 3960                  | 4780               | 4780               | 5040           | 5040      | 4660                | 4950                     | 3600                            | 3960                 | 4680                     | 4320                   | 3660                | 4180                  | 500                      |
| 3750                          | ...          | 1800               | 3960                  | 4700               | 4740               | 4905           | 4905      | 4660                | 4740                     | 3510                            | 3870                 | 4605                     | 4260                   | 3540                | 4080                  | 600                      |
| 3710                          | ...          | 1800               | 3960                  | 4640               | 4700               | 4730           | 4730      | 4660                | ...                      | 3420                            | 3750                 | 4530                     | 4220                   | 3500                | 4020                  | 650                      |
| 3665                          | ...          | 1760               | 3900                  | 4430               | 4430               | 4430           | 4430      | 4430                | ...                      | ...                             | 3690                 | 4430                     | 4180                   | 3440                | 3920                  | 700                      |
| 3600                          | ...          | 1700               | 3820                  | 4230               | 4230               | 4230           | 4230      | 4230                | ...                      | ...                             | 3600                 | 4230                     | 4140                   | 3400                | 3860                  | 750                      |
| ...                           | ...          | 1700               | 2830                  | 4060               | 4060               | ...            | 4060      | 4060                | ...                      | ...                             | ...                  | ...                      | 4060                   | 3320                | 3780                  | 800                      |
| ...                           | ...          | 1155               | 2055                  | 3745               | 3745               | ...            | 3745      | 3745                | ...                      | ...                             | ...                  | ...                      | 3745                   | 3300                | 3690                  | 850                      |
| ...                           | ...          | 950                | ...                   | 2725               | 3220               | ...            | 3220      | 3220                | ...                      | ...                             | ...                  | ...                      | 3220                   | 3220                | 3220                  | 900                      |
| ...                           | ...          | 770                | ...                   | 1800               | 3030               | ...            | 3030      | 3030                | ...                      | ...                             | ...                  | ...                      | 3030                   | 3030                | 3030                  | 950                      |
| ...                           | ...          | 615                | ...                   | 1155               | 3000               | ...            | 3000      | 3000                | ...                      | ...                             | ...                  | ...                      | ...                    | 2710                | 2570                  | 1000                     |
| ...                           | ...          | 515                | ...                   | 770                | 2685               | ...            | 2685      | 2685                | ...                      | ...                             | ...                  | ...                      | ...                    | 2675                | 2005                  | 1050                     |
| ...                           | ...          | 385                | ...                   | 565                | 2285               | ...            | 2285      | 2285                | ...                      | ...                             | ...                  | ...                      | ...                    | 2285                | 1545                  | 1100                     |
| ...                           | ...          | 310                | ...                   | 515                | 1695               | ...            | 1545      | 1715                | ...                      | ...                             | ...                  | ...                      | ...                    | 1715                | 1210                  | 1150                     |
| ...                           | ...          | ...                | ...                   | ...                | 1080               | ...            | 1220      | 1515                | ...                      | ...                             | ...                  | ...                      | ...                    | 1515                | 975                   | 1200                     |
| ...                           | ...          | ...                | ...                   | ...                | 515                | ...            | 900       | 1145                | ...                      | ...                             | ...                  | ...                      | ...                    | 1145                | 795                   | 1250                     |
| ...                           | ...          | ...                | ...                   | ...                | 410                | ...            | ...       | 860                 | ...                      | ...                             | ...                  | ...                      | ...                    | 860                 | 615                   | 1300                     |
| ...                           | ...          | ...                | ...                   | ...                | 285                | ...            | ...       | 630                 | ...                      | ...                             | ...                  | ...                      | ...                    | 630                 | 465                   | 1350                     |
| ...                           | ...          | ...                | ...                   | ...                | 255                | ...            | ...       | 485                 | ...                      | ...                             | ...                  | ...                      | ...                    | 485                 | 385                   | 1400                     |
| ...                           | ...          | ...                | ...                   | ...                | 205                | ...            | ...       | 345                 | ...                      | ...                             | ...                  | ...                      | ...                    | 345                 | 285                   | 1450                     |
| ...                           | ...          | ...                | ...                   | ...                | ...                | ...            | ...       | ...                 | ...                      | ...                             | ...                  | ...                      | ...                    | ...                 | ...                   | 1500                     |

(Notes follow on next page)

TABLE 2 (CONT'D)

## NOTES:

(1) Provisions of Section 2 apply to all ratings.

(2) Temperature notes for all Material Groups, Table 2, Classes 150 through 2500 (see Table 1A for additional information and Notes relating to specific materials):

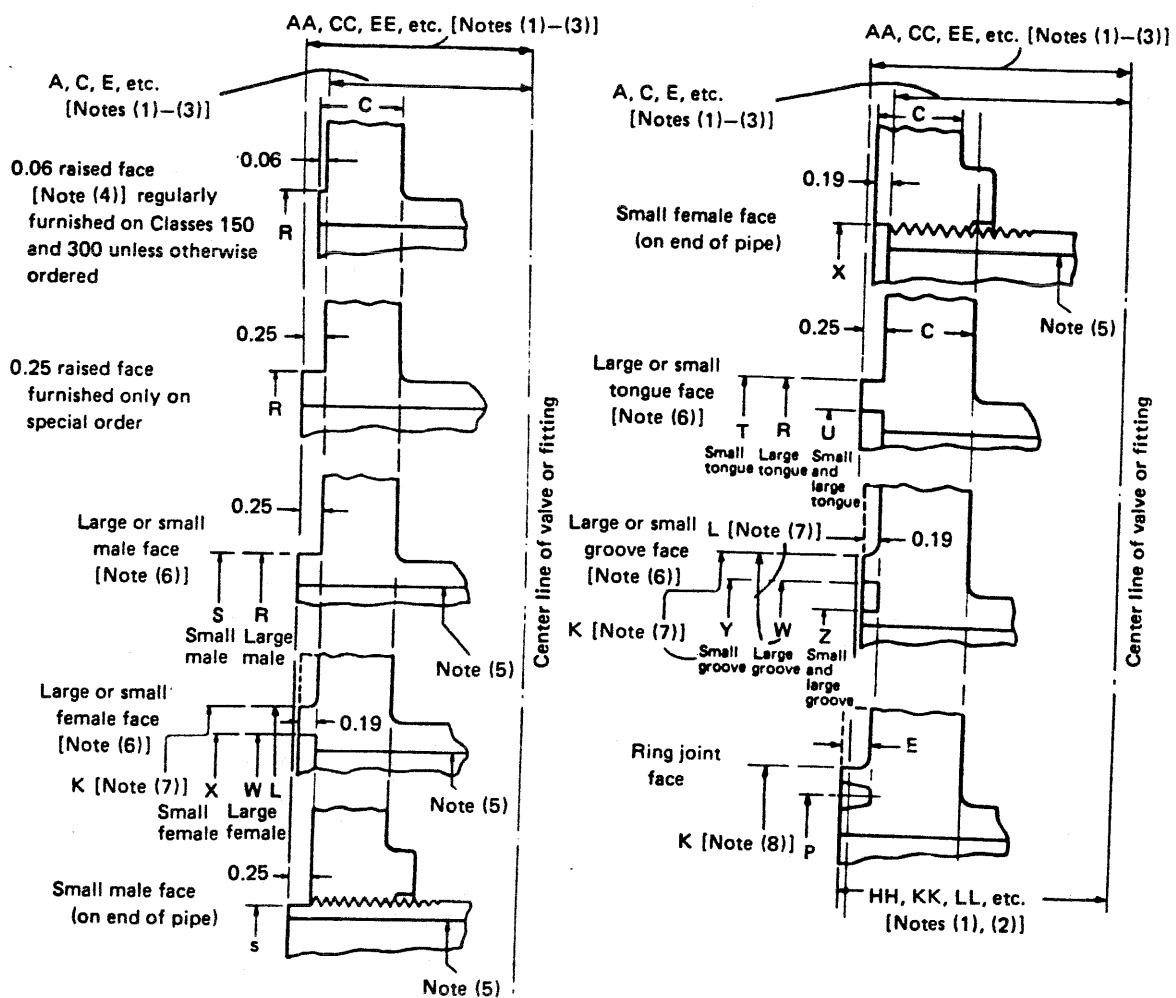
| Material Group No. | Materials (Spec. No. and Grade)                                                         | See Notes                | Material Group No. | Materials (Spec. No. and Grade)                                                                                                                                                  | See Notes                                 |
|--------------------|-----------------------------------------------------------------------------------------|--------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| 1.1                | A 105, A 216 WCB, A 515 70<br>A 516 70<br>A 350 LF2, A 537 Cl.1                         | (a)(b)<br>(a)(c)<br>(d)  | 2.5                | A 182 F347, A 240 347<br>A 182 F347H, A 240 347H<br>A 182 F348, A 240 348<br>A 182 F348H, A 240 F348H                                                                            | (b)<br>...<br>(b)<br>...                  |
| 1.2                | A 203 B, A 203 E, A 216 WCC<br>A 350 LF3, A 352 LC2, A 352 LC3<br>A 350 LCC             | (a)(b)<br>...<br>(d)     | 2.6                | A 240 309S, A 351 CH8, A 351 CH20                                                                                                                                                | ...                                       |
| 1.3                | A 352 LCB<br>A 203 A, A 203 D, A 515 65<br>A 516 65                                     | (a)<br>(a)(b)<br>(a)(c)  | 2.7                | A 182 F310, A 240 310S<br>A 351 CK20                                                                                                                                             | (j)<br>...                                |
| 1.4                | A 515 60<br>A 516 60<br>A 350 LF1                                                       | (a)(b)<br>(a)(c)<br>(d)  | 3.1                | B 462 N08020, B 463 N08020<br>A 351 CN7M                                                                                                                                         | ...<br>(n)                                |
| 1.5                | A 182 F1, A 204 A, A 204 B, A 217 WC1<br>A 352 LC1                                      | (e)(b)<br>(d)            | 3.2                | B 160 N02200, B 162 N02200                                                                                                                                                       | ...                                       |
| 1.7                | A 204 C<br>A 182 F2, A 217 WC4<br>A 217 WC5                                             | (c)<br>(b)<br>(f)        | 3.3                | B 160 N02201, B 162 N02201                                                                                                                                                       | ...                                       |
| 1.9                | A 182 F11, A 182 F12, A 387 11 Cl.2<br>A 217 WC6                                        | (g)<br>(h)               | 3.4                | B 564 N04400, B 127 N04400<br>B 164 N04405                                                                                                                                       | ...<br>...                                |
| 1.10               | A 182 F22, A 387 22 Cl.2<br>A 217 WC9                                                   | (g)<br>(h)               | 3.5                | B 564 N06600, B 168 N06600                                                                                                                                                       | ...                                       |
| 1.13               | A 182 F5, A 182 F5a, A 217 C5                                                           | ...                      | 3.6                | B 564 N08800, B 409 N08800                                                                                                                                                       | ...                                       |
| 1.14               | A 182 F9, A 217 C12                                                                     | ...                      | 3.7                | B 335 N10665, B 333 N10665                                                                                                                                                       | ...                                       |
| 2.1                | A 182 F304, A 182 F304H<br>A 240 304, A 351 CF8<br>A 351 CF3<br>A 240 304H              | ...<br>...<br>(i)<br>... | 3.8                | B 574 N10276, B 575 N10276<br>B 574 N06455, B 575 N06455<br>B 564 N06625, B 443 N06625<br>B 335 N10001, B 333 N10001<br>B 573 N10003, B 434 N10003<br>B 425 N08825, B 424 N08825 | (k)<br>(i)<br>(i)(m)<br>(i)<br>...<br>(b) |
| 2.2                | A 182 F316, A 182 F316H, A 240 316<br>A 240 317, A 351 CF8M<br>A 351 CF3M<br>A 240 316H | ...<br>...<br>(c)<br>... | 3.9                | B 572 N06002, B 435 N06002                                                                                                                                                       | ...                                       |
| 2.3                | A 182 F304L, A 240 304L<br>A 182 F316L, A 240 316L                                      | (i)<br>(c)               | 3.10               | B 672 N08700, B 599 N08700                                                                                                                                                       | ...                                       |
| 2.4                | A 182 F321, A 240 321<br>A 182 F321H, A 240 321H                                        | (b)<br>...               | 3.11               | B 649 N08904, B 625 N08904                                                                                                                                                       | ...                                       |
|                    |                                                                                         |                          | 3.12               | B 621 N08320, B 620 N08320<br>B 581 N06985, B 582 N06985                                                                                                                         | ...<br>...                                |
|                    |                                                                                         |                          | 3.13               | B 581 N06975, B 582 N06975                                                                                                                                                       | ...                                       |
|                    |                                                                                         |                          | 3.14               | B 581 N06007, B 582 N06007                                                                                                                                                       | ...                                       |
|                    |                                                                                         |                          | 3.15               | B 564 N08810, B 409 N08810                                                                                                                                                       | ...                                       |
|                    |                                                                                         |                          | 3.16               | B 511 N08330, B 536 N08330                                                                                                                                                       | ...                                       |

TABLE 2 (CONT'D)

## NOTES (CONT'D):

- (a) permissible but not recommended for prolonged use above about 800°F;
- (b) not to be used over 1000°F;
- (c) not to be used over 850°F;
- (d) not to be used over 650°F;
- (e) permissible but not recommended for prolonged use above about 850°F;
- (f) not to be used over 1050°F;
- (g) permissible but not recommended for prolonged use above about 1100°F;
- (h) not to be used over 1100°F;
- (i) not to be used over 800°F;
- (j) for service temperature 1050°F and above, should be used only when assurance is provided that grain size is not finer than ASTM 6;
- (k) not to be used over 1250°F;
- (l) not to be used over 1200°F;
- (m) Alloy N06625 in the annealed condition is subject to severe loss of impact strength at room temperatures after exposure in the range of 1000°F to 1400°F.
- (n) not to be used over 300°F.

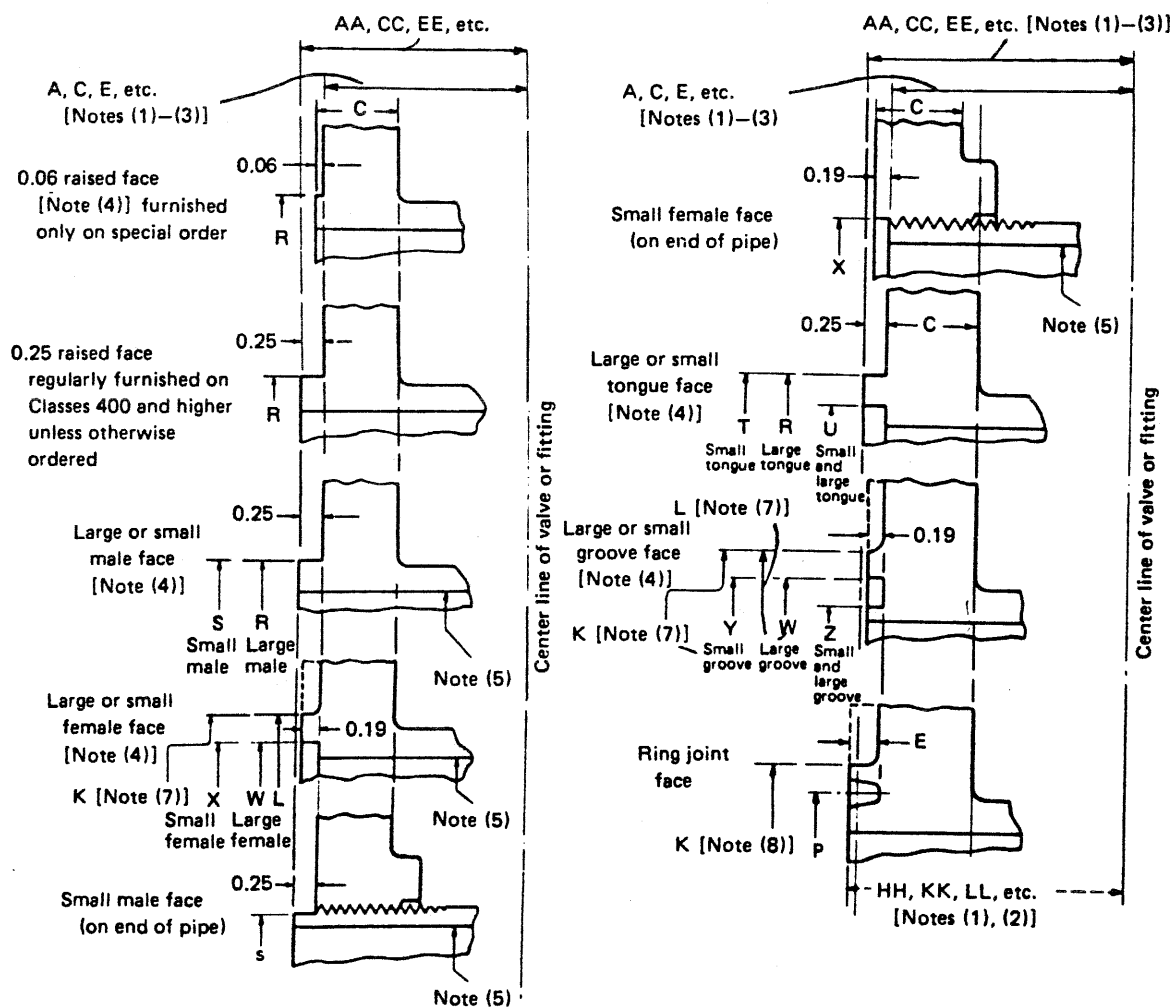
**END FLANGE FACINGS**  
**Flange Thickness and Center-to-End Dimensions**  
**Classes 150 and 300**



**FIG. 7 END FLANGE FACINGS AND THEIR RELATIONSHIP TO FLANGE THICKNESS AND CENTER-TO-END AND END-TO-END DIMENSIONS<sup>1,4</sup>**

(Figure continues on next page; Notes follow at end of Figure)

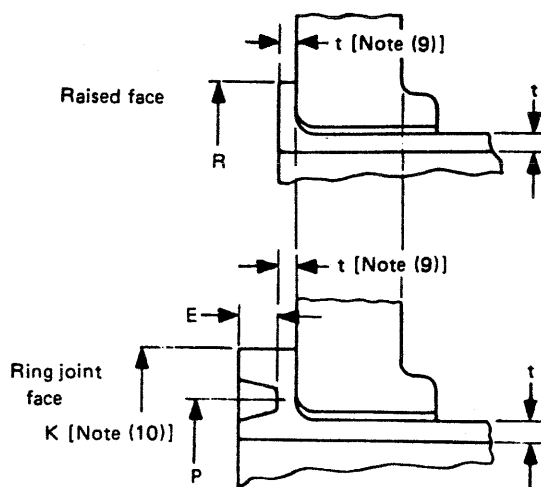
**END FLANGE FACINGS**  
**Flange Thickness and Center-to-End Dimensions**  
**Classes 400 and Higher**



**FIG. 7 END FLANGE FACINGS AND THEIR RELATIONSHIP TO FLANGE THICKNESS AND CENTER-TO-END AND END-TO-END DIMENSIONS<sup>1,4</sup> (CONT'D)**

*(Figure continues and Notes follow on next page)*

**END FLANGE FACINGS**  
**Flange Thickness and End-to-End Dimensions**  
**Lapped Joints**



**FIG. 7 END FLANGE FACINGS AND THEIR RELATIONSHIP TO FLANGE THICKNESS AND CENTER-TO-END AND END-TO-END DIMENSIONS<sup>1,4</sup> (CONT'D)**

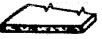
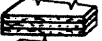
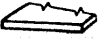
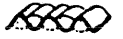
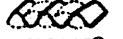
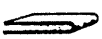
**NOTES:**

- (1) See paras. 6.2 and 6.4.1.
- (2) See Tables 10, 13, 16, 19, 22, 25, and 28.
- (3) For valves, see ASME/ANSI B16.10 for center-to-face dimensions. See ASME/ANSI B16.34 for other requirements.
- (4) See Table 4 for dimensions of facings (other than ring joint) and Table 5 for ring joint facing.
- (5) For small male and female joints, care should be taken in the use of these dimensions to insure that the inside diameter of fitting or pipe is small enough to permit sufficient bearing surface to prevent the crushing of the gasket. (See Table 4.) This applies particularly on lines where the joint is made on the end of the pipe. Threaded companion flanges for small male and female joints are furnished with plain face and are threaded with American National Standard Locknut Thread (NPSL).
- (6) Large male and female faces and large tongue and groove are not applicable to Class 150 because of potential dimensional conflicts.
- (7) See Table 4.
- (8) See Table 5.
- (9) See para. 6.4.2.
- (10) See para. 6.4.2.5 and Table 5.

TABLE 4 DIMENSIONS OF FACINGS<sup>1-4</sup> (OTHER THAN RING JOINTS, ALL PRESSURE RATING CLASSES)

| 1                                          | 2                                                              | 3                         | 4                    | 5                                                                | 6                                         | 7                                              | 8                           | 9                    | 10                                                               | 11                    | 12                    | 13                                    | 14                                                         | 15                                    | 1                            |
|--------------------------------------------|----------------------------------------------------------------|---------------------------|----------------------|------------------------------------------------------------------|-------------------------------------------|------------------------------------------------|-----------------------------|----------------------|------------------------------------------------------------------|-----------------------|-----------------------|---------------------------------------|------------------------------------------------------------|---------------------------------------|------------------------------|
| Nom-<br>inal<br>Pipe<br>Size, <sup>1</sup> | Outside Diameter                                               |                           |                      | Inside<br>Diameter<br>of<br>Large<br>and<br>Small<br>Tongue<br>U | Inside<br>Diameter<br>of<br>Small<br>Male | Outside Diameter                               |                             |                      | Inside<br>Diameter<br>of<br>Large<br>and<br>Small<br>Groove<br>Z | Height                |                       | Depth<br>of<br>Groove<br>or<br>Female | Minimum [(6),(7)]<br>Outside Diameter<br>of Raised Portion |                                       | Nom-<br>inal<br>Pipe<br>Size |
|                                            | Raised<br>Face<br>Large<br>Male<br>and<br>Large<br>Tongue<br>R | Small<br>Male<br>(5)<br>S | Small<br>Tongue<br>T |                                                                  |                                           | Large<br>Female<br>and<br>Large<br>Groove<br>W | Small<br>Female<br>(5)<br>X | Small<br>Groove<br>Y |                                                                  |                       |                       |                                       | Small<br>Female<br>and<br>Groove<br>K                      | Large<br>Female<br>and<br>Groove<br>L |                              |
| 1/2                                        | 1.38                                                           | 0.72                      | 1.38                 | 1.00                                                             | See Note (5)                              | 1.44                                           | 0.78                        | 1.44                 | 0.94                                                             | See Notes (4) and (8) | See Notes (4) and (9) | See Notes (4) and (10)                | 1.75                                                       | 1.81                                  | 1/2                          |
| 3/4                                        | 1.69                                                           | 0.94                      | 1.69                 | 1.31                                                             |                                           | 1.75                                           | 1.00                        | 1.75                 | 1.25                                                             |                       |                       |                                       | 2.06                                                       | 2.12                                  | 3/4                          |
| 1                                          | 2.00                                                           | 1.19                      | 1.88                 | 1.50                                                             |                                           | 2.06                                           | 1.25                        | 1.94                 | 1.44                                                             |                       |                       |                                       | 2.25                                                       | 2.44                                  | 1                            |
| 1 1/4                                      | 2.50                                                           | 1.50                      | 2.25                 | 1.88                                                             |                                           | 2.56                                           | 1.56                        | 2.31                 | 1.81                                                             |                       |                       |                                       | 2.62                                                       | 2.94                                  | 1 1/4                        |
| 1 1/2                                      | 2.88                                                           | 1.75                      | 2.50                 | 2.12                                                             | See Note (5)                              | 2.94                                           | 1.81                        | 2.56                 | 2.06                                                             | See Notes (4) and (8) | See Notes (4) and (9) | See Notes (4) and (10)                | 2.88                                                       | 3.31                                  | 1 1/2                        |
| 2                                          | 3.62                                                           | 2.25                      | 3.25                 | 2.88                                                             |                                           | 3.69                                           | 2.31                        | 3.31                 | 2.81                                                             |                       |                       |                                       | 3.62                                                       | 4.06                                  | 2                            |
| 2 1/2                                      | 4.12                                                           | 2.69                      | 3.75                 | 3.38                                                             |                                           | 4.19                                           | 2.75                        | 3.81                 | 3.31                                                             |                       |                       |                                       | 4.12                                                       | 4.56                                  | 2 1/2                        |
| 3                                          | 5.00                                                           | 3.31                      | 4.62                 | 4.25                                                             |                                           | 5.06                                           | 3.38                        | 4.69                 | 4.19                                                             |                       |                       |                                       | 5.00                                                       | 5.44                                  | 3                            |
| 3 1/2                                      | 5.50                                                           | 3.81                      | 5.12                 | 4.75                                                             | See Note (5)                              | 5.56                                           | 3.88                        | 5.19                 | 4.69                                                             | See Notes (4) and (8) | See Notes (4) and (9) | See Notes (4) and (10)                | 5.50                                                       | 5.94                                  | 3 1/2                        |
| 4                                          | 6.19                                                           | 4.31                      | 5.69                 | 5.19                                                             |                                           | 6.25                                           | 4.38                        | 5.75                 | 5.12                                                             |                       |                       |                                       | 6.19                                                       | 6.62                                  | 4                            |
| 5                                          | 7.31                                                           | 5.38                      | 6.81                 | 6.31                                                             |                                           | 7.38                                           | 5.44                        | 6.88                 | 6.25                                                             |                       |                       |                                       | 7.31                                                       | 7.75                                  | 5                            |
| 6                                          | 8.50                                                           | 6.38                      | 8.00                 | 7.50                                                             |                                           | 8.56                                           | 6.44                        | 8.06                 | 7.44                                                             |                       |                       |                                       | 8.50                                                       | 8.94                                  | 6                            |
| 8                                          | 10.62                                                          | 8.38                      | 10.00                | 9.38                                                             | See Note (5)                              | 10.69                                          | 8.44                        | 10.06                | 9.31                                                             | See Notes (4) and (8) | See Notes (4) and (9) | See Notes (4) and (10)                | 10.62                                                      | 11.06                                 | 8                            |
| 10                                         | 12.75                                                          | 10.50                     | 12.00                | 11.25                                                            |                                           | 12.81                                          | 10.56                       | 12.06                | 11.19                                                            |                       |                       |                                       | 12.75                                                      | 13.19                                 | 10                           |
| 12                                         | 15.00                                                          | 12.50                     | 14.25                | 13.50                                                            |                                           | 15.06                                          | 12.56                       | 14.31                | 13.44                                                            |                       |                       |                                       | 15.00                                                      | 15.44                                 | 12                           |
| 14                                         | 16.25                                                          | 13.75                     | 15.50                | 14.75                                                            |                                           | 16.31                                          | 13.81                       | 15.56                | 14.69                                                            |                       |                       |                                       | 16.25                                                      | 16.69                                 | 14                           |
| 16                                         | 18.50                                                          | 15.75                     | 17.62                | 16.75                                                            | See Note (5)                              | 18.56                                          | 15.81                       | 17.69                | 16.69                                                            | See Notes (4) and (8) | See Notes (4) and (9) | See Notes (4) and (10)                | 18.50                                                      | 18.94                                 | 16                           |
| 18                                         | 21.00                                                          | 17.75                     | 20.12                | 19.25                                                            |                                           | 21.06                                          | 17.81                       | 20.19                | 19.19                                                            |                       |                       |                                       | 21.00                                                      | 21.44                                 | 18                           |
| 20                                         | 23.00                                                          | 19.75                     | 22.00                | 21.00                                                            |                                           | 23.06                                          | 19.81                       | 22.06                | 20.94                                                            |                       |                       |                                       | 23.00                                                      | 23.44                                 | 20                           |
| 24                                         | 27.25                                                          | 23.75                     | 26.25                | 25.25                                                            |                                           | 27.31                                          | 23.81                       | 26.31                | 25.19                                                            |                       |                       |                                       | 27.25                                                      | 27.69                                 | 24                           |

$$m = \frac{p^3}{p}$$

| Gasket Group Number | Gasket Material                                                                                                              |                                            | Gasket Factor m | Minimum Design Seating Stress $\gamma$ , psi | Sketches                                                                              |
|---------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------|----------------------------------------------|---------------------------------------------------------------------------------------|
| Ia                  | Self-energizing types:<br>O rings, metallic, elastomer, other gasket types considered as self-sealing                        |                                            | 0               | 0                                            | -                                                                                     |
|                     | Elastomer without fabric or a high percentage of asbestos fiber:<br>Below 75 Shore durometer<br>75 or higher Shore durometer |                                            | 0.50<br>1.00    | 0<br>200                                     |    |
|                     | Compressed sheet suitable for the operating conditions                                                                       | 0.12 in. thick<br>0.06 in. thick           | 2.00<br>2.75    | 1,600<br>3,700                               |    |
|                     | Elastomer with cotton fabric insertion                                                                                       |                                            | 1.25            | 400                                          |    |
|                     | Elastomer with asbestos fabric insertion, with or without wire reinforcement                                                 | 3 ply                                      | 2.25            | 2,200                                        |    |
|                     |                                                                                                                              | 2 ply                                      | 2.50            | 2,900                                        |                                                                                       |
|                     |                                                                                                                              | 1 ply                                      | 2.75            | 3,700                                        |                                                                                       |
|                     | Vegetable fiber                                                                                                              |                                            | 1.75            | 1,100                                        |    |
| Ib                  | Spiral-wound metal, with asbestos or other nonmetallic filler                                                                | Carbon steel                               | 2.50            | 10,000                                       |    |
|                     |                                                                                                                              | Stainless steel or Monel                   | 3.00            | 10,000                                       |                                                                                       |
|                     | Corrugated metal or corrugated metal double jacketed with nonmetallic filler                                                 | Soft aluminum                              | 2.50            | 2,900                                        |    |
|                     |                                                                                                                              | Soft copper or brass<br>Iron or soft steel | 2.75<br>3.00    | 3,700<br>4,500                               |                                                                                       |
| IIa and IIb         | Corrugated metal                                                                                                             | Soft aluminum<br>Soft copper or brass      | 2.75<br>3.00    | 3,700<br>4,500                               |   |
|                     | Compressed sheet suitable for the operating conditions                                                                       | 0.03 in. thick                             | 3.50            | 6,500                                        |  |
|                     |                                                                                                                              |                                            |                 |                                              |                                                                                       |
|                     | Corrugated metal or corrugated metal double jacketed with nonmetallic filler                                                 | Monel or 4%-6% chrome<br>Stainless steels  | 3.25<br>3.50    | 5,500<br>6,500                               |  |
|                     |                                                                                                                              |                                            |                 |                                              |                                                                                       |
|                     | Corrugated metal                                                                                                             | Iron or soft steel                         | 3.25            | 5,500                                        |  |
|                     |                                                                                                                              | Monel or 4%-6% chrome                      | 3.50            | 6,500                                        |                                                                                       |
|                     |                                                                                                                              | Stainless steels                           | 3.75            | 7,600                                        |                                                                                       |
|                     |                                                                                                                              |                                            |                 |                                              |                                                                                       |
|                     | Flat metal jacketed with nonmetallic filler                                                                                  | Soft aluminum                              | 3.25            | 5,500                                        |  |
|                     |                                                                                                                              | Soft copper or brass                       | 3.50            | 6,500                                        |                                                                                       |
|                     |                                                                                                                              | Iron or soft steel                         | 3.75            | 7,600                                        |                                                                                       |
|                     |                                                                                                                              | Monel                                      | 3.50            | 8,000                                        |                                                                                       |
|                     |                                                                                                                              | 4%-6% chrome<br>Stainless steels           | 3.75<br>3.75    | 9,000<br>9,000                               |                                                                                       |
|                     | Grooved metal                                                                                                                | Soft aluminum                              | 3.25            | 5,500                                        |  |
|                     |                                                                                                                              | Soft copper or brass                       | 3.50            | 6,500                                        |                                                                                       |
|                     |                                                                                                                              | Iron or soft steel                         | 3.75            | 7,600                                        |                                                                                       |
|                     |                                                                                                                              | Monel or 4%-6% chrome<br>Stainless steels  | 3.75<br>4.25    | 9,000<br>10,100                              |                                                                                       |
| IIIa and IIIb       | Solid flat metal                                                                                                             | Soft aluminum                              | 4.00            | 8,800                                        |  |
|                     | Solid flat metal                                                                                                             | Soft copper or brass                       | 4.75            | 13,000                                       |                                                                                       |
|                     |                                                                                                                              | Iron or soft steel                         | 5.50            | 18,000                                       |                                                                                       |
|                     |                                                                                                                              | Monel or 4%-6% chrome                      | 6.00            | 21,800                                       |                                                                                       |
|                     |                                                                                                                              | Stainless steels                           | 6.50            | 26,000                                       |                                                                                       |
|                     | Ring joint                                                                                                                   | Iron or soft steel                         | 5.50            | 18,000                                       |                                                                                       |
|                     |                                                                                                                              | Monel or 4%-6% Chrome                      | 6.00            | 21,800                                       |                                                                                       |
|                     |                                                                                                                              | Stainless steels                           | 6.50            | 26,000                                       |                                                                                       |

**FIG. E1 GASKET MATERIALS AND CONSTRUCTION**  
 Based upon the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.  
 The details given in this Table are suggested only and are not mandatory.

TABLE E1 GROUP NOS. 1a AND 1b GASKETS

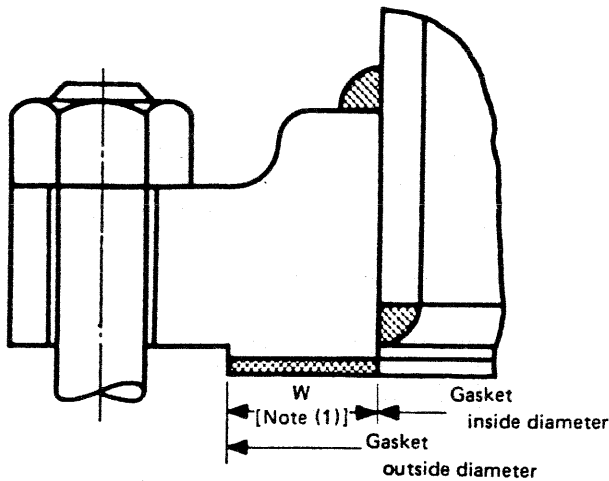


FIG. E2<sup>3</sup>

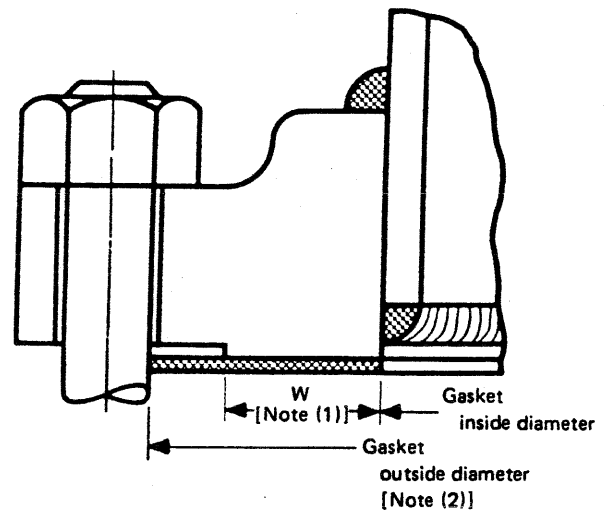


FIG. E3<sup>3</sup>

| Nominal Size | Gasket Contact Width (1) W | Fig. E2         |                  | Fig. E3         |                      |       |       |       |       |       |       |
|--------------|----------------------------|-----------------|------------------|-----------------|----------------------|-------|-------|-------|-------|-------|-------|
|              |                            | Inside Diameter | Outside Diameter | Inside Diameter | Outside Diameter (2) |       |       |       |       |       |       |
|              |                            |                 |                  |                 | 150                  | 300   | 400   | 600   | 900   | 1500  | 2500  |
| 1/2          | 0.27                       | 0.84            | 1.38             | 0.84            | 1.88                 | 2.12  | 2.12  | 2.12  | 2.50  | 2.50  | 2.75  |
| 3/4          | 0.31                       | 1.06            | 1.69             | 1.06            | 2.25                 | 2.62  | 2.62  | 2.62  | 2.75  | 2.75  | 3.00  |
| 1            | 0.34                       | 1.31            | 2.00             | 1.31            | 2.62                 | 2.88  | 2.88  | 2.88  | 3.12  | 3.12  | 3.38  |
| 1 1/4        | 0.42                       | 1.66            | 2.50             | 1.66            | 3.00                 | 3.25  | 3.25  | 3.25  | 3.50  | 3.50  | 4.12  |
| 1 1/2        | 0.48                       | 1.91            | 2.88             | 1.91            | 3.38                 | 3.75  | 3.75  | 3.75  | 3.88  | 3.88  | 4.62  |
| 2            | 0.62                       | 2.38            | 3.62             | 2.38            | 4.12                 | 4.38  | 4.38  | 4.38  | 5.62  | 5.62  | 5.75  |
| 2 1/2        | 0.62                       | 2.88            | 4.12             | 2.88            | 4.88                 | 5.12  | 5.12  | 5.12  | 6.50  | 6.50  | 6.62  |
| 3            | 0.75                       | 3.50            | 5.00             | 3.50            | 5.38                 | 5.88  | 5.88  | 5.88  | 6.62  | 6.88  | 7.75  |
| 3 1/2        | 0.75                       | 4.00            | 5.50             | 4.00            | 6.38                 | 6.50  | 6.38  | 6.38  | ...   | ...   | ...   |
| 4            | 0.84                       | 4.50            | 6.19             | 4.50            | 6.88                 | 7.12  | 7.00  | 7.62  | 8.12  | 8.25  | 9.25  |
| 5            | 0.88                       | 5.56            | 7.31             | 5.56            | 7.75                 | 8.50  | 8.38  | 9.50  | 9.75  | 10.00 | 11.00 |
| 6            | 0.94                       | 6.62            | 8.50             | 6.62            | 8.75                 | 9.88  | 9.75  | 10.50 | 11.38 | 11.12 | 12.50 |
| 8            | 1.00                       | 8.62            | 10.62            | 8.62            | 11.00                | 12.12 | 12.00 | 12.62 | 14.12 | 13.88 | 15.25 |
| 10           | 1.00                       | 10.75           | 12.75            | 10.75           | 13.38                | 14.25 | 14.12 | 15.75 | 17.12 | 17.12 | 18.75 |
| 12           | 1.12                       | 12.75           | 15.00            | 12.75           | 16.12                | 16.62 | 16.50 | 18.00 | 19.62 | 20.50 | 21.62 |
| 14           | 1.12                       | 14.00           | 16.25            | 14.00           | 17.75                | 19.12 | 19.00 | 19.38 | 20.50 | 22.75 | ...   |
| 16           | 1.25                       | 16.00           | 18.50            | 16.00           | 20.25                | 21.25 | 21.12 | 22.25 | 22.62 | 25.25 | ...   |
| 18           | 1.50                       | 18.00           | 21.00            | 18.00           | 21.62                | 23.50 | 23.38 | 24.12 | 25.12 | 27.75 | ...   |
| 20           | 1.50                       | 20.00           | 23.00            | 20.00           | 23.88                | 25.75 | 25.50 | 26.88 | 27.50 | 29.75 | ...   |
| 24           | 1.62                       | 24.00           | 27.25            | 24.00           | 28.25                | 30.50 | 30.25 | 31.12 | 33.00 | 35.50 | ...   |

GENERAL NOTE: Dimensions are in inches.

NOTES:

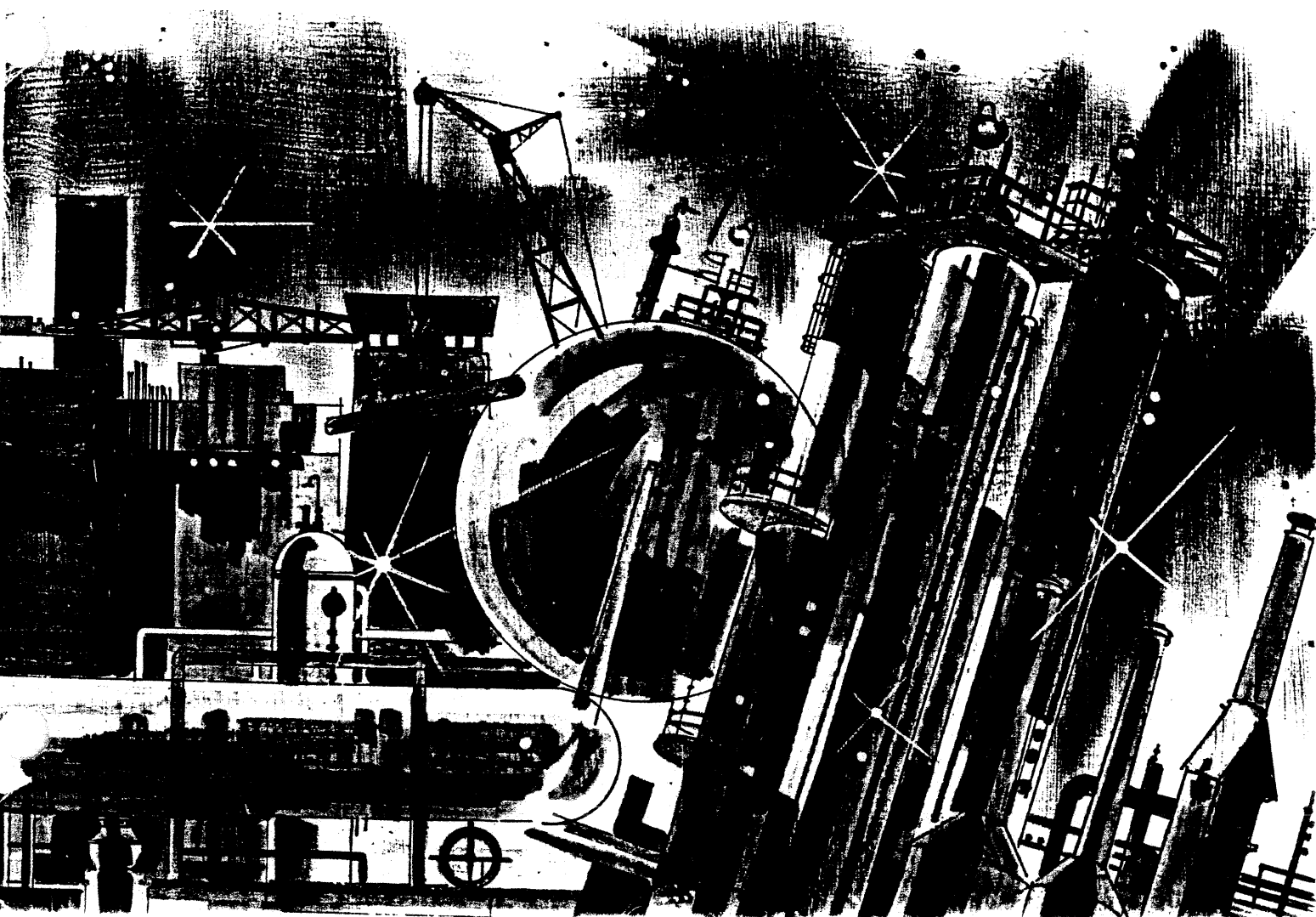
- (1) Applies to both Figs. E2 and E3. Gasket diameters may be varied. In no case, however, should the area of unconfined nonmetallic gaskets be less than that of the bolt. See para. E3(b).
- (2) Gasket outside diameter may be extended, or an attached centering service may be used. The outside diameter of extended metallic gaskets or of any centering ring may be 0.12 in. less than specified.
- (3) Slip-on type flange is shown for illustration purposes only. Gaskets may be used with other types of flange. See para. E3(e).

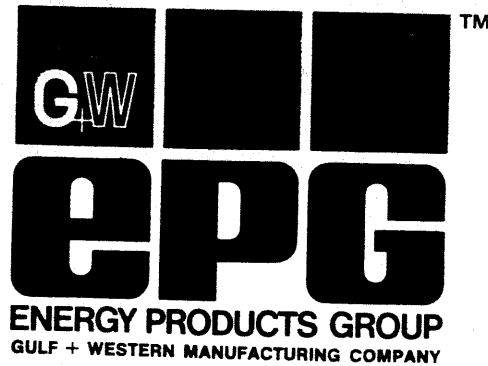
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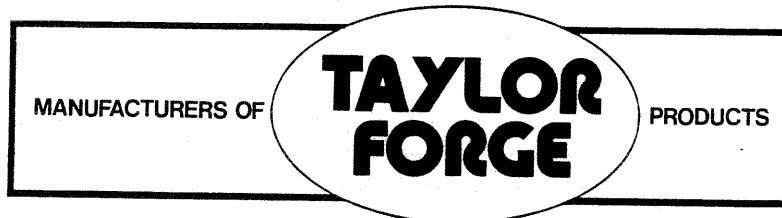
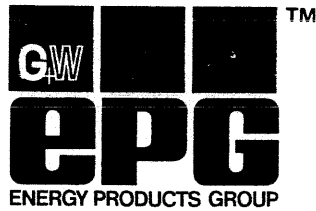
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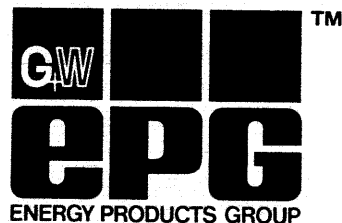
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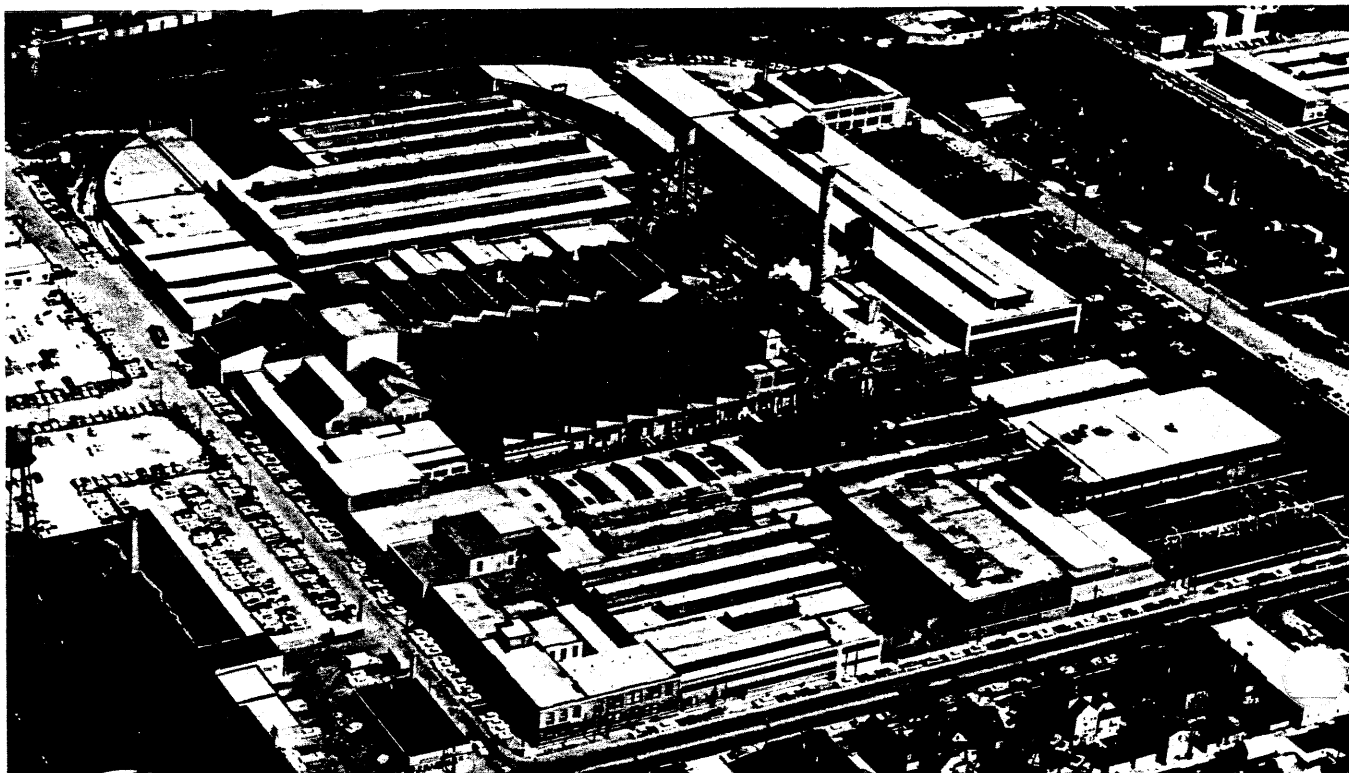
Throughout the years, from the date of its founding in 1900, the history of Taylor Forge has been one of continuous service and contribution to the piping and pressure vessel fields.

Among the first in private industry to recognize the need, Taylor Forge initiated many of the early investigations and research projects involving stress conditions in piping and pressure vessels, particularly with reference to stress concentrations due to openings or to the general geometry and configuration of the system, vessel or part under consideration. A good example of such service is found in the studies initiated and directed by Taylor Forge on bolted flanged connections. The results were published in 1938 under the title of "Modern Flange Design," which is to this day accepted as the standard reference work on the subject.

This is but one. There have been many other Taylor Forge contributions of great im-

portance to the industry. Yet, interesting as it may have been, such pioneering work was not undertaken merely to satisfy intellectual curiosity. Rather, it had the very practical purpose of determining *what new products were needed and how existing designs could be improved*. As answers were obtained, and are still being obtained, facilities were and are still being provided by Taylor Forge to meet industry requirements.

Strict adherence to this guiding principle has earned for Taylor Forge and its products a unique reputation for dependability and integrity. It has resulted in a continuous expansion of plants and facilities to meet the ever increasing need of industry. We of Taylor Forge deeply appreciate the confidence that friends and customers have placed in us and we recognize the responsibility of continuing to justify that confidence.



Main Plant—Chicago, Illinois

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# Taylor Forge

## WELDING FITTINGS of advanced engineering design

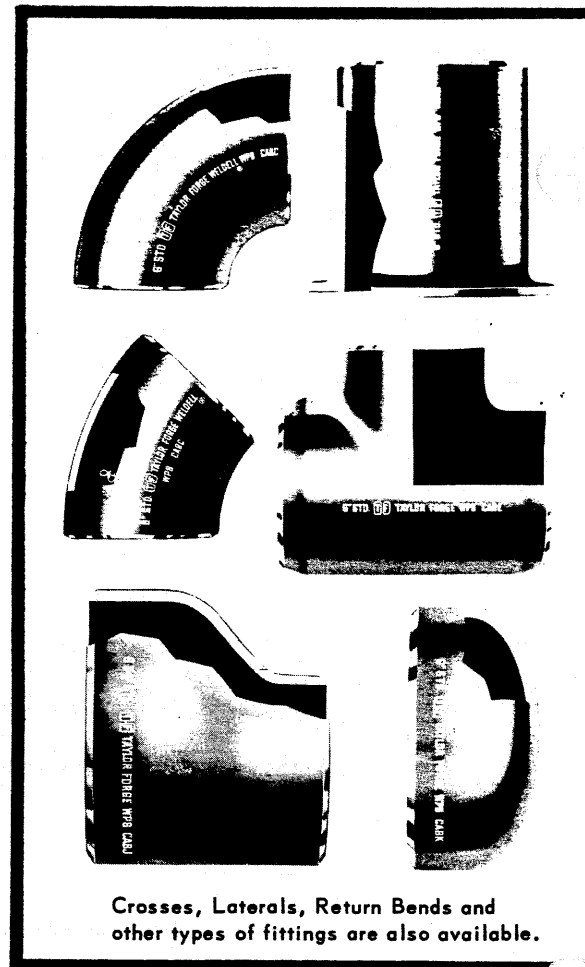
EVERY TYPE . . .

EVERY THICKNESS . . .

EVERY MATERIAL \*

To discuss fully the many design features of Taylor Forge Welding Fittings would require far more space than is justified in a book of this kind. It can be categorically stated, however, that every fitting in the Taylor Forge line is designed to meet—and does meet, fully and completely—the following requirements:—

1. Full pipe strength.
2. Extreme dimensional accuracy.
3. Maximum economy of installation.
4. Finest metallurgical quality.
5. Permanent and positive identification.
6. Complete compliance with applicable Standards.



Crosses, Laterals, Return Bends and other types of fittings are also available.

### WALL THICKNESSES (Dimensions Common to Fittings and Pipe)

| Nominal<br>Pipe<br>Size | Nominal<br>Outside<br>Diameter | NOMINAL WALL THICKNESS    |              |              |                           |              |              |                          |              |               |               |               |               |            | Nomina<br>Pipe<br>Size |
|-------------------------|--------------------------------|---------------------------|--------------|--------------|---------------------------|--------------|--------------|--------------------------|--------------|---------------|---------------|---------------|---------------|------------|------------------------|
|                         |                                | Sched.<br>10 <sup>1</sup> | Sched.<br>20 | Sched.<br>30 | STD. <sup>2</sup><br>WALL | Sched.<br>40 | Sched.<br>60 | EX. <sup>3</sup><br>STG. | Sched.<br>80 | Sched.<br>100 | Sched.<br>120 | Sched.<br>140 | Sched.<br>160 | XX<br>STG. |                        |
| ½                       | 0.840                          | .083                      | —            | —            | .109                      | .109         | —            | .147                     | .147         | —             | —             | —             | .188          | .294       | ½                      |
| ¾                       | 1.050                          | .083                      | —            | —            | .113                      | .113         | —            | .154                     | .154         | —             | —             | —             | .219          | .308       | ¾                      |
| 1                       | 1.315                          | .109                      | —            | —            | .133                      | .133         | —            | .179                     | .179         | —             | —             | —             | .250          | .358       | 1                      |
| 1¼                      | 1.660                          | .109                      | —            | —            | .140                      | .140         | —            | .191                     | .191         | —             | —             | —             | .250          | .382       | 1¼                     |
| 1½                      | 1.900                          | .109                      | —            | —            | .145                      | .145         | —            | .200                     | .200         | —             | —             | —             | .281          | .400       | 1½                     |
| 2                       | 2.375                          | .109                      | —            | —            | .154                      | .154         | —            | .218                     | .218         | —             | —             | —             | .344          | .436       | 2                      |
| 2½                      | 2.875                          | .120                      | —            | —            | .203                      | .203         | —            | .276                     | .276         | —             | —             | —             | .375          | .552       | 2½                     |
| 3                       | 3.500                          | .120                      | —            | —            | .216                      | .216         | —            | .300                     | .300         | —             | —             | —             | .438          | .600       | 3                      |
| 3½                      | 4.000                          | .120                      | —            | —            | .226                      | .226         | —            | .318                     | .318         | —             | —             | —             | —             | .636*      | 3½                     |
| 4                       | 4.500                          | .120                      | —            | —            | .237                      | .237         | —            | .337                     | .337         | —             | .438          | —             | .531          | .674       | 4                      |
| 5                       | 5.563                          | .134                      | —            | —            | .258                      | .258         | —            | .375                     | .375         | —             | .500          | —             | .625          | .750       | 5                      |
| 6                       | 6.625                          | .134                      | —            | —            | .280                      | .280         | —            | .432                     | .432         | —             | .562          | —             | .719          | .864       | 6                      |
| 8                       | 8.625                          | .148                      | .250         | .277         | .322                      | .322         | .406         | .500                     | .500         | .594          | .719          | .812          | .906          | .875       | 8                      |
| 10                      | 10.750                         | .165                      | .250         | .307         | .365                      | .365         | .500         | .500                     | .594         | .719          | .844          | 1.000         | 1.125         | 1.000      | 10                     |
| 12                      | 12.750                         | .180                      | .250         | .330         | .375                      | .406         | .562         | .500                     | .688         | .844          | 1.000         | 1.125         | 1.312         | 1.000      | 12                     |
| 14                      | 14.000                         | .250                      | .312         | .375         | .375                      | .438         | .594         | .500                     | .750         | .938          | 1.094         | 1.250         | 1.406         | —          | 14                     |
| 16                      | 16.000                         | .250                      | .312         | .375         | .375                      | .500         | .656         | .500                     | .844         | 1.031         | 1.219         | 1.438         | 1.594         | —          | 16                     |
| 18                      | 18.000                         | .250                      | .312         | .438         | .375                      | .562         | .750         | .500                     | .938         | 1.156         | 1.375         | 1.562         | 1.781         | —          | 18                     |
| 20                      | 20.000                         | .250                      | .375         | .500         | .375                      | .594         | .812         | .500                     | 1.031        | 1.281         | 1.500         | 1.750         | 1.969         | —          | 20                     |
| 22                      | 22.000                         | .250                      | —            | —            | .375                      | —            | —            | .500                     | —            | —             | —             | —             | —             | —          | 22                     |
| 24                      | 24.000                         | .250                      | .375         | .562         | .375                      | .688         | .969         | .500                     | 1.219        | 1.531         | 1.812         | 2.062         | 2.344         | —          | 24                     |
| 26                      | 26.000                         | —                         | —            | —            | .375                      | —            | —            | .500                     | —            | —             | —             | —             | —             | —          | 26                     |
| 30                      | 30.000                         | .312                      | .500         | .625         | .375                      | —            | —            | .500                     | —            | —             | —             | —             | —             | —          | 30                     |
| 36                      | 36.000                         | .312                      | .500         | .625         | .375                      | .750         | —            | .500                     | —            | —             | —             | —             | —             | —          | 36                     |
| 40                      | 40.000                         | —                         | —            | —            | .375                      | —            | —            | .500                     | —            | —             | —             | —             | —             | —          | 40                     |
| 42                      | 42.000                         | —                         | —            | —            | .375                      | —            | —            | .500                     | —            | —             | —             | —             | —             | —          | 42                     |
| 48                      | 48.000                         | —                         | —            | —            | .375                      | —            | —            | .500                     | —            | —             | —             | —             | —             | —          | 48                     |

Dimensions are in inches.

\*Taylor Forge welding fittings are available in every type, size and material grade except sizes in shaded area, are not available in Grade B carbon steel.

1. Light Wall thicknesses are identical to stainless steel Schedule 10S in sizes thru 12", and to Schedule 10 in sizes 14" and larger.

2. Standard Wall thicknesses are identical to stainless steel Schedule 40S in sizes thru 12".

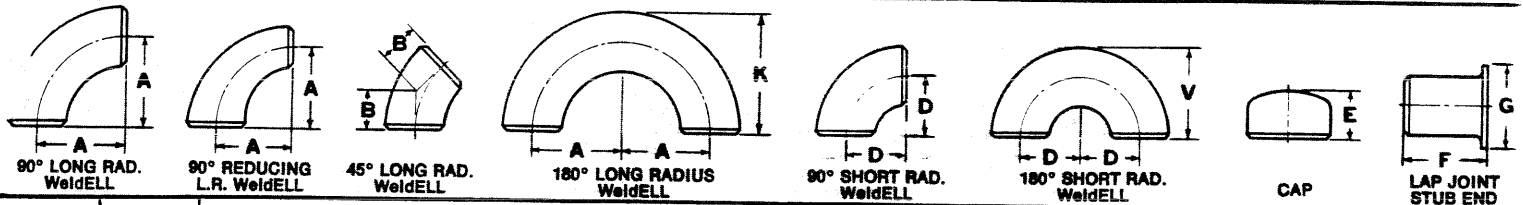
3. Extra Strong Wall thicknesses are identical to stainless steel Schedule 80S in sizes thru 12".

4. Other types, sizes and thicknesses of fittings on application.

5. Stocked in carbon steel and a variety of other metals and alloys.

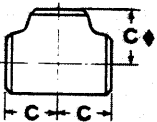
6. Inside pipe diameters are provided by table on page 14.

# 5 DIMENSIONS

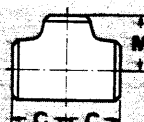


| Nom.<br>Pipe<br>Size | Pipe<br>O.D. | WeldELL |        |       |         |         | CAPS*  | STUB ENDS |                |                     | Nom.<br>Pipe<br>Size |
|----------------------|--------------|---------|--------|-------|---------|---------|--------|-----------|----------------|---------------------|----------------------|
|                      |              | A       | B      | D     | K       | V       |        | E         | F<br>ANSI Std. | G<br>O.D. of<br>Lap |                      |
| 1/2                  | .840         | 1 1/2   | 5/8    | —     | 1 7/8   | —       | 1      | 3         | 1 3/8          | 1/8                 | 1/2                  |
| 3/4                  | 1.050        | 1 5/8   | 7/16   | —     | 1 11/16 | —       | 1      | 3         | 1 11/16        | 1/8                 | 3/4                  |
| 1                    | 1.315        | 1 1/2   | 7/8    | 1     | 2 3/16  | 1 5/8   | 1 1/2  | 4         | 2              | 1/8                 | 1                    |
| 1 1/4                | 1.660        | 1 7/8   | 1      | 1 1/4 | 2 3/4   | 2 1/16  | 1 1/2  | 4         | 2 1/2          | 3/16                | 1 1/4                |
| 1 1/2                | 1.900        | 2 1/4   | 1 1/8  | 1 1/2 | 3 1/4   | 2 7/16  | 1 1/2  | 4         | 2 7/8          | 1/4                 | 1 1/2                |
| 2                    | 2.375        | 3       | 1 3/8  | 2     | 4 3/16  | 3 3/16  | 1 1/2  | 6         | 3 5/8          | 5/16                | 2                    |
| 2 1/2                | 2.875        | 3 3/4   | 1 3/4  | 2 1/2 | 5 3/16  | 3 15/16 | 1 1/2  | 6         | 4 1/8          | 5/16                | 2 1/2                |
| 3                    | 3.500        | 4 1/2   | 2      | 3     | 6 1/4   | 4 3/4   | 2      | 6         | 5              | 3/8                 | 3                    |
| 3 1/2                | 4.000        | 5 1/4   | 2 1/4  | 3 1/2 | 7 1/4   | 5 1/2   | 2 1/2  | 6         | 5 1/2          | 3/8                 | 3 1/2                |
| 4                    | 4.500        | 6       | 2 1/2  | 4     | 8 1/4   | 6 1/4   | 2 1/2  | 6         | 6 3/16         | 7/16                | 4                    |
| 5                    | 5.563        | 7 1/2   | 3 1/8  | 5     | 10 5/16 | 7 3/4   | 3      | 8         | 7 5/16         | 7/16                | 5                    |
| 6                    | 6.625        | 9       | 3 3/4  | 6     | 12 5/16 | 9 5/16  | 3 1/2  | 8         | 8 1/2          | 1/2                 | 6                    |
| 8                    | 8.625        | 12      | 5      | 8     | 16 5/16 | 12 5/16 | 4      | 8         | 10 5/8         | 1/2                 | 8                    |
| 10                   | 10.750       | 15      | 6 1/4  | 10    | 20 3/8  | 15 3/8  | 5      | 10        | 12 3/4         | 1/2                 | 10                   |
| 12                   | 12.750       | 18      | 7 1/2  | 12    | 24 3/8  | 18 3/8  | 6      | 10        | 15             | 1/2                 | 12                   |
| 14                   | 14.000       | 21      | 8 3/4  | 14    | 28      | 21      | 6 1/2  | 12        | 16 1/4         | 1/2                 | 14                   |
| 16                   | 16.000       | 24      | 10     | 16    | 32      | 24      | 7      | 12        | 18 1/2         | 1/2                 | 16                   |
| 18                   | 18.000       | 27      | 11 1/4 | 18    | 36      | 27      | 8      | 12        | 21             | 1/2                 | 18                   |
| 20                   | 20.000       | 30      | 12 1/2 | 20    | 40      | 30      | 9      | 12        | 23             | 1/2                 | 20                   |
| 24                   | 24.000       | 36      | 15     | 24    | 48      | 26      | 10 1/2 | 12        | 27 1/2         | 1/2                 | 24                   |
| 30                   | 30.000       | 45      | 18 1/2 | 30    | 60      | 45      | 10 1/2 | —         | —              | —                   | 30                   |
| 36                   | 36.000       | 54      | 22 1/4 | 36    | —       | —       | 12     | —         | —              | —                   | 36                   |
| 42                   | 42.000       | 63      | 26     | 42    | —       | —       | 12     | —         | —              | —                   | 42                   |
| 48                   | 48.000       | 72      | 29 7/8 | 48    | —       | —       | 13 1/2 | —         | —              | —                   | 48                   |

STRAIGHT TEE



REDUCING TEE



CONCENTRIC REDUCER



ECCENTRIC REDUCER



| Nom. Pipe Size | Outlet | C     | M     | H     | Nom. Pipe Size | Outlet | C     | M     | H     | Nom. Pipe Size | Outlet | C      | M      | H  | Nom. Pipe Size | Outlet | C      | M      | H  |
|----------------|--------|-------|-------|-------|----------------|--------|-------|-------|-------|----------------|--------|--------|--------|----|----------------|--------|--------|--------|----|
| 3/4            | 3/4    | 1 1/8 | 1 1/8 | 1 1/2 | 3 1/2          | 3 1/2  | 3 3/4 | 3 3/4 | 4     | 10             | 10     | 8 1/2  | 8      | 7  | 20             | 20     | 15     | 14 1/2 | 20 |
| 1              | 1      | 1 1/2 | 1 1/2 | 2     | 3              | 3      | 3 3/4 | 3 3/4 | 4     | 8              | 8      | 8 1/2  | 8      | 7  | 16 & 14        | 15     | 14     | 14     | 20 |
|                | 3/4    | 1 1/2 | 1 1/2 | 2     | 2              | 2      | 3 3/4 | 3 3/4 | 4     | 6              | 6      | 8 1/2  | 7 3/4  | 7  | 12             | 15     | 13 5/8 | 13 5/8 | 20 |
|                | 1/2    | 1 1/2 | 1 1/2 | 2     | 1 1/2          | 1 1/2  | 3 3/4 | 3 3/4 | 4     | 4              | 4      | 8 1/2  | 7 1/4  | 7  | 10             | 15     | 13 1/4 | 13 1/4 | 20 |
| 1 1/4          | 1 1/4  | 1 7/8 | 1 7/8 | 2     | 4              | 4      | 4 1/8 | 4 1/8 | 4     | 12             | 12     | 10     | 9 1/2  | 8  | 24             | 17     | 17     | 17     | 20 |
| 1 1/2          | 1 1/2  | 1 7/8 | 1 7/8 | 2     | 3 1/2          | 3 1/2  | 4 1/8 | 4 1/8 | 4     | 10             | 10     | 10     | 9      | 8  | 20             | 17     | 16 1/2 | 16 1/2 | 20 |
|                | 3/4    | 1 7/8 | 1 7/8 | 2     | 2 1/2          | 2 1/2  | 4 1/8 | 4 1/8 | 4     | 8              | 8      | 10     | 8 3/4  | 8  | 16 & 14        | 17     | 16     | 16     | 20 |
|                | 1/2    | 1 7/8 | 1 7/8 | 2     | 2              | 2      | 4 1/8 | 4 1/8 | 4     | 6              | 6      | 10     | 8 1/2  | 8  | 12             | 17     | 15 5/8 | 15 5/8 | 20 |
| 1 1/2          | 1 1/2  | 2 1/4 | 2 1/4 | 2 1/2 | 5              | 5      | 4 3/4 | 4 3/4 | 5     | 14             | 14     | 11     | 10 3/4 | 13 | 30             | 22     | 21     | 21     | 24 |
| 2              | 2      | 2 1/2 | 2 1/2 | 3     | 4              | 4      | 4 3/4 | 4 3/4 | 5     | 12             | 12     | 11     | 10 1/2 | 13 | 24             | 22     | 20     | 20     | 24 |
|                | 1 1/4  | 2 1/2 | 2 1/2 | 3     | 3 1/2          | 3 1/2  | 4 3/4 | 4 3/4 | 5     | 10             | 10     | 11     | 9 3/4  | 13 | 20             | 22     | 19 1/2 | 19 1/2 | 24 |
|                | 1      | 2 1/2 | 2 1/2 | 3     | 2 1/2          | 2 1/2  | 4 3/4 | 4 3/4 | 5     | 8              | 8      | 11     | 9 3/4  | 13 | 16 & 14        | 22     | 19     | 19     | 24 |
| 2 1/2          | 2 1/2  | 3     | 3     | 3 1/2 | 6              | 6      | 5 5/8 | 5 5/8 | 5 1/2 | 16             | 16     | 12     | 12     | 14 | 36             | 26 1/2 | 25     | 25     | 24 |
|                | 2      | 3     | 3     | 3 1/2 | 5              | 5      | 5 5/8 | 5 5/8 | 5 1/2 | 14             | 14     | 12     | 11 1/2 | 14 | 30             | 26 1/2 | 24     | 24     | 24 |
|                | 1 1/2  | 3     | 3     | 3 1/2 | 4              | 4      | 5 5/8 | 5 5/8 | 5 1/2 | 12             | 12     | 12     | 11 1/4 | 14 | 24             | 26 1/2 | 23     | 23     | 24 |
|                | 1 1/4  | 3     | 3     | 3 1/2 | 3              | 3      | 5 5/8 | 5 5/8 | 5 1/2 | 10             | 10     | 12     | 10 3/4 | 14 | 20             | 26 1/2 | 22 1/2 | 22 1/2 | 24 |
|                | 1      | 3     | 3     | 3 1/2 | 2 1/2          | 2 1/2  | 5 5/8 | 5 5/8 | 5 1/2 | 8              | 8      | 12     | 10 3/4 | 14 | 16             | 26 1/2 | 22     | 22     | 24 |
| 3              | 3      | 3 3/4 | 3 3/4 | 3 3/2 | 8              | 8      | 7     | 6 3/4 | 6     | 18             | 18     | 13 1/2 | 13     | 15 | 42             | 30     | 28     | 28     | 24 |
|                | 2 1/2  | 3 3/4 | 3 3/4 | 3 3/2 | 6              | 6      | 7     | 6 3/4 | 6     | 16             | 16     | 13 1/2 | 13     | 15 | 36 & 30        | 30     | 28     | 28     | 24 |
|                | 2      | 3 3/4 | 3 3/4 | 3 3/2 | 5              | 5      | 7     | 6 3/4 | 6     | 14             | 14     | 13 1/2 | 13     | 15 | 24 & 20        | 30     | 26     | 26     | 24 |
|                | 1 1/2  | 3 3/4 | 3 3/4 | 3 3/2 | 4              | 4      | 7     | 6 3/4 | 6     | 12             | 12     | 13 1/2 | 13     | 15 | 48             | 35     | 33     | 33     | 28 |
|                | 1 1/4  | 3 3/4 | 3 3/4 | 3 3/2 | 3 1/2          | 3 1/2  | 7     | 6 3/4 | 6     | 10             | 10     | 13 1/2 | 13     | 15 | 42             | 35     | 32     | 32     | 28 |
|                | 1      | 3 3/4 | 3 3/4 | 3 3/2 | 3              | 3      | 7     | 6 3/4 | 6     | 8              | 8      | 13 1/2 | 13     | 15 | 36             | 35     | 31     | 31     | 28 |
|                |        | 3 3/4 | 3 3/4 | 3 3/2 | 3              | 3      | 7     | 6 3/4 | 6     |                |        | 13 1/2 | 13     | 15 | 30             | 35     | 30     | 30     | 28 |
|                |        | 3 3/4 | 3 3/4 | 3 3/2 | 3              | 3      | 7     | 6 3/4 | 6     |                |        | 13 1/2 | 13     | 15 | 24             | 35     | 29     | 29     | 28 |

♦ See M dimensions for branch height of 42" or 48" full branch tee. All dimensions are in inches. For approximate weights, see pages 6 to 11.  
See ANSI B16.9 for cap lengths when wall thicknesses are greater than x-stg.

See notes on page 11

Approximate Weight Each - Pounds

| 90° LR WeldELLS      |                |            |            |      |            |            |        |            |             |             |             |             |            |                      |
|----------------------|----------------|------------|------------|------|------------|------------|--------|------------|-------------|-------------|-------------|-------------|------------|----------------------|
| Nom.<br>Pipe<br>Size | Wall Thickness |            |            |      |            |            |        |            |             |             |             |             |            | Nom.<br>Pipe<br>Size |
|                      | Sch.<br>10     | Sch.<br>20 | Sch.<br>30 | Std. | Sch.<br>40 | Sch.<br>60 | X-Stg. | Sch.<br>80 | Sch.<br>100 | Sch.<br>120 | Sch.<br>140 | Sch.<br>160 | XX<br>Stg. |                      |
| ½                    | —              | —          | —          | .17  | .17        | —          | .22    | .22        | —           | —           | —           | —           | —          | ½                    |
| ¾                    | .13            | —          | —          | .17  | .17        | —          | .23    | .23        | —           | —           | —           | —           | .70        | ¾                    |
| 1                    | .29            | —          | —          | .34  | .34        | —          | .45    | .45        | —           | —           | —           | .59         | .75        | 1                    |
| 1¼                   | .47            | —          | —          | .58  | .58        | —          | .77    | .77        | —           | —           | —           | .97         | 1.3        | 1¼                   |
| 1½                   | .64            | —          | —          | .84  | .84        | —          | 1.1    | 1.1        | —           | —           | —           | 1.5         | 2.0        | 1½                   |
| 2                    | 1.1            | —          | —          | 1.5  | 1.5        | —          | 2.1    | 2.1        | —           | —           | —           | 3.0         | 3.7        | 2                    |
| 2½                   | 1.8            | —          | —          | 3.0  | 3.0        | —          | 4.0    | 4.0        | —           | —           | —           | 5.2         | 7.1        | 2½                   |
| 3                    | 2.7            | —          | —          | 4.7  | 4.7        | —          | 6.3    | 6.3        | —           | —           | —           | 8.8         | 11         | 3                    |
| 3½                   | 3.6            | —          | —          | 6.6  | 6.6        | —          | 9.0    | 9.0        | —           | —           | —           | —           | 16         | 3½                   |
| 4                    | 4.6            | —          | —          | 8.9  | 8.9        | —          | 12     | 12         | —           | 16          | —           | 19          | 23         | 4                    |
| 5                    | 8.0            | —          | —          | 15   | 15         | —          | 21     | 21         | —           | 28          | —           | 34          | 40         | 5                    |
| 6                    | 11             | —          | —          | 24   | 24         | —          | 35     | 35         | —           | 45          | —           | 56          | 66         | 6                    |
| 8                    | 22             | 36         | 41         | 47   | 47         | 58         | 71     | 71         | 84          | 100         | 111         | 123         | 120        | 8                    |
| 10                   | 39             | 57         | 70         | 83   | 83         | 112        | 112    | 132        | 159         | 184         | 214         | 238         | 230        | 10                   |
| 12                   | 59             | 82         | 108        | 123  | 132        | 182        | 162    | 219        | 266         | 311         | 347         | 397         | 325        | 12                   |
| 14                   | 106            | 132        | 158        | 158  | 183        | 245        | 208    | 307        | 375         | 420         | 489         | 546         | —          | 14                   |
| 16                   | 139            | 172        | 207        | 207  | 273        | 355        | 273    | 450        | 539         | 631         | 740         | 809         | —          | 16                   |
| 18                   | 176            | 219        | 308        | 263  | 390        | 510        | 347    | 634        | 765         | 879         | 1002        | 1090        | —          | 18                   |
| 20                   | 217            | 323        | 428        | 323  | 506        | 686        | 428    | 861        | 1027        | 1208        | 1400        | 1520        | —          | 20                   |
| 22                   | 262            | —          | —          | 392  | —          | —          | 520    | —          | —           | —           | —           | —           | —          | 22                   |
| 24                   | 314            | 468        | 702        | 468  | 846        | 1176       | 622    | 1470       | 1750        | 1810        | 2283        | 2510        | —          | 24                   |
| 26                   | —              | —          | —          | 550  | —          | —          | 720    | —          | —           | —           | —           | —           | —          | 26                   |
| 30                   | 612            | 972        | 1215       | 733  | —          | —          | 972    | —          | —           | —           | —           | —           | —          | 30                   |
| 36                   | —              | —          | —          | 1061 | —          | —          | 1407   | —          | —           | —           | —           | —           | —          | 36                   |
| 42                   | —              | —          | —          | 1442 | —          | —          | 1916   | —          | —           | —           | —           | —           | —          | 42                   |
| 45° LR WeldELLS      |                |            |            |      |            |            |        |            |             |             |             |             |            |                      |
| ½                    | —              | —          | —          | .09  | .09        | —          | .11    | .11        | —           | —           | —           | —           | —          | ½                    |
| ¾                    | .07            | —          | —          | .09  | .09        | —          | .11    | .11        | —           | —           | —           | —           | —          | ¾                    |
| 1                    | .14            | —          | —          | .17  | .17        | —          | .22    | .22        | —           | —           | —           | .29         | .38        | 1                    |
| 1¼                   | .23            | —          | —          | .29  | .29        | —          | .39    | .39        | —           | —           | —           | .49         | .67        | 1¼                   |
| 1½                   | .32            | —          | —          | .42  | .42        | —          | .56    | .56        | —           | —           | —           | .75         | .99        | 1½                   |
| 2                    | .54            | —          | —          | .75  | .75        | —          | 1.0    | 1.0        | —           | —           | —           | 1.5         | 1.9        | 2                    |
| 2½                   | .91            | —          | —          | 1.5  | 1.5        | —          | 2.0    | 2.0        | —           | —           | —           | 2.6         | 3.5        | 2½                   |
| 3                    | 1.3            | —          | —          | 2.3  | 2.3        | —          | 3.2    | 3.2        | —           | —           | —           | 4.4         | 5.7        | 3                    |
| 3½                   | 1.8            | —          | —          | 3.3  | 3.3        | —          | 4.5    | 4.5        | —           | —           | —           | —           | 8.2        | 3½                   |
| 4                    | 2.3            | —          | —          | 4.4  | 4.4        | —          | 6.2    | 6.2        | —           | 7.8         | —           | 9.3         | 11         | 4                    |
| 5                    | 4.0            | —          | —          | 7.5  | 7.5        | —          | 11     | 11         | —           | 14          | —           | 17          | 20         | 5                    |
| 6                    | 5.7            | —          | —          | 12   | 12         | —          | 18     | 18         | —           | 22          | —           | 28          | 33         | 6                    |
| 8                    | 11             | 18         | 20         | 23   | 23         | 29         | 36     | 36         | 42          | 50          | 55          | 61          | 60         | 8                    |
| 10                   | 19             | 28         | 35         | 42   | 42         | 56         | 56     | 66         | 79          | 92          | 107         | 119         | 115        | 10                   |
| 12                   | 30             | 41         | 54         | 61   | 66         | 91         | 81     | 110        | 133         | 156         | 174         | 199         | 161        | 12                   |
| 14                   | 53             | 66         | 79         | 79   | 81         | 123        | 104    | 154        | 185         | 207         | 241         | 273         | —          | 14                   |
| 16                   | 69             | 86         | 104        | 104  | 137        | 178        | 137    | 225        | 270         | 316         | 373         | 405         | —          | 16                   |
| 18                   | 88             | 110        | 154        | 132  | 195        | 255        | 174    | 317        | 383         | 431         | 497         | 550         | —          | 18                   |
| 20                   | 109            | 162        | 214        | 162  | 253        | 343        | 214    | 431        | 514         | 604         | 702         | 770         | —          | 20                   |
| 22                   | 131            | —          | —          | 196  | —          | —          | 260    | —          | —           | —           | —           | —           | —          | 22                   |
| 24                   | 157            | 234        | 351        | 234  | 423        | 588        | 311    | 735        | 875         | 996         | 1145        | 1270        | —          | 24                   |
| 26                   | —              | —          | —          | 275  | —          | —          | 365    | —          | —           | —           | —           | —           | —          | 26                   |
| 30                   | 306            | 486        | 608        | 367  | —          | —          | 486    | —          | —           | —           | —           | —           | —          | 30                   |
| 36                   | —              | —          | —          | 531  | —          | —          | 704    | —          | —           | —           | —           | —           | —          | 36                   |
| 42                   | —              | —          | —          | 721  | —          | —          | 958    | —          | —           | —           | —           | —           | —          | 42                   |

See notes on page 11

Approximate Weight Each - Pounds

| 90° SR WeldELLS      |                |            |      |            |            |        |            |             |             |             |             |            |                      |
|----------------------|----------------|------------|------|------------|------------|--------|------------|-------------|-------------|-------------|-------------|------------|----------------------|
| Nom.<br>Pipe<br>Size | Wall Thickness |            |      |            |            |        |            |             |             |             |             |            | Nom.<br>Pipe<br>Size |
|                      | Sch.<br>20     | Sch.<br>30 | Std. | Sch.<br>40 | Sch.<br>60 | X-Stg. | Sch.<br>80 | Sch.<br>100 | Sch.<br>120 | Sch.<br>140 | Sch.<br>160 | XX<br>Stg. |                      |
| 1                    | -              | -          | .23  | .23        | -          | -      | -          | -           | -           | -           | .34         | .47        | 1                    |
| 1¼                   | -              | -          | .39  | .39        | -          | -      | -          | -           | -           | -           | .69         | .91        | 1¼                   |
| 1½                   | -              | -          | .56  | .56        | -          | .75    | .75        | -           | -           | -           | .98         | 1.4        | 1½                   |
| 2                    | -              | -          | 1.0  | 1.0        | -          | 1.4    | 1.4        | -           | -           | -           | 1.9         | 2.6        | 2                    |
| 2½                   | -              | -          | 2.0  | 2.0        | -          | 2.6    | 2.6        | -           | -           | -           | 3.2         | 4.9        | 2½                   |
| 3                    | -              | -          | 3.1  | 3.1        | -          | 4.2    | 4.2        | -           | -           | -           | 5.6         | 7.7        | 3                    |
| 3½                   | -              | -          | 4.4  | 4.4        | -          | 6.0    | 6.0        | -           | -           | -           | -           | 11         | 3½                   |
| 4                    | -              | -          | 6.0  | 6.0        | -          | 8.2    | 8.2        | -           | 10          | -           | 12          | 14         | 4                    |
| 5                    | -              | -          | 10   | 10         | -          | 14     | 14         | -           | 19          | -           | 21          | 25         | 5                    |
| 6                    | -              | -          | 16   | 16         | -          | 23     | 23         | -           | 30          | -           | 35          | 44         | 6                    |
| 8                    | 24             | 27         | 31   | 31         | 39         | 48     | 48         | 56          | 66          | 74          | 79          | 77         | 8                    |
| 10                   | 38             | 47         | 56   | 56         | 75         | 75     | 88         | 106         | 123         | 143         | 151         | 143        | 10                   |
| 12                   | 55             | 72         | 82   | 88         | 121        | 108    | 146        | 177         | 207         | 231         | 253         | 207        | 12                   |
| 14                   | 87             | 105        | 105  | 122        | 163        | 139    | 205        | 242         | 277         | 313         | 345         | -          | 14                   |
| 16                   | 115            | 138        | 138  | 182        | 236        | 182    | 300        | 343         | 400         | 467         | 512         | -          | 16                   |
| 18                   | 146            | 205        | 175  | 259        | 340        | 231    | 422        | 492         | 517         | 650         | 727         | -          | 18                   |
| 20                   | 215            | 286        | 215  | 338        | 457        | 286    | 573        | 678         | 775         | 890         | 993         | -          | 20                   |
| 24                   | 313            | 470        | 313  | 564        | 783        | 415    | 977        | 1150        | 1340        | 1500        | 1735        | -          | 24                   |
| 30                   | 649            | 811        | 488  | -          | -          | 649    | -          | -           | -           | -           | -           | -          | 30                   |
| 36                   | -              | -          | 707  | 1300       | -          | 939    | -          | -           | -           | -           | -           | -          | 36                   |
| 42                   | -              | -          | 1079 | -          | -          | 1278   | -          | -           | -           | -           | -           | -          | 42                   |
| Caps                 |                |            |      |            |            |        |            |             |             |             |             |            |                      |
| ½                    | -              | -          | .07  | .07        | -          | .10    | .10        | -           | -           | -           | -           | -          | ½                    |
| ¾                    | -              | -          | .13  | .13        | -          | .19    | .19        | -           | -           | -           | -           | -          | ¾                    |
| 1                    | -              | -          | .22  | .22        | -          | .28    | .28        | -           | -           | -           | .35         | .45        | 1                    |
| 1¼                   | -              | -          | .31  | .31        | -          | .40    | .40        | -           | -           | -           | .49         | .64        | 1¼                   |
| 1½                   | -              | -          | .37  | .37        | -          | .49    | .49        | -           | -           | -           | .63         | .80        | 1½                   |
| 2                    | -              | -          | .51  | .51        | -          | .69    | .69        | -           | -           | -           | 1.1         | 1.3        | 2                    |
| 2½                   | -              | -          | .81  | .81        | -          | 1.0    | 1.0        | -           | -           | -           | 1.8         | 2.2        | 2½                   |
| 3                    | -              | -          | 1.4  | 1.4        | -          | 1.9    | 1.9        | -           | -           | -           | 3.1         | 3.9        | 3                    |
| 3½                   | -              | -          | 2.1  | 2.1        | -          | 2.9    | 2.9        | -           | -           | -           | -           | 5.8        | 3½                   |
| 4                    | -              | -          | 2.5  | 2.5        | -          | 3.5    | 3.5        | -           | 5.1         | -           | 6           | 7          | 4                    |
| 5                    | -              | -          | 4.2  | 4.2        | -          | 5.8    | 5.8        | -           | 8.6         | -           | 10          | 12         | 5                    |
| 6                    | -              | -          | 6.4  | 6.4        | -          | 9.4    | 9.4        | -           | 13          | -           | 16          | 19         | 6                    |
| 8                    | 8.7            | 9.6        | 11   | 11         | 14         | 17     | 17         | 24          | 28          | 31          | 34          | 33         | 8                    |
| 10                   | 14             | 17         | 20   | 20         | 26         | 26     | 36         | 44          | 49          | 57          | 63          | -          | 10                   |
| 12                   | 20             | 26         | 29   | 32         | 49         | 38     | 59         | 71          | 81          | 90          | 100         | -          | 12                   |
| 14                   | 29             | 35         | 35   | 41         | 61         | 45     | 76         | 85          | 110         | 120         | 130         | -          | 14                   |
| 16                   | 37             | 45         | 45   | 58         | 84         | 58     | 105        | 120         | 140         | 165         | 180         | -          | 16                   |
| 18                   | 48             | 67         | 57   | 92         | 121        | 74     | 149        | 200         | 230         | 240         | 255         | -          | 18                   |
| 20                   | 71             | 94         | 71   | 121        | 162        | 94     | 201        | 275         | 300         | 350         | 420         | -          | 20                   |
| 22                   | -              | -          | 83   | -          | -          | 110    | -          | -           | -           | -           | -           | -          | 22                   |
| 24                   | 102            | 147        | 102  | 205        | 282        | 131    | 342        | 365         | 430         | 475         | 530         | -          | 24                   |
| 26                   | -              | -          | 110  | -          | -          | 146    | -          | -           | -           | -           | -           | -          | 26                   |
| 30                   | 175            | 218        | 137  | -          | -          | 186    | -          | -           | -           | -           | -           | -          | 30                   |
| 36                   | -              | -          | 165  | -          | -          | 260    | -          | -           | -           | -           | -           | -          | 36                   |

See notes on page 11

Approximate Weight Each - Pounds

| Stub Ends                             |                |            |      |            |            |        |            |             |             |             |             |            |                      |
|---------------------------------------|----------------|------------|------|------------|------------|--------|------------|-------------|-------------|-------------|-------------|------------|----------------------|
| Nom.<br>Pipe<br>Size                  | Wall Thickness |            |      |            |            |        |            |             |             |             |             |            | Nom.<br>Pipe<br>Size |
|                                       | Sch.<br>20     | Sch.<br>30 | Std. | Sch.<br>40 | Sch.<br>60 | X-Stg. | Sch.<br>80 | Sch.<br>100 | Sch.<br>120 | Sch.<br>140 | Sch.<br>160 | XX<br>Stg. |                      |
| ½                                     | —              | —          | .30  | .30        | —          | .32    | .32        | —           | —           | —           | —           | —          | ½                    |
| ¾                                     | —              | —          | .40  | .40        | —          | .44    | .44        | —           | —           | —           | —           | .77        | ¾                    |
| 1                                     | —              | —          | .66  | .66        | —          | .85    | .85        | —           | —           | —           | 1.1         | 1.5        | 1                    |
| 1¼                                    | —              | —          | .91  | .91        | —          | 1.2    | 1.2        | —           | —           | —           | 1.5         | 2.1        | 1¼                   |
| 1½                                    | —              | —          | 1.2  | 1.2        | —          | 1.5    | 1.5        | —           | —           | —           | 2.0         | 2.7        | 1½                   |
| 2                                     | —              | —          | 2.2  | 2.2        | —          | 3.0    | 3.0        | —           | —           | —           | 4.5         | 5.5        | 2                    |
| 2½                                    | —              | —          | 3.5  | 3.5        | —          | 4.6    | 4.6        | —           | —           | —           | 6.0         | 8.3        | 2½                   |
| 3                                     | —              | —          | 4.7  | 4.7        | —          | 6.3    | 6.3        | —           | —           | —           | 8.8         | 12         | 3                    |
| 3½                                    | —              | —          | 5.5  | 5.5        | —          | 6.6    | 6.6        | —           | —           | —           | —           | 14         | 3½                   |
| 4                                     | —              | —          | 7.0  | 7.0        | —          | 9.3    | 9.3        | —           | 12          | —           | 14          | 17         | 4                    |
| 5                                     | —              | —          | 12   | 12         | —          | 17     | 17         | —           | 21          | —           | 26          | 31         | 5                    |
| 6                                     | —              | —          | 15   | 15         | —          | 23     | 23         | —           | 29          | —           | 36          | 43         | 6                    |
| 8                                     | 18             | 20         | 23   | 23         | 29         | 35     | 35         | 41          | 50          | 55          | 60          | 60         | 8                    |
| 10                                    | 27             | 33         | 40   | 40         | 54         | 54     | 63         | 75          | 87          | 102         | 113         | —          | 10                   |
| 12                                    | 33             | 43         | 49   | 52         | 72         | 66     | 87         | 106         | 125         | 139         | 160         | —          | 12                   |
| 14                                    | 53             | 64         | 64   | 73         | 99         | 89     | 123        | —           | —           | —           | —           | —          | 14                   |
| 16                                    | 60             | 72         | 72   | 97         | 127        | 96     | 161        | —           | —           | —           | —           | —          | 16                   |
| 18                                    | 71             | 99         | 85   | 126        | 166        | 112    | 205        | —           | —           | —           | —           | —          | 18                   |
| 20                                    | 94             | 125        | 94   | 147        | 198        | 125    | 251        | —           | —           | —           | —           | —          | 20                   |
| 22                                    | —              | —          | 105  | —          | —          | 139    | —          | —           | —           | —           | —           | —          | 22                   |
| 24                                    | 113            | 170        | 113  | 205        | 288        | 151    | 359        | —           | —           | —           | —           | —          | 24                   |
| Reducers * (Concentric and Eccentric) |                |            |      |            |            |        |            |             |             |             |             |            |                      |
| ¾                                     | —              | —          | .15  | .15        | —          | .22    | .22        | —           | —           | —           | .32         | .41        | ¾                    |
| 1                                     | —              | —          | .28  | .28        | —          | .36    | .36        | —           | —           | —           | .47         | .61        | 1                    |
| 1¼                                    | —              | —          | .38  | .38        | —          | .50    | .50        | —           | —           | —           | .63         | .87        | 1¼                   |
| 1½                                    | —              | —          | .57  | .57        | —          | .76    | .76        | —           | —           | —           | 1.0         | 1.3        | 1½                   |
| 2                                     | —              | —          | .90  | .90        | —          | 1.2    | 1.2        | —           | —           | —           | 1.9         | 2.3        | 2                    |
| 2½                                    | —              | —          | 1.7  | 1.7        | —          | 2.2    | 2.2        | —           | —           | —           | 2.9         | 4.0        | 2½                   |
| 3                                     | —              | —          | 2.2  | 2.2        | —          | 3.0    | 3.0        | —           | —           | —           | 4.2         | 5.4        | 3                    |
| 3½                                    | —              | —          | 3.0  | 3.0        | —          | 4.2    | 4.2        | —           | —           | —           | 5.8         | 7.6        | 3½                   |
| 4                                     | —              | —          | 3.6  | 3.6        | —          | 5.0    | 5.0        | —           | 6.3         | —           | 7.5         | 9.2        | 4                    |
| 5                                     | —              | —          | 6.1  | 6.1        | —          | 8.6    | 8.6        | —           | 12          | —           | 14          | 16         | 5                    |
| 6                                     | —              | —          | 8.7  | 8.7        | —          | 13     | 13         | —           | 17          | —           | 21          | 24         | 6                    |
| 8                                     | 11             | 12         | 14   | 14         | 18         | 22     | 22         | 25          | 30          | 34          | 37          | 36         | 8                    |
| 10                                    | 16             | 20         | 24   | 24         | 32         | 32     | 38         | 45          | 52          | 61          | 67          | 61         | 10                   |
| 12                                    | 22             | 29         | 33   | 36         | 49         | 44     | 59         | 71          | 84          | 93          | 107         | 84         | 12                   |
| 14                                    | 49             | 59         | 59   | 69         | 92         | 78     | 115        | 142         | 164         | 185         | 208         | —          | 14                   |
| 16                                    | 61             | 73         | 73   | 96         | 125        | 97     | 159        | 194         | 224         | 262         | 286         | —          | 16                   |
| 18                                    | 73             | 103        | 88   | 131        | 173        | 117    | 213        | 257         | 304         | 343         | 385         | —          | 18                   |
| 20                                    | 131            | 174        | 131  | 205        | 278        | 174    | 348        | 425         | 494         | 567         | 630         | —          | 20                   |
| 22                                    | —              | —          | 144  | —          | —          | 191    | —          | —           | —           | —           | —           | —          | 22                   |
| 24                                    | 158            | 236        | 158  | 285        | 397        | 210    | 490        | 610         | 710         | 800         | 900         | —          | 24                   |
| 26                                    | —              | —          | 205  | —          | —          | 272    | —          | —           | —           | —           | —           | —          | 26                   |
| 30                                    | 315            | 394        | 237  | —          | —          | 315    | —          | —           | —           | —           | —           | —          | 30                   |
| 36                                    | —              | —          | 285  | —          | —          | 379    | —          | —           | —           | —           | —           | —          | 36                   |
| 42                                    | —              | —          | 334  | —          | —          | 443    | —          | —           | —           | —           | —           | —          | 42                   |

See notes on page 11

## WEIGHTS

Approximate Weight Each - Pounds

| Tees (Straight and Reducing) |               |                |            |            |      |            |            |        |            |             |             |             |             |         |
|------------------------------|---------------|----------------|------------|------------|------|------------|------------|--------|------------|-------------|-------------|-------------|-------------|---------|
| Nominal<br>Pipe<br>Size      |               | Wall Thickness |            |            |      |            |            |        |            |             |             |             |             |         |
|                              |               | Sch.<br>10     | Sch.<br>20 | Sch.<br>30 | Std. | Sch.<br>40 | Sch.<br>60 | X-Stg. | Sch.<br>80 | Sch.<br>100 | Sch.<br>120 | Sch.<br>140 | Sch.<br>160 | XX-Stg. |
| Run                          | Branch        |                |            |            |      |            |            |        |            |             |             |             |             |         |
| ¾                            | ¾<br>½        | .24            | —          | —          | .45  | .45        | —          | .60    | .60        | —           | —           | —           | .51         | .63     |
|                              |               | .23            | —          | —          | .50  | .50        | —          | .50    | .50        | —           | —           | —           | .47         | .59     |
| 1                            | 1             | .60            | —          | —          | .63  | .63        | —          | .78    | .78        | —           | —           | —           | .99         | 1.3     |
|                              | ¾             | .52            | —          | —          | .58  | .58        | —          | .73    | .73        | —           | —           | —           | .92         | 1.2     |
|                              | ½             | .51            | —          | —          | .57  | .57        | —          | .71    | .71        | —           | —           | —           | .88         | 1.1     |
| 1¼                           | 1¼            | 1.0            | —          | —          | 1.2  | 1.2        | —          | 1.4    | 1.4        | —           | —           | —           | 1.7         | 2.3     |
|                              | 1             | .92            | —          | —          | 1.1  | 1.1        | —          | 1.3    | 1.3        | —           | —           | —           | 1.6         | 2.1     |
|                              | ¾             | .90            | —          | —          | 1.1  | 1.1        | —          | 1.3    | 1.3        | —           | —           | —           | 1.6         | 2.1     |
|                              | ½             | .88            | —          | —          | 1.0  | 1.0        | —          | 1.3    | 1.3        | —           | —           | —           | 1.5         | 2.0     |
| 1½                           | 1½            | 1.4            | —          | —          | 1.7  | 1.7        | —          | 2.1    | 2.1        | —           | —           | —           | 2.7         | 3.4     |
|                              | 1¼            | 1.3            | —          | —          | 1.6  | 1.6        | —          | 2.0    | 2.0        | —           | —           | —           | 2.5         | 3.3     |
|                              | 1             | 1.3            | —          | —          | 1.6  | 1.6        | —          | 1.9    | 1.9        | —           | —           | —           | 2.5         | 3.1     |
|                              | ¾<br>½        | 1.3            | —          | —          | 1.5  | 1.5        | —          | 1.9    | 1.9        | —           | —           | —           | 2.4         | 3.0     |
|                              |               | 1.2            | —          | —          | 1.5  | 1.5        | —          | 1.9    | 1.9        | —           | —           | —           | —           | 3.0     |
| 2                            | 2             | 3.7            | —          | —          | 4.2  | 4.2        | —          | 4.1    | 4.1        | —           | —           | —           | 5.0         | 5.9     |
|                              | 1½            | 3.7            | —          | —          | 4.2  | 4.2        | —          | 4.1    | 4.1        | —           | —           | —           | 4.6         | 5.5     |
|                              | 1¼            | 3.7            | —          | —          | 4.2  | 4.2        | —          | 4.1    | 4.1        | —           | —           | —           | 4.5         | 5.4     |
|                              | 1<br>¾        | 3.7            | —          | —          | 4.2  | 4.2        | —          | 4.1    | 4.1        | —           | —           | —           | 4.4         | 5.3     |
|                              |               | 3.7            | —          | —          | 4.2  | 4.2        | —          | 4.1    | 4.1        | —           | —           | —           | 4.3         | 5.1     |
| 2½                           | 2½            | 4.8            | —          | —          | 5.9  | 5.9        | —          | 6.8    | 6.8        | —           | —           | —           | 7.6         | 10      |
|                              | 2             | 4.8            | —          | —          | 5.9  | 5.9        | —          | 6.8    | 6.8        | —           | —           | —           | 6.9         | 9.2     |
|                              | 1½            | 4.8            | —          | —          | 6.8  | 6.8        | —          | 6.8    | 6.8        | —           | —           | —           | 6.7         | 9.0     |
|                              | 1¼<br>1       | 4.8            | —          | —          | 6.8  | 6.8        | —          | 6.8    | 6.8        | —           | —           | —           | 6.6         | 9.0     |
|                              |               | 4.8            | —          | —          | 6.8  | 6.8        | —          | 6.8    | 6.8        | —           | —           | —           | 6.6         | 8.6     |
| 3                            | 3             | 6.6            | —          | —          | 8.4  | 8.4        | —          | 10     | 10         | —           | —           | —           | 14          | 17      |
|                              | 2½            | 6.6            | —          | —          | 8.4  | 8.4        | —          | 10     | 10         | —           | —           | —           | 13          | 16      |
|                              | 2             | 6.6            | —          | —          | 8.4  | 8.4        | —          | 10     | 10         | —           | —           | —           | 12          | 15      |
|                              | 1½<br>1¼      | 6.6            | —          | —          | 8.4  | 8.4        | —          | 10     | 10         | —           | —           | —           | 12          | 15      |
|                              |               | 6.6            | —          | —          | 8.4  | 8.4        | —          | 10     | 10         | —           | —           | —           | 12          | 15      |
| 3½                           | 3½            | 9.8            | —          | —          | 11   | 11         | —          | 14     | 14         | —           | —           | —           | —           | 21      |
|                              | 3             | 8.8            | —          | —          | 11   | 11         | —          | 14     | 14         | —           | —           | —           | —           | 20      |
|                              | 2½            | 8.8            | —          | —          | 11   | 11         | —          | 14     | 14         | —           | —           | —           | —           | 20      |
|                              | 2<br>1½       | 8.8            | —          | —          | 11   | 11         | —          | 14     | 14         | —           | —           | —           | —           | 19      |
|                              |               | 8.8            | —          | —          | 11   | 11         | —          | 14     | 14         | —           | —           | —           | —           | 19      |
| 4                            | 4             | 9.6            | —          | —          | 13   | 13         | —          | 19     | 19         | —           | 23          | —           | 34          | 34      |
|                              | 3½            | 9.6            | —          | —          | 13   | 13         | —          | 19     | 19         | —           | 23          | —           | 28          | 34      |
|                              | 3             | 9.6            | —          | —          | 13   | 13         | —          | 19     | 19         | —           | 23          | —           | 28          | 34      |
|                              | 2½<br>2<br>1½ | 9.6            | —          | —          | 13   | 13         | —          | 19     | 19         | —           | 23          | —           | 28          | 34      |
|                              |               | 9.6            | —          | —          | 13   | 13         | —          | 19     | 19         | —           | 23          | —           | 28          | 34      |
|                              |               | 9.6            | —          | —          | 13   | 13         | —          | 19     | 19         | —           | 23          | —           | 28          | 34      |
| 5                            | 5             | 16             | —          | —          | 22   | 22         | —          | 28     | 28         | —           | 44          | —           | 53          | 53      |
|                              | 4             | 16             | —          | —          | 22   | 22         | —          | 28     | 28         | —           | 44          | —           | 44          | 53      |
|                              | 3½            | 16             | —          | —          | 22   | 22         | —          | 28     | 28         | —           | 44          | —           | 44          | 53      |
|                              | 3<br>2½<br>2  | 16             | —          | —          | 22   | 22         | —          | 28     | 28         | —           | 44          | —           | 44          | 53      |
|                              |               | 16             | —          | —          | 22   | 22         | —          | 28     | 28         | —           | 44          | —           | 44          | 44      |
|                              |               | 16             | —          | —          | 22   | 22         | —          | 28     | 28         | —           | 44          | —           | 44          | 44      |
|                              |               | 16             | —          | —          | 22   | 22         | —          | 28     | 28         | —           | 44          | —           | 44          | 44      |

See notes on page 11

Approximate Weight Each - Pounds

| Tees (Straight and Reducing) |        |                |            |            |      |            |            |        |            |             |             |             |             |         |
|------------------------------|--------|----------------|------------|------------|------|------------|------------|--------|------------|-------------|-------------|-------------|-------------|---------|
| Nominal<br>Pipe<br>Size      |        | Wall Thickness |            |            |      |            |            |        |            |             |             |             |             |         |
|                              |        | Sch.<br>10     | Sch.<br>20 | Sch.<br>30 | Std. | Sch.<br>40 | Sch.<br>60 | X-Stg. | Sch.<br>80 | Sch.<br>100 | Sch.<br>120 | Sch.<br>140 | Sch.<br>160 | XX-Stg. |
| Run                          | Branch |                |            |            |      |            |            |        |            |             |             |             |             |         |
| 6                            | 6      | 27             | -          | -          | 36   | 36         | -          | 42     | 42         | -           | 64          | -           | 44          | 85      |
|                              | 5      | 27             | -          | -          | 36   | 36         | -          | 42     | 42         | -           | 64          | -           | 85          | 85      |
|                              | 4      | 27             | -          | -          | 33   | 33         | -          | 42     | 42         | -           | 64          | -           | 67          | 64      |
|                              | 3½     | 27             | -          | -          | 33   | 33         | -          | 42     | 42         | -           | 64          | -           | 67          | 64      |
|                              | 3      | 27             | -          | -          | 33   | 33         | -          | 42     | 42         | -           | 64          | -           | 67          | 64      |
|                              | 2½     | 27             | -          | -          | 33   | 33         | -          | 42     | 42         | -           | 64          | -           | 64          | 64      |
| 8                            | 8      | 44             | 54         | 57         | 61   | 61         | 76         | 76     | 76         | 97          | 115         | 133         | 152         | 152     |
|                              | 6      | 44             | 54         | 57         | 61   | 61         | 76         | 76     | 76         | 97          | 115         | 115         | 115         | 114     |
|                              | 5      | 44             | 54         | 57         | 61   | 61         | 76         | 76     | 76         | 97          | 97          | 115         | 115         | 114     |
|                              | 4      | 44             | 54         | 57         | 61   | 61         | 76         | 76     | 76         | 97          | 97          | 109         | 109         | 114     |
|                              | 3½     | 44             | 54         | 57         | 61   | 61         | 76         | 76     | 76         | 97          | 97          | 109         | 109         | 114     |
|                              |        |                |            |            |      |            |            |        |            |             |             |             |             |         |
| 10                           | 10     | 60             | 73         | 81         | 91   | 91         | 129        | 129    | 161        | 180         | 215         | 241         | 280         | 241     |
|                              | 8      | 57             | 70         | 78         | 88   | 88         | 116        | 116    | 157        | 161         | 197         | 219         | 241         | 219     |
|                              | 6      | 57             | 70         | 78         | 88   | 88         | 116        | 116    | 120        | 161         | 180         | 201         | 223         | 201     |
|                              | 5      | 57             | 70         | 78         | 88   | 88         | 116        | 116    | 116        | 120         | 157         | 177         | 197         | 177     |
|                              | 4      | 57             | 70         | 78         | 88   | 88         | 116        | 116    | 116        | 116         | 157         | 177         | 188         | 177     |
|                              |        |                |            |            |      |            |            |        |            |             |             |             |             |         |
| 12                           | 12     | 105            | 120        | 136        | 147  | 147        | 226        | 187    | 245        | 304         | 353         | 404         | 429         | 353     |
|                              | 10     | 105            | 120        | 136        | 147  | 147        | 226        | 187    | 226        | 279         | 329         | 353         | 377         | 329     |
|                              | 8      | 101            | 116        | 132        | 143  | 143        | 181        | 180    | 180        | 269         | 294         | 318         | 341         | 294     |
|                              | 6      | 101            | 116        | 132        | 143  | 143        | 181        | 180    | 180        | 245         | 245         | 270         | 318         | 245     |
|                              | 5      | 101            | 116        | 132        | 143  | 143        | 181        | 180    | 180        | 226         | 226         | 270         | 318         | 226     |
|                              |        |                |            |            |      |            |            |        |            |             |             |             |             |         |
| 14                           | 14     | 193            | 210        | 226        | 226  | 252        | 311        | 280    | 369        | 480         | 528         | 624         | 720         | -       |
|                              | 12     | 193            | 210        | 226        | 226  | 252        | 311        | 280    | 315        | 504         | 528         | 648         | 696         | -       |
|                              | 10     | 184            | 201        | 217        | 217  | 217        | 299        | 268    | 310        | 384         | 384         | 600         | 624         | -       |
|                              | 8      | 184            | 201        | 217        | 217  | 217        | 299        | 268    | 268        | 360         | 456         | 480         | 528         | -       |
|                              | 6      | 184            | 201        | 217        | 217  | 217        | 299        | 268    | 268        | 360         | 432         | 450         | 480         | -       |
|                              |        |                |            |            |      |            |            |        |            |             |             |             |             |         |
| 16                           | 16     | 201            | 222        | 242        | 242  | 370        | 458        | 369    | 548        | 780         | 826         | 962         | 1066        | -       |
|                              | 14     | 201            | 222        | 242        | 242  | 370        | 458        | 369    | 440        | 676         | 728         | 806         | 910         | -       |
|                              | 12     | 201            | 222        | 242        | 242  | 359        | 399        | 359    | 399        | 546         | 624         | 806         | 884         | -       |
|                              | 10     | 194            | 215        | 235        | 235  | 354        | 360        | 352    | 360        | 468         | 572         | 806         | 884         | -       |
|                              | 8      | 194            | 215        | 235        | 235  | 354        | 354        | 352    | 360        | 494         | 572         | 806         | 884         | -       |
|                              | 6      | 194            | 215        | 235        | 235  | 354        | 354        | 352    | 360        | 494         | 572         | 806         | 884         | -       |
| 18                           | 18     | 281            | 307        | 399        | 333  | 525        | 612        | 425    | 710        | 1131        | 1160        | 1189        | 1392        | -       |
|                              | 16     | 281            | 307        | 399        | 333  | 525        | 565        | 425    | 615        | 928         | 957         | 1100        | 1160        | -       |
|                              | 14     | 281            | 307        | 399        | 333  | 427        | 468        | 425    | 569        | 928         | 957         | 1100        | 1160        | -       |
|                              | 12     | 281            | 307        | 313        | 333  | 427        | 468        | 339    | 516        | 928         | 957         | 1100        | 1160        | -       |
|                              | 10     | 267            | 293        | 296        | 319  | 330        | 414        | 322    | 496        | 928         | 957         | 1100        | 1160        | -       |
|                              | 8      | 267            | 293        | 296        | 319  | 330        | 414        | 322    | 449        | 928         | 957         | 1075        | 1150        | -       |
| 20                           | 20     | 439            | 504        | 583        | 504  | 706        | 834        | 583    | 1021       | 1344        | 1504        | 1696        | 1792        | -       |
|                              | 18     | 439            | 504        | 504        | 504  | 584        | 774        | 504    | 903        | 1025        | 1312        | 1312        | 1536        | -       |
|                              | 16     | 439            | 504        | 504        | 504  | 506        | 713        | 504    | 782        | 928         | 1312        | 1312        | 1536        | -       |
|                              | 14     | 428            | 493        | 493        | 493  | 494        | 645        | 493    | 713        | 832         | 1206        | 1312        | 1536        | -       |
|                              | 12     | 428            | 493        | 493        | 493  | 494        | 645        | 493    | 713        | 832         | 1206        | 1312        | 1536        | -       |
|                              | 10     | 417            | 482        | 482        | 482  | 485        | 630        | 482    | 645        | 832         | 1206        | 1312        | 1536        | -       |
| 22                           | 8      | 417            | 482        | 482        | 482  | 485        | 494        | 482    | 645        | 832         | 1206        | 1312        | 1536        | -       |
|                              | 22     | 477            | -          | -          | 555  | -          | -          | 811    | -          | -           | -           | -           | -           | -       |
|                              | 20     | 477            | -          | -          | 555  | -          | -          | 811    | -          | -           | -           | -           | -           | -       |
|                              | 18     | 449            | -          | -          | 527  | -          | -          | 670    | -          | -           | -           | -           | -           | -       |
|                              | 16     | 449            | -          | -          | 527  | -          | -          | 670    | -          | -           | -           | -           | -           | -       |
|                              | 14     | 367            | -          | -          | 445  | -          | -          | 517    | -          | -           | -           | -           | -           | -       |
| 22                           | 12     | 367            | -          | -          | 445  | -          | -          | 517    | -          | -           | -           | -           | -           | -       |
|                              | 10     | 367            | -          | -          | 445  | -          | -          | 517    | -          | -           | -           | -           | -           | -       |

See notes on page 11

## WEIGHTS

Approximate Weight Each - Pounds

| Tees (Straight and Reducing) |        |                |         |         |      |         |         |        |         |          |          |          |          |         |
|------------------------------|--------|----------------|---------|---------|------|---------|---------|--------|---------|----------|----------|----------|----------|---------|
| Nominal Pipe Size            |        | Wall Thickness |         |         |      |         |         |        |         |          |          |          |          |         |
|                              |        | Sch. 10        | Sch. 20 | Sch. 30 | Std. | Sch. 40 | Sch. 60 | X-Stg. | Sch. 80 | Sch. 100 | Sch. 120 | Sch. 140 | Sch. 160 | XX-Stg. |
| Run                          | Branch |                |         |         |      |         |         |        |         |          |          |          |          |         |
| 24                           | 24     | 677            | 765     | 977     | 765  | 1257    | 1446    | 934    | 1673    | 2592     | 2808     | 2950     | 3096     | -       |
|                              | 22     | 593            | 601     | 849     | 681  | 1130    | 1300    | 849    | 1673    | 2592     | 2808     | 2950     | 3096     | -       |
|                              | 20     | 513            | 601     | 726     | 601  | 860     | 1200    | 683    | 1361    | 2100     | 2206     | 2320     | 2800     | -       |
|                              | 18     | 513            | 601     | 726     | 601  | 860     | 1040    | 683    | 1200    | 1944     | 2206     | 2320     | 2800     | -       |
|                              | 16     | 418            | 506     | 553     | 506  | 681     | 941     | 509    | 1106    | 1944     | 2206     | 2320     | 2440     | -       |
|                              | 14     | 418            | 506     | 553     | 506  | 681     | 941     | 509    | 1106    | 1944     | 2206     | 2320     | 2440     | -       |
|                              | 12     | 418            | 506     | 553     | 506  | 681     | 860     | 509    | 1021    | 1800     | 2026     | 2160     | 2250     | -       |
|                              | 10     | 336            | 424     | 553     | 424  | 681     | 860     | 509    | 1021    | 1800     | 2026     | 2160     | 2250     | -       |
|                              | 26     | -              | -       | -       | 826  | -       | -       | 1121   | -       | -        | -        | -        | -        | -       |
|                              | 24     | -              | -       | -       | 826  | -       | -       | 1121   | -       | -        | -        | -        | -        | -       |
|                              | 22     | -              | -       | -       | 727  | -       | -       | 925    | -       | -        | -        | -        | -        | -       |
|                              | 20     | -              | -       | -       | 727  | -       | -       | 925    | -       | -        | -        | -        | -        | -       |
| 26                           | 18     | -              | -       | -       | 614  | -       | -       | 713    | -       | -        | -        | -        | -        | -       |
|                              | 16     | -              | -       | -       | 614  | -       | -       | 713    | -       | -        | -        | -        | -        | -       |
|                              | 14     | -              | -       | -       | 614  | -       | -       | 713    | -       | -        | -        | -        | -        | -       |
|                              | 12     | -              | -       | -       | 614  | -       | -       | 713    | -       | -        | -        | -        | -        | -       |
|                              | 30     | 1058           | 1375    | 1517    | 1130 | -       | -       | 1510   | -       | -        | -        | -        | -        | -       |
|                              | 26     | 993            | 1257    | 1517    | 1065 | -       | -       | 1257   | -       | -        | -        | -        | -        | -       |
|                              | 24     | 993            | 1090    | 1232    | 1065 | -       | -       | 1257   | -       | -        | -        | -        | -        | -       |
|                              | 22     | 849            | 1090    | 1232    | 921  | -       | -       | 1048   | -       | -        | -        | -        | -        | -       |
| 30                           | 20     | 849            | 1090    | 1232    | 921  | -       | -       | 1048   | -       | -        | -        | -        | -        | -       |
|                              | 18     | 849            | 1090    | 1232    | 921  | -       | -       | 1048   | -       | -        | -        | -        | -        | -       |
|                              | 16     | 720            | 1090    | 1232    | 792  | -       | -       | 921    | -       | -        | -        | -        | -        | -       |
|                              | 14     | 720            | 1090    | 1232    | 792  | -       | -       | 921    | -       | -        | -        | -        | -        | -       |
|                              | 36     | 1617           | 2165    | 2700    | 1617 | 2925    | -       | 2165   | -       | -        | -        | -        | -        | -       |
|                              | 30     | 1524           | 1893    | 2700    | 1524 | 2925    | -       | 1893   | -       | -        | -        | -        | -        | -       |
| 36                           | 26     | 1321           | 1504    | 2280    | 1321 | 2380    | -       | 1504   | -       | -        | -        | -        | -        | -       |
|                              | 24     | 1321           | 1504    | 2280    | 1321 | 2380    | -       | 1504   | -       | -        | -        | -        | -        | -       |
|                              | 20     | 1321           | 1504    | 2280    | 1321 | 2380    | -       | 1504   | -       | -        | -        | -        | -        | -       |
|                              | 18     | 1321           | 1321    | 2280    | 1321 | 2380    | -       | 1321   | -       | -        | -        | -        | -        | -       |
|                              | 16     | 1136           | 1321    | 1900    | 1136 | 2010    | -       | 1321   | -       | -        | -        | -        | -        | -       |
|                              | 42     | -              | -       | -       | 2900 | -       | -       | 2900   | -       | -        | -        | -        | -        | -       |
| 42                           | 36     | -              | -       | -       | 2755 | -       | -       | 2755   | -       | -        | -        | -        | -        | -       |
|                              | 30     | -              | -       | -       | 2755 | -       | -       | 2755   | -       | -        | -        | -        | -        | -       |
|                              | 24     | -              | -       | -       | 2755 | -       | -       | 2755   | -       | -        | -        | -        | -        | -       |
|                              | 20     | -              | -       | -       | 2755 | -       | -       | 2755   | -       | -        | -        | -        | -        | -       |
|                              | 48     | -              | -       | -       | 3120 | -       | -       | 3120   | -       | -        | -        | -        | -        | -       |
|                              | 44     | -              | -       | -       | 2970 | -       | -       | 2970   | -       | -        | -        | -        | -        | -       |

For dimensions, see pages 4 &amp; 5.

4. For material specifications, see pages 55 &amp; 56.

5. Dimensional Tolerances - page 43.

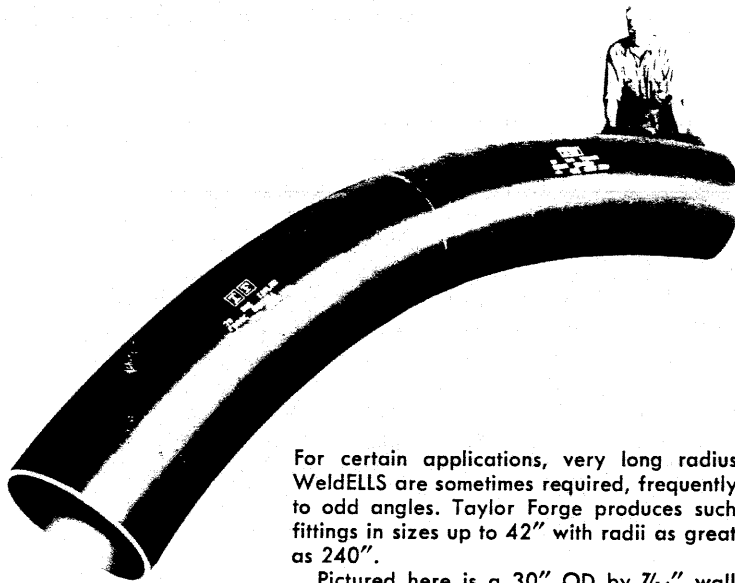
6. Pressure Ratings: Same as for seamless pipe.

7. Bevels: Per ANSI B16.25, see page 43.

8. Diameters and Thicknesses: See page 4.

9. Specifications: All Taylor Forge fittings conform to ANSI Std. B16.9 or B16.28 as applicable. See page 42.

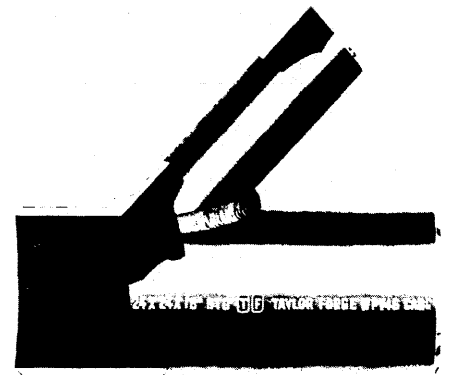
1. Taylor Forge welding fittings are available in every type, size and material grade except sizes in shaded area, are not available in Grade B Carbon Steel.
2. For approximate weight of 180° LR or SR Return Bends, double approximate weight of respective 90° WeldELL (See page 6 for weights of 90° LR WeldELL, page 7 for 90° SR).
- \* 3. Weights for Reducers are approximate and will vary slightly according to size of reduction.



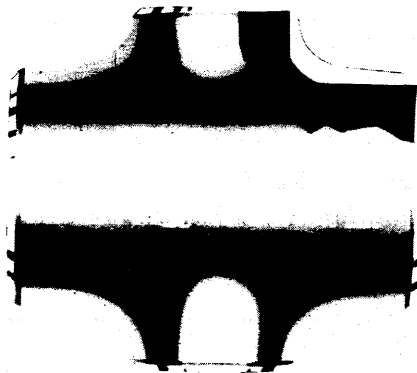
For certain applications, very long radius WeldELLS are sometimes required, frequently to odd angles. Taylor Forge produces such fittings in sizes up to 42" with radii as great as 240".

Pictured here is a 30" OD by  $\frac{7}{16}$ " wall fabricated 60° WeldELL made up of two 30° WeldELLS, formed to a radius of 120".

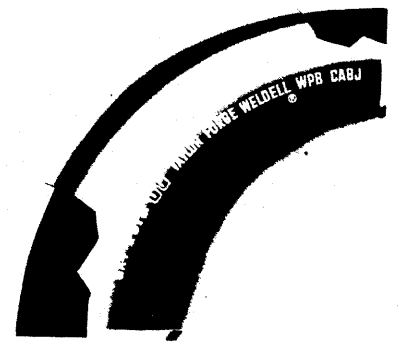
90° WeldELLS formed to a radius of 3 diameters and without a girth weld are also available.



45° Laterals, both straight and reducing, are often required in transmission and distribution piping systems as well as other services.

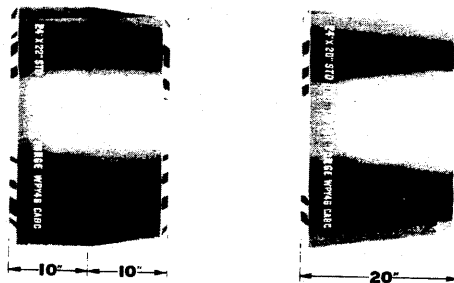


Welding Crosses, straight and reducing, are available in a wide range of sizes and in Standard, Extra-Strong and Special wall thicknesses.

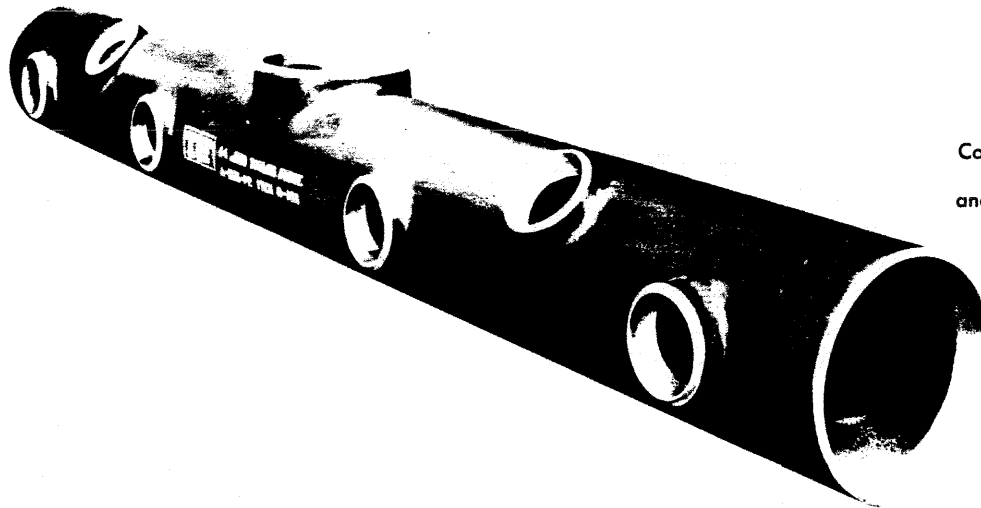


Taylor Forge 90° Reducing WeldELLS are available in a wide range of standard and special reductions, and with Standard, Extra Strong and Special Wall thicknesses. These pipeline fittings are frequently used in preference to a standard elbow and reducer combination in order to hold fabrication costs to a minimum.

## VENTURI REDUCERS



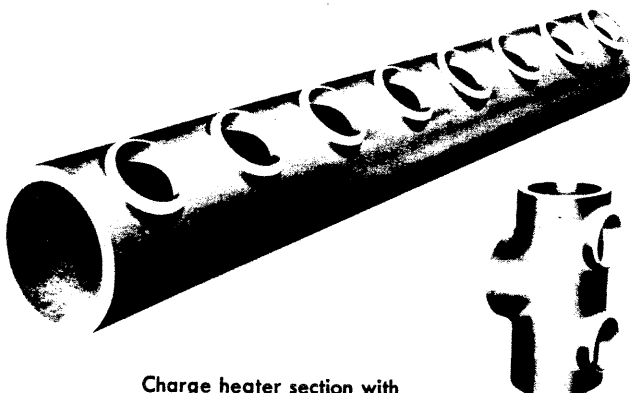
Two different Reducer units are made as shown. All sizes are 20" in length. Where a 2" reduction is required, the unit at the left will be furnished. Reductions of more than 4" are accomplished by butting welding large to small ends of any required combination of units. Venturi Type Reducers, having gradual uniform taper, are widely used in pipeline construction. They serve to improve the flow conditions and reduce pressure drop by lessening turbulence. The Taylor Forge standardized stock reducer of this type is dimensioned to provide a 2" reduction in pipe diameter for each 10" of Reducer length. This uniform taper of 5° 42' gives excellent flow results.



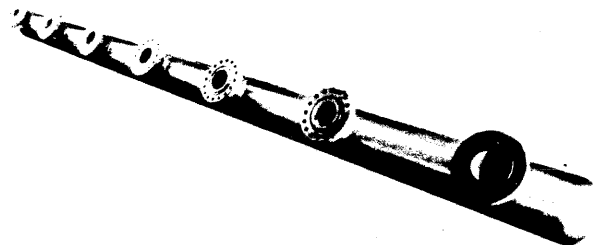
Contoured Outlet Headers of this type are widely used in refineries and other petroleum processing plants.



Central power station header, designed for 2175 psi at 1050F. This 16" OD by 9½" ID, 2¼% Cr—1% Mo, Contoured Outlet Header is believed to be the heaviest of seamless construction ever produced.



Charge heater section with Multiple Outlet Tee component.



Gas meter station header with Taylor Forge 600 lb. Ring Joint Welding Neck Flanges.

## ENGINEERING SERVICES— PROBLEMS INVITED

Taylor Forge is a leader in the field of engineering research, development, product design and application of pipe lines system components. The know-how is strengthened by active participation in engineering society work where codes, material specifications and standards are formulated. As a result, our engineers are able to provide unique solutions to problems involving unusual designs, thickness, reinforcements and special materials.

# Taylor Forge

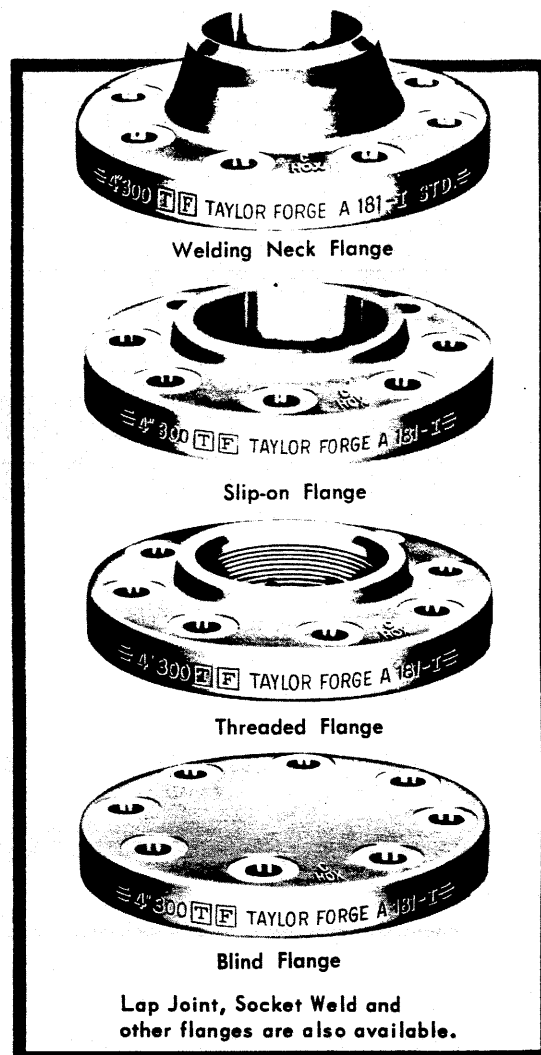
## ANSI FLANGES

in every type, size and pressure rating covered by ANSI B16.5

Unless other material is specified, Taylor Forge Flanges are forged from rolled steel billets conforming with ASTM Specification A105. Flow lines (because of proper forging or rolling) are so disposed as to provide maximum resistance to working stresses. All are also available in alloy and stainless steels or any other forgeable metal.

Check these advantages of Taylor Forge flanges:

1. Gasket face is always square with axis of pipe.
2. Bolt holes are multiple-drilled with extreme accuracy.
3. Spot or back facing is always parallel to gasket face for even seating of bolt heads and/or nuts.
4. The fillet radius at base of hub is designed to provide enough clearance so that socket wrenches can be used.
5. Clean, sharp and uniform threads for perfect fit.
6. Any standard or special facing can be furnished.
7. Marking is complete on every flange.



### Welding Neck Flange Bores

| Nominal Pipe Size | Nominal Outside Diameter | NOMINAL INSIDE DIAMETER |           |           |           |           |           |          |           |            |            |            |            |         | Nominal Pipe Size |
|-------------------|--------------------------|-------------------------|-----------|-----------|-----------|-----------|-----------|----------|-----------|------------|------------|------------|------------|---------|-------------------|
|                   |                          | Sched. 10†              | Sched. 20 | Sched. 30 | STD. WALL | Sched. 40 | Sched. 60 | EX. STG. | Sched. 80 | Sched. 100 | Sched. 120 | Sched. 140 | Sched. 160 | XX STG. |                   |
| 1/2               | 0.840                    | .674                    | —         | —         | .622      | .622      | —         | .546     | .546      | —          | —          | —          | .464       | .252    | 1/2               |
| 3/4               | 1.050                    | .884                    | —         | —         | .824      | .824      | —         | .742     | .742      | —          | —          | —          | .612       | .434    | 3/4               |
| 1                 | 1.315                    | 1.097                   | —         | —         | 1.049     | 1.049     | —         | .957     | .957      | —          | —          | —          | .815       | .599    | 1                 |
| 1 1/4             | 1.660                    | 1.442                   | —         | —         | 1.380     | 1.380     | —         | 1.278    | 1.278     | —          | —          | —          | 1.160      | .896    | 1 1/4             |
| 1 1/2             | 1.900                    | 1.682                   | —         | —         | 1.610     | 1.610     | —         | 1.500    | 1.500     | —          | —          | —          | 1.338      | 1.100   | 1 1/2             |
| 2                 | 2.375                    | 2.157                   | —         | —         | 2.067     | 2.067     | —         | 1.939    | 1.939     | —          | —          | —          | 1.687      | 1.503   | 2                 |
| 2 1/2             | 2.875                    | 2.635                   | —         | —         | 2.469     | 2.469     | —         | 2.323    | 2.323     | —          | —          | —          | 2.125      | 1.771   | 2 1/2             |
| 3                 | 3.500                    | 3.260                   | —         | —         | 3.068     | 3.068     | —         | 2.900    | 2.900     | —          | —          | —          | 2.624      | 2.300   | 3                 |
| 3 1/2             | 4.000                    | 3.760                   | —         | —         | 3.548     | 3.548     | —         | 3.364    | 3.364     | —          | —          | —          | —          | 2.728*  | 3 1/2             |
| 4                 | 4.500                    | 4.260                   | —         | —         | 4.026     | 4.026     | —         | 3.826    | 3.826     | —          | 3.624      | —          | 3.438      | 3.152   | 4                 |
| 5                 | 5.563                    | 5.295                   | —         | —         | 5.047     | 5.047     | —         | 4.813    | 4.813     | —          | 4.563      | —          | 4.313      | 4.063   | 5                 |
| 6                 | 6.625                    | 6.357                   | —         | —         | 6.065     | 6.065     | —         | 5.761    | 5.761     | —          | 5.501      | —          | 5.187      | 4.897   | 6                 |
| 8                 | 8.625                    | 8.329                   | 8.125     | 8.071     | 7.981     | 7.981     | 7.813     | 7.625    | 7.625     | 7.437      | 7.187      | 7.001      | 6.813      | 6.875   | 8                 |
| 10                | 10.750                   | 10.420                  | 10.250    | 10.136    | 10.020    | 10.020    | 9.750     | 9.750    | 9.562     | 9.312      | 9.062      | 8.750      | 8.500      | 8.750   | 10                |
| 12                | 12.750                   | 12.390                  | 12.250    | 12.090    | 12.000    | 11.938    | 11.626    | 11.750   | 11.374    | 11.062     | 10.750     | 10.500     | 10.126     | 10.750  | 12                |
| 14                | 14.000                   | 13.500                  | 13.376    | 13.250    | 13.250    | 13.124    | 12.812    | 13.000   | 12.500    | 12.124     | 11.812     | 11.500     | 11.188     | —       | 14                |
| 16                | 16.000                   | 15.500                  | 15.376    | 15.250    | 15.250    | 15.000    | 14.688    | 15.000   | 14.312    | 13.938     | 13.562     | 13.124     | 12.812     | —       | 16                |
| 18                | 18.000                   | 17.500                  | 17.376    | 17.124    | 17.250    | 16.876    | 16.500    | 17.000   | 16.124    | 15.688     | 15.250     | 14.876     | 14.438     | —       | 18                |
| 20                | 20.000                   | 19.500                  | 19.250    | 19.000    | 19.250    | 18.812    | 18.376    | 19.000   | 17.938    | 17.438     | 17.000     | 16.500     | 16.062     | —       | 20                |
| 22                | 22.000                   | 21.500                  | —         | —         | 21.250    | —         | —         | 21.000   | —         | —          | —          | —          | —          | —       | 22                |
| 24                | 24.000                   | 23.500                  | 23.250    | 22.876    | 23.250    | 22.624    | 22.062    | 23.000   | 21.562    | 20.938     | 20.376     | 19.876     | 19.312     | —       | 24                |
| 26                | 26.000                   | —                       | —         | —         | 25.250    | —         | —         | 25.000   | —         | —          | —          | —          | —          | —       | 26                |
| 30                | 30.000                   | 29.376                  | 29.000    | 28.750    | 29.250    | —         | —         | 29.000   | —         | —          | —          | —          | —          | —       | 30                |
| 36                | 36.000                   | 35.376                  | 35.000    | 34.750    | 35.250    | 34.500    | —         | 35.000   | —         | —          | —          | —          | —          | —       | 36                |
| 40                | 40.000                   | —                       | —         | —         | 39.250    | —         | —         | 39.000   | —         | —          | —          | —          | —          | —       | 40                |
| 42                | 42.000                   | —                       | —         | —         | 41.250    | —         | —         | 41.000   | —         | —          | —          | —          | —          | —       | 42                |
| 48                | 48.000                   | —                       | —         | —         | 47.250    | —         | —         | 47.000   | —         | —          | —          | —          | —          | —       | 48                |

Dimensions are in inches.

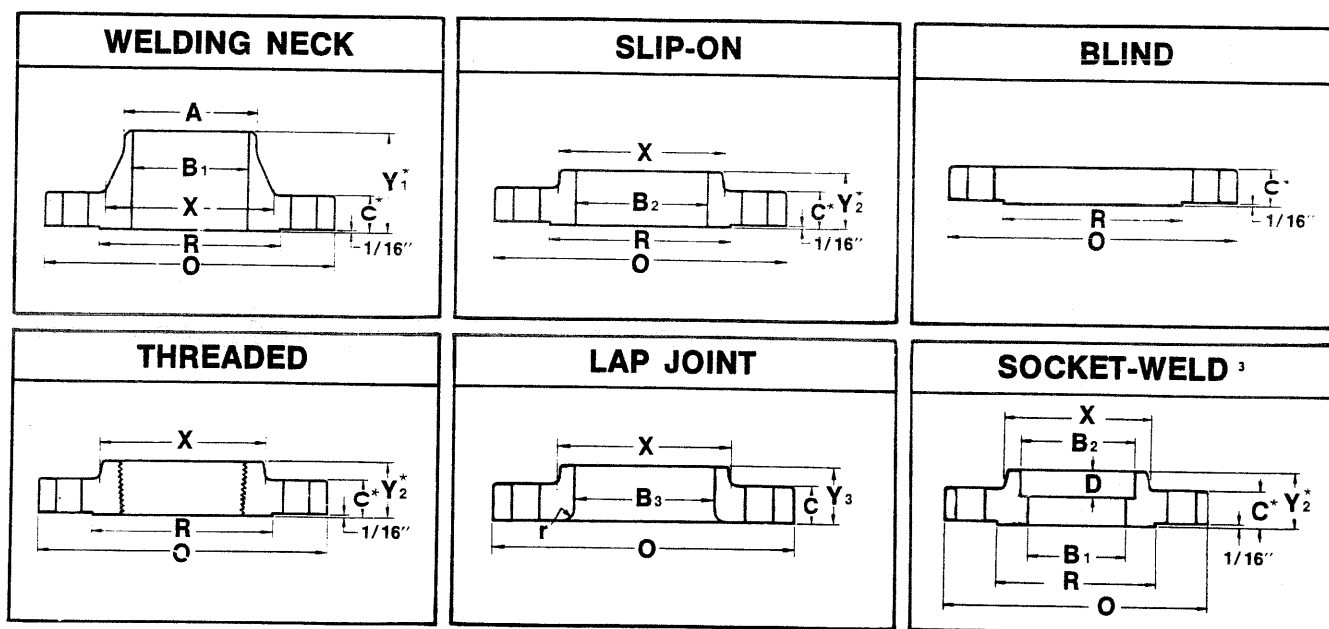
\*Source: ANSI B36.10.

†Schedule 10 for sizes 14" and larger. Sizes 12" and smaller are Light Wall Thickness, or Stainless Steel Schedule 10S.

■ Inside pipe diameters are also provided by this table. Always specify bore when ordering.

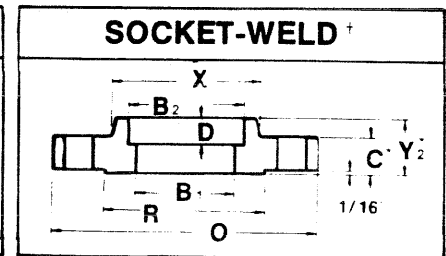
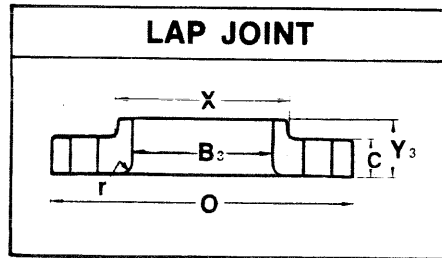
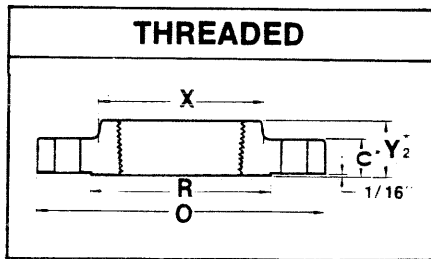
## FLANGES

## DIMENSIONS



| 150-LB.        |                |              |                     |           |                 |                        |           |                   |                        |           |                 |                       |                        |           |       |           |             |                   |
|----------------|----------------|--------------|---------------------|-----------|-----------------|------------------------|-----------|-------------------|------------------------|-----------|-----------------|-----------------------|------------------------|-----------|-------|-----------|-------------|-------------------|
| Nom. Pipe Size | Out-side Diam. | Thkn. (min.) | O.D. of Raised Face | Hub Diam. | Length thru Hub |                        |           | Bore <sup>□</sup> |                        |           | Depth of Socket | Approx. Weight (Lbs.) |                        |           |       | Drilling  |             |                   |
|                |                |              |                     |           | Wldg. Neck      | Slip-on Thrd. Sock. W. | Lap Joint | Wldg. Neck        | Slip-on Thrd. Sock. W. | Lap Joint |                 | Wldg. Neck            | Slip-on Thrd. Sock. W. | Lap Joint | Blind | No. Holes | Diam. Holes | Bolt Circle Diam. |
| 1/2            | 3 1/2          | 3/16         | 1 3/8               | 1 1/8     | 1 7/8           | 5/8                    | 5/8       | 0.62              | 0.88                   | 0.90      | 3/8             | 2                     | 1                      | 1         | 1     | 4         | 5/8         | 2 3/8             |
| 3/4            | 3 7/8          | 1/2          | 1 11/16             | 1 1/2     | 2 1/8           | 5/8                    | 5/8       | 0.82              | 1.09                   | 1.11      | 7/8             | 2                     | 2                      | 2         | 2     | 4         | 5/8         | 2 3/4             |
| 1              | 4 1/4          | 5/8          | 2                   | 1 13/16   | 2 3/8           | 1 1/8                  | 1 1/8     | 1.05              | 1.36                   | 1.38      | 1 1/2           | 3                     | 2                      | 2         | 2     | 4         | 5/8         | 3 1/8             |
| 1 1/4          | 4 5/8          | 5/8          | 2 1/2               | 2 3/8     | 2 1/4           | 1 3/8                  | 1 3/8     | 1.38              | 1.70                   | 1.72      | 1 5/8           | 3                     | 3                      | 3         | 3     | 4         | 5/8         | 3 1/2             |
| 1 1/2          | 5              | 1 1/16       | 2 7/8               | 2 3/4     | 2 5/8           | 7/8                    | 7/8       | 1.61              | 1.95                   | 1.97      | 1 3/4           | 4                     | 3                      | 3         | 4     | 4         | 5/8         | 3 7/8             |
| 2              | 6              | 3/4          | 3 5/8               | 3 1/8     | 2 1/2           | 1                      | 1         | 2.07              | 2.44                   | 2.46      | 1 7/8           | 6                     | 5                      | 5         | 5     | 4         | 3/4         | 4 3/4             |
| 2 1/2          | 7              | 7/8          | 4 1/8               | 3 3/8     | 2 3/4           | 1 1/8                  | 1 1/8     | 2.47              | 2.94                   | 2.97      | 2 1/8           | 8                     | 7                      | 7         | 7     | 4         | 3/4         | 5 1/2             |
| 3              | 7 1/2          | 1 5/16       | 5                   | 4 1/4     | 2 3/4           | 1 3/8                  | 1 3/8     | 3.07              | 3.57                   | 3.60      | 2 3/8           | 10                    | 8                      | 8         | 9     | 4         | 3/4         | 6                 |
| 3 1/2          | 8 1/2          | 1 5/16       | 5 1/2               | 4 13/16   | 2 13/16         | 1 1/4                  | 1 1/4     | 3.55              | 4.07                   | 4.10      | 2 7/8           | 12                    | 11                     | 11        | 13    | 8         | 3/4         | 7                 |
| 4              | 9              | 1 5/16       | 6 1/8               | 5 3/8     | 3               | 1 3/8                  | 1 3/8     | 4.03              | 4.57                   | 4.60      | 3 1/8           | 15                    | 13                     | 13        | 17    | 8         | 3/4         | 7 1/2             |
| 5              | 10             | 1 5/16       | 7 1/8               | 6 3/8     | 3 1/2           | 1 3/8                  | 1 3/8     | 5.05              | 5.66                   | 5.69      | 3 1/8           | 19                    | 15                     | 15        | 20    | 8         | 7/8         | 8 1/2             |
| 6              | 11             | 1            | 8 1/2               | 7 3/8     | 3 1/2           | 1 3/8                  | 1 3/8     | 6.07              | 6.72                   | 6.75      | 3 1/2           | 24                    | 19                     | 19        | 26    | 8         | 7/8         | 9 1/2             |
| 8              | 13 1/2         | 1 1/8        | 10 5/8              | 9 1/8     | 4               | 1 3/4                  | 1 3/4     | 7.98              | 8.72                   | 8.75      | 4 1/8           | 39                    | 30                     | 30        | 45    | 8         | 7/8         | 11 3/4            |
| 10             | 16             | 1 3/8        | 12 3/4              | 12        | 4               | 1 5/8                  | 1 5/8     | 10.02             | 10.88                  | 10.92     | 4 1/8           | 52                    | 43                     | 43        | 70    | 12        | 1           | 14 1/4            |
| 12             | 19             | 1 1/4        | 15                  | 14 3/8    | 4 1/2           | 2 3/8                  | 2 3/8     | 12.00             | 12.88                  | 12.92     | 4 1/8           | 80                    | 64                     | 64        | 110   | 12        | 1           | 17                |
| 14             | 21             | 1 3/8        | 16 1/4              | 15 3/4    | 5               | 2 1/4                  | 3 1/8     | 13.25             | 14.14                  | 14.18     | 4 1/8           | 110                   | 90                     | 105       | 140   | 12        | 1 1/8       | 18 3/4            |
| 16             | 23 1/2         | 1 3/8        | 18 1/2              | 18        | 5               | 2 1/2                  | 3 3/8     | 15.25             | 16.16                  | 16.19     | 4 1/8           | 140                   | 98                     | 140       | 180   | 16        | 1 1/8       | 21 1/4            |
| 18             | 25             | 1 3/8        | 21                  | 19 7/8    | 5 1/2           | 2 11/16                | 3 11/16   | 17.25             | 18.18                  | 18.20     | 4 1/8           | 150                   | 130                    | 160       | 220   | 16        | 1 1/4       | 22 3/4            |
| 20             | 27 1/2         | 1 11/16      | 23                  | 22        | 5 11/16         | 2 7/8                  | 4 1/8     | 19.25             | 20.20                  | 20.25     | 4 1/8           | 180                   | 165                    | 195       | 285   | 20        | 1 1/4       | 25                |
| 22             | 29 1/2         | 1 13/16      | 25 1/4              | 24 1/4    | 5 7/8           | 3 1/8                  | 4 1/4     | 21.25             | 22.22                  | 22.25     | 4 1/8           | 225                   | 185                    | 245       | 355   | 20        | 1 3/8       | 27 1/4            |
| 24             | 32             | 1 7/8        | 27 1/4              | 26 1/8    | 6               | 3 3/4                  | 4 3/8     | 23.25             | 24.25                  | 24.25     | 4 1/8           | 260                   | 220                    | 275       | 430   | 20        | 1 3/8       | 29 1/2            |

ANSI B16.5 only covers sizes through 24". For larger sizes refer to MSS—SP44, API 605, AWWA C207, class 125 p. 29, or class 175 p. 32. Special designs can also be furnished as indicated in modern flange design, bulletin 502.



600-lb.

| Nom. Pipe Size | Out-side Diam. | Thkn. (min.) | O.D. of Raised Face | Hub Diam. | Length thru Hub |                        |           | Bore       |                   |           | Depth of Socket | Approx. Weight (Lbs.) |                        |           |       | Drilling  |             |                   |
|----------------|----------------|--------------|---------------------|-----------|-----------------|------------------------|-----------|------------|-------------------|-----------|-----------------|-----------------------|------------------------|-----------|-------|-----------|-------------|-------------------|
|                |                |              |                     |           | Wldg. Neck      | Slip-On Thrd. Sock. W. | Lap Joint | Wldg. Neck | Slip-On Socket W. | Lap Joint |                 | Wldg. Neck            | Slip-On Thrd. Sock. W. | Lap Joint | Blind | No. Holes | Diam. Holes | Bolt Circle Diam. |
| 1/2            | 3 3/4          | 3/16         | 1 3/8               | 1 1/2     | 2 1/16          | 7/8                    | 7/8       | —          | 0.88              | 0.90      | 3/8             | 2                     | 2                      | 2         | 2     | 4         | 5/8         | 2 5/8             |
| 3/4            | 4 5/8          | 5/8          | 1 11/16             | 1 7/8     | 2 1/4           | 1                      | 1         | —          | 1.09              | 1.11      | 7/16            | 4                     | 3                      | 3         | 3     | 4         | 3/4         | 3 1/4             |
| 1              | 4 7/8          | 1 1/16       | 2                   | 2 1/8     | 2 3/16          | 1 1/16                 | 1 1/16    | —          | 1.36              | 1.38      | 1/2             | 4                     | 4                      | 4         | 4     | 4         | 3/4         | 3 1/2             |
| 1 1/4          | 5 1/4          | 1 3/8        | 2 1/2               | 2 1/2     | 2 5/8           | 1 1/8                  | 1 1/8     | —          | 1.70              | 1.72      | 5/8             | 6                     | 5                      | 5         | 5     | 4         | 3/4         | 3 3/8             |
| 1 1/2          | 6 1/8          | 7/8          | 2 7/8               | 2 3/4     | 2 3/4           | 1 1/4                  | 1 1/4     | —          | 1.95              | 1.97      | 5/8             | 8                     | 7                      | 7         | 8     | 4         | 7/8         | 4 1/2             |
| 2              | 6 1/2          | 1            | 3 5/8               | 3 3/4     | 2 7/8           | 1 1/2                  | 1 1/2     | —          | 2.44              | 2.46      | 1 1/16          | 12                    | 9                      | 9         | 10    | 8         | 3/4         | 5                 |
| 2 1/2          | 7 1/2          | 1 1/8        | 4 1/8               | 3 11/16   | 3 1/8           | 1 5/8                  | 1 5/8     | —          | 2.94              | 2.97      | 3/4             | 18                    | 13                     | 12        | 15    | 8         | 7/8         | 5 7/8             |
| 3              | 8 1/4          | 1 1/4        | 5                   | 4 5/8     | 3 1/4           | 1 11/16                | 1 11/16   | —          | 3.57              | 3.60      | 13/16           | 23                    | 16                     | 15        | 20    | 8         | 7/8         | 6 5/8             |
| 3 1/2          | 9              | 1 3/8        | 5 1/2               | 5 1/4     | 3 3/8           | 1 15/16                | 1 15/16   | —          | 4.07              | 4.10      | —               | 26                    | 21                     | 20        | 29    | 8         | 1           | 7 1/4             |
| 4              | 10 3/4         | 1 1/2        | 6 1/16              | 6         | 4               | 2 1/8                  | 2 1/8     | —          | 4.57              | 4.60      | —               | 42                    | 37                     | 36        | 41    | 8         | 1           | 8 1/2             |
| 5              | 13             | 1 3/4        | 7 1/16              | 7 1/16    | 4 1/2           | 2 3/8                  | 2 3/8     | —          | 5.66              | 5.69      | —               | 68                    | 63                     | 61        | 68    | 8         | 1 1/8       | 10 1/2            |
| 6              | 14             | 1 7/8        | 8 1/2               | 8 3/4     | 4 5/8           | 2 5/8                  | 2 5/8     | —          | 6.72              | 6.75      | —               | 81                    | 80                     | 78        | 86    | 12        | 1 1/8       | 11 1/2            |
| 8              | 16 1/2         | 2 3/16       | 10 5/8              | 10 3/4    | 5 1/4           | 3                      | 3         | —          | 8.72              | 8.75      | —               | 120                   | 115                    | 110       | 140   | 12        | 1 1/4       | 13 3/4            |
| 10             | 20             | 2 1/2        | 12 3/4              | 13 1/2    | 6               | 3 3/8                  | 4 3/8     | —          | 10.88             | 10.92     | —               | 190                   | 170                    | 170       | 230   | 16        | 1 3/8       | 17                |
| 12             | 22             | 2 5/8        | 15                  | 15 3/4    | 6 1/8           | 3 5/8                  | 4 5/8     | —          | 12.88             | 12.92     | —               | 225                   | 200                    | 200       | 295   | 20        | 1 3/8       | 19 1/4            |
| 14             | 23 3/4         | 2 3/4        | 16 1/4              | 17        | 6 1/2           | 3 11/16                | 5         | —          | 14.14             | 14.18     | —               | 280                   | 230                    | 250       | 355   | 20        | 1 1/2       | 20 3/4            |
| 16             | 27             | 3            | 18 1/2              | 19 1/2    | 7               | 4 1/16                 | 5 1/2     | —          | 16.16             | 16.19     | —               | 390                   | 330                    | 365       | 495   | 20        | 1 5/8       | 23 3/4            |
| 18             | 29 1/4         | 3 1/4        | 21                  | 21 1/2    | 7 1/4           | 4 5/8                  | 6         | —          | 18.18             | 18.20     | —               | 475                   | 400                    | 435       | 630   | 20        | 1 3/4       | 25 3/4            |
| 20             | 32             | 3 1/2        | 23                  | 24        | 7 1/2           | 5                      | 6 1/2     | —          | 20.20             | 20.25     | —               | 590                   | 510                    | 570       | 810   | 24        | 1 3/4       | 28 1/2            |
| 22             | 34 1/4         | 3 3/4        | 25 1/4              | 26 1/4    | 7 3/4           | 5 1/4                  | 6 7/8     | —          | 22.22             | 22.25     | —               | 720                   | 590                    | 670       | 1000  | 24        | 1 7/8       | 30 5/8            |
| 24             | 37             | 4            | 27 1/4              | 28 1/4    | 8               | 5 1/2                  | 7 1/4     | —          | 24.25             | 24.25     | —               | 830                   | 730                    | 810       | 1250  | 24        | 2           | 33                |

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For further information on this Standard see Page 27

| 26 | 40     | 4 1/4 | 29 1/2 | 29 1/16 | 8 3/4  | — | — | — | — | — | — | 1025 | 950  | — | 1525 | 28 | 2     | 36     |
|----|--------|-------|--------|---------|--------|---|---|---|---|---|---|------|------|---|------|----|-------|--------|
| 28 | 42 1/4 | 4 3/8 | 31 1/2 | 31 1/8  | 9 1/4  | — | — | — | — | — | — | 1175 | 1075 | — | 1750 | 28 | 2 1/8 | 38     |
| 30 | 44 1/2 | 4 1/2 | 33 3/4 | 33 1/16 | 9 3/4  | — | — | — | — | — | — | 1300 | 1175 | — | 2000 | 28 | 2 1/8 | 40 1/4 |
| 32 | 47     | 4 5/8 | 36     | 36 1/8  | 10 1/4 | — | — | — | — | — | — | 1500 | 1375 | — | 2300 | 28 | 2 3/8 | 42 1/2 |
| 34 | 49     | 4 3/4 | 38     | 38 1/8  | 10 5/8 | — | — | — | — | — | — | 1650 | 1500 | — | 2575 | 28 | 2 3/8 | 44 1/2 |
| 36 | 51 3/4 | 4 7/8 | 40 1/4 | 40 5/8  | 11 1/8 | — | — | — | — | — | — | 1750 | 1600 | — | 2950 | 28 | 2 5/8 | 47     |

900-lb.

(NOTE: Sizes 1/2" thru 2 1/2" are identical with 1500 lb. flanges (see next page).)

|    |     |    |     |     |     |    |     |                              |       |       |   |      |      |      |      |    |    |     |
|----|-----|----|-----|-----|-----|----|-----|------------------------------|-------|-------|---|------|------|------|------|----|----|-----|
| 3  | 9½  | 1½ | 5   | 5   | 4   | 2½ | 2½  | To be specified by purchaser | 3.57  | 3.60  | — | 31   | 26   | 25   | 29   | 8  | 1  | 7½  |
| 4  | 11½ | 1¾ | 6⅙  | 6¼  | 4½  | 2¾ | 2¾  |                              | 4.57  | 4.60  | — | 53   | 53   | 51   | 54   | 8  | 1¼ | 9¼  |
| 5  | 13¾ | 2  | 7⅙  | 7½  | 5   | 3⅙ | 3⅙  |                              | 5.66  | 5.69  | — | 86   | 83   | 81   | 87   | 8  | 1⅝ | 11  |
| 6  | 15  | 2⅙ | 8½  | 9¼  | 5½  | 3⅜ | 3⅜  |                              | 6.72  | 6.75  | — | 110  | 110  | 105  | 115  | 12 | 1¼ | 12½ |
| 8  | 18½ | 2½ | 10⅝ | 11¾ | 6⅜  | 4  | 4½  | To be specified by purchaser | 8.72  | 8.75  | — | 175  | 170  | 190  | 200  | 12 | 1½ | 15½ |
| 10 | 21½ | 2¾ | 12¾ | 14½ | 7¼  | 4¼ | 5   |                              | 10.88 | 10.92 | — | 260  | 245  | 275  | 290  | 16 | 1½ | 18½ |
| 12 | 24  | 3⅛ | 15  | 16½ | 7⅞  | 4⅝ | 5⅝  |                              | 12.88 | 12.92 | — | 325  | 325  | 370  | 415  | 20 | 1½ | 21  |
| 14 | 25¼ | 3⅜ | 16¼ | 17¾ | 8⅜  | 5⅛ | 6⅛  |                              | 14.14 | 14.18 | — | 400  | 400  | 415  | 520  | 20 | 1⅝ | 22  |
| 16 | 27¾ | 3½ | 18½ | 20  | 8½  | 5¼ | 6½  | To be specified by purchaser | 16.16 | 16.19 | — | 495  | 425  | 465  | 600  | 20 | 1¾ | 24¼ |
| 18 | 31  | 4  | 21  | 22¼ | 9   | 6  | 7½  |                              | 18.18 | 18.20 | — | 680  | 600  | 650  | 850  | 20 | 2  | 27  |
| 20 | 33¾ | 4¼ | 23  | 24½ | 9¾  | 6¼ | 8¼  |                              | 20.20 | 20.25 | — | 830  | 730  | 810  | 1075 | 20 | 2⅞ | 29½ |
| 22 | —   | —  | —   | —   | —   | —  | —   |                              | —     | —     | — | —    | —    | —    | —    | —  | —  | —   |
| 24 | 41  | 5½ | 27¼ | 29½ | 11½ | 8  | 10½ | To be specified by purchaser | 24.25 | 24.25 | — | 1500 | 1400 | 1550 | 2025 | 20 | 2⅞ | 35½ |
|    |     |    |     |     |     |    |     |                              |       |       |   |      |      |      |      |    |    |     |
|    |     |    |     |     |     |    |     |                              |       |       |   |      |      |      |      |    |    |     |
|    |     |    |     |     |     |    |     |                              |       |       |   |      |      |      |      |    |    |     |

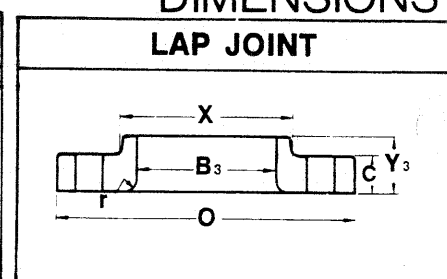
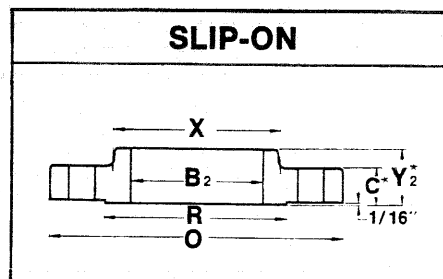
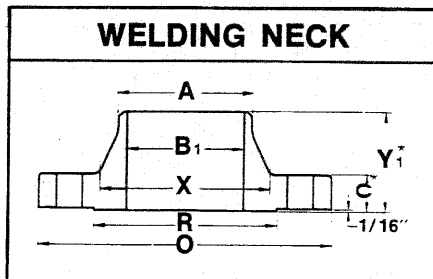
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For further information on this Standard see Page 27

| For further information on this Standard see Page 27 |     |    |     |     |     |   |   |                                           |   |   |   |      |      |   |      |    |    |     |
|------------------------------------------------------|-----|----|-----|-----|-----|---|---|-------------------------------------------|---|---|---|------|------|---|------|----|----|-----|
| 26                                                   | 42¾ | 5½ | 29½ | 30½ | 11¼ | — | — | P<br>u<br>r<br>c<br>h<br>a<br>s<br>e<br>r | — | — | — | 1575 | 1525 | — | 2200 | 20 | 2⅞ | 37½ |
| 28                                                   | 46  | 5⅝ | 31½ | 32¾ | 11¾ | — | — |                                           | — | — | — | 1850 | 1800 | — | 2575 | 20 | 3⅛ | 40¼ |
| 30                                                   | 48½ | 5⅞ | 33¾ | 35  | 12¼ | — | — |                                           | — | — | — | 2150 | 2075 | — | 3025 | 20 | 3⅛ | 42¾ |
| 32                                                   | 51¾ | 6¼ | 36  | 37¼ | 13  | — | — |                                           | — | — | — | 2575 | 2500 | — | 3650 | 20 | 3⅜ | 45½ |
| 34                                                   | 55  | 6½ | 38  | 39⅝ | 13¾ | — | — |                                           | — | — | — | 3025 | 2950 | — | 4275 | 20 | 3⅝ | 48¼ |
| 36                                                   | 57½ | 6¾ | 40¼ | 41⅞ | 14¼ | — | — |                                           | — | — | — | 3450 | 3350 | — | 4900 | 20 | 3⅝ | 50¾ |

# 18 FLANGES

## DIMENSIONS



| 1500-lb.       |                |              |                     |           |                 |                        |           |                             |                  |           |                 |                     |                        |           |       |           |             |                   |
|----------------|----------------|--------------|---------------------|-----------|-----------------|------------------------|-----------|-----------------------------|------------------|-----------|-----------------|---------------------|------------------------|-----------|-------|-----------|-------------|-------------------|
| Nom. Pipe Size | Out-side Diam. | Thkn. (min.) | O.D. of Raised Face | Hub Diam. | Length thru Hub |                        |           | Bore                        |                  |           | Depth of Socket | Approx. Wgt. (Lbs.) |                        |           |       | Drilling  |             |                   |
|                |                |              |                     |           | Widg. Neck      | Slip-On Thrd. Sock. W. | Lap Joint | Widg. Neck                  | Slip-on Sock. W. | Lap Joint |                 | Widg. Neck          | Slip-On Thrd. Sock. W. | Lap Joint | Blind | No. Holes | Diam. Holes | Bolt Circle Diam. |
| 1/2            | 4 3/4          | 7/8          | 1 3/8               | 1 1/2     | 2 3/8           | 1 1/4                  | 1 1/4     | To be specified by customer | 0.88             | 0.90      | 3/8             | 5                   | 4                      | 4         | 4     | 4         | 7/8         | 3 1/4             |
| 3/4            | 5 1/8          | 1            | 1 11/16             | 1 3/4     | 2 3/4           | 1 3/8                  | 1 3/8     |                             | 1.09             | 1.11      | 3/8             | 6                   | 5                      | 5         | 6     | 4         | 7/8         | 3 1/2             |
| 1              | 5 7/8          | 1 1/8        | 2                   | 2 1/8     | 2 7/8           | 1 5/8                  | 1 5/8     |                             | 1.36             | 1.38      | 1/2             | 9                   | 8                      | 8         | 8     | 4         | 1           | 4                 |
| 1 1/4          | 6 1/4          | 1 1/8        | 2 1/2               | 2 1/2     | 2 7/8           | 1 5/8                  | 1 5/8     | To be specified by customer | 1.70             | 1.72      | 3/8             | 10                  | 9                      | 9         | 9     | 4         | 1           | 4 3/8             |
| 1 1/2          | 7              | 1 1/4        | 2 7/8               | 2 3/4     | 3 1/4           | 1 3/4                  | 1 3/4     |                             | 1.95             | 1.97      | 3/8             | 13                  | 12                     | 12        | 13    | 4         | 1 1/8       | 4 7/8             |
| 2              | 8 1/2          | 1 1/2        | 3 5/8               | 4 1/8     | 4               | 2 1/4                  | 2 1/4     |                             | 2.44             | 2.46      | 1 1/8           | 25                  | 25                     | 25        | 25    | 8         | 1           | 6 1/2             |
| 2 1/2          | 9 5/8          | 1 5/8        | 4 7/8               | 4 7/8     | 4 1/8           | 2 1/2                  | 2 1/2     | To be specified by customer | 2.94             | 2.97      | 3/4             | 36                  | 36                     | 35        | 35    | 8         | 1 1/8       | 7 1/2             |
| 3              | 10 1/2         | 1 7/8        | 5                   | 5 1/4     | 4 5/8           | 2 7/8                  | 2 7/8     |                             | 3.57             | 3.60      | —               | 48                  | 48                     | 47        | 48    | 8         | 1 1/4       | 8                 |
| 3 1/2          | —              | —            | —                   | —         | —               | —                      | —         |                             | —                | —         | —               | —                   | —                      | —         | —     | —         | —           | —                 |
| 4              | 12 1/4         | 2 1/8        | 6 3/8               | 6 3/8     | 4 7/8           | 3 3/8                  | 3 3/8     | To be specified by customer | 4.57             | 4.60      | —               | 73                  | 73                     | 75        | 73    | 8         | 1 3/8       | 9 1/2             |
| 5              | 14 3/4         | 2 7/8        | 7 3/8               | 7 3/4     | 6 1/8           | 4 1/8                  | 4 1/8     |                             | 5.66             | 5.69      | —               | 130                 | 130                    | 140       | 140   | 8         | 1 5/8       | 11 1/2            |
| 6              | 15 1/2         | 3 1/4        | 8 1/2               | 9         | 6 3/4           | 4 1 1/8                | 4 1 1/8   |                             | 6.72             | 6.75      | —               | 165                 | 165                    | 170       | 160   | 12        | 1 1/2       | 12 1/2            |
| 8              | 19             | 3 5/8        | 10 5/8              | 11 1/2    | 8 3/8           | 5 5/8                  | 5 5/8     | To be specified by customer | 8.72             | 8.75      | —               | 275                 | 260                    | 285       | 300   | 12        | 1 3/4       | 15 1/2            |
| 10             | 23             | 4 1/4        | 12 3/4              | 14 1/2    | 10              | 6 1/4                  | 7         |                             | 10.88            | 10.92     | —               | 455                 | 435                    | 485       | 510   | 12        | 2           | 19                |
| 12             | 26 1/2         | 4 7/8        | 15                  | 17 3/4    | 11 1/8          | 7 1/8                  | 8 5/8     |                             | 12.88            | 12.92     | —               | 690                 | 580                    | 630       | 690   | 16        | 2 1/8       | 22 1/2            |
| 14             | 29 1/2         | 5 1/4        | 16 1/4              | 19 1/2    | 11 3/4          | —                      | 9 1/2     | To be specified by customer | —                | 14.18     | —               | 940                 | —                      | 890       | 975   | 16        | 2 3/8       | 25                |
| 16             | 32 1/2         | 5 3/4        | 18 1/2              | 21 3/4    | 12 1/4          | —                      | 10 1/4    |                             | —                | 16.19     | —               | 1250                | —                      | 1150      | 1300  | 16        | 2 5/8       | 27 3/4            |
| 18             | 36             | 6 3/8        | 21                  | 23 1/2    | 12 7/8          | —                      | 10 7/8    |                             | —                | 18.20     | —               | 1625                | —                      | 1475      | 1750  | 16        | 2 7/8       | 30 1/2            |
| 20             | 38 3/4         | 7            | 23                  | 25 1/4    | 14              | —                      | 11 1/2    | To be specified by customer | —                | 20.25     | —               | 2050                | —                      | 1775      | 2225  | 16        | 3 1/8       | 32 3/4            |
| 22             | —              | —            | —                   | —         | —               | —                      | —         |                             | —                | —         | —               | —                   | —                      | —         | —     | —         | —           | —                 |
| 24             | 46             | 8            | 27 1/4              | 30        | 16              | —                      | 13        |                             | —                | 24.25     | —               | 3325                | —                      | 2825      | 3625  | 16        | 3 3/8       | 39                |

### 2500-lb.

|       |        |       |         |         |        |         |         |                             |       |       |                              |      |      |      |      |    |       |        |
|-------|--------|-------|---------|---------|--------|---------|---------|-----------------------------|-------|-------|------------------------------|------|------|------|------|----|-------|--------|
| 1/2   | 5 1/4  | 1 3/8 | 1 3/8   | 1 11/16 | 2 7/8  | 1 1/8   | 1 1/8   | To be specified by customer | 0.88  | 0.90  | Not manufactured in 2500-lb. | 7    | 7    | 7    | 7    | 4  | 7/8   | 3 1/2  |
| 3/4   | 5 1/2  | 1 1/4 | 1 11/16 | 2       | 3 1/8  | 1 11/16 | 1 11/16 |                             | 1.09  | 1.11  |                              | 8    | 8    | 8    | 8    | 4  | 7/8   | 3 3/4  |
| 1     | 6 1/4  | 1 3/8 | 2       | 2 1/4   | 3 1/2  | 1 7/8   | 1 7/8   |                             | 1.36  | 1.38  |                              | 12   | 11   | 11   | 11   | 4  | 1     | 4 1/4  |
| 1 1/4 | 7 1/4  | 1 1/2 | 2 1/2   | 2 7/8   | 3 3/4  | 2 1/8   | 2 1/8   | To be specified by customer | 1.70  | 1.72  | Not manufactured in 2500-lb. | 17   | 16   | 16   | 17   | 4  | 1 1/8 | 5 1/8  |
| 1 1/2 | 8      | 1 3/4 | 2 7/8   | 3 1/8   | 4 3/8  | 2 3/8   | 2 3/8   |                             | 1.95  | 1.97  |                              | 25   | 22   | 22   | 23   | 4  | 1 1/4 | 5 3/4  |
| 2     | 9 1/4  | 2     | 3 5/8   | 3 3/4   | 5      | 2 3/4   | 2 3/4   |                             | 2.44  | 2.46  |                              | 42   | 38   | 37   | 39   | 8  | 1 1/8 | 6 3/4  |
| 2 1/2 | 10 1/2 | 2 1/4 | 4 1/8   | 4 1/2   | 5 5/8  | 3 3/8   | 3 3/8   | To be specified by customer | 2.94  | 2.97  | Not manufactured in 2500-lb. | 52   | 55   | 53   | 56   | 8  | 1 1/4 | 7 3/4  |
| 3     | 12     | 2 5/8 | 5       | 5 1/4   | 6 5/8  | 3 5/8   | 3 5/8   |                             | 3.57  | 3.60  |                              | 94   | 83   | 80   | 86   | 8  | 1 3/8 | 9      |
| 3 1/2 | —      | —     | —       | —       | —      | —       | —       |                             | —     | —     |                              | —    | —    | —    | —    | —  | —     | —      |
| 4     | 14     | 3     | 6 3/8   | 6 1/2   | 7 1/2  | 4 1/4   | 4 1/4   | To be specified by customer | 4.57  | 4.60  | Not manufactured in 2500-lb. | 145  | 125  | 120  | 135  | 8  | 1 5/8 | 10 3/4 |
| 5     | 16 1/2 | 3 5/8 | 7 3/8   | 8       | 9      | 5 1/8   | 5 1/8   |                             | 5.66  | 5.69  |                              | 245  | 210  | 205  | 225  | 8  | 1 7/8 | 12 3/4 |
| 6     | 19     | 4 1/4 | 8 1/2   | 9 1/4   | 10 3/4 | 6       | 6       |                             | 6.72  | 6.75  |                              | 380  | 325  | 315  | 345  | 8  | 2 1/8 | 14 1/2 |
| 8     | 21 3/4 | 5     | 10 5/8  | 12      | 12 1/2 | 7       | 7       | To be specified by customer | 8.72  | 8.75  | Not manufactured in 2500-lb. | 580  | 485  | 470  | 530  | 12 | 2 1/8 | 17 1/4 |
| 10    | 26 1/2 | 6 1/2 | 12 3/4  | 14 3/4  | 16 1/2 | 9       | 9       |                             | 10.88 | 10.92 |                              | 1075 | 930  | 900  | 1025 | 12 | 2 5/8 | 21 1/4 |
| 12    | 30     | 7 1/4 | 15      | 17 3/8  | 18 1/4 | 10      | 10      |                             | 12.88 | 12.92 |                              | 1525 | 1100 | 1100 | 1300 | 12 | 2 7/8 | 24 3/4 |

◆ Threaded, Blind and Socket Weld Flanges are illustrated on Pg. 17.

1. Dimensions are in inches. Prices on application.
2. Standard bore will be furnished unless otherwise specified.
3. Socket Weld flgs. are not mfd. in 150# type over 24", in 300# and 600# over 3", in 1500# over 2 1/2", in 400# and 2500# in any size.
4. Specifications — All Taylor Forge flanges conform to ANSI Std. B16.5 MSS — SP44 and ASTM material SPRS, A105, A182, and A350 as applicable.
5. Welding bevel standards and tolerances — Page 43 & 44.
6. Pressure — Temperature ratings — Refer ANSI — B16.5.
7. Threading details — Page 53.

8. Large diameter flanges — See Pages 28 thru 34.
- Minimum bores — Page 46.

\* Facings: 150# and 300# flanges (except Lap Joint) furnished with 1/16" raised face, which is included in the thickness and hub length shown, 400# and heavier flanges (except Lap Joint) furnished with 1/4" raised face, which is not included in thickness or hub length dimensions. Other facings Pg. 48 & 50.

\*\* Refer to Taylor Forge Pipeline Catalog 723 for complete listings of MSS-SP44 and API 605 flanges.

■ Dimension of blind flange is same as companion flange, however, this is not true for MSS blind flanges, class 300 or heavier, 26" and larger, which have a greater thickness. Dimensions for MSS blind flanges are listed on pages 20 and 21 of Components Division Pipeline Catalog 723.

# ORIFICE FLANGES

For the Precise Metering of Liquids and Gases

**WELDING NECK • SLIP-ON • THREADED**

In Carbon, Alloy and Stainless

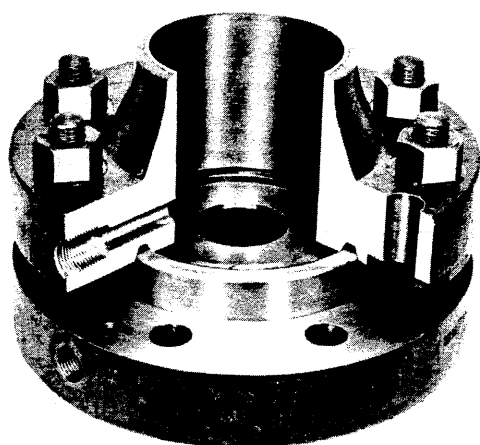
300 lb. through 2500 lb., raised face or ring joint

ORIFICE FLANGES, first developed by Taylor Forge with the assistance and cooperation of the principal instrument manufacturers, were originally designed for use with the type of meter recommended by the American Gas Association for the accurate measurement of natural gas flow. Highly favorable experience in this application resulted in the extension of the method into other fields and it is now almost universally used wherever substantial volumes are involved or where

other factors make displacement meters impractical.

The very principle of metering flow by measurement of pressure drop across an orifice depends for its accuracy upon the precision of the assembled orifice flange union, particularly with reference to the position of the pipe tap with respect to the opening in the orifice plate. Very slight variations in positioning will adversely affect the accuracy of measurement. In recognition of this principle, Taylor Forge established at the outset machining and inspection processes and procedures designed to guarantee extreme accuracy of dimensions.

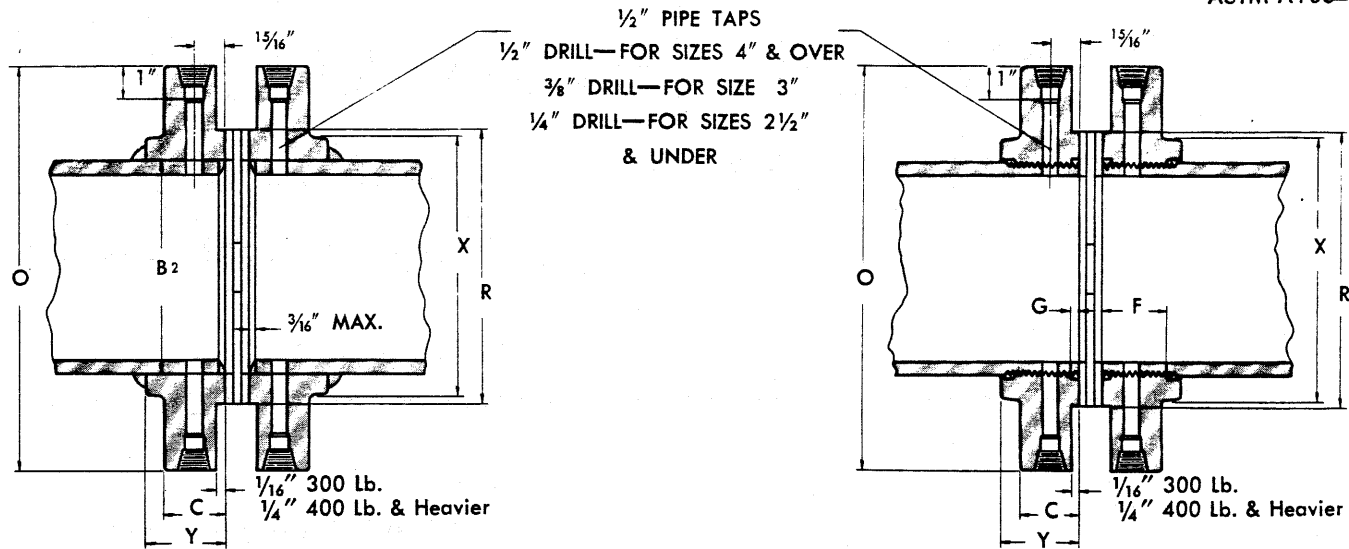
For a great many years, Taylor Forge Orifice Flange Unions have been the first choice of exacting engineers everywhere and they are in service today literally throughout the world.



Raised Face and Ring Joint

**Welding Neck, Slip-on\* and Threaded**Conforming to  
A.G.A. Recommendation

ASTM A105

**Drilling Template and Bolting**

| Nominal Pipe Size | DRILLING          |                 |                | BOLTING        |              |            |
|-------------------|-------------------|-----------------|----------------|----------------|--------------|------------|
|                   | Bolt Circle Diam. | Number of Holes | Diam. of Holes | Diam. of Bolts | Bolt Length+ |            |
|                   |                   |                 |                |                | Raised Face  | Ring Joint |
| 1                 | 3 1/2             | 4               | 1 1/16         | 5/8            | 4            | 4 3/4      |
| 1 1/4             | 3 3/8             | 4               | 1 1/16         | 5/8            | 4            | 4 3/4      |
| 1 1/2             | 4 1/2             | 4               | 1 3/16         | 3/4            | 4 1/4        | 5          |
| 2                 | 5                 | 8               | 1 1/16         | 5/8            | 4            | 4 3/4      |
| 2 1/2             | 5 7/8             | 8               | 1 3/16         | 3/4            | 4 1/4        | 5          |
| 3                 | 6 5/8             | 8               | 1 3/16         | 3/4            | 4 1/4        | 5          |
| 4                 | 7 7/8             | 8               | 1 3/16         | 3/4            | 4 1/4        | 5          |
| 5                 | 9 1/4             | 8               | 7/8            | 3/4            | 4 1/4        | 5 1/2      |
| 6                 | 10 5/8            | 12              | 7/8            | 3/4            | 4 1/4        | 5 1/2      |
| 8                 | 13                | 12              | 1              | 7/8            | 4 1/2        | 6          |
| 10                | 15 1/4            | 16              | 1 1/8          | 1              | 5 1/2        | 6 1/2      |
| 12                | 17 3/4            | 16              | 1 1/4          | 1 1/8          | 5 1/2        | 7          |
| 14                | 20 1/4            | 20              | 1 1/4          | 1 1/8          | 6            | 7          |
| 16                | 22 1/2            | 20              | 1 3/8          | 1 1/4          | 6 1/2        | 8          |
| 18                | 24 3/4            | 24              | 1 3/8          | 1 1/4          | 6 1/2        | 8          |
| 20                | 27                | 24              | 1 3/8          | 1 1/4          | 7            | 8          |
| 22                | 29 1/4            | 24              | 1 5/8          | 1 1/2          | 7 1/2        | 9          |
| 24                | 32                | 24              | 1 5/8          | 1 1/2          | 7 1/2        | 9          |
|                   |                   |                 |                |                |              |            |
|                   |                   |                 |                |                |              |            |

**Weights**

| Nominal Pipe Size | APPROXIMATE WEIGHT PER UNION (Pounds) |            |                      |            |
|-------------------|---------------------------------------|------------|----------------------|------------|
|                   | Welding Neck                          |            | Slip-On and Threaded |            |
|                   | Raised Face                           | Ring Joint | Raised Face          | Ring Joint |
| 1                 | 18                                    | 20         | 15                   | 17         |
| 1 1/4             | 21                                    | 23         | 17                   | 20         |
| 1 1/2             | 28                                    | 30         | 24                   | 28         |
| 2                 | 33                                    | 36         | 27                   | 31         |
| 2 1/2             | 43                                    | 46         | 36                   | 42         |
| 3                 | 48                                    | 52         | 42                   | 48         |
| 4                 | 68                                    | 73         | 60                   | 66         |
| 5                 | 78                                    | 89         | 69                   | 80         |
| 6                 | 100                                   | 115        | 94                   | 110        |
| 8                 | 155                                   | 180        | 135                  | 160        |
| 10                | 220                                   | 255        | 200                  | 230        |
| 12                | 330                                   | 380        | 280                  | 325        |
| 14                | 425                                   | 485        | 395                  | 450        |
| 16                | 590                                   | 660        | 465                  | 535        |
| 18                | 750                                   | 830        | 610                  | 690        |
| 20                | 910                                   | 1025       | 740                  | 840        |
| 22                | 1125                                  | 1250       | 920                  | 1050       |
| 24                | 1350                                  | 1500       | 1125                 | 1300       |
|                   |                                       |            |                      |            |
|                   |                                       |            |                      |            |

Tolerances are the same as for ANSI B16.5 flanges except for the following:

1. Tolerance for the pressure tap hole-to-face dimensions  
 $\pm 0.02$ " for flanges  $< 4$ "  
 $\pm 0.03$ " for flanges  $\geq 4$ ".
2. WNF bores  $\pm 0.5\%$  of nominal size.  
 All dimensions are in inches. Prices on application.  
 Ring Joint Facing details—Page 50.  
 Other Facings—Page 48.  
 Pressure-Temperature ratings—See ANSI B16.5

Tolerances—Per note 1 & ANSI B16.5  
Welding Bevel Standards—Page 43.  
Threading Details—Page 53 & 54.

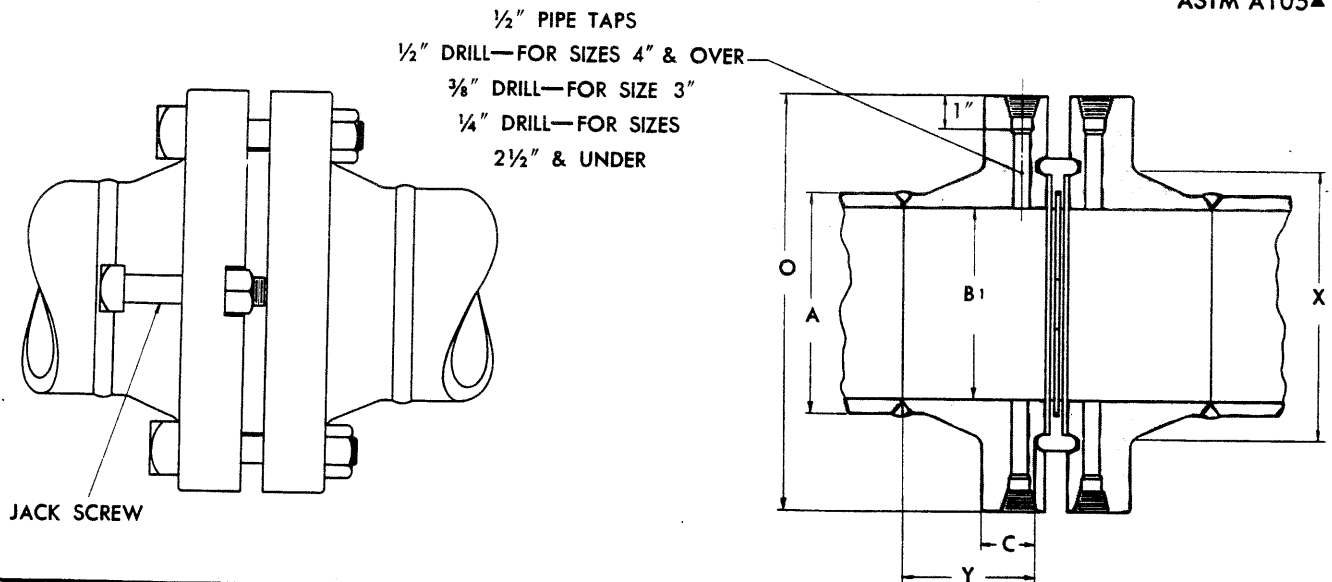
- + Sizes through 24" furnished with carbon steel square-head machine bolts, ASTM Specification A307- Grade B; length does not include thickness of head. Larger sizes furnished with alloy steel studs, ASTM Specification A354- Grade BC; length includes thickness of two nuts but not height of crown. All nuts are semi-finished Amn. Std. heavy hex. Threaded type in sizes through 24" only.

Raised Face and Ring Joint

## Welding Neck, Slip-on\* and Threaded

Conforming to  
A.G.A. Recommendations

ASTM A105▲



| Nominal<br>Pipe<br>Size | COMMON DIMENSIONS |                           |                            |                        |               | BORE            |                | LENGTH THRU HUB Y |                |                         |               | Diam.<br>Hub at<br>Bevel | Face<br>to Hub<br>Counter-<br>bore | Face<br>Counter-<br>bore<br>Depth |
|-------------------------|-------------------|---------------------------|----------------------------|------------------------|---------------|-----------------|----------------|-------------------|----------------|-------------------------|---------------|--------------------------|------------------------------------|-----------------------------------|
|                         | Out-side<br>Diam. | O.D. of<br>Raised<br>Face | Diam.<br>at Base<br>of Hub | Thickness<br>Min.<br>C |               | Welding<br>Neck | Slip-<br>On    | Welding<br>Neck   |                | Slip-On and<br>Threaded |               |                          |                                    |                                   |
|                         |                   |                           |                            | Raised<br>Face         | Ring<br>Joint |                 |                | Raised<br>Face    | Ring<br>Joint  | Raised<br>Face          | Ring<br>Joint |                          |                                    |                                   |
|                         |                   |                           |                            |                        |               |                 |                |                   |                |                         |               |                          |                                    |                                   |
| O                       | R                 | X                         | Raised<br>Face             | Ring<br>Joint          | B1            | B2              | Raised<br>Face | Ring<br>Joint     | Raised<br>Face | Ring<br>Joint           | A             | F                        | G                                  |                                   |
| 1                       | 4 3/8             | 2                         | 2 1/8                      | 1 1/2                  | 1 1/4         | 1.049           | 1.36           | 3 1/4             | 3              | 1 3/8                   | 1 3/8         | 1.32                     | 1 1/4                              | 5/8                               |
| 1 1/4                   | 5 1/4             | 2 1/2                     | 2 1/2                      | 1 1/2                  | 1 1/4         | 1.380           | 1.70           | 3 3/8             | 3 1/8          | 1 13/16                 | 1 1/8         | 1.66                     | 1 1/4                              | 3/4                               |
| 1 1/2                   | 6 1/8             | 2 3/4                     | 2 3/4                      | 1 1/2                  | 1 1/4         | 1.610           | 1.95           | 3 3/8             | 3 3/8          | 1 7/8                   | 1 3/8         | 1.90                     | 1 1/4                              | 3/8                               |
| 2                       | 6 1/2             | 3 3/8                     | 3 3/8                      | 1 1/2                  | 1 1/4         | 2.067           | 2.44           | 3 3/8             | 3 3/8          | 1 15/16                 | 1 11/16       | 2.38                     | 1 1/2                              | 1/2                               |
| 2 1/2                   | 7 1/2             | 4 1/8                     | 3 15/16                    | 1 1/2                  | 1 1/4         | 2.469           | 2.94           | 3 1/2             | 3 3/4          | 2                       | 1 3/4         | 2.88                     | 1 3/4                              | 3/8                               |
| 3                       | 8 1/4             | 5                         | 4 3/8                      | 1 1/2                  | 1 1/4         | 3.068           | 3.57           | 3 1/2             | 3 3/4          | 2 1/16                  | 1 13/16       | 3.50                     | 1 3/4                              | 1/2                               |
| 4                       | 10                | 6 3/8                     | 5 3/4                      | 1 1/2                  | 1 1/4         | 4.026           | 4.57           | 3 5/8             | 3 3/8          | 2 1/8                   | 1 7/8         | 4.50                     | 1 3/4                              | 7/16                              |
| 5                       | 11                | 7 3/8                     | 7                          | 1 1/2                  | 1 3/8         | 5.047           | 5.66           | 4                 | 3 3/8          | 2 3/8                   | 2             | 5.56                     | 1 3/4                              | 3/8                               |
| 6                       | 12 1/2            | 8 1/2                     | 8 3/8                      | 1 1/2                  | 1 7/8         | 6.065           | 6.72           | 3 15/16           | 3 3/8          | 2 1/8                   | 2 1/16        | 6.63                     | 1 3/4                              | 1/4                               |
| 8                       | 15                | 10 3/8                    | 10 1/4                     | 1 3/8                  | 1 3/8         | 7.981           | 8.72           | 4 3/8             | 4 3/8          | 2 7/8                   | 2 7/8         | 8.63                     | 2                                  | --                                |
| 10                      | 17 1/2            | 12 3/4                    | 12 3/8                     | 1 7/8                  | 1 7/8         | 10.020          | 10.88          | 4 3/4             | 4 3/8          | 2 3/4                   | 2 3/4         | 10.75                    | 2 3/8                              | --                                |
| 12                      | 20 1/2            | 15                        | 14 3/4                     | 2                      | 2             | 12.000          | 12.88          | 5 1/8             | 5 1/8          | 2 3/4                   | 2 3/4         | 12.75                    | 2 3/8                              | --                                |
| 14                      | 23                | 16 1/4                    | 16 3/4                     | 2 1/8                  | 2 1/8         | 13.250          | 14.14          | 5 3/8             | 5 3/8          | 3                       | 3             | 14.00                    | 2 1/2                              | --                                |
| 16                      | 25 1/2            | 18 1/2                    | 19                         | 2 1/4                  | 2 1/4         | 15.250          | 16.16          | 5 3/4             | 5 3/4          | 3 1/4                   | 3 1/4         | 16.00                    | 2 11/16                            | --                                |
| 18                      | 28                | 21                        | 21                         | 2 3/8                  | 2 3/8         | 17.250          | 18.18          | 6 1/4             | 6 1/4          | 3 1/2                   | 3 1/2         | 18.00                    | 2 3/4                              | --                                |
| 20                      | 30 1/2            | 23                        | 23 1/8                     | 2 1/2                  | 2 1/2         | 19.250          | 20.20          | 6 3/8             | 6 3/8          | 3 3/4                   | 3 3/4         | 20.00                    | 2 7/8                              | --                                |
| 22                      | 33                | 25 1/4                    | 25 1/4                     | 2 5/8                  | 2 5/8         | 21.250          | 22.22          | 6 1/2             | 6 1/2          | 4                       | 4             | 22.00                    | 3                                  | --                                |
| 24                      | 36                | 27 1/4                    | 27 3/8                     | 2 3/4                  | 2 3/4         | 23.250          | 24.25          | 6 3/4             | 6 3/4          | 4 3/8                   | 4 3/8         | 24.00                    | 3 1/4                              | --                                |
|                         |                   |                           |                            |                        |               |                 |                |                   |                |                         |               |                          |                                    |                                   |

▲ Available in other materials, see Page 55.  
Unions are furnished with two asbestos composition gaskets and two carbon steel bolts to be used as jack screws.  
Tapped openings are provided with pipe plugs.  
Sizes larger than 24" conform to MSS — SP44 dimensions.  
To conform with A.G.A. requirements, pipe must be threaded so

that the end is not more than 3/16" from the face of the flange.  
A combination ring joint gasket and orifice plate (not supplied by Components Division) is used with orifice flanges when ring joint faced.  
■ 300 lb. Slip-on Orifice Flanges can also be furnished in Socket Welding Type.

Raised Face and Ring Joint

Conforming to  
A.G.A. Recommendation

## Welding Neck

Drilling Template and Bolting

Weights

ASTM A105▲

**400 lb.**

Sizes 3" and smaller are same as 300 lb. Unions, except that alloy stud bolts are furnished. Length of studs is  $\frac{3}{4}$ " greater for raised face and  $\frac{1}{2}$ " greater for ring joint than listed length of machine bolts.

| Nominal<br>Pipe<br>Size <sup>○</sup> | DRILLING                |                       |                      | BOLTING              |                    |                 |
|--------------------------------------|-------------------------|-----------------------|----------------------|----------------------|--------------------|-----------------|
|                                      | Bolt<br>Circle<br>Diam. | Number<br>of<br>Holes | Diam.<br>of<br>Holes | Diam.<br>of<br>Bolts | Stud Bolt Length + |                 |
| 4                                    | 7 $\frac{1}{2}$         | 8                     | 1                    | $\frac{3}{8}$        | 5 $\frac{1}{2}$    | 6               |
| 5                                    | 9 $\frac{1}{4}$         | 8                     | 1                    | $\frac{3}{8}$        | 5 $\frac{3}{4}$    | 6 $\frac{1}{4}$ |
| 6                                    | 10 $\frac{3}{4}$        | 12                    | 1                    | $\frac{3}{8}$        | 6 $\frac{1}{4}$    | 6 $\frac{1}{2}$ |
| 8                                    | 13                      | 12                    | 1 $\frac{1}{8}$      | 1                    | 6 $\frac{3}{4}$    | 7 $\frac{1}{4}$ |
| 10                                   | 15 $\frac{1}{4}$        | 16                    | 1 $\frac{1}{4}$      | 1 $\frac{1}{8}$      | 7 $\frac{3}{8}$    | 8               |
| 12                                   | 17 $\frac{3}{4}$        | 16                    | 1 $\frac{3}{8}$      | 1 $\frac{1}{4}$      | 8                  | 8 $\frac{1}{2}$ |

| Nominal<br>Pipe<br>Size <sup>○</sup> | APPROXIMATE WEIGHT<br>PER UNION (Pounds) |               |  |  |
|--------------------------------------|------------------------------------------|---------------|--|--|
|                                      | Welding Neck                             |               |  |  |
|                                      | Raised<br>Face                           | Ring<br>Joint |  |  |
| 4                                    | 83                                       | 92            |  |  |
| 5                                    | 99                                       | 110           |  |  |
| 6                                    | 135                                      | 145           |  |  |
| 8                                    | 205                                      | 225           |  |  |
| 10                                   | 300                                      | 325           |  |  |
| 12                                   | 420                                      | 445           |  |  |

**600 lb.**

Sizes 3" and smaller are same as 300 lb. Unions, except: (1) alloy stud bolts are furnished (see note above regarding length); and (2) when faced for ring joint, flanges are drilled with bolt holes  $\frac{1}{8}$ " larger than bolt diameters given in 300 lb. table.

|    |                  |    |                 |                 |                 |                 |
|----|------------------|----|-----------------|-----------------|-----------------|-----------------|
| 4  | 8 $\frac{1}{2}$  | 8  | 1               | $\frac{3}{8}$   | 5 $\frac{3}{4}$ | 6 $\frac{1}{4}$ |
| 5  | 10 $\frac{1}{2}$ | 8  | 1 $\frac{1}{8}$ | 1               | 6 $\frac{1}{2}$ | 7               |
| 6  | 11 $\frac{1}{2}$ | 12 | 1 $\frac{1}{8}$ | 1               | 6 $\frac{3}{4}$ | 7 $\frac{1}{4}$ |
| 8  | 13 $\frac{3}{4}$ | 12 | 1 $\frac{1}{4}$ | 1 $\frac{1}{8}$ | 7 $\frac{3}{8}$ | 8 $\frac{1}{4}$ |
| 10 | 17               | 16 | 1 $\frac{3}{8}$ | 1 $\frac{1}{4}$ | 8 $\frac{1}{2}$ | 9               |
| 12 | 19 $\frac{1}{4}$ | 20 | 1 $\frac{3}{8}$ | 1 $\frac{1}{4}$ | 9               | 9 $\frac{1}{4}$ |

|    |     |     |  |  |
|----|-----|-----|--|--|
| 4  | 97  | 110 |  |  |
| 5  | 155 | 170 |  |  |
| 6  | 195 | 210 |  |  |
| 8  | 285 | 305 |  |  |
| 10 | 450 | 485 |  |  |
| 12 | 540 | 580 |  |  |

**900 lb.**For sizes 2 $\frac{1}{2}$ " and smaller use 1500 lb. Standard.

| Nominal<br>Pipe<br>Size <sup>○</sup> | DRILLING                |                       |                      | BOLTING              |                    |                  |
|--------------------------------------|-------------------------|-----------------------|----------------------|----------------------|--------------------|------------------|
|                                      | Bolt<br>Circle<br>Diam. | Number<br>of<br>Holes | Diam.<br>of<br>Holes | Diam.<br>of<br>Bolts | Stud Bolt Length + |                  |
| 3                                    | 7 $\frac{1}{2}$         | 8                     | 1                    | $\frac{3}{8}$        | 5 $\frac{3}{4}$    | 6 $\frac{1}{4}$  |
| 4                                    | 9 $\frac{1}{4}$         | 8                     | 1 $\frac{1}{4}$      | 1 $\frac{1}{8}$      | 7                  | 7 $\frac{1}{4}$  |
| 5                                    | 11                      | 8                     | 1 $\frac{3}{8}$      | 1 $\frac{1}{4}$      | 7 $\frac{1}{2}$    | 8                |
| 6                                    | 12 $\frac{1}{2}$        | 12                    | 1 $\frac{1}{4}$      | 1 $\frac{1}{8}$      | 7 $\frac{3}{8}$    | 8 $\frac{1}{4}$  |
| 8                                    | 15 $\frac{1}{2}$        | 12                    | 1 $\frac{1}{2}$      | 1 $\frac{3}{8}$      | 9                  | 9 $\frac{1}{4}$  |
| 10                                   | 18 $\frac{1}{2}$        | 16                    | 1 $\frac{1}{2}$      | 1 $\frac{3}{8}$      | 9 $\frac{1}{4}$    | 9 $\frac{3}{4}$  |
| 12                                   | 21                      | 20                    | 1 $\frac{1}{2}$      | 1 $\frac{3}{8}$      | 10                 | 10 $\frac{3}{4}$ |

| Nominal<br>Pipe<br>Size <sup>○</sup> | APPROXIMATE WEIGHT<br>PER UNION (Pounds) |               |  |  |
|--------------------------------------|------------------------------------------|---------------|--|--|
|                                      | Welding Neck                             |               |  |  |
|                                      | Raised<br>Face                           | Ring<br>Joint |  |  |
| 3                                    | 75                                       | 84            |  |  |
| 4                                    | 125                                      | 140           |  |  |
| 5                                    | 205                                      | 225           |  |  |
| 6                                    | 260                                      | 290           |  |  |
| 8                                    | 420                                      | 450           |  |  |
| 10                                   | 610                                      | 660           |  |  |
| 12                                   | 760                                      | 820           |  |  |

**1500 lb.**

|                 |                  |    |                 |                 |                  |                  |
|-----------------|------------------|----|-----------------|-----------------|------------------|------------------|
| 1               | 4                | 4  | 1               | $\frac{3}{8}$   | 5 $\frac{1}{2}$  | 5 $\frac{3}{4}$  |
| 1 $\frac{1}{4}$ | 4 $\frac{3}{4}$  | 4  | 1               | $\frac{3}{8}$   | 5 $\frac{1}{2}$  | 5 $\frac{3}{4}$  |
| 1 $\frac{1}{2}$ | 4 $\frac{7}{8}$  | 4  | 1 $\frac{1}{8}$ | 1               | 5 $\frac{3}{4}$  | 6                |
| 2               | 6 $\frac{1}{2}$  | 8  | 1               | $\frac{3}{8}$   | 5 $\frac{3}{4}$  | 6 $\frac{1}{4}$  |
| 2 $\frac{1}{2}$ | 7 $\frac{1}{2}$  | 8  | 1 $\frac{1}{8}$ | 1               | 6 $\frac{1}{4}$  | 6 $\frac{3}{4}$  |
| 3               | 8                | 8  | 1 $\frac{1}{4}$ | 1 $\frac{1}{8}$ | 7                | 7 $\frac{3}{8}$  |
| 4               | 9 $\frac{1}{2}$  | 8  | 1 $\frac{3}{8}$ | 1 $\frac{1}{4}$ | 7 $\frac{3}{4}$  | 8 $\frac{1}{4}$  |
| 5               | 11 $\frac{1}{2}$ | 8  | 1 $\frac{3}{8}$ | 1 $\frac{1}{2}$ | 9 $\frac{3}{4}$  | 10 $\frac{1}{4}$ |
| 6               | 12 $\frac{1}{2}$ | 12 | 1 $\frac{1}{2}$ | 1 $\frac{3}{8}$ | 10 $\frac{1}{4}$ | 11               |
| 8               | 15 $\frac{1}{2}$ | 12 | 1 $\frac{3}{4}$ | 1 $\frac{3}{8}$ | 11 $\frac{1}{2}$ | 12 $\frac{1}{2}$ |
| 10              | 19               | 12 | 2               | 1 $\frac{1}{8}$ | 13 $\frac{1}{4}$ | 14 $\frac{1}{4}$ |
| 12              | 22 $\frac{1}{2}$ | 16 | 2 $\frac{1}{4}$ | 2               | 14 $\frac{3}{4}$ | 16               |

|                 |      |      |  |  |
|-----------------|------|------|--|--|
| 1               | 29   | 28   |  |  |
| 1 $\frac{1}{4}$ | 31   | 31   |  |  |
| 1 $\frac{1}{2}$ | 38   | 40   |  |  |
| 2               | 63   | 72   |  |  |
| 2 $\frac{1}{2}$ | 90   | 100  |  |  |
| 3               | 120  | 135  |  |  |
| 4               | 180  | 195  |  |  |
| 5               | 320  | 345  |  |  |
| 6               | 405  | 440  |  |  |
| 8               | 630  | 730  |  |  |
| 10              | 1100 | 1175 |  |  |
| 12              | 1675 | 1825 |  |  |

All dimensions are in inches. Prices on application.  
Ring Joint Facing details—Page 50  
Facing other than Ring Joint—Page 48  
Pressure-Temperature ratings—See ANSI B16.5

Tolerances—Page 44  
Welding Bevel Standards—Page 43  
Threading details—Page 53 & 54.  
+ Lengths include thickness of two nuts but not height of

## JACK SCREW SIZES FOR ORIFICE FLANGES

[illegible]

## RAISED FACE ORIFICE FLANGES

[illegible]

Raised Face and Ring Joint

Conforming to  
A.G.A. Recommendations

## Welding Neck, Slip-on and Threaded

ASTM A105<sup>▲</sup>Dimensions of sizes 3" and smaller are identical with those of 300 lb.  
Orifice Flanges. For differences in bolting, see opposite page.**400 lb.**

| Nominal<br>Pipe<br>Size <sup>○</sup> | COMMON DIMENSIONS     |                           |                            |                        | BORE                                            |             | LENGTH THRU HUB<br>Y |  |       | Diam.<br>Hub at<br>Bevel | Face<br>to Hub<br>Counter-<br>bore |
|--------------------------------------|-----------------------|---------------------------|----------------------------|------------------------|-------------------------------------------------|-------------|----------------------|--|-------|--------------------------|------------------------------------|
|                                      | Out-<br>side<br>Diam. | O.D. of<br>Raised<br>Face | Diam.<br>at Base<br>of Hub | Thick-<br>ness<br>Min. | Welding<br>Neck                                 | Slip-<br>on | Welding<br>Neck      |  |       |                          |                                    |
|                                      |                       |                           |                            |                        |                                                 |             |                      |  | O     | R                        | X                                  |
| 4                                    | 10                    | 6¾                        | 5¾                         | 1¾                     | To be<br>speci-<br>fied<br>by<br>pur-<br>chaser | 4.57        | 3½                   |  | 4.50  | 1⅞                       |                                    |
| 5                                    | 11                    | 7¾                        | 7                          | 1½                     |                                                 | 5.66        | 4                    |  | 5.56  | 1⅞                       |                                    |
| 6                                    | 12½                   | 8½                        | 8¾                         | 1¾                     |                                                 | 6.72        | 4⅞                   |  | 6.63  | 2¼                       |                                    |
| 8                                    | 15                    | 10¾                       | 10¼                        | 1¾                     |                                                 | 8.72        | 4¾                   |  | 8.63  | 2¼                       |                                    |
| 10                                   | 17½                   | 12¾                       | 12¾                        | 2¼                     |                                                 | 10.88       | 4¾                   |  | 10.75 | 2¾                       |                                    |
| 12                                   | 20½                   | 15                        | 14¾                        | 2¼                     |                                                 | 12.88       | 5¾                   |  | 12.75 | 2¾                       |                                    |

**600 lb.**Dimensions of sizes 3" and smaller are identical with those of 300 lb.  
Orifice Flanges, except as indicated on opposite page.

|    |                  |                  |                  |                 |                                                 |       |                 |  |  |       |                 |
|----|------------------|------------------|------------------|-----------------|-------------------------------------------------|-------|-----------------|--|--|-------|-----------------|
| 4  | 10 $\frac{3}{4}$ | 6 $\frac{3}{4}$  | 6                | 1 $\frac{1}{2}$ | To be<br>speci-<br>fied<br>by<br>pur-<br>chaser | 4.57  | 4               |  |  | 4.50  | 1 $\frac{3}{4}$ |
| 5  | 13               | 7 $\frac{3}{4}$  | 7 $\frac{3}{4}$  | 1 $\frac{3}{4}$ |                                                 | 5.66  | 4 $\frac{1}{2}$ |  |  | 5.56  | 2 $\frac{1}{4}$ |
| 6  | 14               | 8 $\frac{1}{2}$  | 8 $\frac{3}{4}$  | 1 $\frac{3}{4}$ |                                                 | 6.72  | 4 $\frac{3}{4}$ |  |  | 6.63  | 2 $\frac{1}{2}$ |
| 8  | 16 $\frac{1}{2}$ | 10 $\frac{3}{4}$ | 10 $\frac{3}{4}$ | 2 $\frac{3}{4}$ |                                                 | 8.72  | 5 $\frac{1}{4}$ |  |  | 8.63  | 2 $\frac{1}{2}$ |
| 10 | 20               | 12 $\frac{3}{4}$ | 13 $\frac{1}{2}$ | 2 $\frac{1}{2}$ |                                                 | 10.88 | 6               |  |  | 10.75 | 2 $\frac{3}{4}$ |
| 12 | 22               | 15               | 15 $\frac{3}{4}$ | 2 $\frac{3}{4}$ |                                                 | 12.88 | 6 $\frac{1}{4}$ |  |  | 12.75 | 3               |

**900 lb.**For sizes 2 $\frac{1}{2}$ " and smaller, use 1500 lb. Standard

| Nominal<br>Pipe<br>Size <sup>○</sup> | COMMON DIMENSIONS     |                           |                            |                           |               | BORE                                            |             | LENGTH THRU HUB Y |               |  |       | Diam.<br>Hub at<br>Bevel | Face<br>to Hub<br>Counter-<br>bore |
|--------------------------------------|-----------------------|---------------------------|----------------------------|---------------------------|---------------|-------------------------------------------------|-------------|-------------------|---------------|--|-------|--------------------------|------------------------------------|
|                                      | Out-<br>side<br>Diam. | O.D. of<br>Raised<br>Face | Diam.<br>at Base<br>of Hub | Thickness<br>Minimum<br>C |               | Welding<br>Neck                                 | Slip-<br>On | Welding<br>Neck   |               |  |       |                          |                                    |
|                                      |                       |                           |                            | Raised<br>Face            | Ring<br>Joint |                                                 |             | Raised<br>Face    | Ring<br>Joint |  |       |                          |                                    |
|                                      |                       |                           |                            |                           |               |                                                 |             |                   |               |  |       |                          |                                    |
|                                      | O                     | R                         | X                          |                           |               | B1                                              | B2          |                   |               |  |       | A                        | F                                  |
| 3                                    | 9½                    | 5                         | 5                          | 1½                        | 1½            | To be<br>speci-<br>fied<br>by<br>pur-<br>chaser | 3.57        | 4                 | 4             |  |       | 3.50                     | 1½                                 |
| 4                                    | 11½                   | 6¾                        | 6¼                         | 1¾                        | 1¾            |                                                 | 4.57        | 4½                | 4½            |  |       | 4.50                     | 2½                                 |
| 5                                    | 13¾                   | 7¾                        | 7½                         | 2                         | 2             |                                                 | 5.66        | 5                 | 5             |  |       | 5.56                     | 2¾                                 |
| 6                                    | 15                    | 8½                        | 9¼                         | 2¾                        | 2¾            |                                                 | 6.72        | 5½                | 5½            |  |       | 6.63                     | 2½                                 |
| 8                                    | 18½                   | 10¾                       | 11¾                        | 2½                        | 2½            | 8.72                                            | 6¾          | 6¾                |               |  | 8.63  | 2¾                       |                                    |
| 10                                   | 21½                   | 12¾                       | 14½                        | 2¾                        | 2¾            | 10.88                                           | 7¼          | 7¼                |               |  | 10.75 | 3¼                       |                                    |
| 12                                   | 24                    | 15                        | 16½                        | 3¼                        | 3¼            | 12.88                                           | 7¾          | 7¾                |               |  | 12.75 | 3¼                       |                                    |

**1500 lb.**

2500 lb. Orifice Flanges are also available.

|                 |                  |                  |                  |                 |                 |                                                 |       |                  |                  |  |  |       |                 |
|-----------------|------------------|------------------|------------------|-----------------|-----------------|-------------------------------------------------|-------|------------------|------------------|--|--|-------|-----------------|
| 1               | 5 $\frac{1}{4}$  | 2                | 2 $\frac{1}{4}$  | 1 $\frac{1}{2}$ | 1 $\frac{1}{2}$ | To be<br>speci-<br>fied<br>by<br>pur-<br>chaser | 1.36  | 3 $\frac{1}{4}$  | 3 $\frac{1}{4}$  |  |  | 1.32  | 1 $\frac{1}{2}$ |
| 1 $\frac{1}{4}$ | 6 $\frac{1}{4}$  | 2 $\frac{1}{2}$  | 2 $\frac{1}{2}$  | 1 $\frac{1}{2}$ | 1 $\frac{1}{2}$ |                                                 | 1.70  | 3 $\frac{1}{4}$  | 3 $\frac{1}{4}$  |  |  | 1.66  | 1 $\frac{1}{2}$ |
| 1 $\frac{1}{2}$ | 7                | 2 $\frac{3}{4}$  | 2 $\frac{3}{4}$  | 1 $\frac{1}{2}$ | 1 $\frac{1}{2}$ |                                                 | 1.95  | 3 $\frac{1}{2}$  | 3 $\frac{1}{2}$  |  |  | 1.90  | 1 $\frac{1}{2}$ |
| 2               | 8 $\frac{1}{2}$  | 3 $\frac{3}{4}$  | 4 $\frac{1}{4}$  | 1 $\frac{1}{2}$ | 1 $\frac{1}{2}$ |                                                 | 2.44  | 4                | 4                |  |  | 2.38  | 1 $\frac{3}{4}$ |
| 2 $\frac{1}{2}$ | 9 $\frac{3}{4}$  | 4 $\frac{1}{4}$  | 4 $\frac{3}{4}$  | 1 $\frac{3}{4}$ | 1 $\frac{3}{4}$ |                                                 | 2.94  | 4 $\frac{1}{4}$  | 4 $\frac{1}{4}$  |  |  | 2.88  | 2 $\frac{1}{4}$ |
| 3               | 10 $\frac{1}{2}$ | 5                | 5 $\frac{1}{4}$  | 1 $\frac{3}{4}$ | 1 $\frac{3}{4}$ |                                                 | 3.57  | 4 $\frac{3}{4}$  | 4 $\frac{3}{4}$  |  |  | 3.50  | 2 $\frac{3}{4}$ |
| 4               | 12 $\frac{1}{4}$ | 6 $\frac{3}{4}$  | 6 $\frac{3}{4}$  | 2 $\frac{1}{4}$ | 2 $\frac{1}{4}$ |                                                 | 4.57  | 4 $\frac{3}{4}$  | 4 $\frac{3}{4}$  |  |  | 4.50  | 2 $\frac{1}{2}$ |
| 5               | 14 $\frac{3}{4}$ | 7 $\frac{3}{4}$  | 7 $\frac{3}{4}$  | 2 $\frac{3}{4}$ | 2 $\frac{3}{4}$ |                                                 | 5.66  | 6 $\frac{1}{4}$  | 6 $\frac{1}{4}$  |  |  | 5.56  | 2 $\frac{3}{4}$ |
| 6               | 15 $\frac{1}{2}$ | 8 $\frac{1}{2}$  | 9                | 3 $\frac{1}{4}$ | 3 $\frac{1}{4}$ |                                                 | 6.72  | 6 $\frac{3}{4}$  | 6 $\frac{3}{4}$  |  |  | 6.63  | 3               |
| 8               | 19               | 10 $\frac{3}{4}$ | 11 $\frac{1}{2}$ | 3 $\frac{3}{4}$ | 3 $\frac{3}{4}$ |                                                 | 8.72  | 8 $\frac{3}{4}$  | 8 $\frac{3}{4}$  |  |  | 8.63  | 3 $\frac{1}{4}$ |
| 10              | 23               | 12 $\frac{3}{4}$ | 14 $\frac{1}{2}$ | 4 $\frac{1}{4}$ | 4 $\frac{1}{4}$ |                                                 | 10.88 | 10               | 10               |  |  | 10.75 | 3 $\frac{3}{4}$ |
| 12              | 26 $\frac{1}{2}$ | 15               | 17 $\frac{1}{4}$ | 4 $\frac{3}{4}$ | 4 $\frac{3}{4}$ |                                                 | 12.88 | 11 $\frac{1}{4}$ | 11 $\frac{1}{4}$ |  |  | 12.75 | 3 $\frac{3}{4}$ |

<sup>▲</sup> Available in other materials, see Page 55

Unions are furnished with alloy steel studs per ASTM Specification A354. Grade BC, with semi-finished carbon steel American Standard heavy hex. nuts and two asbestos composition gaskets.  
Each Union includes two carbon steel bolts to be used as jack screws.

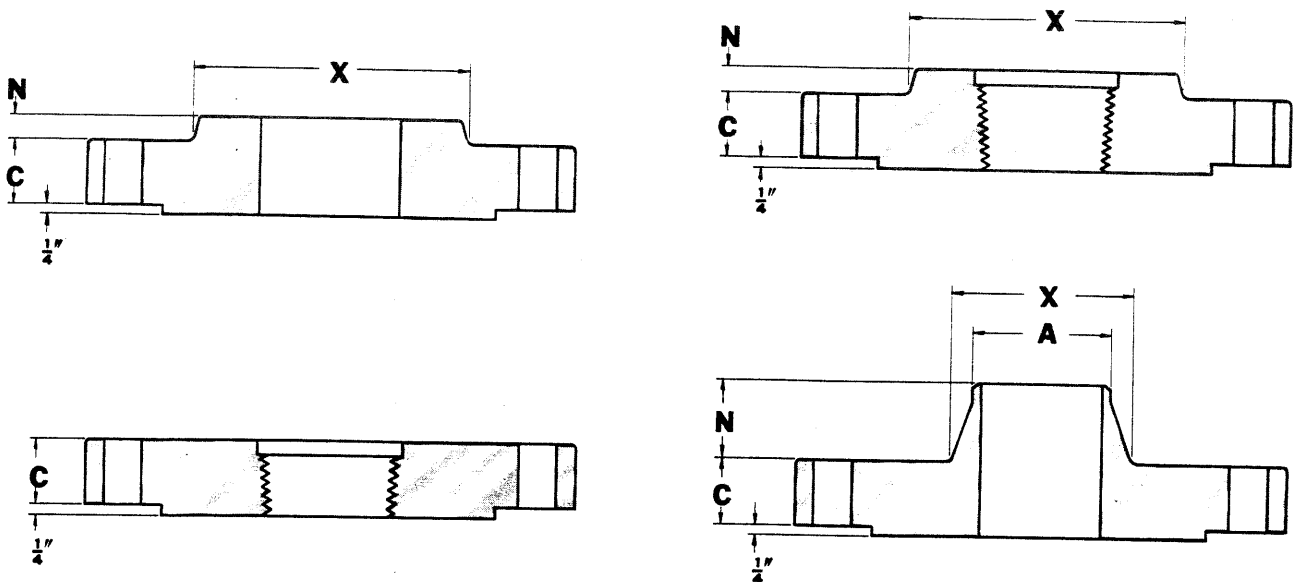
Tapped openings are provided with pipe plugs and  $\frac{3}{4}$ " x  $\frac{1}{2}$ " bushings, except that bushings are not furnished with alloy flanges.

To conform with A.G.A. requirements, pipe must be threaded so that the end is not more than  $\frac{3}{4}$ " from the face of the flange. A combination ring joint gasket and orifice plate (not supplied by Taylor Forge) is used with orifice flanges when ring joint faced.

<sup>○</sup> Available in any required larger size.

# REDUCING FLANGES

Slip-on, Threaded and Welding Neck



## Dimensional and Material References

**OUTSIDE DIAMETER, THICKNESS, FACING and DRILLING TEMPLATE:**—All of these dimensions correspond exactly with those of the full size flange of the nominal pipe size *from* which the reduction is being made. For convenient reference, the outside diameters of all ANSI B16.5 sizes and standards are shown on the opposite page. If other dimensions are required, refer to the catalog page listing flanges of the Pressure Standard (150 lb., 300 lb., etc.) involved.

As in the case of regular full size flanges, the  $\frac{1}{16}$ " Raised Face on 150 lb. and 300 lb. reducing flanges is included in listed flange thickness dimensions. The  $\frac{1}{4}$ " Raised Face on flanges in the 400 lb. and higher Pressure Standards is not included in listed flange thicknesses. Any other facing can be furnished. See Page 48 for facing details.

**HUB DIAMETER and HEIGHT:**—For Reducing Slip-On and Threaded flanges, regardless of the amount of reduction, the hub diameter (X) and height of hub above back face of flange (N) are the same as those of a full size flange of the same type and Pressure Standard, but *one (1) nominal pipe size smaller* than the size from which the reduction is being made.

For Reducing Welding Neck flanges hub dimensions are the same as those of a full size flange of the nominal pipe size (and Pressure Standard) to which the reduction is being made. Consult proper catalog page for these dimensions.

Reducing Welding Neck flanges are made only on special order.

**BORE or TAPPING:**—Reducing Slip-On flanges are bored to the same diameters as full size flanges of the size (and Pressure Standard) to which the reduction is made.

Reducing Threaded flanges in the 150 lb. Standard do not require a counterbore. On 300 lb. and higher Pressure Standards depth of counterbore is  $\frac{1}{4}$ " for tappings 2" and smaller and  $\frac{3}{8}$ " for tappings 2½" and larger. Counterbore diameters are the same as for full size flanges of identical tapping. For threading details see Page 54.

**MINIMUM BORES:**—The smallest sizes to which hubbed flanges can be bored or tapped are listed on the opposite page. For reductions to sizes smaller than listed, **BLIND FLANGES** are furnished bored or tapped to required nominal pipe size.

**MATERIALS:**—400 lb. through 2500 lb. flanges are carried in stock in ASTM A105-75a normalized.

As with regular full size flanges, Reducing Flanges can be furnished on special order in practically any forgeable metal. See catalog section on special materials.

# REDUCING FLANGES

Slip-on, Threaded and Welding Neck

## IMPORTANT NOTE

For a great many years Reducing Flanges have been specified in accordance with the practice outlined in the table below, which is that given in ANSI B16.5.

With the publication of this catalog, Taylor Forge suggests an innovation which, it is believed, will simplify the specifying and ordering of Reducing Flanges and help eliminate many of the errors that result from current practice.

It is suggested that in ordering Reducing Flanges users simply indicate the two nominal pipe sizes involved, giving the

larger one first, and the Pressure Standard required.

Examples:—

- (1) 6" to 4" 150 lb. Reduc. S. O. Flanges
- (2) 12" to 8" 600 lb. Reduc. THRD. Flanges
- (3) 16" to 14" 900 lb. Reduc. W. N. Flanges

In these examples the abbreviated nomenclature is as explained on Page 69, the term "Reduc.," of course meaning "Reducing", and the abbreviations "S.O., THRD." and "W.N." identifying respectively Slip-On, Threaded and Welding Neck type flanges.

ANSI B16.5

ASTM A181 & A

| In Ordering Specify<br>First<br>The reduced<br>Nominal<br>Pipe Size<br>i.e.<br>the size<br>to which<br>reduction<br>is to be<br>made | Second { The Outside Diameter (as listed below) of the larger size flange from which the reduction is to be made |                  |                  |                 |                  |                  |                  | Flange Size Having Diameters Listed at Left | Minimum Bore or Tapping of Hub Flange |
|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------|------------------|-----------------|------------------|------------------|------------------|---------------------------------------------|---------------------------------------|
|                                                                                                                                      | 150 Lb.                                                                                                          | 300 Lb.          | 400 Lb.          | 600 Lb.         | 900 Lb.          | 1500 Lb.         | 2500 Lb.         |                                             |                                       |
|                                                                                                                                      | 3½<br>4¼<br>4½                                                                                                   | 4½<br>4¾<br>5¼   | 4½<br>4¾<br>5¼   | 4½<br>4¾<br>5¼  | 5½<br>5¾<br>6¼   | 5½<br>5¾<br>6¼   | 5½<br>6¼<br>7¼   | ¾<br>1<br>1¼                                | ½<br>½<br>½                           |
|                                                                                                                                      | 5<br>6<br>7                                                                                                      | 6½<br>6½<br>7½   | 6½<br>6½<br>7½   | 6½<br>6½<br>7½  | 7<br>8½<br>9½    | 7<br>8½<br>9½    | 8<br>9¼<br>10½   | 1½<br>2<br>2½                               | ½<br>1<br>1¼                          |
|                                                                                                                                      | 7½<br>8½<br>9                                                                                                    | 8¼<br>9<br>10    | 8¼<br>9<br>10    | 8¼<br>9<br>10¾  | 9½<br>--<br>11½  | 10½<br>--<br>12¼ | 12<br>--<br>14   | 3<br>3½<br>4                                | 1¼<br>1½<br>1½                        |
|                                                                                                                                      | 10<br>11<br>13½                                                                                                  | 11<br>12½<br>15  | 11<br>12½<br>15  | 13<br>14<br>16½ | 13¾<br>15<br>18½ | 14¾<br>15½<br>19 | 16½<br>19<br>21¾ | 5<br>6<br>8                                 | 1½<br>2½<br>3                         |
|                                                                                                                                      | 16<br>19<br>21                                                                                                   | 17½<br>20½<br>23 | 17½<br>20½<br>23 | 20<br>22<br>23¾ | 21½<br>24<br>25¼ | 23<br>26½<br>29½ | 26½<br>30<br>--  | 10<br>12<br>14                              | 3½<br>3½<br>3½                        |
|                                                                                                                                      | 23½<br>25<br>27½                                                                                                 | 25½<br>28<br>30½ | 25½<br>28<br>30½ | 27<br>29¼<br>32 | 27¾<br>31<br>33¾ | 32½<br>36<br>38¾ | --<br>--<br>--   | 16<br>18<br>20                              | 4<br>4<br>4                           |
|                                                                                                                                      | 29½<br>32                                                                                                        | 33<br>36         | 33<br>36         | 34½<br>37       | --<br>41         | --<br>46         | --<br>--         | 22†<br>24                                   | 4<br>4                                |

All dimensions are in inches. Prices on application.  
Pressure-Temperature ratings—Page 57.  
Tolerances—Page 44.

Welding Bevel Standards—Page 43.  
Threading details—Page 53 & 54.  
† 22" size not covered by ANSI B16.5.

## DISCUSSION OF ANSI AND OTHER PIPE FLANGE STANDARDS

By far the most widely used steel pipe flanges are those covered by the American National Standards Institute's B16.5. This Standard is the result of the most painstaking study and almost continuous effort over a period of more than 35 years by ANSI Standards Committee B16, first organized in 1920 to accomplish standardization of pipe flanges and fittings.

From the organization of the committee up to the present moment Taylor Forge has always been closely identified with its work, and we are proud indeed of having contributed so largely in the development of much of the fundamental technical information upon which the Standard is based.

Currently the largest size covered by ANSI B16.5 is 24", and when *steel* flanges are required in larger diameters they are often furnished to the dimensions of Cast Iron Standards under ANSI B16.1. This, of course, is because such flanges are usually required to connect with valves, pumps, compressors, blowers and similar equipment having flanged ends made to Cast Iron Standards. Over the years industry usages have resulted in the adoption of dimensions that are acceptable common practice and such standards are not easily abandoned, nor is it necessarily desirable that they should be.

In addition to ANSI Steel and Cast Iron Standards the American Water Works Association has established Steel Flange Standards designated "Standard Specifications for Steel Pipe Flanges" AWWA C207-54T. In developing these standards, the American Water Works Association quite properly drew largely on existing Steel and Cast Iron ANSI Standards, taking over some without change and adapting others to their requirements.

As the first and still the largest American manufacturer of steel pipe flanges, Taylor Forge began many years ago to design and forge steel flanges for many specialized applications, often involving heat exchanger, boiler and other pressure vessel work. Favorable experience with these designs and wide usage permitted standardization by Taylor Forge which, in turn, lowered flange costs and made possible factory stocking for more prompt service. These flanges are not covered by any engineering body's standard; in fact, quite generally they antedate such standards. The fundamental integrity of their design is attested by the favorable experience of users over nearly half a century.

The following pages are devoted to the cataloging of that group of flanges which may be roughly classified as "Large Diameter Flanges" and we offer the following commentary to provide a summary for better understanding of applicable standards, including those established by Taylor Forge. For clarity and ready reference comments are made on a page by page basis:

### CLASS 125 LW (Light Weight)—Page 29

With the publication of this catalog, Taylor Forge establishes this designation in order to end the confusion that has resulted from the previous practice of applying several different names to these flanges, the most common being "American Standard Diameter and Drilling" and "Light Weight ASME".

Class 125 LW flanges are intended for use with light wall pipe, say 1/4" wall thickness or less, and they have been widely used with Spiral-Weld Pipe for flanged connections to cast iron valves, pump outlets or other cast iron equipment. Cloth inserted rubber gaskets should be used with carbon steel bolts. They are identical with AWWA hub flanges Class D shown on page 34. They also match in diameter and drilling Class 125 Cast Iron (ANSI B16.1) and 150 lb. Steel (ANSI B16.5) but are thinner.

### CLASS 125—Page 30

Strictly speaking, there is no *Steel* Flange Standard of this designation, the term "Class 125" being precisely applicable to Cast Iron Standard ANSI B16.1. These flanges are used for connections to cast steel valves, pumps or other equipment, having flanged ends made to Cast Iron Standard dimensions.

Class 125 flanges are wide in face since the bolt circle must be relatively large, because of the thickness of the cast body. Carbon steel bolting is intended and alloy studs should not be used without special precautions as the higher strength of alloy bolting makes dishing of the flange a hazard.

These flanges are identical with Class E of AWWA C207-54T.

### CLASS 250—Page 31

As in the case of Class 125, there is no *Steel* Flange Standard of this designation, and the dimensions listed correspond with those of Class 250 for Cast Iron, ANSI B16.1. They are ordinarily used for flanged connections to cast steel valves and equipment made to Class 250 Cast Iron Standard dimensions and we recommend their use only for such purposes.

We do not recommend usage of Class 250 flanges at pressure ratings higher than those established for the comparable dimensions of cast iron. Statements made in connection with face width and bolting of Class 125 apply also to Class 250.

**CLASS 75—Page 32**

This designation has been established by Taylor Forge to apply to flanges formerly listed as "Taylor Forge Large Diameter Flanges—50 lb. pressure at 100F." They are designed in accordance with "Modern Flange Design" (Bulletin 502) and hence they comply in all respects with the current ASME Code.

Dimensions of Class 75 flanges were established by Taylor Forge about 1938 for designers requiring flanges for low pressure piping systems and storage tanks operating at substantially atmospheric temperatures. The dimensions are such that they are suitable only for pipe to pipe or pressure vessel to head connections since the bolt circle has been pulled in close to the outside diameter of the shell and the bolting does not match valve or equipment Standards. Pressure ratings are indicated in the footnotes to the tables.

**CLASSES 175 and 350—Pages 33—34**

These designations have been established by Taylor Forge to apply to Flanges formerly listed as "Taylor Forge Large Diameter Flanges—150 lb. W.S.P. at 750F" and "300 lb. W.S.P. at 750F".

These dimensions were established about 1938 to provide a set of standard dimensions for pressure vessel and piping designers on jobs which do not justify special designing to exact requirements. The dimensions do not match existing valve or equipment standards and the flanges are not suitable for bolting to valve, pump and other cast equipment outlets.

The pressure ratings indicated in the footnotes of the respective tables are based on the use of alloy bolts and compressed asbestos gaskets.

These flanges have been designed to comply in all respects with the current ASME Code.

**AWWA C207-54T FLANGES****CLASS B—Page 35**

These flanges match Class 25 Cast Iron (ANSI B16b2) in outside diameter, bolt circle and number of bolts. The bolt size is also identical for flange sizes 48" and smaller. In sizes larger than 48", however, the bolt diameter is somewhat greater than specified in the Cast Iron Standard. It might be noted that these flanges also match Class 125 Cast Iron Flanges (ANSI B16.1) in diameter, bolt circle and number of bolts but the bolt diameter is smaller.

As indicated in the footnotes of the table, the water pressure rating of 86 lbs. is based on cloth inserted rubber gaskets and carbon steel bolts.

AWWA Specification C207-54T also tabulates Class B flanges of rectangular cross section but they are not as rugged as hubbed flanges. While Taylor Forge can, of course, produce the rectangular sections, it is usually more prudent to specify the hub type flange unless very large

quantities are involved. Class B hub flange forgings are carried in stock in sizes up to and including 36" and because of their restricted use we do not catalog the rectangular ring type.

**CLASS D—Page 35**

AWWA Specification C207-54T also lists both hub and ring flanges, but in this class, because of the strength added by the hub, the hub flanges are thinner than the ring flanges. We catalog here only the hub type and because of their superiority in every way, users are urged to specify only the hub type.

These flanges are identical with Class 125 LW shown on Page 28 and all of the comments applying to Class 125 LW are equally applicable to these flanges.

**CLASS E—Page 35**

The Standard covers hub flanges only. In outside diameter, thickness and drilling (except that of all sizes bolt holes are  $\frac{1}{8}$ " larger than bolt diameter) they agree with Class 125 Cast Iron which in sizes 24" and smaller are identical with 150 lb. ANSI B16.5 Forged Steel Flanges, flat faced.

If the wall thickness of the pipe is less than  $\frac{1}{4}$ " we would recommend the use of Class 125 LW instead of Class E because the Class 125 LW flanges are proportioned somewhat better for attachment to the thin wall pipe.

**MSS-SP-44**

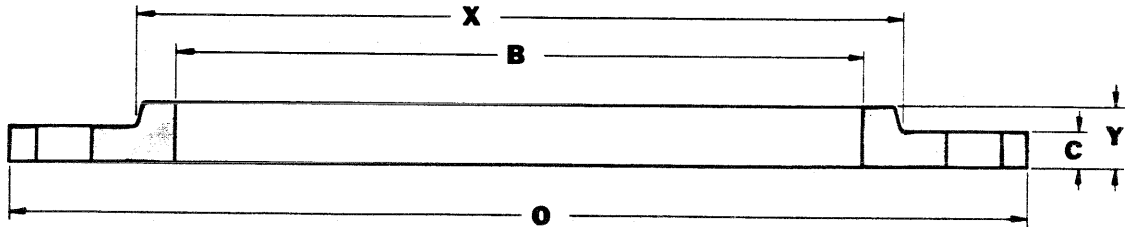
MSS SP-44 was developed to establish uniform flange dimensions for use with high pressure pipe lines of 26" through 36" size, and classes 300 through 900. It is now revised to include Class 150 and sizes 12"-60". The design of these flanges provides for use with API 5LX line pipe and they are proportioned accordingly. The design also reflects the higher stresses allowable in pipe-line service. Refer to Taylor Forge Pipeline Catalog 723 for complete listing of MSS SP-44 and API 605 Flanges.

**CAUTIONARY NOTE**

Attention is directed to the difference between ANSI B16.5 and MSS SP-44 Flanges. Flanges shown in ANSI B16.5 were originally designed for attachment to relative thickwall pipe, whereas the larger pipe line flanges shown in MSS SP-44 have hubs specifically designed for attachment to relatively thin-wall, high yield strength pipe.

When applying 12" and larger ANSI B16.5 flanges (as well as the 22" size detailed in MSS SP-44) to thin-wall pipe for service pressures at or near the maximum atmospheric temperature rating of the flanges, the user should satisfy himself that the resultant stresses at the small end of the flange hub will not be excessive.

Also due care should be taken when using MSS SP-44 flanges with relatively thick-wall pipe or on pressure vessels to avoid stresses beyond the limits of the applicable Code.



## Forged and Rolled Steel

ASTM A181

| Nominal<br>Pipe<br>Size | Outside<br>Diameter | Thick-<br>ness | Bore  | Length<br>thru<br>Hub | Diam.<br>at Base<br>of Hub | Approx<br>Weight<br>Pounds | DRILLING TEMPLATE       |                       |                      |                      |
|-------------------------|---------------------|----------------|-------|-----------------------|----------------------------|----------------------------|-------------------------|-----------------------|----------------------|----------------------|
|                         | O                   | C              | B     | Y                     | X                          |                            | Bolt<br>Circle<br>Diam. | Number<br>of<br>Holes | Diam.<br>of<br>Holes | Diam.<br>of<br>Bolts |
| 6                       | 11                  | 5/16           | 6.72  | 1 1/4                 | 7 7/16                     | 13                         | 9 1/2                   | 8                     | 3/4                  | 3/4                  |
| 8                       | 13 1/2              | 5/16           | 8.72  | 1 1/4                 | 9 1/16                     | 18                         | 11 3/4                  | 8                     | 3/4                  | 3/4                  |
| 10                      | 16                  | 11/16          | 10.88 | 1 1/4                 | 12                         | 26                         | 14 1/4                  | 12                    | 1                    | 3/4                  |
| 12                      | 19                  | 1 1/16         | 12.88 | 1 1/4                 | 14 3/8                     | 42                         | 17                      | 12                    | 1                    | 3/4                  |
| 14                      | 21                  | 3/4            | 14.14 | 1 1/4                 | 15 3/4                     | 44                         | 18 3/4                  | 12                    | 1 1/8                | 1                    |
| 16                      | 23 1/2              | 3/4            | 16.16 | 1 1/4                 | 18                         | 58                         | 21 1/4                  | 16                    | 1 1/8                | 1                    |
| 18                      | 25                  | 3/4            | 18.18 | 1 1/4                 | 19 7/8                     | 59                         | 22 3/4                  | 16                    | 1 1/4                | 1 1/8                |
| 20                      | 27 1/2              | 3/4            | 20.20 | 1 1/4                 | 22                         | 69                         | 25                      | 20                    | 1 1/4                | 1 1/8                |
| 22                      | 29 1/2              | 1              | 22.22 | 1 3/4                 | 24 1/4                     | 76                         | 27 1/4                  | 20                    | 1 3/8                | 1 1/4                |
| 24                      | 32                  | 1              | 24.25 | 1 3/4                 | 26 1/8                     | 115                        | 29 1/2                  | 20                    | 1 3/8                | 1 1/4                |
| 26                      | 34 1/4              | 1              | 26.25 | 1 3/4                 | 28 1/2                     | 125                        | 31 3/4                  | 24                    | 1 3/8                | 1 1/4                |
| 28                      | 36 1/2              | 1              | 28.25 | 1 3/4                 | 30 1/2                     | 140                        | 34                      | 28                    | 1 3/8                | 1 1/4                |
| 30                      | 38 3/4              | 1              | 30.25 | 1 3/4                 | 32 1/2                     | 150                        | 36                      | 28                    | 1 3/8                | 1 1/4                |
| 32                      | 41 1/4              | 1 1/8          | 32.25 | 1 3/4                 | 34 3/4                     | 205                        | 38 1/2                  | 28                    | 1 3/8                | 1 1/2                |
| 34                      | 43 3/4              | 1 1/8          | 34.25 | 1 3/4                 | 36 3/4                     | 215                        | 40 1/2                  | 32                    | 1 3/8                | 1 1/2                |
| 36                      | 46                  | 1 1/8          | 36.25 | 1 3/4                 | 38 3/4                     | 235                        | 42 3/4                  | 32                    | 1 3/8                | 1 1/2                |
| 38                      | 48 3/4              | 1 1/8          | 38.25 | 1 3/4                 | 40 3/4                     | 265                        | 45 1/4                  | 32                    | 1 3/8                | 1 1/2                |
| 40                      | 50 3/4              | 1 1/8          | 40.25 | 1 3/4                 | 43                         | 280                        | 47 1/4                  | 36                    | 1 3/8                | 1 1/2                |
| 42                      | 53                  | 1 1/4          | 42.25 | 1 3/4                 | 45                         | 330                        | 49 1/2                  | 36                    | 1 3/8                | 1 1/2                |
| 44                      | 55 1/4              | 1 1/4          | 44.25 | 2 1/4                 | 47                         | 350                        | 51 3/4                  | 40                    | 1 3/8                | 1 1/2                |
| 46                      | 57 1/4              | 1 1/4          | 46.25 | 2 1/4                 | 49                         | 365                        | 53 3/4                  | 40                    | 1 3/8                | 1 1/2                |
| 48                      | 59 1/2              | 1 3/8          | 48.25 | 2 1/2                 | 51                         | 425                        | 56                      | 44                    | 1 3/8                | 1 1/2                |
| 50                      | 61 3/4              | 1 3/8          | 50.25 | 2 1/2                 | 53                         | 450                        | 58 1/4                  | 44                    | 1 3/8                | 1 3/4                |
| 52                      | 64                  | 1 3/8          | 52.25 | 2 1/2                 | 55                         | 475                        | 60 1/2                  | 44                    | 1 3/8                | 1 3/4                |
| 54                      | 66 1/4              | 1 3/8          | 54.25 | 2 1/2                 | 57                         | 500                        | 62 3/4                  | 44                    | 1 3/8                | 1 3/4                |
| 60                      | 73                  | 1 1/2          | 60.25 | 2 3/4                 | 63                         | 640                        | 69 1/4                  | 52                    | 1 3/8                | 1 3/4                |
| 66                      | 80                  | 1 1/2          | 66.25 | 2 3/4                 | 69                         | 750                        | 76                      | 52                    | 1 3/8                | 1 3/4                |
| 72                      | 86 1/2              | 1 1/2          | 72.25 | 2 3/4                 | 75                         | 850                        | 82 1/2                  | 60                    | 1 3/8                | 1 3/4                |
| 84                      | 99 3/4              | 1 3/4          | 84.25 | 3                     | 87 1/2                     | 1000                       | 95 1/2                  | 64                    | 2 1/8                | 2                    |
| 96                      | 113 1/4             | 2              | 96.25 | 3 1/4                 | 100                        | 1650                       | 108 1/2                 | 68                    | 2 3/8                | 2 1/4                |

All dimensions are in inches. Prices on application.

Carbon steel bolts are intended.

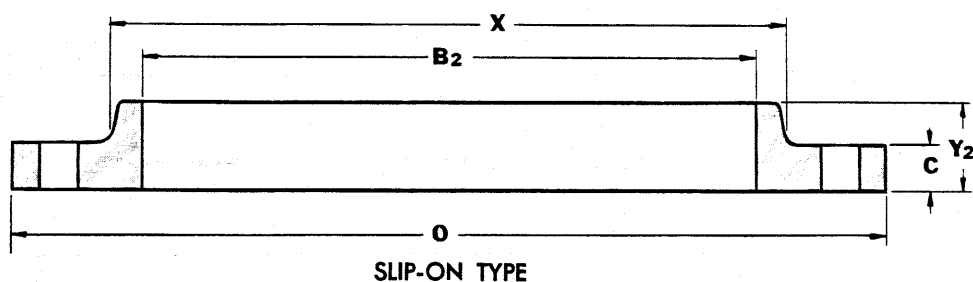
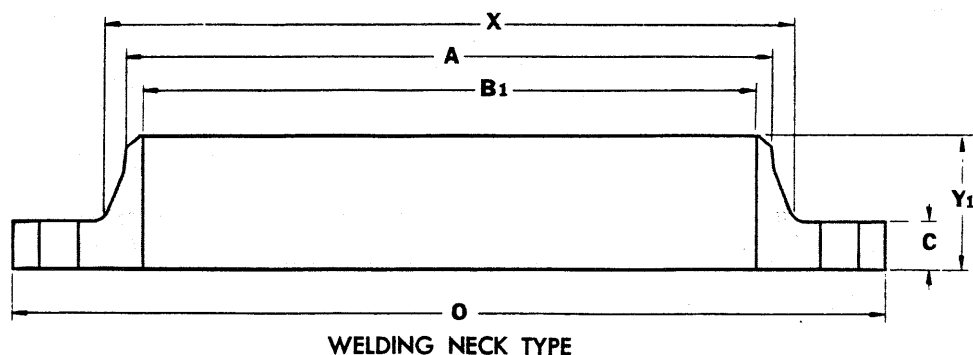
- Taylor Forge has established this designation in order to end the confusion that has resulted from the previous practice of applying several different names to these flanges, the most common being "American Standard Diameter and Drilling" and "Light Weight ASME." See Page 26 for further discussion.

These flanges are commonly used with full face gasket, but ring gaskets extending to the inside edge of the bolt holes may also be used.

Water service rating at atmospheric temperatures: Sizes 6" to 12" inclusive 175 psi; Sizes larger than 12" 150 psi. Blind Flanges will be furnished to the thicknesses listed above, unless otherwise specified.

These flanges have the same diameter and drilling as Class 125 cast iron flanges (ANSI B16.1). In sizes 24" and smaller they also match ANSI B16.5 150 lb. Standard. Class 125 LW Flanges are same as AWWA Class D.

Tolerances—Page 44

**Forged and Rolled Steel**

| Nominal<br>Pipe<br>Size | COMMON<br>DIMENSIONS  |                |                            | LENGTH<br>THRU HUB   |         | BORE                         |         | Diam.<br>of Hub<br>at Bevel | Approx<br>Weight<br>Pounds |         | DRILLING TEMPLATE       |                       |                      |                      |
|-------------------------|-----------------------|----------------|----------------------------|----------------------|---------|------------------------------|---------|-----------------------------|----------------------------|---------|-------------------------|-----------------------|----------------------|----------------------|
|                         | Out-<br>side<br>Diam. | Thick-<br>ness | Diam.<br>at Base<br>of Hub | Weld-<br>ing<br>Neck | Slip-On | Weld-<br>ing<br>Neck         | Slip-On |                             | Weld-<br>ing<br>Neck       | Slip-On | Bolt<br>Circle<br>Diam. | Number<br>of<br>Holes | Diam.<br>of<br>Holes | Diam.<br>of<br>Bolts |
|                         | O                     | C              | X                          | Y1                   | Y2      | B1                           | B2      |                             | A                          |         |                         |                       |                      |                      |
| 26                      | 34 1/4                | 2              | 28 1/2                     | 5                    | 3 3/8   | To be specified by purchaser | 26 1/4  | 26                          | 260                        | 235     | 31 3/4                  | 24                    | 1 3/8                | 1 1/4                |
| 28                      | 36 1/2                | 2 1/16         | 30 3/4                     | 5 1/16               | 3 3/16  |                              | 28 1/4  | 28                          | 295                        | 270     | 34                      | 28                    | 1 3/8                | 1 1/4                |
| 30                      | 38 3/4                | 2 1/8          | 32 3/4                     | 5 1/8                | 3 1/2   |                              | 30 1/4  | 30                          | 340                        | 305     | 36                      | 28                    | 1 3/8                | 1 1/4                |
| 32                      | 41 3/4                | 2 1/4          | 35                         | 5 1/4                | 3 5/8   |                              | 32 1/4  | 32                          | 410                        | 375     | 38 1/2                  | 28                    | 1 3/8                | 1 1/2                |
| 34                      | 43 3/4                | 2 3/16         | 37                         | 5 5/16               | 3 11/16 |                              | 34 1/4  | 34                          | 440                        | 400     | 40 1/2                  | 32                    | 1 3/8                | 1 1/2                |
| 36                      | 46                    | 2 3/8          | 39 1/4                     | 5 3/8                | 3 3/4   |                              | 36 1/4  | 36                          | 495                        | 450     | 42 3/4                  | 32                    | 1 3/8                | 1 1/2                |
| 38                      | 48 3/4                | 2 3/8          | 41 3/4                     | 5 3/8                | 3 3/4   |                              | 38 1/4  | 38                          | 570                        | 530     | 45 1/4                  | 32                    | 1 3/8                | 1 1/2                |
| 40                      | 50 3/4                | 2 1/2          | 43 3/4                     | 5 1/2                | 3 3/8   |                              | 40 1/4  | 40                          | 620                        | 570     | 47 1/4                  | 36                    | 1 3/8                | 1 1/2                |
| 42                      | 53                    | 2 5/8          | 46                         | 5 5/8                | 4       |                              | 42 1/4  | 42                          | 710                        | 650     | 49 1/2                  | 36                    | 1 3/8                | 1 1/2                |
| 44                      | 55 1/4                | 2 3/8          | 48                         | 5 5/8                | 4       |                              | 44 1/4  | 44                          | 750                        | 690     | 51 3/4                  | 40                    | 1 3/8                | 1 1/2                |
| 46                      | 57 1/4                | 2 11/16        | 50                         | 5 11/16              | 4 1/16  |                              | 46 1/4  | 46                          | 800                        | 730     | 53 3/4                  | 40                    | 1 3/8                | 1 1/2                |
| 48                      | 59 1/2                | 2 3/4          | 52 1/4                     | 5 3/4                | 4 1/8   |                              | 48 1/4  | 48                          | 870                        | 800     | 56                      | 44                    | 1 3/8                | 1 1/2                |
| 50                      | 61 3/4                | 2 3/4          | 54 1/4                     | 5 3/4                | 4 1/8   |                              | 50 1/4  | 50                          | 900                        | 830     | 58 1/4                  | 44                    | 1 7/8                | 1 3/4                |
| 52                      | 64                    | 2 7/8          | 56 1/2                     | 5 7/8                | 4 1/4   |                              | 52 1/4  | 52                          | 1000                       | 920     | 60 1/2                  | 44                    | 1 7/8                | 1 3/4                |
| 54                      | 66 1/4                | 3              | 58 3/4                     | 6                    | 4 3/8   |                              | 54 1/4  | 54                          | 1100                       | 1025    | 62 3/4                  | 44                    | 1 7/8                | 1 3/4                |
| 60                      | 73                    | 3 1/8          | 65 1/4                     | 6 1/8                | 4 1/2   |                              | 60 1/4  | 60                          | 1350                       | 1250    | 69 1/4                  | 52                    | 1 7/8                | 1 3/4                |
| 66                      | 80                    | 3 3/8          | 71 1/2                     | 6 3/8                | 4 7/8   |                              | 66 1/4  | 66                          | 1775                       | 1625    | 76                      | 52                    | 1 7/8                | 1 3/4                |
| 72                      | 86 1/2                | 3 1/2          | 78 1/2                     | 6 1/2                | 5       |                              | 72 1/4  | 72                          | 2100                       | 1925    | 82 1/2                  | 60                    | 1 7/8                | 1 3/4                |
| 84                      | 99 3/4                | 3 7/8          | 90 1/2                     | 6 7/8                | 5 3/8   |                              | 84 1/4  | 84                          | 2825                       | 2600    | 95 1/2                  | 64                    | 2 1/8                | 2                    |
| 96                      | 113 1/4               | 4 1/4          | 102 3/4                    | 7 1/4                | 5 3/4   |                              | 96 1/4  | 96                          | 3800                       | 3275    | 108 1/2                 | 68                    | 2 3/8                | 2 1/4                |

All dimensions are in inches. Prices on application.

- Properly there is no Steel Flange Standard of this designation, the term "Class 125" being precisely applicable to a Cast Iron Standard under ANSI B16.1. The above flanges correspond to this Standard in diameter, thickness and drilling, except that for all sizes bolt holes are 1/8" larger than bolt diameter. For further discussion of this designation, its correspondence also with AWWA C207-54T, Class E,

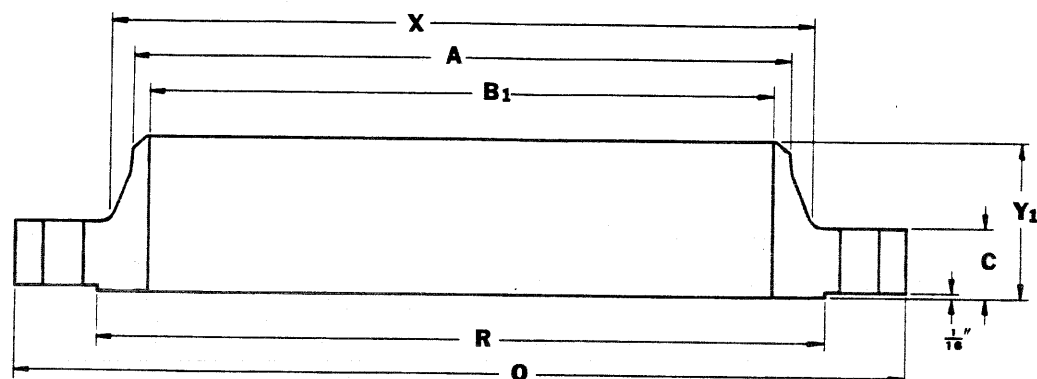
and selection of sizes under 26", see Page 26.

Water service rating at atmospheric temperatures—275 psi (under AWWA Standard).

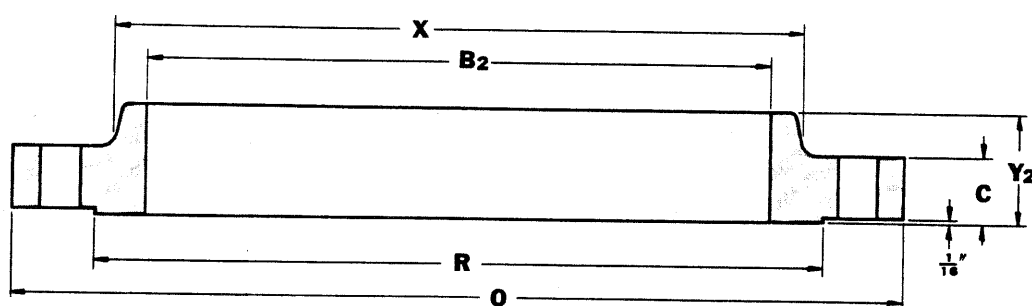
These flanges furnished flat faced unless otherwise specified. They may be used with full face gaskets or with ring gaskets extending to the inside edge of the bolt holes. Carbon steel bolts are intended.

Blind Flanges will be furnished to thicknesses listed above, unless otherwise specified.

Tolerances—Page 44



WELDING NECK TYPE



SLIP-ON TYPE

## Forged and Rolled Steel

ASTM A181

| Nominal<br>Pipe<br>Size | COMMON<br>DIMENSIONS  |                |                        |                            | LENGTH<br>THRU HUB   |             | BORE                         |             | Diam.<br>of Hub<br>at Bevel | Approx<br>Weight<br>Pounds |             | DRILLING TEMPLATE       |                       |                      |                      |
|-------------------------|-----------------------|----------------|------------------------|----------------------------|----------------------|-------------|------------------------------|-------------|-----------------------------|----------------------------|-------------|-------------------------|-----------------------|----------------------|----------------------|
|                         | Out-<br>side<br>Diam. | Thick-<br>ness | O.D.<br>Raised<br>Face | Diam.<br>at Base<br>of Hub | Weld-<br>ing<br>Neck | Slip-<br>On | Weld-<br>ing<br>Neck         | Slip-<br>On |                             |                            |             | Bolt<br>Circle<br>Diam. | Number<br>of<br>Holes | Diam.<br>of<br>Holes | Diam.<br>of<br>Bolts |
|                         | O                     | C              | R                      | X                          | Y1                   | Y2          | B1                           | B2          | A                           | Weld-<br>ing<br>Neck       | Slip-<br>On |                         |                       |                      |                      |
| 26                      | 38 1/4                | 2 1/16         | 32 7/16                | 30 1/2                     | 5 13/16              | 4 3/4       | To be specified by purchaser | 26 1/4      | 26                          | 530                        | 530         | 34 1/2                  | 28                    | 1 7/8                | 1 3/4                |
| 28                      | 40 3/4                | 2 1/16         | 34 1/16                | 33                         | 5 1/2                | 5           |                              | 28 1/4      | 28                          | 630                        | 640         | 37                      | 28                    | 1 7/8                | 1 3/4                |
| 30                      | 43                    | 3              | 37 3/16                | 35 1/4                     | 6                    | 5           |                              | 30 1/4      | 30                          | 700                        | 710         | 39 1/4                  | 28                    | 1 7/8                | 1 3/4                |
| 32                      | 45 1/4                | 3 1/8          | 39 7/16                | 37 1/2                     | 6 1/8                | 5 1/8       |                              | 32 1/4      | 32                          | 790                        | 800         | 41 1/2                  | 28                    | 1 7/8                | 1 3/4                |
| 34                      | 47 1/2                | 3 1/4          | 41 1/16                | 39 1/2                     | 6 1/4                | 5 1/4       |                              | 34 1/4      | 34                          | 880                        | 890         | 43 1/2                  | 28                    | 1 7/8                | 1 3/4                |
| 36                      | 50                    | 3 3/8          | 43 1/16                | 41 1/2                     | 6 3/8                | 5 3/8       |                              | 36 1/4      | 36                          | 970                        | 970         | 46                      | 32                    | 2 1/8                | 2                    |
| 38                      | 52 1/4                | 3 7/16         | 45 1/16                | 43 1/2                     | 6 7/16               | 5 1/2       |                              | 38 1/4      | 38                          | 1050                       | 1050        | 48                      | 32                    | 2 1/8                | 2                    |
| 40                      | 54 1/2                | 3 1/2          | 47 1/16                | 45 3/4                     | 6 1/2                | 5 1/2       |                              | 40 1/4      | 40                          | 1150                       | 1175        | 50 1/4                  | 36                    | 2 1/8                | 2                    |
| 42                      | 57                    | 3 1/16         | 50 1/16                | 47 3/4                     | 6 1/2                | 5 5/8       |                              | 42 1/4      | 42                          | 1325                       | 1300        | 52 1/4                  | 36                    | 2 1/8                | 2                    |
| 44                      | 59 1/4                | 3 3/4          | 52 1/16                | 49 3/4                     | 7                    | 5 3/4       |                              | 44 1/4      | 44                          | 1425                       | 1400        | 55                      | 36                    | 2 1/8                | 2                    |
| 46                      | 61 1/2                | 3 3/8          | 54 1/16                | 51 3/4                     | 7 1/8                | 5 5/8       |                              | 46 1/4      | 46                          | 1525                       | 1500        | 57 1/4                  | 40                    | 2 1/8                | 2                    |
| 48                      | 65                    | 4              | 58 1/16                | 54                         | 7 1/4                | 6           |                              | 48 1/4      | 48                          | 1825                       | 1800        | 60 1/4                  | 40                    | 2 1/8                | 2                    |

All dimensions are in inches. Prices on application.

- Properly there is no Steel Flange Standard of this designation, the term "Class 250" being precisely applicable to a Cast Iron Standard under ANSI B16b. The above flanges correspond to this Standard in diameter, thickness and drilling (except that bolt holes are 1/8" larger than bolt diam-

eter) and they carry the same pressure rating. For further discussion of this designation and the selection of sizes under 26", see Page 26.

While the Class 250 Standard specifies a 1/16" raised face, any other type of facing can be furnished. See Page 48 Carbon steel bolts are intended.

Blind Flanges will be furnished to the thicknesses listed above, unless otherwise specified.

Tolerances—Page 44

For applicable drawings  
see page 33

When ordering Flanges in these  
Classes the thickness and outside  
diameter of the pipe or shell to  
be used must be specified.

CLASS 75  
and  
CLASS 175

## Welding Neck and Blind\*

| Nominal<br>Size<br>(Inside<br>Diam.) | COMMON DIMENSIONS     |                        |                            | THICKNESS<br>C |     | Diam.<br>at Base<br>of Hub | Length<br>Thru<br>Hub | Approx Weight<br>Pounds |      | DRILLING TEMPLATE    |       |                         |                       |
|--------------------------------------|-----------------------|------------------------|----------------------------|----------------|-----|----------------------------|-----------------------|-------------------------|------|----------------------|-------|-------------------------|-----------------------|
|                                      | Out-<br>side<br>Diam. | O.D.<br>Raised<br>Face | Asbestos<br>Gasket<br>Size |                |     |                            |                       |                         |      | Weld-<br>ing<br>Neck | Blind | Bolt<br>Circle<br>Diam. | Number<br>of<br>Holes |
|                                      |                       |                        |                            | O              | R   |                            |                       |                         |      |                      |       |                         |                       |
|                                      |                       |                        |                            |                |     |                            | X                     | Y                       |      |                      |       |                         |                       |
| 26                                   | 31 ½                  | 28 ¾                   | 27 ¾x28 ¾                  | 1 ¼            | 1 ¼ | 27 ⅞                       | 3                     | 98                      | 265  | 29 ⅞                 | 32    | 1                       | ⅞                     |
| 28                                   | 33 ½                  | 30 ⅝                   | 29 ¾x30 ⅝                  | 1 ¼            | 1 ¼ | 29 ⅞                       | 3                     | 105                     | 300  | 31 ⅞                 | 36    | 1                       | ⅞                     |
| 30                                   | 35 ½                  | 32 ⅝                   | 31 ¾x32 ⅝                  | 1 ¼            | 1 ⅝ | 31 ⅞                       | 3                     | 110                     | 370  | 33 ⅝                 | 36    | 1                       | ⅞                     |
| 32                                   | 38 ¼                  | 35                     | 33 ⅞x35                    | 1 ¼            | 1 ½ | 33 ⅜                       | 3 ¼                   | 140                     | 470  | 36 ⅞                 | 36    | 1 ⅞                     | 1                     |
| 34                                   | 40 ¼                  | 37                     | 35 ⅞x37                    | 1 ¼            | 1 ½ | 35 ⅜                       | 3 ¼                   | 150                     | 520  | 38 ⅞                 | 40    | 1 ⅞                     | 1                     |
| 36                                   | 42 ¼                  | 39                     | 37 ⅞x39                    | 1 ¼            | 1 ⅝ | 37 ⅜                       | 3 ¼                   | 160                     | 620  | 40 ⅞                 | 40    | 1 ⅞                     | 1                     |
| 42                                   | 49                    | 45 ½                   | 44 ⅞x45 ½                  | 1 ¼            | 1 ⅞ | 43 ⅜                       | 3 ½                   | 210                     | 970  | 46 ⅜                 | 48    | 1 ¼                     | 1 ⅞                   |
| 48                                   | 55                    | 51 ½                   | 50 ⅞x51 ½                  | 1 ¼            | 2 ⅞ | 49 ⅜                       | 3 ¾                   | 240                     | 1375 | 52 ⅜                 | 52    | 1 ¼                     | 1 ⅞                   |
| 54                                   | 61 ¼                  | 57 ¾                   | 56 ¼x57 ¾                  | 1 ⅝            | 2 ⅝ | 56                         | 4                     | 310                     | 1925 | 59                   | 64    | 1 ¼                     | 1 ⅞                   |
| 60                                   | 67 ¼                  | 63 ¾                   | 62 ¼x63 ¾                  | 1 ⅝            | 2 ⅞ | 62                         | 4 ⅞                   | 400                     | 2575 | 65                   | 72    | 1 ¼                     | 1 ⅞                   |
| 66                                   | 74                    | 70 ⅞                   | 68 ⅞x70 ⅞                  | 1 ⅞            | 2 ⅞ | 68                         | 4 ⅞                   | 560                     | 3400 | 71 ½                 | 72    | 1 ⅝                     | 1 ¼                   |
| 72                                   | 80                    | 76 ⅞                   | 74 ⅞x76 ⅞                  | 2 ¼            | 3 ⅞ | 74                         | 5 ¼                   | 700                     | 4350 | 77 ½                 | 80    | 1 ⅝                     | 1 ¼                   |

## Slip-On and Blind\*

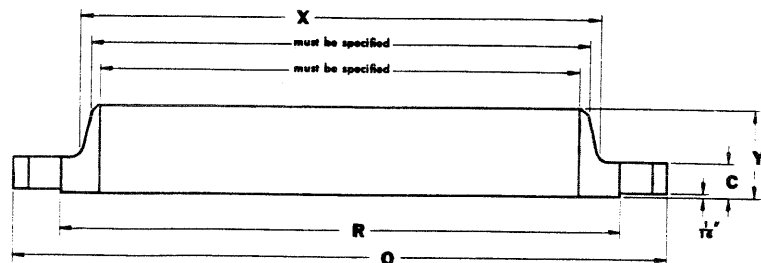
| Nominal<br>Size<br>(Inside<br>Diam.) | COMMON DIMENSIONS     |                        |                            | THICKNESS<br>C |       | Diam.<br>at Base<br>of Hub | Length<br>Thru<br>Hub | Approx Weight<br>Pounds |       | DRILLING TEMPLATE       |                       |                      |                      |
|--------------------------------------|-----------------------|------------------------|----------------------------|----------------|-------|----------------------------|-----------------------|-------------------------|-------|-------------------------|-----------------------|----------------------|----------------------|
|                                      | Out-<br>side<br>Diam. | O.D.<br>Raised<br>Face | Asbestos<br>Gasket<br>Size |                |       |                            |                       |                         |       | Bolt<br>Circle<br>Diam. | Number<br>of<br>Holes | Diam.<br>of<br>Holes | Diam.<br>of<br>Bolts |
|                                      |                       |                        |                            | Slip-<br>On    | Blind |                            |                       | Slip-<br>On             | Blind |                         |                       |                      |                      |
|                                      | O                     | R                      |                            |                |       |                            | X                     | Y                       |       |                         |                       |                      |                      |
| 26                                   | 33                    | 30                     | 29½x30                     | 1¼             | 1¼    | 28½                        | 2¼                    | 120                     | 290   | 31                      | 32                    | 1                    | ⅞                    |
| 28                                   | 35                    | 32                     | 31⅞x32                     | 1¼             | 1⅜    | 30½                        | 2¼                    | 140                     | 360   | 33                      | 36                    | 1                    | ⅞                    |
| 30                                   | 37                    | 34                     | 33⅞x34                     | 1¼             | 1⅜    | 32½                        | 2¼                    | 150                     | 405   | 35                      | 36                    | 1                    | ⅞                    |
| 32                                   | 39½                   | 36¼                    | 35⅞x36¼                    | 1¼             | 1½    | 34¾                        | 2½                    | 170                     | 500   | 37¾                     | 40                    | 1⅞                   | 1                    |
| 34                                   | 41½                   | 38¼                    | 37⅞x38¼                    | 1¼             | 1⅜    | 36¾                        | 2½                    | 180                     | 600   | 39¾                     | 40                    | 1⅞                   | 1                    |
| 36                                   | 43½                   | 40¼                    | 39⅞x40¼                    | 1¼             | 1⅜    | 38¾                        | 2½                    | 190                     | 660   | 41¾                     | 44                    | 1⅞                   | 1                    |
| 42                                   | 50                    | 46½                    | 45⅞x46½                    | 1¼             | 1⅞    | 44¾                        | 2¾                    | 235                     | 1000  | 47¾                     | 48                    | 1¼                   | 1⅞                   |
| 48                                   | 56                    | 52½                    | 51⅞x52½                    | 1¼             | 2⅞    | 50¾                        | 2⅞                    | 270                     | 1450  | 53¾                     | 56                    | 1¼                   | 1⅞                   |
| 54                                   | 62½                   | 59                     | 57½x59                     | 1⅜             | 2⅜    | 57¼                        | 3⅞                    | 335                     | 2000  | 60¼                     | 68                    | 1¼                   | 1⅞                   |
| 60                                   | 68½                   | 65                     | 63½x65                     | 1⅞             | 2⅞    | 63¼                        | 3⅞                    | 450                     | 2675  | 66¼                     | 72                    | 1¼                   | 1⅞                   |
| 66                                   | 75½                   | 71⅞                    | 69⅞x71⅞                    | 1¾             | 2⅞    | 69½                        | 4                     | 590                     | 3550  | 73                      | 72                    | 1⅜                   | 1¼                   |
| 72                                   | 81½                   | 77⅞                    | 75⅞x77⅞                    | 2              | 3⅞    | 75½                        | 4½                    | 730                     | 4500  | 79                      | 80                    | 1⅜                   | 1¼                   |

### Notes Applicable to CLASS 75

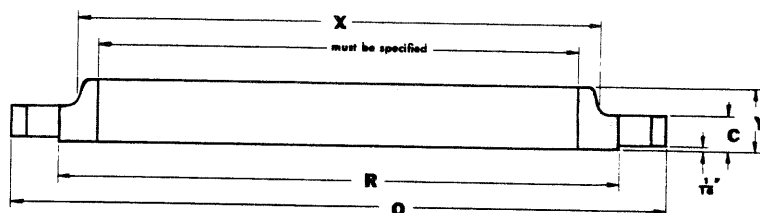
- This designation applies to flanges formerly listed as "50 Lb. Pressure at 100°F."
- \* Outside diameter, facing diameter and drilling of Class 75 Blind Flanges depend on whether they are used against Welding Neck or Slip-On type flanges. Dimensions are tabulated above for each application. Pressure ratings are based on inside diameters of pipe or shell as listed in "Nominal Size" column, and pipe or shell thicknesses ranging from 1/4" to 1/2". Class 75 flanges are rated:—  
With cloth inserted rubber gasket (from OD of raised face to flange bore):— 75 psi at —20F to 100F;  
With asbestos gasket:— 50 psi at —20F to 450F.  
Carbon steel bolts are intended.

### Notes Applicable to CLASSES 75 and 175

All dimensions are in inches. Prices on application. Classes 75 and 175 flanges are designed in accordance with "Modern Flange Design" Taylor Forge Bulletin 502) and comply in all respects with the current ASME Boiler and Pressure Vessel Code. For further discussion of these Standards, see Page 27. While a 1/16" raised face is indicated, any other type of facing can be furnished. See Pages 48 and 50. Larger sizes as well as intermediate sizes can be furnished. All dimensions may be varied without die expense. Tolerances—Page 44.



WELDING NECK TYPE



SLIP-ON TYPE

## Welding Neck, Slip-on and Blind

| Nominal Size* | COMMON DIMENSIONS |                  |                      |                      | THICKNESS C   |         |       | LENGTH THRU HUB Y |         | Approx Weight Pounds |         |       | DRILLING TEMPLATE |                 |                |
|---------------|-------------------|------------------|----------------------|----------------------|---------------|---------|-------|-------------------|---------|----------------------|---------|-------|-------------------|-----------------|----------------|
|               | Out-side Diam.    | O.D. Raised Face | Diam. at Base of Hub | Asbestos Gasket Size | Weld-ing Neck | Slip-On | Blind | Weld-ing Neck     | Slip-On | Weld-ing Neck        | Slip-On | Blind | Bolt Circle Diam. | Number of Holes | Diam. of Holes |
|               | O                 | R                | X                    |                      |               |         |       |                   |         |                      |         |       |                   |                 |                |
| 26            | 31½               | 29               | 27⅞                  | 28 x 29              | 1⅞            | 1⅞      | 1⅞    | 3⅞                | 2⅞      | 120                  | 105     | 405   | 29⅞               | 28              | ⅞              |
| 28            | 33½               | 31               | 29⅞                  | 30 x 31              | 1⅞            | 1⅞      | 2     | 3⅞                | 2⅞      | 130                  | 115     | 490   | 31⅞               | 28              | ⅞              |
| 30            | 35½               | 33¼              | 31⅞                  | 32 x 33¼             | 1⅞            | 1⅞      | 2⅞    | 3⅞                | 2⅞      | 150                  | 130     | 590   | 34⅞               | 36              | ⅞              |
| 32            | 37¼               | 35¼              | 33⅞                  | 34 x 35¼             | 1⅞            | 1⅞      | 2¼    | 3⅞                | 2⅞      | 160                  | 140     | 700   | 36⅞               | 36              | ⅞              |
| 34            | 40¼               | 37⅞              | 35⅞                  | 35⅞ x 37⅞            | 1½            | 1¼      | 2⅞    | 3⅞                | 3⅞      | 195                  | 200     | 840   | 38⅞               | 36              | 1              |
| 36            | 42¼               | 39⅞              | 37⅞                  | 37⅞ x 39⅞            | 1½            | 1¼      | 2½    | 3⅞                | 3⅞      | 205                  | 210     | 970   | 40⅞               | 36              | 1              |
| 38            | 44¼               | 41⅞              | 39⅞                  | 39⅞ x 41⅞            | 1¾            | 2       | 2⅞    | 4⅞                | 3¾      | 245                  | 250     | 1125  | 42⅞               | 36              | 1              |
| 40            | 46¼               | 43⅞              | 41⅞                  | 41⅞ x 43⅞            | 1¾            | 2       | 2¾    | 4⅞                | 4       | 255                  | 270     | 1300  | 44⅞               | 40              | 1              |
| 42            | 49                | 45¾              | 44⅞                  | 44 x 45¾             | 2             | 2⅞      | 2⅞    | 4½                | 4⅞      | 340                  | 365     | 1500  | 46⅞               | 40              | 1½             |
| 44            | 51                | 47¾              | 46⅞                  | 46 x 47¾             | 2             | 2⅞      | 3     | 4½                | 4⅞      | 360                  | 380     | 1700  | 48⅞               | 40              | 1½             |
| 46            | 53                | 49¾              | 48⅞                  | 48 x 49¾             | 2             | 2⅞      | 3⅞    | 4½                | 4⅞      | 375                  | 410     | 1925  | 50⅞               | 40              | 1½             |
| 48            | 55                | 51¾              | 50⅞                  | 50 x 51¾             | 2¼            | 2⅞      | 3⅞    | 4⅞                | 4⅞      | 430                  | 460     | 2225  | 52⅞               | 44              | 1½             |
| 50            | 57                | 53¾              | 52⅞                  | 52 x 53¾             | 2¼            | 2⅞      | 3⅞    | 4⅞                | 4⅞      | 450                  | 480     | 2400  | 54⅞               | 44              | 1½             |
| 52            | 59½               | 56               | 54¼                  | 54 x 56              | 2⅞            | 3       | 3⅞    | 5⅞                | 5⅞      | 560                  | 600     | 2800  | 57¼               | 44              | 1¼             |
| 54            | 61½               | 58               | 56¼                  | 56 x 58              | 2⅞            | 3       | 3⅞    | 5⅞                | 5⅞      | 580                  | 620     | 3000  | 59¼               | 44              | 1¼             |
| 60            | 67½               | 64               | 62¼                  | 62 x 64              | 2¾            | 3⅞      | 4     | 5¾                | 5⅞      | 680                  | 730     | 4000  | 65¼               | 48              | 1¼             |
| 66            | 73½               | 70               | 68½                  | 68 x 70              | 3⅞            | 4       | 4¾    | 6⅞                | 6⅞      | 830                  | 1000    | 5175  | 71¼               | 56              | 1¼             |
| 72            | 80                | 76½              | 74½                  | 74 x 76½             | 3⅞            | 5       | 4¾    | 6⅞                | 8       | 1075                 | 1400    | 6650  | 77¼               | 64              | 1¼             |
| 84            | 94                | 90⅞              | 88                   | 86⅞ x 90⅞            | 3             | 5       | 5½    | 7                 | 8½      | 1550                 | 2250    | - -   | 91½               | 72              | 1⅞             |
| 96            | 106               | 102⅞             | 100                  | 100⅞ x 102⅞          | 3½            | 5       | 6⅞    | 7½                | 9       | 1950                 | 2600    | - -   | 103½              | 88              | 1⅞             |

■ This designation applies to flanges formerly listed as "150 Lb. W.S.P. at 750°F."

\* Sizes are nominal inside diameters of pipe or shell used with Welding Neck flanges, and nominal outside diameters of pipe or shell used with Slip-On flanges. Pressure rating:— 175 psi at —20F to 650F; or 150 psi at 750F.

When applied to Welding Neck flanges, these ratings are based on inside diameters of pipe or shell as listed in

"Nominal Size" column, and pipe or shell thicknesses ranging from ⅜" to ⅝".

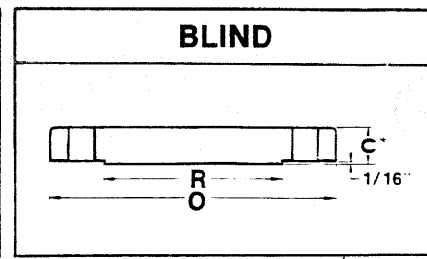
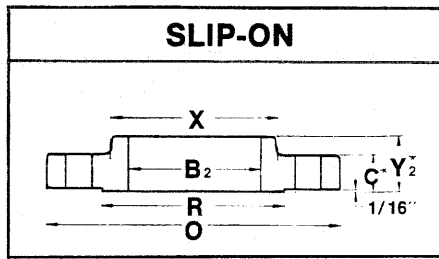
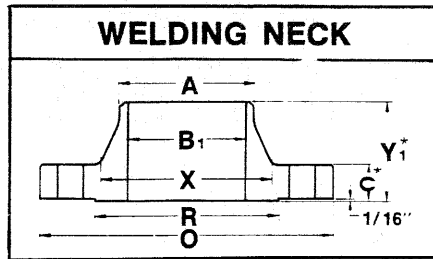
When applied to Slip-On flanges, ratings are based on outside diameters of pipe or shell as listed in "Nominal Size" column. Bored to slip over nominal OD pipe, any larger bore will affect the pressure rating.

Alloy steel bolts and asbestos composition gaskets are intended.

For other applicable footnotes see opposite page.

# 16 FLANGES

## DIMENSIONS



### 300-lb.

| Nom. Pipe Size | Outside Diam. | Thkn. (min.) | O.D. of Raised Face | Hub Diam. | Length thru Hub |                        |           | Bore □     |                  |           | Depth of Sock. | Approx. Weight (Lbs.) |                        |           |       | Drilling  |             |                   |
|----------------|---------------|--------------|---------------------|-----------|-----------------|------------------------|-----------|------------|------------------|-----------|----------------|-----------------------|------------------------|-----------|-------|-----------|-------------|-------------------|
|                |               |              |                     |           | Wldg. Neck      | Slip-on Thrd. Sock. W. | Lap Joint | Wldg. Neck | Slip-on Sock. W. | Lap Joint |                | Wldg. Neck            | Slip-on Thrd. Sock. W. | Lap Joint | Blind | No. Holes | Diam. Holes | Bolt Circle Diam. |
| 1/2            | 3 3/4         | 3/16         | 1 3/8               | 1 1/2     | 2 1/8           | 7/8                    | 7/8       | 0.62       | 0.88             | 0.90      | 3/8            | 2                     | 2                      | 2         | 2     | 4         | 5/8         | 2 5/8             |
| 3/4            | 4 5/8         | 5/16         | 1 11/16             | 1 7/8     | 2 1/4           | 1                      | 1         | 0.82       | 1.09             | 1.11      | 7/16           | 3                     | 3                      | 3         | 3     | 4         | 3/4         | 3 1/4             |
| 1              | 4 7/8         | 1 1/16       | 2                   | 2 1/8     | 2 3/8           | 1 1/8                  | 1 1/8     | 1.05       | 1.36             | 1.38      | 1/2            | 4                     | 3                      | 3         | 3     | 4         | 3/4         | 3 1/2             |
| 1 1/4          | 5 1/4         | 3/8          | 2 1/2               | 2 1/2     | 2 5/8           | 1 1/4                  | 1 1/4     | 1.38       | 1.70             | 1.72      | 5/8            | 5                     | 4                      | 4         | 4     | 4         | 3/4         | 3 3/8             |
| 1 1/2          | 6 1/8         | 1 3/16       | 2 7/8               | 2 3/4     | 2 11/16         | 1 3/8                  | 1 3/8     | 1.61       | 1.95             | 1.97      | 5/8            | 7                     | 6                      | 6         | 6     | 4         | 7/8         | 4 1/2             |
| 2              | 6 1/2         | 7/8          | 3 5/8               | 3 3/8     | 2 3/4           | 1 5/8                  | 1 5/8     | 2.07       | 2.44             | 2.46      | 1 1/8          | 9                     | 7                      | 7         | 8     | 8         | 3/4         | 5                 |
| 2 1/2          | 7 1/2         | 1            | 4 1/8               | 3 11/8    | 3               | 1 1/2                  | 1 1/2     | 2.47       | 2.94             | 2.97      | 3/4            | 12                    | 10                     | 10        | 12    | 8         | 7/8         | 5 7/8             |
| 3              | 8 1/4         | 1 1/8        | 5                   | 4 5/8     | 3 3/8           | 1 11/16                | 1 11/16   | 3.07       | 3.57             | 3.60      | 1 3/8          | 15                    | 13                     | 13        | 16    | 8         | 7/8         | 6 5/8             |
| 3 1/2          | 9             | 1 3/16       | 5 1/2               | 5 1/4     | 3 3/8           | 1 3/4                  | 1 3/4     | 3.55       | 4.07             | 4.10      | 1 3/8          | 18                    | 17                     | 17        | 21    | 8         | 7/8         | 7 1/4             |
| 4              | 10            | 1 1/4        | 6 3/8               | 5 3/4     | 3 3/8           | 1 7/8                  | 1 7/8     | 4.03       | 4.57             | 4.60      | —              | 25                    | 22                     | 22        | 27    | 8         | 7/8         | 7 7/8             |
| 5              | 11            | 1 3/8        | 7 3/8               | 7         | 3 3/8           | 2                      | 2         | 5.05       | 5.66             | 5.69      | —              | 32                    | 28                     | 28        | 35    | 8         | 7/8         | 9 1/4             |
| 6              | 12 1/2        | 1 7/8        | 8 1/2               | 8 1/8     | 3 3/8           | 2 1/8                  | 2 1/8     | 6.07       | 6.72             | 6.75      | —              | 42                    | 39                     | 39        | 50    | 12        | 7/8         | 10 5/8            |
| 8              | 15            | 1 5/8        | 10 5/8              | 10 1/4    | 4 3/8           | 2 3/8                  | 2 3/8     | 7.98       | 8.72             | 8.75      | —              | 67                    | 58                     | 58        | 81    | 12        | 1           | 13                |
| 10             | 17 1/2        | 1 7/8        | 12 3/4              | 12 5/8    | 4 5/8           | 2 5/8                  | 3 3/4     | 10.02      | 10.88            | 10.92     | —              | 91                    | 81                     | 91        | 124   | 16        | 1 1/8       | 15 1/4            |
| 12             | 20 1/2        | 2            | 15                  | 14 3/4    | 5 1/8           | 2 7/8                  | 4         | 12.00      | 12.88            | 12.92     | —              | 140                   | 115                    | 140       | 185   | 16        | 1 1/4       | 17 3/4            |
| 14             | 23            | 2 1/8        | 16 1/4              | 16 3/4    | 5 5/8           | 3                      | 4 3/8     | 13.25      | 14.14            | 14.18     | —              | 180                   | 165                    | 190       | 250   | 20        | 1 1/4       | 20 1/4            |
| 16             | 25 1/2        | 2 1/4        | 18 1/2              | 19        | 5 3/4           | 3 1/4                  | 4 3/4     | 15.25      | 16.16            | 16.19     | —              | 250                   | 190                    | 250       | 295   | 20        | 1 3/8       | 22 1/2            |
| 18             | 28            | 2 3/8        | 21                  | 21        | 6 1/4           | 3 1/2                  | 5 1/8     | 17.25      | 18.18            | 18.20     | —              | 320                   | 250                    | 295       | 395   | 24        | 1 3/8       | 24 1/2            |
| 20             | 30 1/2        | 2 1/2        | 23                  | 23 1/8    | 6 3/8           | 3 3/4                  | 5 1/2     | 19.25      | 20.20            | 20.25     | —              | 400                   | 315                    | 370       | 505   | 24        | 1 3/8       | 27                |
| 22             | 33            | 2 5/8        | 25 1/4              | 25 1/4    | 6 1/2           | 4                      | 5 3/4     | 21.25      | 22.22            | 22.25     | —              | 465                   | 370                    | 435       | 640   | 24        | 1 5/8       | 29 1/4            |
| 24             | 36            | 2 3/4        | 27 1/4              | 27 5/8    | 6 5/8           | 4 3/8                  | 6         | 23.25      | 24.25            | 24.25     | —              | 580                   | 475                    | 550       | 790   | 24        | 1 5/8       | 32                |

### MSS—SP44 Class 300\*\*

For further information on this Standard see Page 27

|    |        |         |        |          |       |   |   |                              |   |   |   |      |      |   |      |    |       |        |
|----|--------|---------|--------|----------|-------|---|---|------------------------------|---|---|---|------|------|---|------|----|-------|--------|
| 26 | 38 1/4 | 3 1/8   | 29 1/2 | 28 3/8   | 7 1/4 | — | — | To be specified by purchaser | — | — | — | 670  | 570  | — | 1050 | 28 | 1 3/4 | 34 1/2 |
| 28 | 40 3/4 | 3 3/8   | 31 1/2 | 30 1/2   | 7 3/4 | — | — |                              | — | — | — | 810  | 720  | — | 1275 | 28 | 1 3/4 | 37     |
| 30 | 43     | 3 5/8   | 33 3/4 | 32 1/8   | 8 1/4 | — | — |                              | — | — | — | 930  | 810  | — | 1500 | 28 | 1 7/8 | 39 1/4 |
| 32 | 45 1/4 | 3 7/8   | 36     | 34 11/16 | 8 3/4 | — | — | To be specified by purchaser | — | — | — | 1025 | 890  | — | 1775 | 28 | 2     | 41 1/2 |
| 34 | 47 1/2 | 4       | 38     | 36 7/8   | 9 1/8 | — | — |                              | — | — | — | 1200 | 1075 | — | 2025 | 28 | 2     | 43 1/2 |
| 36 | 50     | 4 1/8   | 40 1/4 | 39       | 9 1/2 | — | — |                              | — | — | — | 1300 | 1200 | — | 2275 | 32 | 2 1/8 | 46     |
| 42 | 50 3/4 | 4 11/16 | 44 3/4 | 43 1/4   | 7 7/8 | — | — |                              | — | — | — | —    | —    | — | —    | 32 | 1 3/4 | 47 1/2 |

### 400-lb.

(NOTE: Sizes 1/2" thru 3 1/2" are identical with 600 lb. flanges (see next page).)

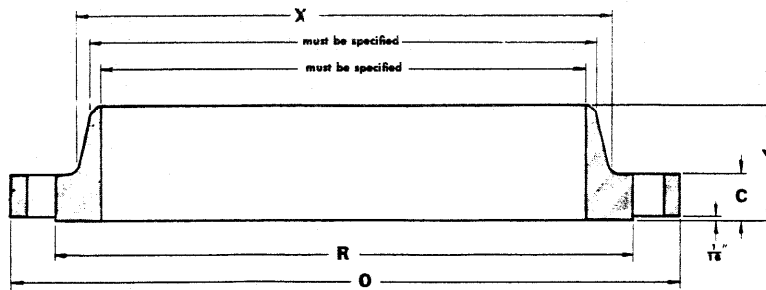
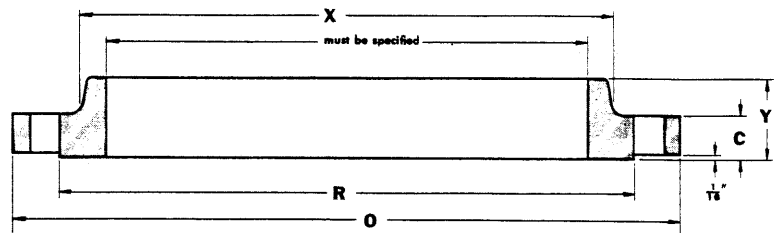
|    |        |       |        |        |       |         |         |                              |       |       |                  |     |     |     |     |    |       |        |
|----|--------|-------|--------|--------|-------|---------|---------|------------------------------|-------|-------|------------------|-----|-----|-----|-----|----|-------|--------|
| 4  | 10     | 1 3/8 | 6 3/8  | 5 3/4  | 3 1/2 | 2       | 2       | To be specified by purchaser | 4.57  | 4.60  | Not manufactured | 35  | 26  | 25  | 33  | 8  | 1     | 7 7/8  |
| 5  | 11     | 1 1/2 | 7 3/8  | 7      | 4     | 2 1/8   | 2 1/8   |                              | 5.66  | 5.69  |                  | 43  | 31  | 29  | 44  | 8  | 1     | 9 1/4  |
| 6  | 12 1/2 | 1 5/8 | 8 1/2  | 8 1/8  | 4 1/8 | 2 1/4   | 2 1/4   |                              | 6.72  | 6.75  |                  | 57  | 44  | 42  | 61  | 12 | 1     | 10 5/8 |
| 8  | 15     | 1 7/8 | 10 5/8 | 10 1/4 | 4 5/8 | 2 11/16 | 2 11/16 | To be specified by purchaser | 8.72  | 8.75  | Not manufactured | 89  | 67  | 64  | 100 | 12 | 1 1/8 | 13     |
| 10 | 17 1/2 | 2 1/8 | 12 3/4 | 12 5/8 | 4 7/8 | 2 7/8   | 4       |                              | 10.88 | 10.92 |                  | 125 | 91  | 110 | 155 | 16 | 1 1/4 | 15 1/4 |
| 12 | 20 1/2 | 2 1/4 | 15     | 14 3/4 | 5 3/8 | 3 1/8   | 4 1/4   |                              | 12.88 | 12.92 |                  | 175 | 130 | 150 | 225 | 16 | 1 3/8 | 17 3/4 |
| 14 | 23     | 2 3/8 | 16 1/4 | 16 3/4 | 5 7/8 | 3 3/8   | 4 5/8   |                              | 14.14 | 14.18 |                  | 230 | 180 | 205 | 290 | 20 | 1 3/8 | 20 1/4 |
| 16 | 25 1/2 | 2 1/2 | 18 1/2 | 19     | 6     | 3 11/16 | 5       | To be specified by purchaser | 16.16 | 16.19 | Not manufactured | 295 | 235 | 260 | 370 | 20 | 1 1/2 | 22 1/2 |
| 18 | 28     | 2 5/8 | 21     | 21     | 6 1/2 | 3 7/8   | 5 3/8   |                              | 18.18 | 18.20 |                  | 350 | 285 | 315 | 455 | 24 | 1 1/2 | 24 3/4 |
| 20 | 30 1/2 | 2 3/4 | 23     | 23 1/8 | 6 5/8 | 4       | 5 3/4   |                              | 20.20 | 20.25 |                  | 425 | 345 | 385 | 587 | 24 | 1 5/8 | 27     |
| 22 | 33     | 2 7/8 | 25 1/4 | 25 1/4 | 6 3/4 | 4 1/4   | 6       |                              | 22.22 | 22.25 |                  | 505 | 405 | 455 | 720 | 24 | 1 3/4 | 29 1/4 |
| 24 | 36     | 3     | 27 1/4 | 27 5/8 | 6 7/8 | 4 1/2   | 6 1/4   | To be specified by purchaser | 24.25 | 24.25 | Not manufactured | 620 | 510 | 570 | 890 | 24 | 1 7/8 | 32     |

### MSS—SP44 Class 400\*\*

For further information on this Standard see Page 27

|    |        |       |        |          |       |   |   |                              |   |   |                  |      |      |   |      |    |       |        |
|----|--------|-------|--------|----------|-------|---|---|------------------------------|---|---|------------------|------|------|---|------|----|-------|--------|
| 26 | 38 1/4 | 3 1/2 | 29 1/2 | 28 5/8   | 7 5/8 | — | — | To be specified by purchaser | — | — | Not manufactured | 750  | 650  | — | 1125 | 28 | 1 7/8 | 34 1/2 |
| 28 | 40 3/4 | 3 3/4 | 31 1/2 | 30 13/16 | 8 1/2 | — | — |                              | — | — |                  | 880  | 780  | — | 1425 | 28 | 2     | 37     |
| 30 | 43     | 4     | 33 3/4 | 32 15/16 | 8 5/8 | — | — |                              | — | — |                  | 1000 | 900  | — | 1675 | 28 | 2 1/8 | 39 1/4 |
| 32 | 45 1/4 | 4 1/4 | 36     | 35       | 9 1/8 | — | — | To be specified by purchaser | — | — | Not manufactured | 1150 | 1025 | — | 1975 | 28 | 2 1/8 | 41 1/2 |
| 34 | 47 1/2 | 4 3/8 | 38     | 37 3/8   | 9 1/2 | — | — |                              | — | — |                  | 1300 | 1150 | — | 2250 | 28 | 2 1/8 | 43 1/2 |
| 36 | 50     | 4 1/2 | 40 1/4 | 39 3/8   | 9 7/8 | — | — |                              | — | — |                  | 1475 | 1325 | — | 2525 | 32 | 2 1/8 | 46     |

See notes on page 18


**WELDING NECK TYPE**

**SLIP-ON TYPE**

### Welding Neck, Slip-on and Blind

| Nominal Size* | COMMON DIMENSIONS |                  |                      |                      | Thickness C   |         |       | Length Thru Hub Y |         | Approx. Weight Pounds |         |       | Drilling Template |                 |                |
|---------------|-------------------|------------------|----------------------|----------------------|---------------|---------|-------|-------------------|---------|-----------------------|---------|-------|-------------------|-----------------|----------------|
|               | Out-side Diam.    | O.D. Raised Face | Diam. at Base of Hub | Asbestos Gasket Size | Weld-ing Neck | Slip-On | Blind | Weld-ing Neck     | Slip-On | Weld-ing Neck         | Slip-On | Blind | Bolt Circle Diam. | Number of Holes | Diam. of Holes |
|               | O                 | R                | X                    |                      |               |         |       |                   |         |                       |         |       |                   |                 |                |
| 26            | 32 3/4            | 29 1/2           | 27 7/8               | 28 1/2 x 29 1/2      | 2 1/2         | 2 1/2   | 2 3/4 | 5                 | 4 1/2   | 245                   | 225     | 580   | 30 3/8            | 28              | 1 1/2          |
| 28            | 34 3/4            | 31 1/2           | 29 7/8               | 30 1/2 x 31 1/2      | 2 1/2         | 2 1/2   | 2 7/8 | 5                 | 4 1/2   | 260                   | 250     | 750   | 32 3/8            | 28              | 1 1/2          |
| 30            | 37                | 33 3/4           | 32 1/2               | 32 1/2 x 33 3/4      | 2 5/8         | 2 5/8   | 3     | 5 1/4             | 4 3/4   | 305                   | 295     | 890   | 34 3/8            | 32              | 1 1/2          |
| 32            | 39                | 35 3/4           | 34 1/4               | 34 1/2 x 35 3/4      | 2 3/4         | 2 3/4   | 3 1/4 | 5 1/2             | 5       | 340                   | 325     | 1050  | 36 3/8            | 36              | 1 1/2          |
| 34            | 41                | 37 3/4           | 36 1/8               | 36 1/2 x 37 3/4      | 2 7/8         | 2 7/8   | 3 3/8 | 5 3/4             | 5 1/8   | 375                   | 355     | 1225  | 38 3/8            | 40              | 1 1/2          |
| 36            | 43 3/4            | 40 1/4           | 38 1/2               | 38 3/8 x 40 1/4      | 3 1/8         | 3 1/8   | 3 5/8 | 6 1/8             | 5 5/8   | 480                   | 465     | 1500  | 41 1/2            | 40              | 1 1/4          |
| 38            | 45 3/4            | 42 1/4           | 40 1/2               | 40 3/4 x 42 1/4      | 3 1/8         | 3 1/8   | 3 3/4 | 6 1/8             | 5 5/8   | 510                   | 490     | 1700  | 43 1/2            | 40              | 1 1/4          |
| 40            | 47 3/4            | 44 1/4           | 42 1/2               | 42 1/2 x 44 1/4      | 3 3/4         | 3 3/4   | 4     | 6 3/4             | 5 7/8   | 540                   | 530     | 1975  | 45 1/2            | 44              | 1 1/4          |
| 42            | 50                | 46 1/2           | 44 3/4               | 44 1/2 x 46 1/2      | 3 1/2         | 3 1/2   | 4 1/8 | 6 1/2             | 6 1/8   | 640                   | 620     | 2225  | 47 3/4            | 48              | 1 1/4          |
| 44            | 52 3/4            | 48 3/8           | 46 3/4               | 46 3/8 x 48 3/8      | 3 3/4         | 3 3/4   | 4 3/8 | 6 3/4             | 6 3/8   | 760                   | 760     | 2625  | 50 3/4            | 44              | 1 3/8          |
| 46            | 54 3/4            | 50 3/8           | 48 3/4               | 48 3/8 x 50 3/8      | 4 1/4         | 4 1/4   | 4 3/4 | 7 1/4             | 7 1/8   | 880                   | 880     | 2950  | 52 1/4            | 48              | 1 3/8          |
| 48            | 56 3/4            | 52 3/8           | 50 3/4               | 50 3/8 x 52 3/8      | 4 1/4         | 4 1/4   | 4 3/4 | 7 1/4             | 7 1/8   | 920                   | 920     | 3300  | 54 1/4            | 48              | 1 3/8          |
| 52            | 61 1/2            | 57 1/4           | 55                   | 54 3/4 x 57 1/4      | 4 1/4         | --      | --    | 7 1/2             | --      | 1075                  | --      | --    | 58 3/8            | 52              | 1 1/2          |
| 54            | 63 1/2            | 59 1/4           | 57                   | 56 3/4 x 59 1/4      | 4 1/2         | 4 3/4   | --    | 7 3/4             | 8 1/4   | 1200                  | 1150    | --    | 60 3/8            | 52              | 1 1/2          |
| 60            | 69 1/2            | 65 1/4           | 63                   | 62 3/4 x 65 1/4      | 4 1/2         | 5       | --    | 8                 | 8 1/2   | 1325                  | 1450    | --    | 66 3/8            | 60              | 1 1/2          |
| 66            | 77                | 72 3/4           | 70                   | 67 3/4 x 72 3/4      | 4             | --      | --    | 8 1/2             | --      | 1675                  | --      | --    | 74                | 60              | 1 5/8          |
| 72            | 83                | 78 3/4           | 76                   | 73 3/4 x 78 3/4      | 4             | --      | --    | 9                 | --      | 1850                  | --      | --    | 80                | 72              | 1 5/8          |
| 84            | 96 1/2            | 91 1/2           | 89                   | 86 1/2 x 91 1/2      | 5             | --      | --    | 10                | --      | 2950                  | --      | --    | 93 3/4            | 80              | 1 3/4          |
| 96            | 109 1/4           | 103 3/4          | 101 1/4              | 98 3/4 x 103 3/4     | 6 1/4         | --      | --    | 11 1/4            | --      | 4250                  | --      | --    | 105 3/4           | 84              | 1 3/4          |

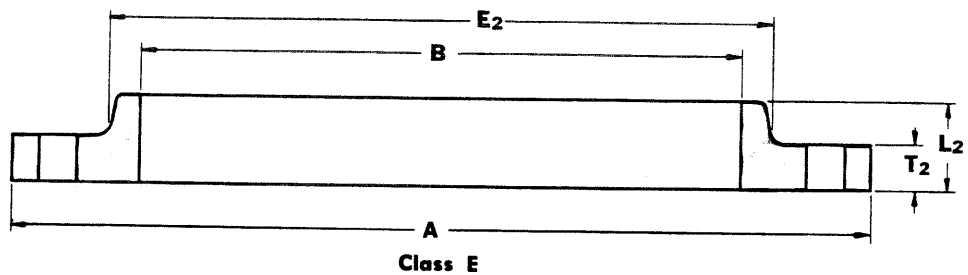
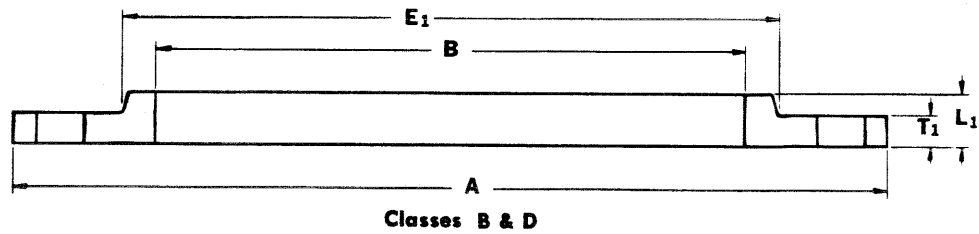
All dimensions are in inches. Prices on application.

- This designation applies to flanges formerly listed as "300 Lb. W.S.P. at 750°F." Class 350 flanges are designed in accordance with "Modern Flange Design" Taylor Forge Bulletin 502) and comply in all respects with the current ASME Boiler and Pressure Vessel Code. For further discussion of this Standard, see Page 27.

- \* Sizes are nominal inside diameters of pipe or shell used with Welding Neck flanges, and nominal outside diameters of pipe or shell used with Slip-On flanges. While a 1/16" raised face is indicated, any other type of facing can be furnished. See Pages 48 and 50.

Pressure rating:—350 psi at —20F to 650F; or 300 psi at 750F. When applied to Welding Neck flanges, these ratings are based on inside diameters of pipe or shell as listed in "Nominal Size" column, and pipe or shell thicknesses ranging from 1/2" to 1". When applied to Slip-On flanges, ratings are based on outside diameters of pipe or shell as listed in "Nominal Size" column. Bored to slip over nominal OD pipe, any larger bore will affect the pressure rating.

Alloy steel bolts and asbestos composition gaskets are intended. Larger sizes as well as intermediate sizes can be furnished. All dimensions may be varied without die expense. Tolerances—Page 44.

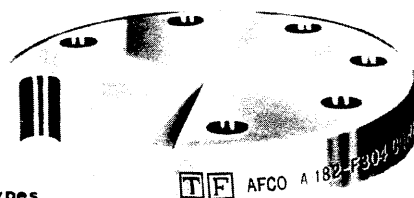
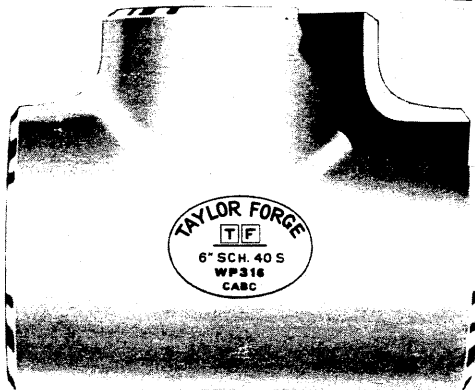
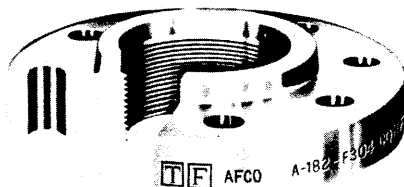
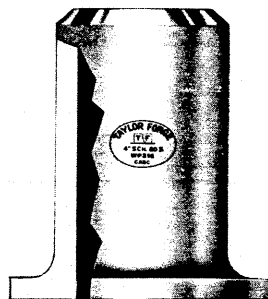
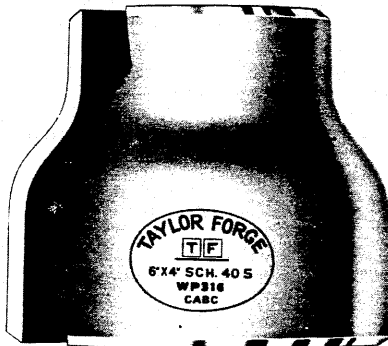
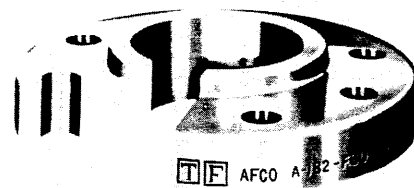
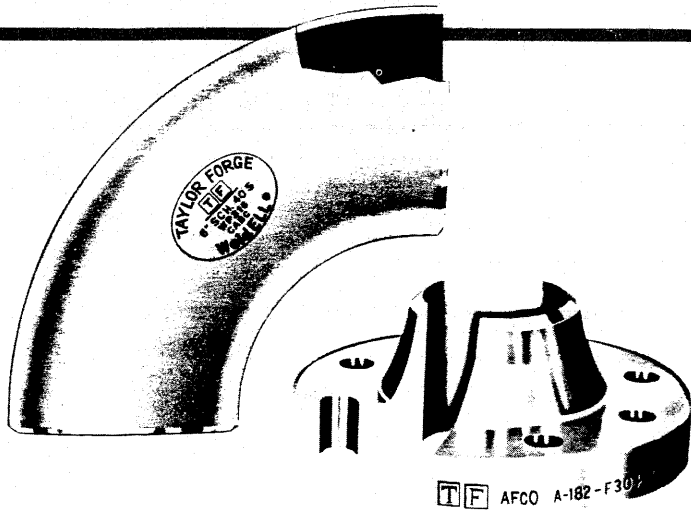


AWWA C207-54T

| Nominal<br>Pipe<br>Size | COMMON DIMENSIONS     |      |                         |                       | Thickness        |            | Length Thru Hub  |            | Diameter of Hub  |            | Diameter of Bolt Holes |                  | Approx. Weight Pounds |            |
|-------------------------|-----------------------|------|-------------------------|-----------------------|------------------|------------|------------------|------------|------------------|------------|------------------------|------------------|-----------------------|------------|
|                         | Out-<br>side<br>Diam. | Bore | Bolt<br>Circle<br>Diam. | Number<br>of<br>Bolts | Classes<br>B & D | Class<br>E | Classes<br>B & D | Class<br>E | Classes<br>B & D | Class<br>E | Class<br>B             | Classes<br>D & E | Classes<br>B & D      | Class<br>E |
|                         |                       |      |                         |                       | T1               | T2         | L1               | L2         | E1               | E2         |                        |                  |                       |            |
|                         |                       |      |                         |                       |                  |            |                  |            |                  |            |                        |                  |                       |            |
| 6                       | 11                    |      | 9 1/2                   | 8                     | 5/8              | 1          | 1 1/4            | 1 1/8      | 7 1/4            | 7 1/8      | 3/4                    | 3/4              | 13                    | 19         |
| 8                       | 13 1/2                |      | 11 3/4                  | 8                     | 5/8              | 1 1/8      | 1 1/4            | 1 3/8      | 9 1/4            | 9 1/8      | 3/4                    | 3/4              | 18                    | 30         |
| 10                      | 16                    |      | 14 1/4                  | 12                    | 1 1/8            | 1 3/8      | 1 1/4            | 1 5/8      | 12               | 12         | 3/4                    | 1                | 26                    | 43         |
| 12                      | 19                    |      | 17                      | 12                    | 1 1/8            | 1 3/4      | 1 1/4            | 2 1/8      | 14 3/4           | 14 3/8     | 3/4                    | 1                | 42                    | 64         |
| 14                      | 21                    |      | 18 3/4                  | 12                    | 3/4              | 1 3/8      | 1 1/4            | 2 1/4      | 15 3/4           | 15 3/8     | 3/4                    | 1 1/8            | 44                    | 85         |
| 16                      | 23 1/2                |      | 21 1/4                  | 16                    | 3/4              | 1 7/8      | 1 1/4            | 2 1/2      | 18               | 18         | 3/4                    | 1 1/4            | 58                    | 93         |
| 18                      | 25                    |      | 22 3/4                  | 16                    | 3/4              | 1 7/8      | 1 1/4            | 2 11/16    | 19 3/4           | 19 3/8     | 3/4                    | 1 1/4            | 59                    | 120        |
| 20                      | 27 1/2                |      | 25                      | 20                    | 3/4              | 1 11/16    | 1 1/4            | 2 3/8      | 22               | 22         | 3/4                    | 1 1/4            | 69                    | 155        |
| 22                      | 29 1/2                |      | 27 1/4                  | 20                    | 1                | 1 13/16    | 1 1/4            | 3 3/8      | 24 1/4           | 24 3/8     | 3/4                    | 1 1/4            | 76                    | 175        |
| 24                      | 32                    |      | 29 1/2                  | 20                    | 1                | 1 3/4      | 1 1/4            | 3 3/4      | 26 1/4           | 26 3/8     | 3/4                    | 1 1/4            | 115                   | 210        |
| 26                      | 34 1/4                |      | 31 3/4                  | 24                    | 1                | 2          | 1 1/4            | 3 3/8      | 28 1/2           | 28 3/8     | 3/4                    | 1 1/4            | 125                   | 235        |
| 28                      | 36 1/2                |      | 34                      | 28                    | 1                | 2 1/8      | 1 1/4            | 3 7/8      | 30 1/2           | 30 3/8     | 3/4                    | 1 1/4            | 140                   | 270        |
| 30                      | 38 3/4                |      | 36                      | 28                    | 1                | 2 1/4      | 1 1/4            | 3 1/2      | 32 1/2           | 32 3/8     | 1                      | 1 1/4            | 150                   | 305        |
| 32                      | 41 3/4                |      | 38 1/2                  | 28                    | 1 1/8            | 2 1/4      | 1 1/4            | 3 3/8      | 34 3/4           | 35         | 1                      | 1 1/4            | 205                   | 375        |
| 34                      | 43 3/4                |      | 40 1/2                  | 32                    | 1 1/8            | 2 5/8      | 1 1/4            | 3 11/16    | 36 3/4           | 37         | 1                      | 1 1/4            | 215                   | 400        |
| 36                      | 46                    |      | 42 3/4                  | 32                    | 1 1/8            | 2 3/4      | 1 1/4            | 3 3/4      | 38 3/4           | 39 1/4     | 1                      | 1 1/4            | 235                   | 450        |
| 38                      | 48 3/4                |      | 45 1/4                  | 32                    | 1 1/8            | 2 3/4      | 1 1/4            | 3 3/4      | 40 3/4           | 41 1/4     | 1                      | 1 1/4            | 265                   | 530        |
| 40                      | 50 3/4                |      | 47 1/4                  | 36                    | 1 1/8            | 2 1/2      | 1 1/4            | 3 3/4      | 43               | 43 3/8     | 1                      | 1 1/4            | 280                   | 570        |
| 42                      | 53                    |      | 49 1/2                  | 36                    | 1 1/4            | 2 3/4      | 1 1/4            | 4          | 45               | 46         | 1 1/8                  | 1 1/4            | 330                   | 650        |
| 44                      | 55 1/4                |      | 51 3/4                  | 40                    | 1 1/4            | 2 3/4      | 2 1/4            | 4          | 47               | 48         | 1 1/8                  | 1 1/4            | 350                   | 690        |
| 46                      | 57 1/4                |      | 53 3/4                  | 40                    | 1 1/4            | 2 11/16    | 2 1/4            | 4 1/8      | 49               | 50         | 1 1/8                  | 1 1/4            | 365                   | 730        |
| 48                      | 59 1/2                |      | 56                      | 44                    | 1 3/8            | 2 3/4      | 2 1/2            | 4 1/8      | 51               | 52 1/4     | 1 1/8                  | 1 1/4            | 425                   | 800        |
| 50                      | 61 3/4                |      | 58 1/4                  | 44                    | 1 3/8            | 2 3/4      | 2 1/2            | 4 1/8      | 53               | 54 1/4     | 1 1/8                  | 1 1/4            | 450                   | 830        |
| 52                      | 64                    |      | 60 1/2                  | 44                    | 1 3/8            | 2 3/4      | 2 1/2            | 4 1/4      | 55               | 56 1/2     | 1 1/8                  | 1 1/4            | 475                   | 920        |
| 54                      | 66 1/4                |      | 62 3/4                  | 44                    | 1 3/8            | 3          | 2 1/2            | 4 3/8      | 57               | 58 3/4     | 1 3/8                  | 1 1/4            | 500                   | 1025       |
| 60                      | 73                    |      | 69 1/4                  | 52                    | 1 1/2            | 3 3/8      | 2 3/4            | 4 1/2      | 63               | 65 1/4     | 1 3/8                  | 1 1/4            | 640                   | 1250       |
| 66                      | 80                    |      | 76                      | 52                    | 1 1/2            | 3 3/8      | 2 3/4            | 4 3/8      | 69               | 71 1/2     | 1 3/8                  | 1 1/4            | 750                   | 1625       |
| 72                      | 86 1/2                |      | 82 1/2                  | 60                    | 1 1/2            | 3 1/2      | 2 3/4            | 5          | 75               | 78 1/2     | 1 3/8                  | 1 1/4            | 850                   | 1925       |
| 84                      | 99 3/4                |      | 95 1/2                  | 64                    | 1 3/4            | 3 3/8      | 3                | 5 3/8      | 87 1/2           | 90 1/2     | 1 3/8                  | 2 1/4            | 1225                  | 2600       |
| 96                      | 113 1/4               |      | 108 1/2                 | 68                    | 2                | 4 1/4      | 3 3/4            | 5 3/8      | 100              | 102 3/4    | 1 3/8                  | 2 3/4            | 1725                  | 3275       |

All dimensions are in inches. Prices on application.

Classes B and D can also be furnished as plain rings (without hubs) in which case they are of greater thickness. See discussion on Page 27.



Crosses, Stub Ends,  
Laterals and other types  
of fittings are also available.

# Taylor Forge Stainless & Alloy Gro Corrosion Resistant WELDING FITTINGS and FORGED FLANGES in every size and type

Taylor Forge manufactures *Corrosion Resistant* fittings in all types and wall thicknesses as covered by the American National Standard ANSI B16.3. Very thick wall fittings and fittings to non-standard dimensions are often furnished for extremely high pressure-temperature applications and are available upon specific inquiry.

Check these advantages of Taylor Forge fittings:

1. Full pipe strength
2. Extreme dimensional accuracy
3. Maximum economy of installation
4. Finest metallurgical quality
5. Permanent and positive identification
6. Complete compliance with applicable Standards
7. Individual protective packaging

Taylor Forge manufactures American National Standards *Corrosion Resistant* flanges in the sizes and types most commonly used in the chemical and process industries. We also manufacture *Corrosion Resistant* flanges for specialized conditions beyond the scope of the Standards which means we can be depended on to provide flanges and fittings to your needs precisely.

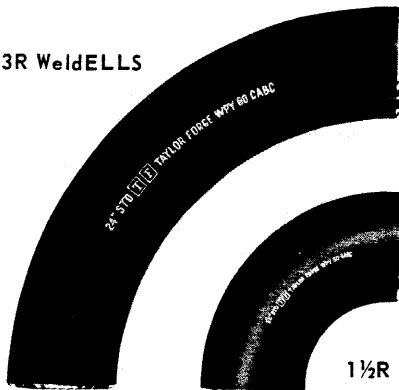
Check these advantages of Taylor Forge flanges:

1. Gasket face is always square with axis of pipe.
2. Bolt holes are multiple-drilled with extreme accuracy.
3. The fillet radius at base of hub is designed to provide enough clearance so socket wrenches can be used.
4. Threads are clean, sharp and uniform for perfect fit.
5. Any standard or special facing can be furnished.
6. Complete permanent marking on every flange.
7. Bore is smooth and accurate resulting in minimum flow resistance.

For complete information on Taylor Forge *Corrosion Resistant* fittings and flanges, see EPG Bulletin 721 or contact your nearest EPG Sales Center.

## WELDING FITTINGS

3R WeldELLS



1½R WeldELLS



STRAIGHT TEE



REDUCING TEE



CONCENTRIC REDUCER



WELDING CAP

## FORGED FLANGES



ANCHOR FLANGE

PIPE LINE HUB



WELDING NECK FLANGE

SLIP-ON FLANGE



BLIND FLANGE

## Basic Specifications

**ANSI B16.9** This standard establishes dimensions, tolerances, pressure ratings, marking and bevel requirements of fittings from ½" through 48".

**MSS SP75** Provides material requirements and dimensions, tolerances, and marking of elbows, return bends, caps, tees, reducers, 16" or larger in diameter for use in high pressure gas transmission and distribution systems. Dimensions for single and multiple outlet extruded headers, crosses, laterals, and factory welded extrusions and transition sections are also covered. Further this specification has been expanded to include smaller than 16" fittings conforming to design and dimensional requirements of ANSI B16.9 and the requirements of this standard for chemical composition, tensile and ductility properties, heat treatment and bend tests.

**ASTM A234** Covers materials, manufacturing methods, heat treatment, etc. for carbon and alloy steel material grades of welding fittings per ANSI B16.9.

**ASTM A420** Covers materials, manufacturing methods, heat treatment and testing for low temperature service fittings.

**ASTM A403** Covers stainless steel grades of fittings for applications in the cryogenic field.

## CROSSES, STUB ENDS, LATERAL AND OTHER FITTINGS ARE AVAILABLE

## Basic Specifications

**ANSI B16.5** Establishes dimensions, tolerances, pressure ratings, marking and bevel requirements of forged steel flanges from ½" thru 24".

**MSS SP44** Provides materials, heat treatment, dimensions, and gaskets for forged steel flanges from 12" thru 60" for use in high pressure gas transmission systems.

**ASTM A105** Covers the materials, manufacturing methods, etc. for carbon steel flanges.

**ASTM A182** Covers requirements for alloy and stainless flanges.

**ASTM A350** Provides material and testing for low temperature service.

## OTHER FLANGES AND FORGED SHAPES ARE AVAILABLE

## 38 PIPELINE PRODUCTS

### Serving the Pipe Line Industries

Taylor Forge is recognized as a leading manufacturer of components for high quality pipe line systems. Our products include welding fittings, special pipe and forged flanges of every type, size, wall thickness and pressure standard. Taylor pipe line components are manufactured to meet the following requirements:

- Full Pipe Strength
- Dimensional Accuracy
- Finest Metallurgical Quality
- True Geometry
- Accurate Weld Bevels
- Permanent and Positive Identification
- Complete compliance with Appropriate standards and/or specifications
- Economy of Installation

### MANUFACTURING STANDARDS

All Taylor Forge products are manufactured in strict accordance with the current applicable world-wide standards and/or specifications issued by such regulatory bodies as:

- Department of Transportation (DOT) Office of Pipe Line Safety
- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Manufacturers Standardization Society (MSS)
- American Society of Mechanical Engineers (ASME)

### PRODUCT MATERIALS

- Hi-Yield Low Alloy Steel
- Low Temperature Steel
- Carbon Steel
- and many others

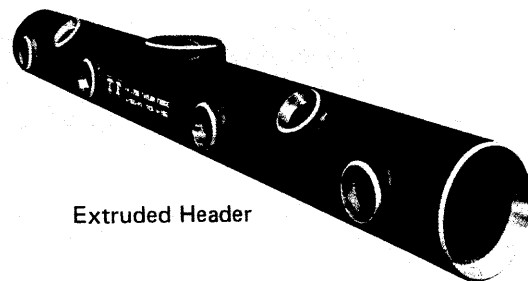
### PRODUCT AVAILABILITY

Large warehouse inventories - covering nearly every type, size and material requirement - in major markets assure Taylor Forge products availability and prompt delivery.

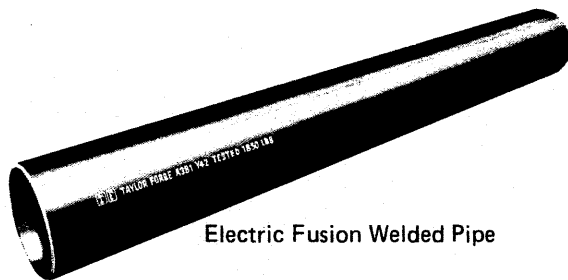
EPG Pipeline Catalog No. 723 complete information on Taylor Forge Line Pipe and Pipe Line products and is available on request.

## PIPELINE PRODUCTS

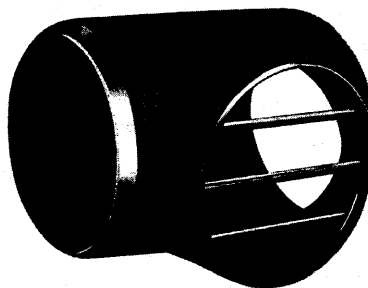
Because of Taylor Forge product integrity - assured through strict quality and manufacturing control - all established Gas and Oil Pipe Line Industry Codes have been met or exceeded. Standardized components and others designed primarily for use by the Pipe Line Industry are manufactured by Taylor Forge from materials and under a quality assurance program that meet the specific needs of this industry. Each manufacturer is expected to furnish these products in strict accordance with code requirements, however, optimum simplicity and economy of design is also expected. Taylor Forge is a leader in this area, manufacturing highly - engineered components which include the following:



Extruded Header



Electric Fusion Welded Pipe



Tee with Scraper Bar

## HIGHEST QUALITY FUSION WELDED PIPE OF CARBON AND ALLOY STEELS

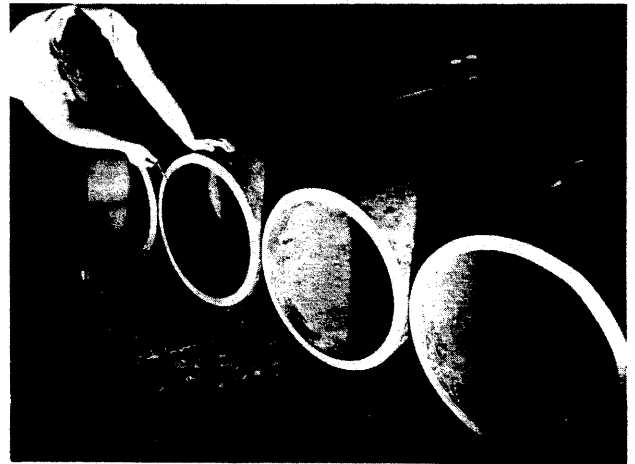
The uniform high quality of Taylor Forge Fusion Welded Pipe is based on more than half a century of experience in the production of large diameter pipe. Among basic reasons for its universally recognized superiority are the following:

1. **FULL STRENGTH WELDS.** Complete penetration is achieved in the Taylor Forge double-welded butt joint. While ordinary practice is to stress relieve, Taylor Forge goes beyond that and *normalizes* after welding by heating to temperatures above the critical range of the steel.

Weld quality is maintained by precise control and by frequent spot X-Ray examinations of work in process.

2. **UNIFORM DUCTILITY.** Upon normalizing, pipe is rerolled from the normalizing temperature. This assures a uniform rate of cooling throughout the entire pipe section and brings about a condition of uniform grain size in the entire structure including the weld and adjacent area.

3. **GOOD FIELD-WELDING CONDITIONS.** Hot rerolling makes it possible to maintain extremely close control of diametric and circumferential tolerances and a wall thickness tolerance of  $-.01"$  is held for all sizes. This accuracy of dimensions facilitates alignment and welding in the field.



16" OD x .938" wall, 2¼% Cr, 1% Mo, ASTM A155, Class 1, Grade 2¼CR, Taylor Forge Electric Fusion Welded Pipe, made for oil refinery service at 1200F.

#### 4. CIRCULARITY TOLERANCES

The closest control of dimensions and circularity assures good field welding conditions — a matter of no small importance since the fabrication of heavy wall pipe precludes the use of line-up clamps to attain circularity. Each length of Taylor Forge Electric Fusion Welded Pipe is end-sized to a tolerance of  $\pm\frac{1}{32}"$ .

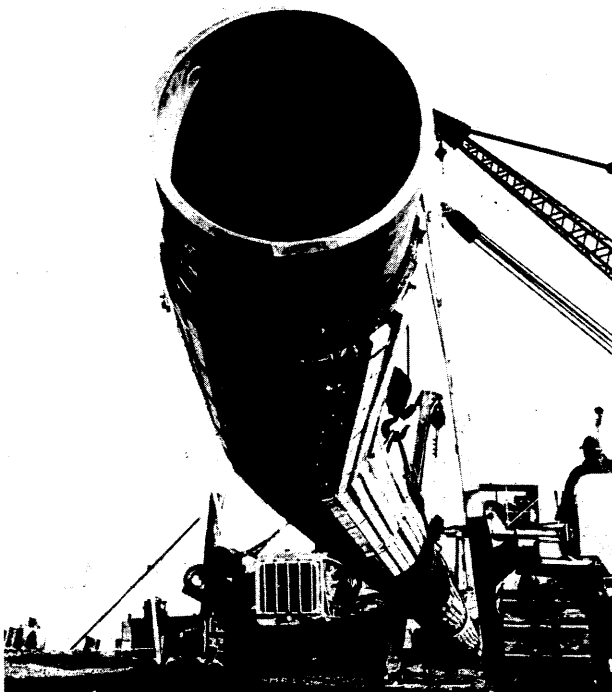
#### Sizes, Lengths, Thicknesses

The following is a summary of the general limitations with respect to combinations of size, length and thickness, in which Taylor Forge Electric Fusion Welded Pipe is available:

| Outside Diameter | Maximum Joint Length | Range of Thicknesses* |
|------------------|----------------------|-----------------------|
| 12¾" and 14"     | 10 ft.               | .312" — .875"         |
| 16" and 18"      | 20 ft.               | .312" — 1.375"        |
| 20" and 96"      | 20 ft.               | .312" — 1.500"        |

All pipe can be double jointed at the factory, if such lengths are more desirable.

\*Heavier wall thicknesses — up to 6" can be furnished in shorter lengths, — lengths available are a factor of diameter and wall thickness.



Taylor Forge Electric Fusion Welded Pipe is widely used for pipeline river crossings. Where pipe failure would result in great expense or hazard, this traditionally dependable product is favored.

## Pipe for High Pressure-Temperature Service

Taylor Forge Electric Fusion Welded Pipe is offered in six types of steel for high pressure-temperature service in piping and pressure vessel applications. These are:—

- 1 *Carbon Steel*: Temperatures from  $-50^{\circ}\text{F}$  to  $775^{\circ}\text{F}$ .
- 2 *Carbon-Molybdenum Steel*: Temperatures from  $750^{\circ}\text{F}$  to  $875^{\circ}\text{F}$ .
- 3 *1¼% Chromium—½% Molybdenum*: Temperatures from  $750^{\circ}\text{F}$  to  $1050^{\circ}\text{F}$ .
- 4 *2¼% Chromium—1% Molybdenum*: Temperatures from  $1050^{\circ}\text{F}$  to  $1200^{\circ}\text{F}$ .
- 5 *5% Chromium—½% Molybdenum*: Temperatures from  $900^{\circ}\text{F}$  to  $1200^{\circ}\text{F}$  (recommended where corrosion and/or high temperature strength is a factor).
- 6 *Stainless and Stainless Clad Steels*: The former for critical service usage where high temperature (to  $1500^{\circ}\text{F}$ ) strength is required; the stainless clad steels largely for corrosion resistance.

## Improved Design with Maximum Economy

All sizes of Taylor Forge Electric Fusion Welded Pipe can be furnished in thicknesses to the nearest  $\frac{1}{32}$ " of that required by the design, with an underthickness tolerance of .01". This gives the engineer great latitude and often offers opportunities to improve design. For example: say that calculations indicate the need for 20" OD x .74" minimum wall. Considering the 12½% underthickness tolerance of seamless pipe, the minimum is .931" wall and the nearest standard thickness pipe 1.031". Taylor Forge Fusion Welded Pipe, in contrast, can be furnished with a thickness of .875". This is an important consideration in flexibility calculations and, with the thinner wall, actual footage of pipe necessary in the configuration for keeping thrust within proper limits, can often be reduced.

Substantial economies can also be effected because (1) no minimum mill run is required and exact footage needed can be purchased; and (2) pipe can be furnished to specified lengths instead of random lengths thus avoiding waste.

## Line Pipe

Almost all pipe currently used is manufactured under specifications established by either the American Society for Test Materials (ASTM) or the American Petroleum Institute (API). The more commonly used are those listed in The Department of Transportation — Title 49, Part 142, Appendix B.

## Special Service Pipe

In pipe line design, numerous conditions arise that cannot be adequately met with ordinary line pipe or other production mill pipe. In such cases it will often be found most advantageous to specify Taylor Forge Electric Fusion Welded Pipe as described in the following paragraphs.

Taylor Forge Division, one of the leading manufacturers of Electric Fusion Welded Pipe for many years, offers the highest quality pipe in sizes from 16" O.D. to 96" O.D., with wall thicknesses from  $\frac{3}{8}$ " thru  $1\frac{1}{2}$ ", in  $\frac{1}{32}$ " increments. Although the governing specification under which this pipe is produced is ASTM A381, Taylor Forge further safeguards quality by imposing even more stringent requirements, particularly with reference to material, end sizing, heat treating and rerolling. Taylor Forge Product Specification 13.13, covers this class of pipe.

EPG Pipeline Catalog No. 723 complete information on Taylor Forge Line Pipe and Pipe Line products and is available on request.