distinct corrosive influence on the materials of engineering. The affinity of iron for oxygen, which may be looked upon as the chief factor of corrosion, is apparent to the most casual observer in the rust developed, which is evident on every hand. That this activity of corrosion is greatly accelerated by an elevation in temperature, is readily seen in the blacksmith shop, where iron oxidizes to form a heavy scale in the short time that elapses between the forge and the hammer.

Not so with brass. Its oxidation is slow and years of exposure are required to effect a noticable corrosion. Metals may be subjected to air, water, sulphurous fumes, nitrogen, hydrogen and free carbon dioxide. The nitrogen is inert, but the oxygen and free or half-bound carbon dioxide in the presence of moisture exercise a distinct corrosive influence, the latter exhibiting, with water, the corroding effects of a weak acid. Iron or steel under these exposures are incomparably more subject to attack than brass, a fact demonstrated by daily experience and extensive research in the laboratory.

Internal corrosion, accelerated by higher temperatures is most to be feared and is often the determining factor in endurance. We often see an old iron pipe that is pitted completely through at certain points, due to this action. The proof of this assertion is shown in the more rapid corrosion of hot-water piping than cold. In cold water piping the temperature of the water restrains the chemical interaction, but gases released at points where a partial vacuum obtains, still exercise a corrosive effect.

The iron oxides have a much greater volume than the metallic iron from which they were originally derived. A 1½ in. pipe, would be entirely closed up when only 1/27 of the thickness of its wall would have been converted into oxides, and in a 1 in. pipe only 1/40. This results in "wire drawing" and greatly reduces the volume of the stream at outlets and leads to complaints that the pressure is abnormally low, whereas the real source of trouble is in excessive interior corrosion.

Brass piping is immune to this type of corrosion, and always delivers water free from discoloration or rust. Due to its maintenance of a smooth, unrusted interior, full flow and pressure are continued throughout the life of the system, and piping friction losses are kept reduced to the minimum.

Under conditions usually obtaining, good quality brass piping and fittings will satisfy all requirements. The architect engineer or contractor should by all means require that piping and fittings be supplied by a reputable dealer, the product of a reputable manufacturer.

Certain known special conditions of corrosion may require special mixtures, in order to obtain for the piping system the longest life. Among such instances might be mentioned salt water service, for which a universal recommendation is "admiralty" mixture (70 per cent copper, 29 per cent zinc, and 1 per cent tin.) Where unusual factors of corrosion are present, the engineer or contractor should heed the recommendations of the pipe manufacturer. *In all cases, pipe fittings should have approximately the same composition as the metal of the pipe itself.*

TABLE 91. WEIGHTS AND MEASUREMENTS OF SEAMLESS BRASS AND COPPER TUBE
IRON PIPE SIZES. REGULAR AND EXTRA HEAVY

Iron Pipe Sizes	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8	9	10
Regular																				
Brass, weight per lineal foot	.246	.437	.612	.911	1.235	1.740	2.567	3.037	4.017	5.83	8.314	10.85	12.29	13.74	15.4	18.44	23.92	30.05	36.94	43.91
Copper, weight per lineal foot	.259	.459	.644	.958	1.298	1.829	2.699	3.193	4.224	6.13	8.741	11.41	12.93	14.44	16.19	19.39	25.15	31.60	38.84	46.17
Exact inside diameter	.405	.540	.675	.840	1.050	1.315	1.660	1.900	2.374	2.875	3.500	4.000	4.000	5.000	5.563	6.625	7.625	8.625	9.625	10.750
Exact thickness of walls	.281	.375	.484	.625	.822	1.062	1.368	1.600	2.062	2.500	3.062	3.500	4.000	4.500	5.062	6.125	7.062	8.00	8.937	10.019
Brass, theoretical safe working pressure. Factor safety six	.064	.083	.096	.1075	.114	.126	.146	.150	.157	.169	.219	.250	.230	.250	.250	.260	.283	.322	.340	.370
Copper, theoretical safe working pressure. Factor safety six	1776	1465	1160	1024	840	750	628	580	509	518	461	449	427	412	400	375	366	357	349	340
Internal area cross section	1332	1102	870	798	630	563	471	435	381	391	346	337	320	309	300	281	275	267	261	255
Thickness of walls at bottom of thread	.057	.104	.192	.305	.533	.863	1.498	2.038	3.356	4.783	7.388	9.887	12.730	15.940	19.990	28.890	38.740	50.040	63.630	78.840
	.036	.040	.043	.048	.062	.059	.065	.070	.079	.098	.109	.118	.129	.139	.151	.172	.193	.214	.236	.258
Extra Heavy																				
Brass, weight per lineal foot	.353	.593	.805	1.191	1.622	2.386	3.291	3.986	5.508	8.407	11.24	13.66	10.41	20.07	22.51	31.32				
Copper, weight per lineal foot	.371	.624	.847	1.253	1.706	2.509	.346	4.191	5.791	8.839	11.82	14.37	17.25	21.10	23.67	32.93				
Exact outside diameter	.405	.540	.675	.840	1.050	1.315	1.660	1.900	2.375	2.875	3.500	4.000	4.500	5.000	5.563	6.625				
Exact inside diameter	.205	.294	.421	.542	.736	.951	1.272	1.494	1.933	2.315	2.892	3.358	3.818	4.250	4.813	5.750				
Exact thickness of walls	.100	.123	.127	.149	.157	.182	.194	.203	.221	.280	.304	.321	.341	.375	.375	.437				
Brass, theoretical safe working pressure. Factor safety six	4442	3401	2508	2166	1739	1500	1250	1142	1006	991	904	846	814		763	740				
Copper, theoretical safe working pressure. Factor safety six	3318	2551	1881	1625	1302	1125	938	857	755	748	678	635	611	14.180	578	555				
Internal area cross section	.033	.068	.139	.231	.452	.710	1.271	1.753	2.935	4.209	6.569	8.856	11.450		18.190	25.960				
Thickness of wall at bottom of thread	.068	.075	.079	.088	.096	.107	.119	.128	.146	.172	.196	.213	.233		.267	.329				
Number of threads per inch	27	18	18	14	14	11½	11½	11½	11½	8	8	8	8		8	8	8	8	8	8
Approximate length of threads	⅛″	¼″	⅜″	½″	¾″	1″	1¼″	1½″	1¾″	2″	2½″	3″	3½″	4″	4½″	5″	6″	7″	8″	9″

Note.—Weights are in pounds. Diameter and thickness in inches. Areas in square inches. The safe working pressure is calculated on thickness of walls at bottom of thread and indicates pounds per square inch internal pressure.