



# PIPELINE

## ASME B16.28

### WROUGHT STEEL BUTTWELDING SHORT RADIUS ELBOWS AND RETURNS

#### Dimension and Tolerances

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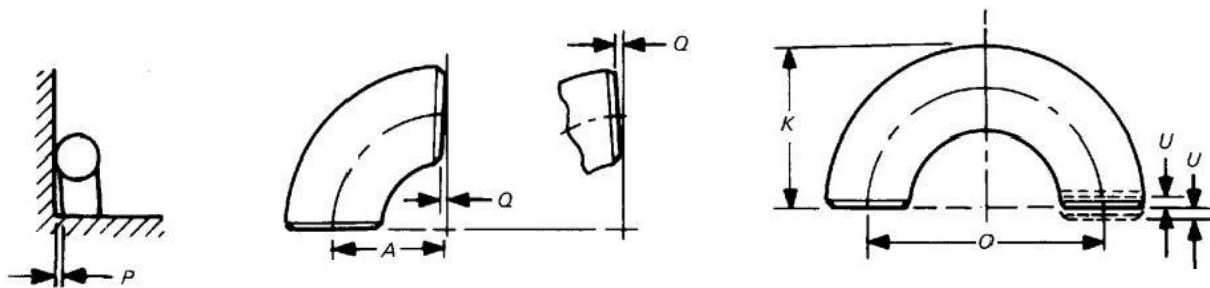


TABLE 1 TOLERANCES

| Nominal Pipe Size | All Fittings                                  |                                                 |                                                            |                           |                           | 90 deg Elbows                | 180 deg Returns                 |                             |                         |
|-------------------|-----------------------------------------------|-------------------------------------------------|------------------------------------------------------------|---------------------------|---------------------------|------------------------------|---------------------------------|-----------------------------|-------------------------|
|                   | Outside Diameter at Bevel<br>[Notes (1), (2)] | Inside Diameter at End<br>[Notes (1), (3), (4)] | Wall Thickness<br>[Note (3)]                               | Angularity Off Angle<br>O | Angularity Off Plane<br>P | Center-to-End Dimension<br>A | Center-to-Center Dimension<br>O | Back-to-Face Dimension<br>K | Alignments of Ends<br>U |
| 1/2 to 2 1/2      | +0.06<br>-0.03                                | 0.03                                            |                                                            | 0.03                      | 0.06                      | 0.06                         | 0.25                            | 0.25                        | 0.03                    |
| 3 to 3 1/2        | 0.06<br>0.06                                  | 0.06<br>0.06                                    |                                                            | 0.03                      | 0.06                      | 0.06                         | 0.25                            | 0.25                        | 0.03                    |
| 4                 | +0.09<br>-0.06                                | 0.06                                            |                                                            | 0.03                      | 0.06                      | 0.06                         | 0.25                            | 0.25                        | 0.03                    |
| 5 to 8            |                                               | 0.06                                            | Not less than 87.5% of nominal thickness marked on fitting | 0.06                      | 0.12                      | 0.06                         | 0.25                            | 0.25                        | 0.03                    |
| 10 to 12          | +0.16<br>-0.12                                | 0.12                                            |                                                            | 0.09                      | 0.19                      | 0.09                         | 0.38                            | 0.25                        | 0.06                    |
| 14 to 16          | +0.16<br>-0.12                                | 0.12                                            |                                                            | 0.09                      | 0.25                      | 0.09                         | 0.38                            | 0.25                        | 0.06                    |
| 18                | +0.16<br>-0.12                                | 0.12                                            |                                                            | 0.12                      | 0.38                      | 0.09                         | 0.38                            | 0.25                        | 0.06                    |
| 20 to 24          | +0.25<br>-0.19                                | 0.19                                            |                                                            | 0.12                      | 0.38                      | 0.09                         | 0.38                            | 0.25                        | 0.06                    |

GENERAL NOTE:Dimensions are in inches.Tolerances are equal plus and minus except as noted.

NOTES:

- (1)Out-of-round is the sum of absolute values of plus and minus tolerance.
- (2)This tolerance may be exceeded in localized areas of formed fittings where increased wall thickness is required to meet design requirements of para.2.1.
- (3)The inside diameter and the nominal wall thicknesses at ends are to be specified by the purchaser.Wall thickness tolerance applies throughout the fitting.
- (4)Unless otherwise specified by the purchaser,these tolerances apply to the nominal inside diameter,which equals the difference between the nominal outside diameter and twice the nominal wall thickness.

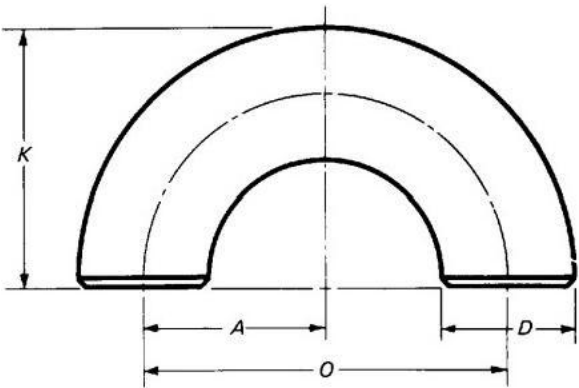
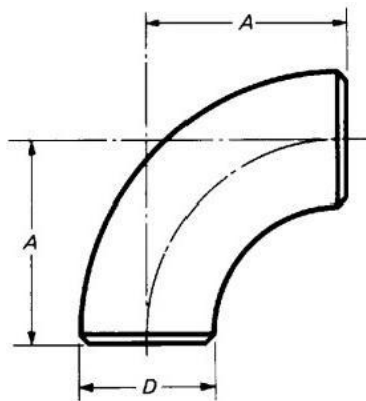


TABLE 2 DIMENSIONS OF SHORT RADIUS

| ELBOWs            |                             |                 |
|-------------------|-----------------------------|-----------------|
| Nominal Pipe Size | Outside Diameter at Bevel D | Center-to-End A |
| 1                 | 1.32                        | 1.00            |
| 1                 | 1.66                        | 1.25            |
| 1 1/4             | 1.90                        | 1.50            |
| 2                 | 2.38                        | 2.00            |
| 2 1/2             | 2.88                        | 2.50            |
| 3                 | 3.50                        | 3.00            |
| 3 1/2             | 4.00                        | 3.50            |
| 4                 | 4.50                        | 4.00            |
| 5                 | 5.56                        | 5.00            |
| 6                 | 6.62                        | 6.00            |
| 8                 | 8.62                        | 8.00            |
| 10                | 10.75                       | 10.00           |
| 12                | 12.75                       | 12.00           |
| 14                | 14.00                       | 14.00           |
| 16                | 16.00                       | 16.00           |
| 18                | 18.00                       | 18.00           |
| 20                | 20.00                       | 20.00           |
| 22                | 22.00                       | 22.00           |
| 24                | 24.00                       | 24.00           |

GENERAL NOTE:Dimensions are in inches.

TABLE 3 DIMENSIONS OF SHORT RADIUS

| 180 deg RET       |                             |                    |                |
|-------------------|-----------------------------|--------------------|----------------|
| URNs              |                             |                    |                |
| Nominal Pipe Size | Outside Diameter at Bevel D | Center-to-Center O | Back-to-Face K |
| 1                 | 1.32                        | 2.00               | 1.62           |
| 1 1/4             | 1.66                        | 2.50               | 2.06           |
| 1 1/2             | 1.90                        | 3.00               | 2.44           |
| 2                 | 2.38                        | 4.00               | 3.19           |
| 2 1/2             | 2.88                        | 5.00               | 3.94           |
| 3                 | 3.50                        | 6.00               | 4.75           |
| 3 1/4             | 4.00                        | 7.00               | 5.50           |
| 4                 | 4.50                        | 8.00               | 6.25           |
| 5                 | 5.56                        | 10.00              | 7.75           |
| 6                 | 6.62                        | 12.00              | 9.31           |
| 8                 | 8.62                        | 16.00              | 12.31          |
| 10                | 10.75                       | 20.00              | 15.38          |
| 12                | 12.75                       | 24.00              | 18.38          |
| 14                | 14.00                       | 28.00              | 21.00          |
| 16                | 16.00                       | 32.00              | 24.00          |
| 18                | 18.00                       | 36.00              | 27.00          |
| 20                | 20.00                       | 40.00              | 30.00          |
| 22                | 22.00                       | 44.00              | 33.00          |
| 24                | 24.00                       | 48.00              | 36.00          |

GENERAL NOTES:  
(a)Dimensions are in inches.  
(b)Dimension A is equal to one-half of dimension O.

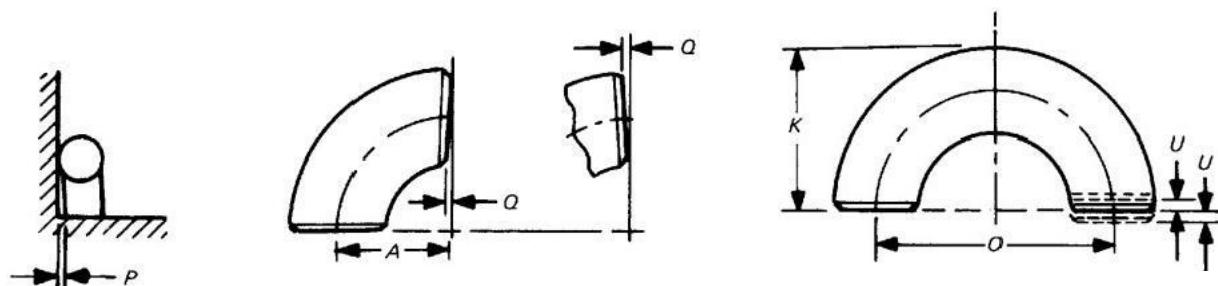


TABLE A1 TOLERANCES

| Nominal Pipe Size | All Fittings                                  |                                                 |                                                            |                           |             | 90 deg Elbows             | 180 deg Returns              |                          |                      |
|-------------------|-----------------------------------------------|-------------------------------------------------|------------------------------------------------------------|---------------------------|-------------|---------------------------|------------------------------|--------------------------|----------------------|
|                   | Outside Diameter at Bevel<br>[Notes (1), (2)] | Inside Diameter at End<br>[Notes (1), (3), (4)] | Wall Thickness<br>Note (3)]                                | Angularity<br>Off Angle Q | Off Plane P | Center-to-End Dimension A | Center-to-Center Dimension O | Back-to-Face Dimension K | Alignments of Ends U |
| 1/2 to 2          | 1                                             | 0.8                                             | Not less than 87.5% of nominal thickness marked on fitting | 1                         | 2           | 2                         | 7                            | 7                        | 1                    |
| 1/2               | 1                                             | 1.6                                             |                                                            | 1                         | 2           | 2                         | 7                            | 7                        | 1                    |
| 3 to 3 1/2        | +2<br>-1                                      | 1.6                                             |                                                            | 1                         | 2           | 2                         | 7                            | 7                        | 1                    |
| 4                 | +3<br>-1                                      | 1.6                                             |                                                            | 2                         | 4           | 2                         | 7                            | 7                        | 1                    |
| 5 to 6            | 2                                             | 1.6                                             |                                                            | 2                         | 4           | 2                         | 7                            | 7                        | 1                    |
| 8                 | +4<br>-3                                      | 3.2                                             |                                                            | 3                         | 5           | 3                         | 10                           | 7                        | 2                    |
| 10 to 12          | +4<br>-3                                      | 3.2                                             |                                                            | 4                         | 10          | 3                         | 10                           | 7                        | 2                    |
| 14 to 18          | +6<br>-5                                      | 4.8                                             |                                                            | 4                         | 10          | 3                         | 10                           | 7                        | 2                    |
| 20 to 24          |                                               |                                                 |                                                            |                           |             |                           |                              |                          |                      |

GENERAL NOTE: Dimensions are in millimeters. Tolerances are equal plus and minus except as noted.

## NOTES:

- (1) Out-of-round is the sum of absolute values of plus and minus tolerance.
- (2) This tolerance may be exceeded in localized areas of formed fittings where increased wall thickness is required to meet design requirements of para. 2.1.
- (3) The inside diameter and the nominal wall thicknesses at ends are to be specified by the purchaser. Wall thickness tolerance applies throughout the fitting.
- (4) Unless otherwise specified by the purchaser, these tolerances apply to the nominal inside diameter, which equals the difference between the nominal outside diameter and twice the nominal wall thickness.

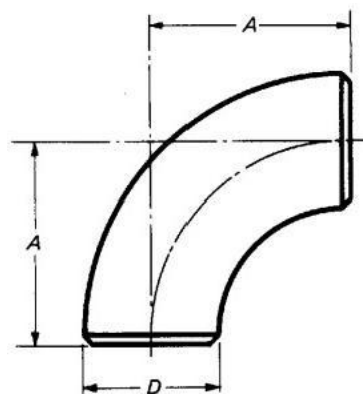


TABLE A2 DIMENSIONS OF SHORT RADIUS ELBOWS

| Nominal<br>Pipe<br>Size | Outside Diameter at Bevel<br>D |      |      | Center-to-End<br>A<br>90 deg Elbows |      |      |
|-------------------------|--------------------------------|------|------|-------------------------------------|------|------|
|                         | Min.                           | Nom. | Max. | Min.                                | Nom. | Max. |
| 1                       | 32                             | 33   | 34   | 23                                  | 25   | 27   |
| 1 1/4                   | 41                             | 42   | 43   | 30                                  | 32   | 34   |
| 1 1/2                   | 47                             | 48   | 49   | 36                                  | 38   | 40   |
| 2                       | 59                             | 60   | 61   | 49                                  | 51   | 53   |
| 2 1/2                   | 72                             | 73   | 74   | 62                                  | 64   | 66   |
| 3                       | 88                             | 89   | 90   | 74                                  | 76   | 78   |
| 3 1/2                   | 101                            | 102  | 103  | 87                                  | 89   | 91   |
| 4                       | 113                            | 114  | 116  | 100                                 | 102  | 104  |
| 5                       | 140                            | 141  | 144  | 125                                 | 127  | 129  |
| 6                       | 167                            | 168  | 171  | 150                                 | 152  | 154  |
| 8                       | 217                            | 219  | 221  | 201                                 | 203  | 205  |
| 10                      | 270                            | 273  | 277  | 252                                 | 254  | 256  |
| 12                      | 321                            | 324  | 328  | 302                                 | 305  | 308  |
| 14                      | 353                            | 356  | 360  | 353                                 | 356  | 359  |
| 16                      | 403                            | 406  | 410  | 403                                 | 406  | 409  |
| 18                      | 454                            | 457  | 461  | 454                                 | 457  | 460  |
| 20                      | 503                            | 508  | 514  | 505                                 | 508  | 511  |
| 22                      | 554                            | 559  | 565  | 556                                 | 559  | 562  |
| 24                      | 605                            | 610  | 616  | 607                                 | 610  | 613  |

**GENERAL NOTE:**Dimensions are in millimeters.