

LINOVECTOR II

Bare Element "4"
Copper/Aluminum and
Steel Element Ratings

Submittal

Specification

Bare Element "4"

ELEMENT:

TYPE: Cu/AL (Mechanically Expanded)
LENGTHS: 2'0" thru 12'6" in 1" Increments
for 1" & 1-1/4" Cu.
2'0" to 8'0" in 1" Increments
for 3/4" Cu.

One End Flared (Std)

See Catalog for Working
Pressures

BRACKETS:

Wall Mtd B.B. Hngr

ELEMENT:

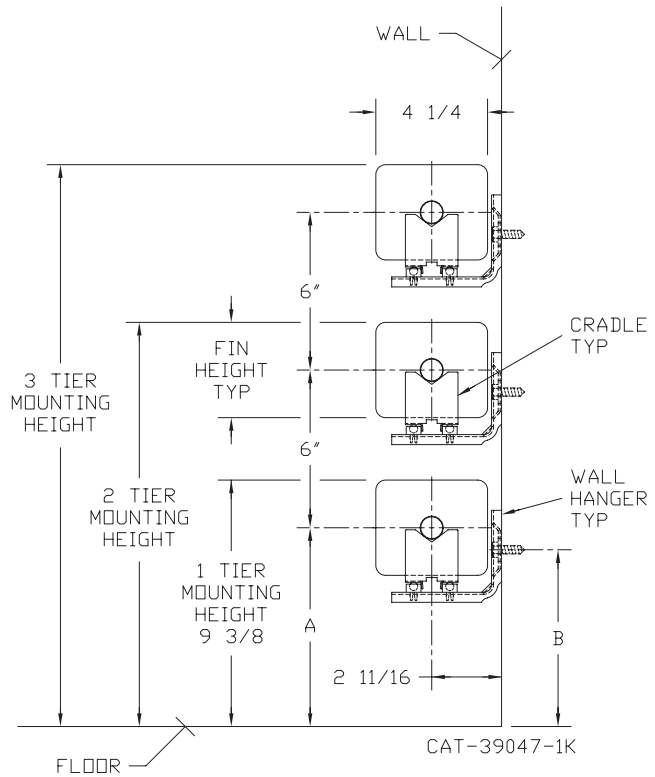
TYPE: IPS Steel (Mechanically Expanded)
LENGTHS: 2'-0" to 12'-6" in 1" Increments
 NPT Thread both Ends (Std)
 Beveled Ends for Field Weld (Opt'l)

See Catalog for Working
Pressures

BRACKETS:

Wall Mtd B.B. Hngr

TUBE SIZE	FIN SIZE HEIGHT x WIDTH	CRADLE NUMBER	A	B
3/4 COPPER	3 5/8 x 4 1/4	2	7 9/16	6 3/4
	4 1/4 x 4 1/4	3A	7 1/4	6"
1" COPPER	3 5/8 x 4 1/4	2	7 9/16	6 9/16
	4 1/4 x 4 1/4		7 1/4	6 1/4
1 1/4 COPPER	3 5/8 x 4 1/4	2	7 9/16	6 7/16
	4 1/4 x 4 1/4		7 1/4	6 1/8
1" STEEL	4 1/4 x 4 1/4	2	7 1/4	6 1/8
1 1/4 STEEL	4 1/4 x 4 1/4	2	7 1/4	5 15/16
2" STEEL	4 1/4 x 4 1/4	1	7 1/4	6 3/16



Vulcan
RADIATOR

260 North Elm St., Westfield, MA 01085
(413) 568-9571 Fax: (413) 564-5661
www.vulcanrad.com

PROJECT: _____ DATE: _____

LOCATION: _____

ARCHITECT: _____

ENGINEER: _____

CONTRACTOR: _____

PO NUMBER: _____

STYLE "4" BARE ELEMENT

COPPER/ALUMINUM ELEMENTS

ALL RATINGS ARE IN BTU/HRLIN FT AND BASED ON 3 FPS VELOCITY, 65° EAT

TUBE SIZE	CATALOG DESIGNATION	FIN SIZE HEIGHT X WIDTH	FINS PER FT.	FIN THICKNESS IN INCHES	TIERS AND CENTERS IN INCHES	MOUNTING HEIGHT IN INCHES	STEAM 215° FACTOR	HOT WATER (AVG.)									
								200°	190°	180°	170°	160°	150°	140°	130°	120°	
								CORRECTION FACTORS FOR AVERAGE WATER TEMPERATURES									
					<i>1</i>	<i>9-3/8</i>	1210	1040	940	830	740	640	540	480	400	310	
3/4"	VC3/4-433	3-5/8" X 4-1/4"	32	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2130 2880	1830 2480	1660 2250	1470 1990	1300 1760	1130 1530	960 1300	850 1150	700 950	550 750	
3/4"	VC3/4-434	3-5/8" X 4-1/4"	40	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2490 3300	2140 2840	1940 2570	1720 2280	1520 2010	1320 1750	1120 1490	1000 1320	820 1090	650 860	
3/4"	VC3/4-435	3-5/8" X 4-1/4"	50	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2650 3450	2280 2970	2070 2690	1830 2380	1620 2100	1400 1830	1190 1550	1060 1380	870 1140	690 900	
1"	VC433	3-5/8" X 4-1/4"	32	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2220 3000	1910 2580	1730 2340	1530 2070	1350 1830	1180 1590	1000 1350	890 1200	730 990	580 780	
1"	VC434	3-5/8" X 4-1/4"	40	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2420 3200	2080 2750	1890 2500	1670 2210	1480 1950	1280 1700	1090 1440	970 1280	800 1060	630 830	
1"	VC435	3-5/8" X 4-1/4"	50	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2640 3450	2270 2970	2060 2690	1820 2380	1610 2100	1400 1830	1190 1550	1060 1380	870 1140	690 900	
1-1/4"	VC1433	3-5/8" X 4-1/4"	32	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2310 3130	1990 2690	1800 2440	1590 2160	1410 1910	1220 1660	1040 1410	920 1250	760 1030	600 810	
1-1/4"	VC1434	3-5/8" X 4-1/4"	40	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2470 3260	2120 2800	1930 2540	1700 2250	1510 1990	1310 1730	1110 1470	990 1300	820 1080	640 850	
1-1/4"	VC1435	3-5/8" X 4-1/4"	50	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2650 3460	2280 2980	2070 2700	1830 2390	1620 2110	1400 1830	1190 1560	1060 1380	870 1140	690 900	
3/4"	VC3/4 43	4-1/4" SQ.	32	.020	2-6 CL 3-6 CL	15-3/8 21-3/8	1340 3200	1150 2750	1050 2500	920 2210	820 1950	710 1700	600 1440	540 1280	440 1060	350 830	
3/4"	VC3/4 44	4-1/4" SQ.	40	.020	2-6 CL 3-6 CL	15-3/8 21-3/8	1600 3330	1380 2860	1250 2600	1100 2300	980 2030	850 1760	720 1500	640 1330	530 1100	420 870	
3/4"	VC3/4 45	4-1/4" SQ.	50	.020	2-6 CL 3-6 CL	15-3/8 21-3/8	1650 3430	1420 2950	1290 2680	1140 2370	1010 2090	870 1820	740 1540	660 1370	540 1130	430 890	
1"	VC43	4-1/4" SQ.	32	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2370 3230	2040 2780	1850 2520	1640 2230	1450 1970	1260 1710	1070 1450	950 1290	780 1070	620 840	
1"	VC44	4-1/4" SQ.	40	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2490 3320	2140 2860	1940 2590	1720 2290	1520 2030	1320 1760	1120 1490	1000 1330	820 1100	650 860	
1"	VC45	4-1/4" SQ.	50	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2650 3460	2280 2980	2070 2700	1830 2390	1620 2110	1400 1830	1190 1560	1060 1380	870 1140	690 900	
1-1/4"	VC143	4-1/4" SQ.	32	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2470 3360	2120 2890	1930 2620	1700 2320	1510 2050	1310 1780	1110 1510	990 1340	820 1110	640 870	
1-1/4"	VC144	4-1/4" SQ.	40	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2680 3490	2300 3000	2090 2720	1850 2410	1630 2130	1420 1850	1210 1570	1070 1400	880 1150	700 910	
1-1/4"	VC145	4-1/4" SQ.	50	<i>.020</i>	2-6 CL 3-6 CL	15-3/8 21-3/8	2460 3200	2120 2750	1920 2500	1700 2210	1500 1950	1300 1700	1110 1440	980 1280	810 1060	640 830	

Note: Copper tube furnished flared one end standard.

STYLE "4" BARE ELEMENT

STEEL ELEMENTS

ALL RATINGS ARE IN BTU/HRLIN FT AND BASED ON 3 FPS VELOCITY, 65° EAT

TUBE SIZE	CATALOG DESIGNATION	FIN SIZE HEIGHT X WIDTH	FINS PER FT.	FIN THICKNESS IN INCHES	TIERS AND CENTERS IN INCHES	MOUNTING HEIGHT IN INCHES	STEAM 215° FACTOR	HOT WATER (AVG.)								
								200°	190°	180°	170°	160°	150°	140°	130°	120°
								CORRECTION FACTORS FOR AVERAGE WATER TEMPERATURES								
					1	9-3/8	1320	1140	1030	910	810	700	590	530	440	340
					2-6 CL	15-3/8	2320	2000	1810	1600	1420	1230	1040	930	770	600
					3-6 CL	21-3/8	3050	2620	2380	2100	1860	1620	1370	1220	1010	790
1"	VS43	4-1/4" SQ.	32	.032	1	9-3/8	1490	1280	1160	1030	910	790	670	600	490	390
1"	VS44	4-1/4" SQ.	40	.032	2-6 CL	15-3/8	2450	2110	1910	1690	1490	1300	1100	980	810	640
1"	VS44	4-1/4" SQ.	40	.032	3-6 CL	21-3/8	3180	2730	2480	2190	1940	1690	1430	1270	1050	830
1"	VS45	4-1/4" SQ.	50	.032	1	9-3/8	1580	1360	1230	1090	960	840	710	630	520	410
1"	VS45	4-1/4" SQ.	50	.032	2-6 CL	15-3/8	2510	2160	1960	1730	1530	1330	1130	1000	830	650
1"	VS45	4-1/4" SQ.	50	.032	3-6 CL	21-3/8	3230	2780	2520	2230	1970	1710	1450	1290	1070	840
1-1/4"	VS143	4-1/4" SQ.	32	.032	1	9-3/8	1220	1050	950	840	740	650	550	490	400	320
1-1/4"	VS143	4-1/4" SQ.	32	.032	2-6 CL	15-3/8	2300	1980	1790	1590	1400	1220	1040	920	760	600
1-1/4"	VS143	4-1/4" SQ.	32	.032	3-6 CL	21-3/8	3030	2610	2360	2090	1850	1610	1360	1210	1000	790
1-1/4"	VS144	4-1/4" SQ.	40	.032	1	9-3/8	1480	1270	1150	1020	900	780	670	590	490	380
1-1/4"	VS144	4-1/4" SQ.	40	.032	2-6 CL	15-3/8	2440	2100	1900	1680	1490	1290	1100	980	810	630
1-1/4"	VS144	4-1/4" SQ.	40	.032	3-6 CL	21-3/8	3170	2730	2470	2190	1930	1680	1430	1270	1050	820
1-1/4"	VS145	4-1/4" SQ.	50	.032	1	9-3/8	1550	1330	1210	1070	950	820	700	620	510	400
1-1/4"	VS145	4-1/4" SQ.	50	.032	2-6 CL	15-3/8	2460	2120	1920	1700	1500	1300	1110	980	810	640
1-1/4"	VS145	4-1/4" SQ.	50	.032	3-6 CL	21-3/8	3200	2750	2500	2210	1950	1700	1440	1280	1060	830
2"	VS242	4-1/4" SQ.	25	.032	1	9-3/8	1140	980	890	790	700	600	510	460	380	300
2"	VS242	4-1/4" SQ.	25	.032	2-6 CL	15-3/8	2030	1750	1580	1400	1240	1080	910	810	670	530
2"	VS242	4-1/4" SQ.	25	.032	3-6 CL	21-3/8	2700	2320	2110	1860	1650	1430	1220	1080	890	700
2"	VS243	4-1/4" SQ.	32	.032	1	9-3/8	1320	1140	1030	910	810	700	590	530	440	340
2"	VS243	4-1/4" SQ.	32	.032	2-6 CL	15-3/8	2230	1920	1740	1540	1360	1180	1000	890	740	580
2"	VS243	4-1/4" SQ.	32	.032	3-6 CL	21-3/8	2910	2500	2270	2010	1780	1540	1310	1160	960	760
2"	VS244	4-1/4" SQ.	40	.032	1	9-3/8	1490	1280	1160	1030	910	790	670	600	490	390
2"	VS244	4-1/4" SQ.	40	.032	2-6 CL	15-3/8	2360	2030	1840	1630	1440	1250	1060	940	780	610
2"	VS244	4-1/4" SQ.	40	.032	3-6 CL	21-3/8	3040	2610	2370	2100	1850	1610	1370	1220	1000	790

- Notes: 1) Steel fins furnished as .032 thick, painted black.
 2) NPT threads furnished on steel elements. Please use domestic fittings for proper installation.
 3) The ends can be provided chamfered for field welded fittings when specified.

Design Data

COMMERCIAL FINNED TUBE CHARTS FOR RATING CORRECTIONS

For assistance with ratings and selection, please use our online Specifier.

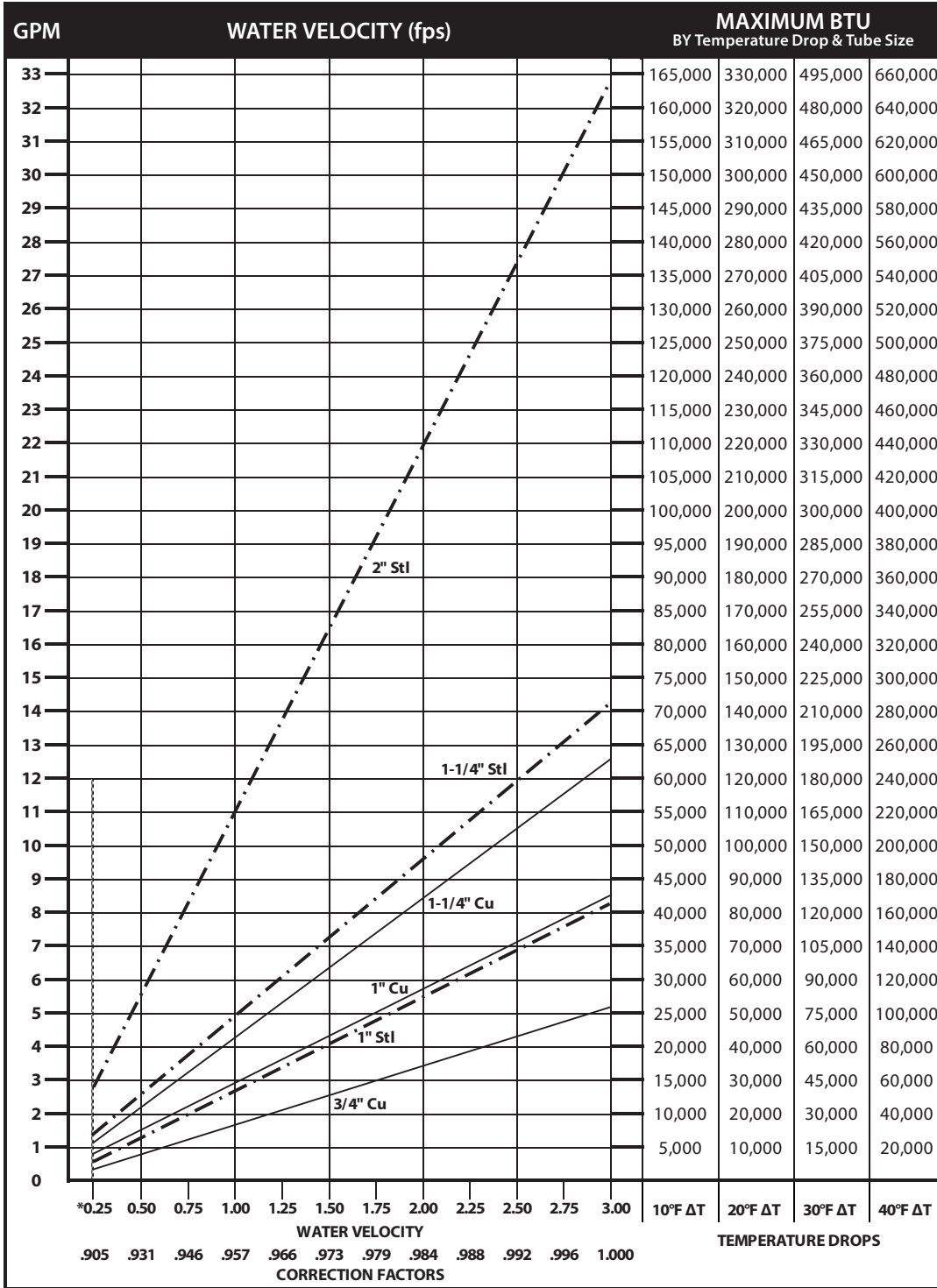
CORRECTION FACTORS FOR WATER TEMPERATURES AND AIR TEMPERATURES OTHER THAN STANDARD															
AVERAGE WATER TEMP. °F	ENTERING AIR TEMPERATURE °F														
	45	55	STD 65	70	75	80	85	90	95	100	110	120	130	140	150
90	.19	.13	.11	.06											
100	.25	.19	.15	.11	.08	.06									
110	.31	.25	.20	.16	.13	.11	.08	.06							
120	.38	.31	.26	.21	.19	.16	.13	.11	.08	.06					
130	.45	.38	.33	.28	.25	.21	.19	.16	.13	.11	.06				
140	.53	.45	.40	.34	.31	.28	.25	.21	.19	.16	.11	.06			
150	.61	.53	.45	.41	.38	.34	.31	.28	.25	.21	.16	.11	.06		
160	.69	.61	.53	.49	.45	.41	.38	.34	.31	.28	.21	.16	.11	.06	
170	.77	.69	.61	.57	.53	.49	.45	.41	.38	.34	.28	.21	.16	.11	.06
180	.86	.77	.69	.65	.61	.57	.53	.49	.45	.41	.34	.28	.21	.16	.11
190	.95	.86	.78	.73	.69	.65	.61	.57	.53	.49	.41	.34	.28	.21	.16
200	1.05	.95	.86	.82	.77	.73	.69	.65	.61	.57	.49	.41	.34	.28	.21
210	1.14	1.05	.95	.91	.86	.82	.77	.73	.69	.65	.57	.49	.41	.34	.28
▶ 215 (STD.)	1.19	1.09	1.00	.95	.91	.86	.82	.77	.73	.69	.61	.53	.45	.38	.31
220	1.24	1.14	1.05	1.00	.95	.91	.86	.82	.77	.73	.65	.57	.49	.41	.34
230	1.34	1.24	1.14	1.09	1.05	1.00	.95	.91	.86	.82	.73	.65	.57	.49	.41
240	1.44	1.34	1.25	1.19	1.14	1.09	1.05	1.00	.95	.91	.82	.73	.65	.57	.49
250	1.55	1.44	1.34	1.29	1.24	1.19	1.14	1.09	1.05	1.00	.91	.82	.73	.65	.57
260	1.66	1.55	1.44	1.39	1.34	1.29	1.24	1.19	1.14	1.09	1.00	.91	.82	.73	.65
270	1.76	1.66	1.55	1.50	1.44	1.39	1.34	1.29	1.24	1.19	1.09	1.00	.91	.82	.73
280	1.87	1.76	1.66	1.60	1.55	1.50	1.44	1.39	1.34	1.29	1.19	1.09	1.00	.91	.82
290	1.99	1.87	1.76	1.71	1.66	1.60	1.55	1.50	1.44	1.39	1.29	1.19	1.09	1.00	.91
300	2.10	1.99	1.87	1.82	1.76	1.71	1.66	1.60	1.55	1.50	1.39	1.29	1.19	1.09	1.00

CORRECTION FACTORS FOR STEAM PRESSURES AND AIR TEMPERATURES OTHER THAN STANDARD																
STEAM		ENTERING AIR TEMPERATURE °F														
PRESSURE		TEMP. °F	45	55	STD 65	70	75	80	85	90	100	110	120	130	140	150
GAUGE	ABS. PSI															
(VAC) 15" HG	7.32	178.9	0.90	0.80	0.70	0.65	0.60	0.56	0.51	0.45	0.39	0.32	0.25	0.18	0.13	0.08
(VAC) 10"	9.78	192.2	1.02	0.91	0.81	0.76	0.71	0.66	0.62	0.55	0.48	0.40	0.33	0.26	0.20	0.14
(VAC) 5"	12.25	202.9	1.11	1.00	0.90	0.85	0.79	0.75	0.70	0.63	0.56	0.48	0.40	0.33	0.27	0.20
▶ 0 PSI	14.696	212.0	1.19	1.09	0.97	0.92	0.87	0.82	0.77	0.70	0.63	0.54	0.46	0.38	0.31	0.25
.899	15.595	215.0	1.22	1.11	1.00	0.95	0.90	0.84	0.80	0.75	0.65	0.57	0.48	0.40	0.33	0.26
5	19.70	227.1	1.34	1.22	1.11	1.05	1.00	0.95	0.90	0.81	0.75	0.66	0.57	0.49	0.41	0.34
10	24.70	239.4	1.45	1.33	1.22	1.17	1.11	1.05	1.00	0.91	0.85	0.75	0.66	0.58	0.50	0.42
15	29.70	249.8	1.55	1.43	1.31	1.26	1.20	1.14	1.09	1.00	0.94	0.84	0.75	0.66	0.57	0.49
20	34.70	258.5	1.63	1.52	1.40	1.33	1.28	1.23	1.17	1.07	1.02	0.92	0.82	0.73	0.64	0.55
25	39.70	266.8	1.71	1.59	1.47	1.41	1.36	1.30	1.25	1.15	1.09	0.98	0.89	0.80	0.71	0.62
30	44.70	274.0	1.78	1.66	1.54	1.48	1.42	1.37	1.31	1.21	1.15	1.05	0.95	0.85	0.76	0.68
40	54.70	286.7	1.91	1.79	1.66	1.61	1.54	1.49	1.43	1.32	1.27	1.16	1.06	0.97	0.87	0.78
50	64.70	297.7	2.02	1.90	1.77	1.71	1.65	1.60	1.54	1.42	1.37	1.26	1.16	1.06	0.96	0.87
60	74.70	307.3	2.10	2.00	1.87	1.81	1.75	1.69	1.63	1.51	1.47	1.35	1.25	1.15	1.05	0.95
70	84.70	316.0	2.20	2.09	1.95	1.89	1.83	1.77	1.71	1.59	1.55	1.44	1.33	1.23	1.12	1.03
80	94.70	323.9	2.27	2.17	2.03	1.97	1.91	1.85	1.80	1.69	1.63	1.52	1.41	1.31	1.20	1.10
90	104.70	331.2	2.36	2.24	2.11	2.05	1.98	1.93	1.87	1.74	1.70	1.59	1.48	1.38	1.28	1.17
100	114.70	337.9	2.43	2.31	2.18	2.11	2.05	2.00	1.94	1.81	1.77	1.65	1.54	1.44	1.33	1.23
125	139.70	352.9	2.59	2.47	2.33	2.27	2.21	2.16	2.10	1.96	1.92	1.80	1.69	1.59	1.48	1.38
150	164.70	365.9	2.73	2.62	2.47	2.43	2.35	2.29	2.23	2.08	2.05	1.94	1.82	1.72	1.61	1.51
175	189.70	377.4	2.86	2.74	2.60	2.54	2.47	2.41	2.35	2.21	2.17	2.05	1.95	1.85	1.73	1.63
200	214.70	387.8	2.95	2.85	2.71	2.63	2.58	2.52	2.47	2.31	2.29	2.17	2.06	1.96	1.84	1.75

From Keenan and Keyes — Linear Interpolation. NOTE: Gauge pressure should be corrected for altitude.

Rate of pitch for steam 1/2" drop over 20-foot run.

Design Data



DYNAMIC FORMULAS

$$BTU = GPM \times 500 \times TD$$

$$GPM = \left(\frac{BTU}{500} \right) \div TD$$

$$TD = \left(\frac{BTU}{500} \right) \div GPM$$

*Do not design below .25 fps.

Pressure Drop at Given Water Velocities (Feet of Water per 100 ft. of pipe) based on Hazen - Williams calculation

Nominal Pipe Size	Water Velocity (ft/sec)												
	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	
3/4" Copper	0.06	0.20	0.42	0.72	1.09	1.53	2.04	2.61	3.25	3.95	4.71	5.53	
1" Copper	0.04	0.15	0.32	0.54	0.81	1.14	1.52	1.94	2.42	2.94	3.50	4.11	
1 1/4" Copper	0.03	0.12	0.25	0.43	0.64	0.90	1.20	1.54	1.92	2.33	2.78	3.26	
1" Steel	0.04	0.15	0.32	0.54	0.81	1.14	1.52	1.95	2.42	2.94	3.51	4.12	
1 1/4" Steel	0.03	0.11	0.23	0.40	0.60	0.84	1.12	1.44	1.79	2.17	2.59	3.05	
2" Steel	0.02	0.07	0.14	0.25	0.37	0.52	0.69	0.89	1.10	1.34	1.60	1.88	

Design Data

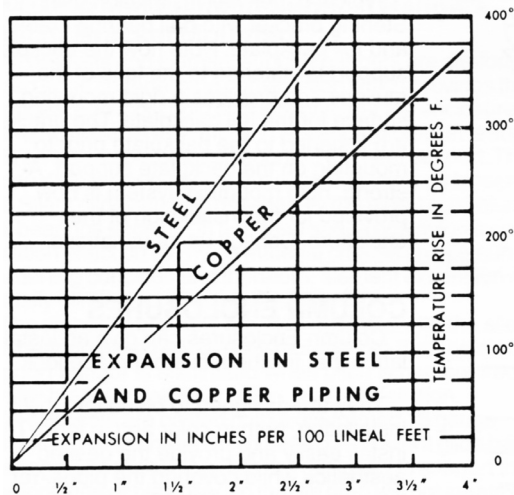
GUARANTEED WORKING PRESSURES

- 1" IPS — 780 at Temperatures up to 650°F.
- 1-1/4" IPS — 660 at Temperatures up to 650°F.
- 2" IPS — 405 at Temperatures up to 650°F.
- 1-1/4" CU — 194 at Temperatures up to 300°F.
- 1" CU 204 at Temperatures up to 300°F.
- 3/4" CU 218 PSI at Temperatures up to 300°F.

MAXIMUM PRESSURES AT OTHER TEMPERATURES ARE AVAILABLE UPON REQUEST.

Pipe Water Capacities and Quantities Circulated at Velocity of 3 Feet Per Second

Nominal Pipe Size	Pipe I.D. (inches)	Gals Per Lin. Ft.	GPM @ 3' per sec Velocity
3/4" Copper	0.835	0.028	5.12
1" Copper	1.077	0.047	8.52
1 1/4" Copper	1.315	0.071	12.70
1" Steel	1.075	0.047	8.49
1 1/4" Steel	1.395	0.079	14.29
2" Steel	2.115	0.183	32.85



Glycol Correction Factors

Fluid Temperature 200°F

% Solution	Ethylene Glycol	Propylene Glycol
20	.952	.988
30	.921	.968
40	.888	.943
50	.852	.912

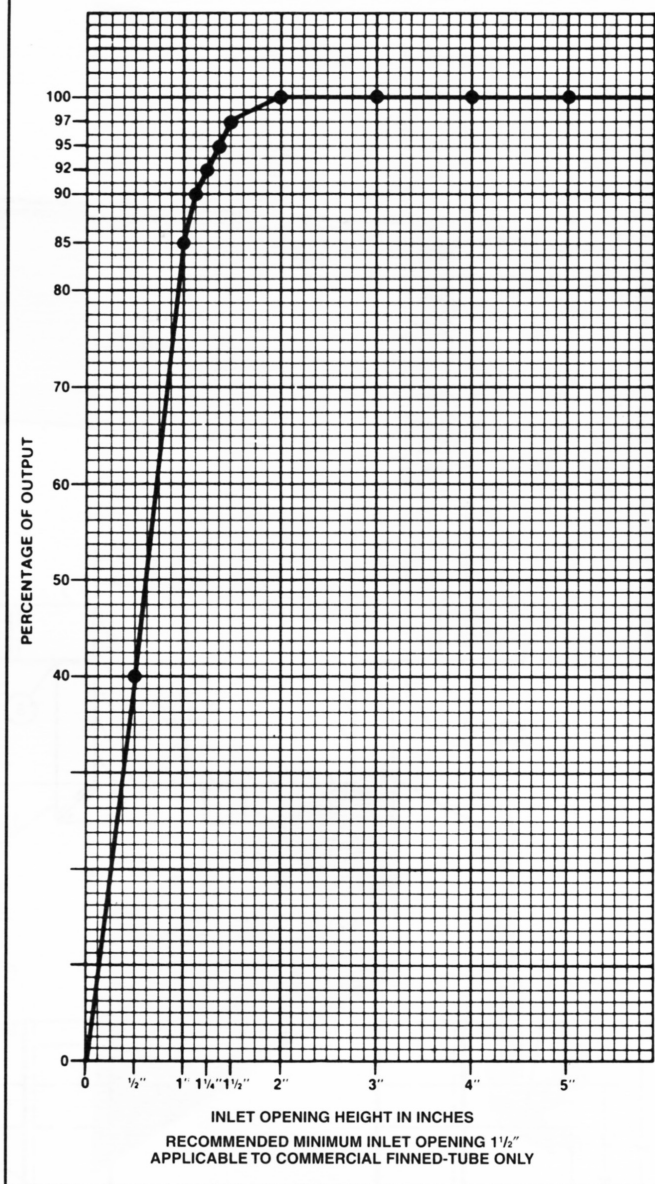
Fluid Temperature 180°F

% Solution	Ethylene Glycol	Propylene Glycol
20	.946	.982
30	.913	.961
40	.879	.934
50	.842	.902

Fluid Temperature 140°F

% Solution	Ethylene Glycol	Propylene Glycol
20	.934	.97
30	.898	.946
40	.861	.916
50	.821	.881

INLET VS. OUTPUT/BTUH CAPACITY REDUCTION



ALTITUDE FACTORS

Approximate factors for convective heat value at varying altitudes

Altitude	Ferrous Units	Copper Alum. Units
Sea Level	1.000	1.000
1,000 ft.	.984	.969
2,000 ft.	.968	.938
3,000 ft.	.952	.908
4,000 ft.	.936	.878
5,000 ft.	.920	.850
6,000 ft.	.904	.822
7,000 ft.	.889	.795
8,000 ft.	.874	.768
9,000 ft.	.859	.743
10,000 ft.	.844	.718
15,000 ft.	.771	.603
20,000 ft.	.703	.502