TABLE 2. DIMENSIONS AND PROPERTIES OF COPPER TUBE
(All Types Except DWV are Based on ASTM B-88)

Nominal Size	Type	Diameter O. D. In.	Diameter I. D. In.	Wall Thickness In.	Surface Area Sq Ft/Lin Ft O. D.	Surface Area Sq Ft/Lin Ft I. D.	Section Area Sq In. O. D.	Section Area Sq In. I. D.	Area of Metal Sq In	Volume Gal/Lin Ft	Weight[a] Lbs/Lin Ft	Working Pressure[b] psia
¼	K[c]	0.375	0.305	0.035	0.0982	0.0798	0.110	0.0730	0.0374	0.00379	0.145	918
	L[c]	0.375	0.315	0.030	0.0982	0.0825	0.110	0.0779	0.0324	0.00404	0.126	764
⅜	K	0.500	0.402	0.049	0.131	0.105	0.196	0.127	0.0695	0.00660	0.269	988
	L	0.500	0.430	0.035	0.131	0.113	0.196	0.145	0.0512	0.00753	0.198	677
½	K	0.625	0.527	0.049	0.164	0.138	0.306	0.218	0.0887	0.0113	0.344	779
	L	0.625	0.545	0.040	0.164	0.143	0.306	0.233	0.0735	0.0121	0.285	625
⅝	K	0.750	0.652	0.049	0.193	0.171	0.441	0.334	0.108	0.0174	0.418	643
	L	0.750	0.666	0.042	0.193	0.174	0.441	0.348	0.0934	0.0181	0.362	547
¾	K	0.875	0.745	0.065	0.229	0.195	0.601	0.436	0.165	0.0227	0.641	747
	L	0.875	0.785	0.045	0.229	0.206	0.601	0.480	0.117	0.0250	0.455	497
1	K	1.125	0.995	0.065	0.295	0.260	0.994	0.778	0.216	0.0405	0.839	574
	L	1.125	1.025	0.050	0.295	0.268	0.994	0.852	0.169	0.0442	0.655	432
1¼	K	1.375	1.245	0.065	0.360	0.326	1.48	1.22	0.268	0.0634	1.04	466
	L	1.375	1.265	0.055	0.360	0.331	1.48	1.26	0.228	0.0655	0.884	387
	M	1.375	1.291	0.042	0.360	0.338	1.48	1.31	0.176	0.0681	0.682	293
	DWV	1.375	1.295	0.040	0.360	0.339	1.48	1.32	0.163	0.0684	0.650	—
1½	K	1.625	1.481	0.072	0.425	0.388	2.07	1.72	0.351	0.0894	1.36	421
	L	1.625	1.505	0.060	0.425	0.394	2.07	1.78	0.295	0.0925	1.14	359
	M	1.625	1.527	0.049	0.425	0.400	2.07	1.83	0.243	0.0950	0.940	289
	DWV	1.625	1.541	0.042	0.425	0.403	2.07	1.86	0.205	0.0969	0.809	—
2	K	2.125	1.959	0.083	0.556	0.513	3.56	3.01	0.532	0.157	2.06	376
	L	2.125	1.985	0.070	0.556	0.520	3.56	3.10	0.452	0.161	1.75	316
	M	2.125	2.009	0.058	0.556	0.526	3.56	3.17	0.377	0.164	1.46	255
	DWV	2.125	2.041	0.042	0.556	0.534	3.56	3.27	0.288	0.142	1.07	—
2½	K	2.625	2.435	0.095	0.687	0.638	5.41	4.66	0.755	0.242	2.93	352
	L	2.625	2.465	0.080	0.687	0.645	5.41	4.77	0.640	0.247	2.48	295
	M	2.625	2.495	0.065	0.687	0.653	5.41	4.89	0.523	0.254	2.03	234
3	K	3.125	2.907	0.109	0.818	0.761	7.67	6.64	1.03	0.345	4.00	343
	L	3.125	2.945	0.090	0.818	0.771	7.67	6.81	0.858	0.354	3.33	278
	M	3.125	2.981	0.072	0.818	0.780	7.67	6.98	0.691	0.362	2.68	220
	DWV	3.125	3.035	0.045	0.818	0.796	7.67	7.23	0.435	0.376	1.69	—
3½	K	3.625	3.385	0.120	0.949	0.886	10.3	9.00	1.32	0.468	5.12	324
	L	3.625	3.425	0.100	0.949	0.897	10.3	9.21	1.11	0.478	4.29	268
	M	3.625	3.459	0.083	0.949	0.906	10.3	9.40	0.924	0.489	3.58	218
4	K	4.125	3.857	0.134	1.08	1.01	13.3	11.7	1.68	0.607	6.51	135
	L	4.125	3.905	0.110	1.08	1.02	13.3	12.0	1.39	0.623	5.38	256
	M	4.125	3.935	0.095	1.08	1.03	13.3	12.2	1.20	0.634	4.66	217
	DWV	4.125	4.009	0.058	1.08	1.05	13.3	12.6	0.67	0.656	2.87	—
5	K	5.125	4.805	0.160	1.34	1.26	20.7	18.1	2.50	0.940	9.67	307
	L	5.125	4.875	0.125	1.34	1.28	20.7	18.7	1.96	0.971	7.61	234
	M	5.125	4.907	0.109	1.34	1.29	20.7	18.9	1.72	0.981	6.66	203
6	K	6.125	5.741	0.192	1.60	1.50	29.4	25.9	3.50	1.35	13.9	308
	L	6.125	5.845	0.140	1.60	1.53	29.4	26.8	2.63	1.39	10.2	221
	M	6.125	5.881	0.122	1.60	1.54	29.4	27.2	2.30	1.42	8.92	190
	DWV	6.125	5.959	0.083	1.60	1.56	29.4	27.9	1.58	1.55	6.10	—
8	K	8.125	7.583	0.271	2.13	1.99	51.8	45.2	6.69	2.34	25.9	330
	L	8.125	7.725	0.200	2.13	2.02	51.8	46.9	4.98	2.43	19.3	239
	M	8.125	7.785	0.170	2.13	2.04	51.8	47.6	4.25	2.47	16.5	200
10	K	10.125	9.449	0.338	2.65	2.47	80.5	70.1	10.4	3.65	40.3	332
	L	10.125	9.625	0.250	2.65	2.52	80.5	72.8	7.76	3.79	30.1	241
	M	10.125	9.701	0.212	2.65	2.54	80.5	73.9	6.60	3.84	25.6	202
12	K	12.125	11.315	0.405	3.17	2.96	115.	101.	14.9	5.24	57.8	334
	L	12.125	11.565	0.280	3.17	3.03	115.	105.	10.4	5.45	40.4	225
	M	12.125	11.617	0.254	3.17	3.04	115.	106.	9.47	5.50	36.7	204

[a] Weight per foot is based on tube without couplings.

[b] Working pressure is based on the American Standard Code for Pressure Piping, published by the *ASME*, revised November, 1952 for plain end tubing (sweat joints).

$$P = \frac{2st_m}{D - 0.8t_m}$$

where P = allowable pressure, pounds per square inch.
s = 6000 psi allowable fiber stress, pounds per square inch.
t_m = minimum wall thickness, inches.
D = maximum O. D., inches.

[c] Types K and L furnished in both hard and soft tempers, Type M in hard only. Standard straight lengths are 20 ft. Standard coils (¼ to 1½ inch) are 60 ft.

copper and red 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 introduction of fittings which permit erection by soldering or sweating, allows the use of tube with thinner walls than would be possible with threaded connections, thereby reducing the cost of installations.

COMMERCIAL PIPE DIMENSIONS

Commercial pipe dimensions are covered in the following specifications of the *American Society for Testing Materials:* (1) steel—*ASTM* A-120 and A-53, (2) wrought-iron—*ASTM* A-72, and (3) copper tube—*ASTM* A-88.

Tables 1 and 2 are based on these specifications.

In addition to the specifications for these three materials, there are

TABLE 3. TABLE OF AVAILABILITY FOR STEEL PIPE

Material	Specification	Available Sizes (Inclusive) Inches Diam.	Allowable Fiber Stress S[a] psi
Butt-weld	A-120	⅛ to 4	6,225
	A-53	⅛ to 4	6,750
Lap-weld	A-120	2 to 12	8,400
	A-53	2 to 24	9,000
Electric-resistance	A-53 Grade A	2 to 24	10,200[b]
	A-53 Grade B	2 to 24	12,750[b]
Seamless	A-53 Grade A	2 to 24	12,000
	A-53 Grade B	2 to 24	15,000
	A-120	2 to 12	10,400

[a] For use in the equation

$$P = \frac{2S\,(t_m - c)}{D - 0.8\,(t_m - c)}$$

See *American Standard Code for Pressure Piping*, published by *ASME*, revised November, 1952.

Where P = working pressure, pounds per square inch.
S = fiberstress, pounds per square inch.
t_m = 0.875 x wall thickness, inches.
D = O. D., inches.
c = joint factor = 0.05 for 1-in. and smaller size or 0.065 for larger than 1-in. size.

[b] For electric resistance welded pipe for applications where the temperature is below 650 F, and where pipe furnished under this classification is subjected to supplemental tests and/or heat treatments as agreed to by the supplier and the purchaser, and whereby such supplemental tests and/or heat treatments demonstrate the strength characteristics of the weld to be equal to the minimum tensile strength specified for the pipe, the S values equal to the corresponding seamless grades may be used.

standards for copper or red brass *IPS*, clay or concrete, and cast-iron pipe. Copies of the following specifications may be obtained from the *American Society for Testing Materials:* (1) steel, wrought-iron and cast-iron—Series A, (2) copper and red brass—Series B, and (3) clay and concrete—Series C.

Table 3 lists the sizes available in each of the specifications and classes of steel pipe. Note that butt-weld is not available above 4-in. size and that lap-weld, electric-resistance-weld, and seamless are not available below 2-in. size.

Listed in Table 3 is the formula for allowable working pressures as given in the *American Standard Code for Pressure Piping*.[1] In this formula is a factor c, which is intended as an allowance for corrosion, mechanical injury, manufacturing tolerances, etc. At times this factor seems too conservative; for example, with ⅛-in., Schedule 40, steel pipe, the allowable working pressure is 314 psi. Yet this pipe is tested at 700 psi. The reasoning in establishing the factor c which influences the working pressure, is that after nominal use the pipe may not be as sturdy as it was at the time