

first cost is said to be justified on the basis of longer life expectancy. Wrought-iron pipe may be identified by the spiral line marked into each length, either knurled into the metal or painted on it in red or other bright color. Otherwise, there is little difference in the appearance of wrought iron and steel pipe, although microscopic examination of polished and etched specimens will readily disclose the difference.

Cast Ferrous Pipe. There are now available several types of cast-ferrous metal pipe made of a good grade of cast-iron with or without additions of nickel, chromium, or other alloy. This pipe is available in sizes from 1½ in. to 6 in., and in standard lengths of 5 or 6 ft with external and internal diameters closely approximating those of extra strong wrought pipe. Cast ferrous pipe may be obtained coupled, beveled for welding, or with ends plain or grooved for the several types of couplings. It is easily cut and threaded as well as welded. The fact that it is readily welded enables the manufacturers to supply the pipe in any lengths practicable for handling.

Alloy Metal Pipe. Steel pipe bearing a small alloy of copper or other alloying element and iron pipe bearing a small alloy of copper and molybdenum have been claimed to possess more resistance to corrosion than plain steel pipe and they are advertised and sold under various trade names.

Copper Pipe and Fittings. Owing to its inherent resistance to corrosion, copper and brass pipe have always been used in heating, ventilating, and water supply installations, but the cost with standard dimensions for threaded connections has been high. The recent introduction of fittings which permit erection by soldering or sweating allows the use of pipe with thinner walls than are possible with threaded connections, thereby reducing the cost of installations.

The initial cost of brass and copper pipe installations generally runs higher than the corresponding job with steel pipe and screwed connections in spite of the use of thin wall pipe, but the corrosive nature of the fluid conveyed or the inaccessibility of some of the piping may warrant use of a more expensive material than plain steel. The advantages of corrosion-resisting pipe and fittings should be weighed against the correspondingly higher initial cost.

COMMERCIAL PIPE DIMENSIONS

The IPS dimensions of commercial pipe universally used at the present time conform to the recommendations made by a Committee of the A.S.M.E. in 1886. Pipe up to 12 in. in diameter is made in certain definite sizes designated by nominal internal diameter which is somewhat different from the actual internal diameter, depending on the wall thickness required. There are three weights of wrought iron and steel pipe commonly used, known as *standard-weight*, *extra-strong*, and *double extra-strong*. Because of the necessity of maintaining the same external diameter in all three weights for the same nominal size, the added wall thickness is obtained by decreasing the internal diameter. The term *full-weight*, when applied to sizes below 8 in., means that the pipe is up to the nominal weight per foot. When applied to sizes between 8 and 12 in., inclusive, it often indicates that the pipe has the heaviest of several wall

CHAPTER 18. PIPE, FITTINGS, WELDING

thicknesses listed. In sizes 14 in. and upward, pipe is designated by its outside diameter (O.D.) and the wall thickness is specified.

While the demands for pipe for the heating and ventilating industry are reasonably well served by the *standard-weight* and *extra-strong* pipe, demands for pipe for higher pressures and temperatures in industry resulted in the use of a multiplicity of wall thicknesses for all sizes. Even in heating installations, the erection of piping by welding was deemed to

TABLE 1. DIMENSIONS OF SCHEDULES 30 AND 40 AND STANDARD WEIGHT PIPE^a

SIZE	DIAMETER IN.		WEIGHT PER FT. LB.			CIRCUM- FERENCE, IN.	TRANSVERSE AREA, Sq. IN.			LENGTH OF PIPE, FT. PER SQ. FT.		LENGTH OF PIPE FT. CON- TAINING 1 Cu. Ft.	WEIGHT OF WATER, LB. PER FT.		
	External	Internal	Thickness, In.	Plain Ends	Threads and Couplings		Threads per In.	External	Internal	Metal	External Surface			Internal Surface	
1/8	0.405	0.289	0.068	0.244	0.245	27	1.272	0.845	0.129	0.057	9.431	14.199	2533.775	0.025	
1/4	0.540	0.354	0.089	0.427	0.428	18	1.696	1.144	0.229	0.104	7.073	10.493	1383.789	0.045	
3/8	0.675	0.493	0.091	0.567	0.568	18	2.121	1.549	0.358	0.191	0.167	5.658	7.748	754.360	0.083
1/2	0.840	0.622	0.109	0.850	0.852	14	2.639	1.954	0.554	0.304	0.250	4.547	6.141	473.906	0.132
3/4	1.050	0.824	0.113	1.130	1.134	14	3.299	2.589	0.866	0.533	0.333	3.637	4.635	270.034	0.231
1	1.315	1.049	0.133	1.678	1.684	11 1/2	4.131	3.296	1.358	0.864	0.494	2.904	3.641	166.618	0.375
1 1/4	1.660	1.380	0.140	2.272	2.281	11 1/2	5.215	4.335	2.164	1.495	0.669	2.301	2.768	96.275	0.65
1 1/2	1.900	1.610	0.145	2.717	2.731	11 1/2	5.969	5.058	2.835	2.036	0.799	2.010	2.372	70.793	0.88
2	2.375	2.067	0.154	3.652	3.678	11 1/2	7.461	6.494	4.430	3.355	1.075	1.608	1.847	42.913	1.45
2 1/2	2.875	2.469	0.203	5.793	5.819	8	9.032	7.757	6.492	4.788	1.704	1.328	1.547	30.077	2.07
3	3.500	3.068	0.216	7.575	7.616	8	10.996	9.638	8.621	7.393	2.228	1.091	1.245	19.479	3.20
3 1/2	4.000	3.548	0.226	9.109	9.202	8	12.566	11.146	12.566	9.886	2.680	0.954	1.076	14.565	4.29
4	4.500	4.026	0.237	10.790	10.889	8	14.137	12.648	15.904	12.730	3.174	0.948	0.948	11.312	5.50
5	5.563	5.047	0.258	14.617	14.810	8	17.477	15.856	24.306	20.006	4.300	0.686	0.756	7.198	8.67
6	6.625	6.065	0.280	18.974	19.185	8	20.813	19.054	34.472	28.891	5.581	0.576	0.629	4.984	12.51
8	8.625	8.071	0.277	24.696	25.000	8	27.096	25.356	58.426	51.161	7.265	0.443	0.478	2.815	22.18
10	8.625	7.981	0.322	28.554	28.808	8	27.096	25.073	58.426	50.027	8.399	0.443	0.478	2.378	21.70
10	10.750	10.192	0.279	31.201	32.000	8	33.772	32.019	90.763	81.585	9.172	0.355	0.374	1.765	35.37
10	10.750	10.136	0.307	34.240	35.000	8	33.772	31.843	90.763	80.691	10.072	0.355	0.376	1.785	34.95
10	10.750	10.020	0.365	40.483	41.132	8	33.772	31.479	90.763	78.855	11.908	0.355	0.381	1.826	34.20
12	12.750	12.090	0.330	43.773	45.000	8	40.055	37.982	127.676	114.800	12.876	0.299	0.315	1.254	49.70
12	12.750	12.000	0.375	49.562	50.706	8	40.055	37.699	127.676	113.097	14.579	0.299	0.318	1.273	49.00

^aStandard-weight wrought-iron pipe has approximately the same wall thicknesses and weights as contained herein for steel pipe. For exact dimensions, see *American Standard for Wrought-Iron and Wrought-Steel Pipe*, A.S.A. B36.10.

^bThicknesses shown in bold face type are identical with thicknesses for Schedule 40 pipe of A.S.A. B36.10.

^cSame as Schedule 30, A.S.A. B36.10.

warrant the use of pipe lighter than standard weight. For these reasons, a *Sectional Committee on Standardization of Wrought-Iron and Wrought-Steel Pipe and Tubing* functioning under the procedure of the *American Standards Association* was appointed to standardize the dimensions and materials of pipe.

The pipe standard recommended by that sectional committee has set up several schedules of pipe including standard-weight and extra-strong thicknesses which are now included in Schedules 40 and 80, respectively. Dimensions and other useful data for standard-weight and extra-strong pipe are given in Tables 1 and 2. Table 3 from A.S.T.M. Specifications