

TABLE 2. EXTRA STRONG WROUGHT PIPE
Table of Standard Dimensions

SIZE INCHES	DIAMETERS		NOMINAL THICKNESS INCHES	CIRCUMFERENCE		TRANSVERSE AREA			LENGTH OF PIPE PER SQUARE FOOT OF		LENGTH OF PIPE CONTAINING ONE CUBIC FOOT PER LINEAL FOOT	NOMINAL WEIGHT PER FOOT PER LINEAL FOOT
	External Inches	Approximate Internal Inches		External Inches	Internal Inches	External Sq In	Internal Sq In	Metal Sq In	External Surface	Internal Surface		
1/8	0.405	0.215	0.095	1.272	0.675	0.129	0.036	0.093	9.431	17.766	3966.392	0.314
1/4	0.540	0.302	0.119	1.696	0.949	0.229	0.072	0.157	7.073	12.648	2010.290	0.535
3/8	0.675	0.423	0.126	2.121	1.329	0.358	0.141	0.217	5.658	9.030	1024.689	0.738
1/2	0.840	0.546	0.147	2.639	1.715	0.554	0.234	0.320	4.547	6.995	615.017	1.087
5/8	1.050	0.742	0.154	3.299	2.331	0.866	0.433	0.433	3.637	5.147	333.016	1.473
3/4	1.315	0.957	0.179	4.131	3.007	1.358	0.719	0.639	2.904	3.991	200.193	2.171
1	1.600	1.278	0.191	5.215	4.015	2.164	1.283	0.881	2.301	2.988	112.256	2.996
1 1/8	1.900	1.500	0.200	5.969	4.712	2.835	1.767	1.068	2.010	2.546	81.487	3.631
1 1/4	2.235	1.739	0.218	7.461	6.092	4.430	2.953	1.477	1.608	1.969	48.766	5.022
1 1/2	2.575	2.033	0.237	9.032	7.298	6.492	4.238	2.254	1.328	1.644	33.976	7.661
2	3.300	2.600	0.300	10.996	9.111	9.621	6.605	3.016	1.091	1.317	21.801	10.252
2 1/2	4.000	3.364	0.318	12.566	10.568	12.566	8.888	3.678	0.954	1.135	16.202	12.505
3	4.500	3.826	0.337	14.137	12.020	15.904	11.497	4.407	0.848	0.998	12.525	14.983
3 1/2	5.000	4.313	0.375	17.477	15.120	24.306	18.194	6.112	0.686	0.793	7.915	20.778
4	5.563	4.813	0.432	20.813	18.099	34.472	26.067	8.405	0.576	0.663	5.524	28.573
5	6.625	5.761	0.500	27.096	23.955	58.426	45.663	12.763	0.442	0.500	3.154	43.388
6	8.625	7.625	0.500	33.772	30.631	90.763	74.662	16.101	0.355	0.391	1.929	54.735
8	10.750	9.750	0.500	40.055	36.914	127.676	108.434	19.242	0.299	0.325	1.328	65.415

double-offset expansion *U*-bend, or the circle bend (Fig. 1); (2) a built-up bend composed of several of the smaller curved pieces illustrated in Fig. 1; (3) a combination of straight pieces with such curved pieces or cast ells; (4) a so-called *square* bend made up entirely of straight pieces, cast ells, etc.

All risers must be anchored and safeguarded so that the difference in length when hot from the length when cold shall not disarrange the normal and orderly provisions for drainage of the branches.

It is especially necessary with light-weight radiators so to anchor and so to give freedom for expansion of the piping that no strain therefrom shall be allowed to distort the radiators. When expansion strains from the pipes are permitted to reach these light metal heaters they usually emit sounds of distress which are exceedingly troublesome.

The linear expansion of the pipe can be determined from Table 3. The elongation values in this table were computed from the following formula:

$$L_t = L_o \left[1 + a \left(\frac{t - 32}{1000} \right) + b \left(\frac{t - 32}{1000} \right)^2 \right] \quad (1)$$

where

L_t = length at temperature t degrees Fahrenheit, feet.

L_o = length at 32 F, feet.

t = final temperature, degrees Fahrenheit.

a and b are constants as follows:

METAL	a	b
Cast-Iron.....	0.005441	0.001747
Steel.....	0.006212	0.001623
Wrought-Iron.....	0.006503	0.001622
Copper.....	0.009278	0.001244

In selecting expansion fittings it is well to allow a margin of 25 per cent between the computed expansion and the actual allowable travel of the expansion fitting to provide for inaccuracies in assembling, etc. Table 4 gives the dimensions of expansion offsets and bends required to take care of different amounts of expansion.

FITTINGS

Fittings for joining the separate lengths of pipe together are made in a variety of forms, and are either screwed or flanged, the former being generally used for the smaller sizes of pipe up to and including 3 1/2 in., and the latter for the larger sizes, 4 in. and above. Screwed fittings of large size as well as flanged fittings of small size are also made and are used for certain classes of work at the proper pressure.

The material used for fittings is generally cast-iron, but in addition to this malleable iron, steel and steel alloys are also used, as well as various grades of brass or bronze. The material to be used depends on the character of the service and the pressure.

As in the case of pipe, there are several weights of fittings manufactured, designed to be used with pipe of corresponding grade. These varia-