

Corrosion Resistance

rates. Keep velocity below 5 feet per second for temperatures up to 60°C (140°F); it should not exceed 3 to 4 feet per second for temperatures greater than 60°C.

CCBDA Information Sheet 97-02 available on request, provides detailed information on the design and installation of hot water recirculating lines.

Galvanic, or Dissimilar Metal, Corrosion of copper and copper alloys is exceptionally rare. Incidents often attributed to galvanic corrosion are usually erroneous. In the galvanic series of metals, copper is one of the most noble metals. (Table 13) This means that copper is the most corrosion resistant. In other words, when copper is in contact with iron, steel or aluminum in water distribution systems, for example, the copper does not corrode; the other metal will eventually fail if the conditions for galvanic corrosion are present. This situation can be prevented by using a dielectric fitting between the copper and the less noble metal. It should be added that electrolysis should not be confused with galvanic corrosion.

Underground Copper lines are renowned for their excellent performance in a wide variety of soil conditions. Copper does not corrode in most clays, chalks, loams, sands, and gravels. There are a few aggressive soil conditions that may result in corrosion when moisture is present. Cinder fill containing sul-

phur is one example. In such conditions, the tube should be insulated from the cinders by a layer of sand mixed with lime, or a layer of limestone, or by wrapping with moisture-proof tape.

Concrete is often thought to cause corrosion of copper, but this is a misconception. Copper is unaffected by Portland cements which provide an alkaline environment. However, non-alkaline cements containing sulphurous ash or other inorganic acids should be avoided, as should foamed concretes which employ ammonia-containing foaming agents.

Table 13: The Galvanic Series

Platinum	Most noble - Most corrosion resistant	
Gold		
Silver		
Stainless Steel - Passive		
Copper		
Tin		
Lead		
Stainless Steel - Active		
Cast Iron		
Mild Steel		
Aluminum		
Galvanized Steel		
Zinc		
Magnesium		Least noble - Least corrosion resistant

Table 1: Dimensions and Weights of Types K, L, M⁽¹⁾ and DWV⁽²⁾ Tube

Nominal or Standard Size, in.	Outside Diameter, in. All Types	Inside Diameter, in.				Wall Thickness, in.				Theoretical Weight Pounds per Linear Foot			
		K	L	M	DWV	K	L	M	DWV	K	L	M	DWV
1/4	0.375	0.305	0.315	*	*	0.035	0.030	*	*	0.145	0.126	*	*
3/8	0.500	0.402	0.430	0.450	*	0.049	0.035	0.025	*	0.269	0.198	0.145	*
1/2	0.625	0.527	0.545	0.569	*	0.049	0.040	0.028	*	0.344	0.285	0.204	*
5/8	0.750	0.652	0.666	*	*	0.049	0.042	*	*	0.418	0.362	*	*
3/4	0.875	0.745	0.785	0.811	*	0.065	0.045	0.032	*	0.641	0.455	0.328	*
1	1.125	0.995	1.025	1.055	*	0.065	0.050	0.035	*	0.839	0.655	0.465	*
1-1/4	1.375	1.245	1.265	1.291	1.295	0.065	0.055	0.042	0.040	1.04	0.884	0.682	0.650
1-1/2	1.625	1.481	1.505	1.527	1.541	0.072	0.060	0.049	0.042	1.36	1.14	0.940	0.809
2	2.125	1.959	1.985	2.009	2.041	0.083	0.070	0.058	0.042	2.06	1.75	1.46	1.07
2-1/2	2.625	2.435	2.465	2.495	*	0.095	0.080	0.065	*	2.93	2.48	2.03	*
3	3.125	2.907	2.945	2.981	3.030	0.109	0.090	0.072	0.045	4.00	3.33	2.68	1.69
3-1/2	3.625	3.385	3.425	3.459	*	0.120	0.100	0.083	*	5.12	4.29	3.58	*
4	4.125	3.857	3.905	3.935	4.009	0.134	0.110	0.095	0.058	6.51	5.38	4.66	2.87
5	5.125	4.805	4.875	4.907	4.981	0.160	0.125	0.109	0.072	9.67	7.61	6.66	4.43
6	6.125	5.741	5.845	5.881	5.959	0.192	0.140	0.122	0.083	13.9	10.2	8.92	6.10
8	8.125	7.583	7.725	7.785	7.907	0.271	0.200	0.170	0.109	25.9	19.3	16.5	10.6
10	10.125	9.449	9.625	9.701	*	0.338	0.250	0.212	*	40.3	30.1	25.6	*
12	12.125	11.315	11.565	11.617	*	0.405	0.280	0.254	*	57.8	40.4	36.7	*

⁽¹⁾ ASTM B 88-96

⁽²⁾ ASTM B 306-96

* Not available