

# USA Standard

## for

# Thickness Design of Cast-Iron Pipe

## Sec. 1-1—Thickness Tables for Standard Conditions

### Sec. 1-1.1—General

Tables 1-1, 1-2 and 1-3, as applicable, permit the direct determination of the required thickness of cast-iron pipe limited to the following conditions:

a. Vertical-sided trench of width at top of pipe not greater than the nominal pipe diameter plus 2 ft

b. Unit weight of soil 120 lb/cu ft

c.  $K_{\mu} = 0.1924$ ,  $K_{\mu}' = 0.130$  (See Sec. 1-3.2 for definition)

d. Truck superload based on two passing trucks with adjacent wheels 3 ft apart, 9,000 lb wheel load, unpaved road or flexible pavement, 1.50 impact factor

e. Surge allowances as shown in Table 1-10

f. Iron strengths of 18/40 and 21/45\*

g. The three most common laying conditions:

A—Pipe laid on flat-bottom trench, backfill not tamped

B—Pipe laid on flat-bottom trench, backfill tamped

\*The first figure designates the bursting tensile strength ( $S$ ) in units of 1,000 psi and the second figure designates the ring modulus of rupture ( $R$ ) in units of 1,000 psi.

F—Pipe bedded in gravel or sand, backfill tamped

h. Allowances for casting tolerance as shown in Table 1-6

i. A corrosion allowance of 0.08 in.

### Sec. 1-1.2—Trench Load and Internal Pressure

The required thickness of cast-iron pressure pipe is determined from a consideration of trench load and internal pressure in combination. Trench load is considered to consist of the earth load on the pipe plus any superload resulting from traffic over the trench. Internal pressure is considered to consist of the design working pressure plus an additional allowance for surge pressure. Two different combinations of trench load and internal pressure are considered in the design:

*Case 1.* Trench load (earth load but no truck superload) in combination with internal pressure (working pressure plus surge pressure) and with 2.5 factor of safety applied to both trench load and internal pressure

*Case 2.* Trench load (earth load plus truck superload) in combination with internal pressure (working pressure but no surge pressure) and with

a 2.5 factor of safety applied to both trench load and internal pressure.

### **Sec. 1-1.3—Traffic Superload and Surge Pressure**

In designing water pipe it is customary to assume that neither traffic superload nor surge pressure will occur in important magnitude simultaneously. Thus, calculations for the required thickness of water pipe are made for both conditions independently, and the greater of the two thicknesses thus determined is chosen as the net thickness.

In designing gas pipe the procedure is the same, except that surge pressure is not a factor and only Case 2 is considered.

### **Sec. 1-1.4—Corrosion Allowance and Casting Tolerance**

To the net thickness determined as explained above, a corrosion allowance and a casting tolerance are added to obtain the calculated thickness shown in Tables 1-1, 1-2, and 1-3. The standard thickness class and/or the nominal thickness for this class shown in Tables 1-1, 1-2, and 1-3 are used for specifying and ordering pipe.

For other than standard conditions the formulas, tables, and diagrams in Sec. 1-2 may be used. The design theory on which Tables 1-1, 1-2, and 1-3 are based is presented in Sec. 1-3. Procedures for determining the net thickness of pipe on piers or piling above- or belowground are presented in Sec. 1-4.