

---

# APPENDIX E3

---

# TUBE PROPERTIES

---

**Ervin L. Geiger**  
*Engineering Supervisor*  
*Bechtel Power Corporation*  
*Frederick, Maryland*

**TABLE E3.1** Weights of Tubing, Pound per Foot Length

OD, in.	Wall thickness, in.															
	0.050	0.095	0.150	0.200	0.250	0.300	0.360	0.400	0.460	0.500	0.625	0.750	0.875	1.000	1.125	1.250
0.500	0.2403	0.4109	0.5607													
0.750	0.3738	0.6646	0.9612	1.175	1.335											
1.000	0.5073	0.9182	1.362	1.709	2.003	2.243	2.461									
1.250	0.6408	1.172	1.762	2.243	2.670	3.044	3.422	3.631								
1.500	0.7743	1.426	2.163	2.777	3.338	3.845	4.383	4.699	5.109	5.340						
1.750	0.9078	1.679	2.563	3.311	4.005	4.646	5.344	5.767	6.338	6.675	7.509					
2.000	1.041	1.933	2.964	3.845	4.673	5.447	6.305	6.835	7.566	8.010	9.178	10.01				
2.250	1.175	2.186	3.364	4.379	5.340	6.248	7.267	7.903	8.794	9.345	10.85	12.02				
2.500	1.308	2.440	3.765	4.913	6.008	7.049	8.228	8.971	10.02	10.68	12.52	14.02	15.19			
2.750	1.442	2.694	4.165	5.447	6.675	7.850	9.189	10.04	11.25	12.02	14.18	16.02	17.52	18.69		
3.000	1.575	2.947	4.566	5.981	7.343	8.651	10.15	11.11	12.48	13.35	15.85	18.02	19.86	21.36		
3.250	1.709	3.201	4.966	6.515	8.010	9.452	11.11	12.18	13.71	14.69	17.52	20.03	22.19	24.03		
3.500	1.842	3.455	5.367	7.049	8.678	10.25	12.07	13.24	14.93	16.02	19.19	22.03	24.53	26.70		
3.750	1.976	3.708	5.767	7.583	9.345	11.05	13.03	14.31	16.16	17.36	20.86	24.03	26.87	29.37	31.54	
4.000	2.109	3.962	6.168	8.117	10.01	11.85	14.00	15.38	17.39	18.69	22.53	26.03	29.20	32.04	34.54	
4.250	2.243	4.216	6.568	8.651	10.68	12.66	14.96	16.45	18.62	20.03	24.20	28.04	31.54	34.71	37.55	
4.500	2.376	4.469	6.969	9.185	11.35	13.46	15.92	17.52	19.85	21.36	25.87	30.04	33.88	37.38	40.55	
4.750	2.510	4.723	7.369	9.719	12.02	14.26	16.88	18.58	21.08	22.70	27.53	32.04	36.21	40.05	43.55	46.73

**TABLE E3.1** Weights of Tubing, Pound per Foot Length (*Continued*)

OD, in.	Wall thickness, in.															
	0.050	0.095	0.150	0.200	0.250	0.300	0.360	0.400	0.460	0.500	0.625	0.750	0.875	1.000	1.125	1.250
5.000	2.643	4.977	7.770	10.25	12.68	15.06	17.84	19.65	22.30	24.03	29.20	34.04	38.55	42.72	46.56	50.06
5.250	....	5.230	8.170	10.79	13.35	15.86	18.80	20.72	23.53	25.37	30.87	36.05	40.88	45.39	49.56	53.40
5.500	....	5.484	8.571	11.32	14.02	16.66	19.76	21.79	24.76	26.70	32.54	38.05	43.22	48.06	52.57	56.74
5.750	....	5.738	8.971	11.85	14.69	17.46	20.72	22.86	25.99	28.04	34.21	40.05	45.56	50.73	55.57	60.08
6.000	....	5.991	9.372	12.39	15.35	18.26	21.68	23.92	27.22	29.37	35.88	42.05	47.89	53.40	58.57	63.41
6.250	....	6.245	9.772	12.92	16.02	19.06	22.65	24.99	28.45	30.71	37.55	44.06	50.23	56.07	61.58	66.75
6.500	....	....	10.17	13.46	16.69	19.86	23.61	26.06	29.67	32.04	39.22	46.06	52.57	58.74	64.58	70.09
6.750	....	....	10.57	13.99	17.36	20.67	24.57	27.13	30.90	33.38	40.88	48.06	54.90	61.41	67.58	73.43
7.000	....	....	10.97	14.52	18.02	21.47	25.53	28.20	32.13	34.71	42.55	50.06	57.24	64.08	70.59	76.76
7.250	....	....	11.37	15.06	18.69	22.27	26.49	29.26	33.36	36.05	44.22	52.07	59.57	66.75	73.59	80.10
7.500	....	....	....	15.59	19.36	23.07	27.45	30.33	34.59	37.38	45.89	54.07	61.91	69.42	76.60	83.44
7.750	....	....	....	16.13	20.03	23.87	28.41	31.40	35.81	38.72	47.56	56.07	64.25	72.09	79.60	86.78
8.000	....	....	....	16.66	20.69	24.67	29.37	32.47	37.04	40.05	49.23	58.07	66.58	74.76	82.60	90.11
8.250	....	....	....	17.19	21.36	25.47	30.34	33.54	38.27	41.39	50.90	60.08	68.92	77.43	85.61	93.45
8.500	....	....	....	17.73	22.03	26.27	31.30	34.60	39.50	42.72	52.57	62.08	71.26	80.10	88.61	96.79
8.750	....	....	....	....	22.70	27.07	32.26	35.67	40.73	44.06	54.23	64.08	73.59	82.77	91.61	100.1
9.000	....	....	....	....	23.36	27.87	33.22	36.74	41.96	45.39	55.90	66.08	75.93	85.44	94.62	103.5
9.250	....	....	....	....	24.03	28.68	34.18	37.81	43.18	46.73	57.57	68.09	78.26	88.11	97.62	106.8
9.500	....	....	....	....	24.70	29.48	35.14	38.88	44.41	48.06	59.24	70.09	80.60	90.78	100.6	110.1
9.750	....	....	....	....	25.37	30.28	36.10	39.94	45.64	49.40	60.91	72.09	82.94	93.45	103.6	113.5
10.000	....	....	....	....	26.03	31.08	37.06	41.01	46.87	50.73	62.58	74.09	85.27	96.12	106.6	116.8

**TABLE E3.2** Diameter and Wall-Thickness Tolerances for Seamless Hot-Finished Mechanical Tubing of Carbon and Alloy Steel (AISI)\*

Specified size, OD, in.	Ratio of wall thickness to OD	OD tolerance		Wall thickness tolerance, %							
				0.109 in. and under		Over 0.109 to 0.172 in., incl.		Over 0.172 to 0.203 in., incl.		Over 0.203 in.	
		Over	Under	Over	Under	Over	Under	Over	Under	Over	Under
Under 3 . . . . .	All wall thicknesses	0.023	0.023	16.5	16.5	15	15	14	14	12.5	12.5
3–5½, excl. . . . .	All wall thicknesses	0.031	0.031	16.5	16.5	15	15	14	14	12.5	12.5
5½–8, excl. . . . .	All wall thicknesses	0.047	0.047	...	...	..	..	14	14	12.5	12.5
8–10¾, incl. . . . .	5% and over	0.047	0.047	...	...	..	..	..	..	12.5	12.5
8–10¾, incl. . . . .	Under 5%	0.063	0.063	...	...	..	..	..	..	12.5	12.5

\* The common range of sizes of hot-finished tubes is 1½ to and including 10¾ in outside diameter with wall thickness not less than 0.095 in (no. 13 BWG) or 3 percent or more of the outside diameter. For sizes under 1½ or over 10¾ in outside diameter, the tolerances are commonly negotiated between the purchaser and producer.

**Source:** Steel Products Manual.

**TABLE E3.3** Diameter and Wall-Thickness Tolerances for Seamless Cold-Worked Mechanical Tubing of Carbon and Alloy Steel (AISI)<sup>1</sup>

Size, OD, in.	Unannealed or finish-annealed				Soft annealed or normalized				Quenched and tempered				Wall thickness all conditions, %	
	OD, in.		ID, in.		OD, in.		ID, in.		OD, in.		ID, in.			
	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under
3/16-1/2, excl. <sup>2,3</sup> . . . . .	0.004	0	....	....	0.006	0.002	....	....	0.010	0.010	....	....	15	15
1/2-1 1/2, incl. <sup>2,3,4,5</sup> . . . . .	0.005	0	0	0.005	0.008	0.002	0.002	0.008	0.015	0.015	0.015	0.015	10	10
1 1/2-3 1/2, excl. <sup>2,3,4,5</sup> . . . . .	0.010	0	0	0.010	0.015	0.005	0.005	0.015	0.030	0.030	0.030	0.030	10	10
3 1/2-5 1/2, excl. <sup>4,5</sup> . . . . .	0.015	0	0.005	0.015	0.023	0.007	0.015	0.025	0.045	0.045	0.045	0.045	10	10
5 1/2-8, excl. <sup>5</sup> , wall . . . . . less than 5% OD	0.030	0.030	0.035	0.035	0.060	0.060	0.070	0.070	....	....	....	....	10	10
5 1/2-8, excl., wall . . . . . from 5 to 7.5% OD	0.020	0.020	0.025	0.025	0.040	0.040	0.050	0.050	....	....	....	....	10	10
5 1/2-8, excl. <sup>4</sup> , wall . . . . . over 7.5% OD	0.030	0	0.015	0.030	0.045	0.015	0.037	0.053	....	....	....	....	10	10
8-10 3/4, incl. <sup>5</sup> , wall . . . . . less than 5% OD	0.045	0.045	0.050	0.050	....	....	....	....	....	....	....	....	10	10
8-10 3/4, incl., wall . . . . . from 5 to 7.5% OD	0.035	0.035	0.040	0.040	....	....	....	....	....	....	....	....	10	10
8-10 3/4, incl. <sup>4</sup> , wall . . . . . over 7.5% OD	0.045	0	0.015	0.040	....	....	....	....	....	....	....	....	10	10

E 3.3

<sup>1</sup> For tolerances closer than those indicated, availability and applicable tolerances for tubing less than 3/16 in OD or larger than 10 3/4-in. OD, the producer should be consulted.

<sup>2</sup> For those tubes with inside diameter less than 1/2 in (or less than 5% in when the wall thickness is more than 20 percent of the outside diameter), which are not commonly drawn over a mandrel, note<sup>4</sup> is not applicable. Unless otherwise agreed upon by the purchaser and producer, the wall thickness may vary 15 percent over and under that specified, and the inside diameter is governed by the outside diameter and wall-thickness tolerances shown.

<sup>3</sup> For tubes with inside diameter less than 1/2 in (or less than 5% in when the wall thickness is more than 20 percent of the outside diameter), which can be produced by the rod or bar mandrel process, the tolerances are as shown in the above table except that the wall-thickness tolerances are 10 percent over and under the specified wall thickness.

<sup>4</sup> Many tubes with inside diameter less than 50 percent of outside diameter, with wall thickness more than 25 percent of outside diameter, with wall thickness over 1 1/4 in or weighing more than 90 lb/ft are difficult to draw over a mandrel. Unless otherwise agreed upon by the purchaser and producer the inside diameter may vary over or under by an amount equal to 10 percent of the wall thickness and the wall thickness may vary 12 1/2 percent over and under that specified.

<sup>5</sup> Tubing have a wall thickness less than 3 percent of the outside diameter cannot be straightened properly without a certain amount of distortion. Consequently, such tubes, while having an average outside diameter and inside diameter within the tolerances shown in the above table, require an ovality tolerance of 0.5 percent over and under nominal outside diameter, this being in addition to the tolerances indicated in the above table.

Source: AISI Steel Products Manual.