

DATE: 12/8/97 SUBMITTED BY: Daniel Scott O'Brien

EQUIPMENT(MAKE,MODEL,S/N):

All

DISCREPANCY OR FAILURE:

Inaccurate Pipe Sizes

CONDITIONS FOUND:

1 1/4" pipe often mis designated as 1 1/2" etc

CAUSE: See attached Dim's.

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As the threads are made up in the fitting, high forces and pressures are developed by the wedging action of the taper. Also, frictional heat is developed as the surfaces are deformed to match the variations in the thread form. It is important that the threads be clean and well lubricated, and that the connection is not screwed up fast enough to generate excessive heat. Use of a lubricant called "dope" allows thread surfaces to deform and mate without galling and seizing. The dope also helps to plug openings resulting from improper threads, and acts as a cement.

Table 32. Commercial Pipe Sizes and Wall Thicknesses

Nominal Pipe Size	Outside Dia.	Nominal Wall Thickness					
		Sched. 5	Sched. 10	Sched. 40 Std.	Sched. 80 Ex. St.	Sched. 160	Ex. Ex. Strong
1/8	.405	—	.049	.068	.095	—	—
1/4	.540	—	.065	.088	.119	—	—
3/8	.675	—	.065	.091	.126	—	—
1/2	.840	—	.083	.109	.147	.187	.294
3/4	1.050	.065	.083	.113	.154	.218	.308
1	1.315	.065	.109	.140	.191	.250	.358
1 1/4	1.660	.065	.109	.145	.200	.281	.400
1 1/2	1.900	.065	.109	.154	.218	.343	.436
2	2.375	.083	.120	.203	.276	.375	.552
2 1/2	2.875	.083	.120	.216	.300	.438	.600
3	3.500	.083	.120	.226	.318	—	—
3 1/2	4.000	.083	.120	.237	.337	.531	.674
4	4.500	.109	.134	.258	.375	.625	.750
5	5.563	.109	.134	.280	.432	.718	.864
6	6.625	.109	.148	.322	.500	.906	.875
8	8.625	.109	.148	.322	.500	.906	.875

The requirements for tight makeup of threaded pipe connections are: good quality threads; clean threads; proper dope for the application; slow final makeup to avoid heat generation.

Pipe schedule numbers shown in Table 32 indicate pipe strength. The higher the number in a given size, the greater the strength. The schedule number indicates the approximate values of the following expression:

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$$\text{Schedule number} = \frac{1000 \times \text{internal pressure}}{\text{allowable stress in pipe}}$$

Copper Water Tube

Seamless copper water tube, popularly called *copper tubing*, is widely used for plumbing, water lines, heater coils, fuel oil lines, gas lines, etc. Standard copper tubing is commercially available in three (3) types, designated as type "K," "L," and "M." The type "K" has the thickest wall and is generally used for underground installations. The type "L" has a thinner wall and is most widely used for general plumbing, heating, etc. The type "M" is the thinwall tubing used for low-pressure and drainage applications.

The outside diameter of copper tubing is uniformly 1/8" larger than the nominal size; for example, the outside diameter of 1" tubing is 1 1/8". All three types of copper tubing in given size have the same outside diameter. The inside diameter of each type will vary as the wall thickness varies (Table 33).

The three types of tubing are made in either "hard" or "soft" grade. Hard tubing is used for applications where lines must be straight without kinks or pockets. Soft tubing is used for bending around obstructions, inaccessible places, etc.

Table 33. Standard Copper Tubing Dimensions

Nominal Size	Outside Dia.	Inside Diameter		
		Type "K"	Type "L"	Type "M"
3/8	1/2	.402	.430	.450
1/2	5/8	.528	.545	.569
3/4	7/8	.652	.668	.690
1	1	.745	.785	.811
1 1/4	1 1/8	.995	1.025	1.055
1 1/2	1 3/8	1.245	1.265	1.291
2	2 1/8	1.481	1.505	1.527
2 1/2	2 3/8	1.959	1.985	2.009
3	3 1/8	2.435	2.465	2.495
3 1/2	3 3/8	2.907	2.945	2.981
4	4 1/8	3.385	3.425	3.459
		3.857	3.905	3.935