LINOVECTOR II

Bare Element “2”
Copper/Aluminum and
Steel Element Ratings

Submittal

☐ **Bare Element “2”**

Specification

ELEMENT:

TYPE: ☐ Cu/AL (Mechanically Expanded)

LENGTHS: VR01 thru VR05 2'0" to 8'0"
in 1'0" Increments
VR06 thru VR10 2'0" to 12'6"
in 1" Increments

One End Flared (Std)

See Catalog for Working
Pressures

BRACKETS:

☐ Wall Mtd B.B. Hngr

ELEMENT:

TYPE: ☐ IPS Steel (Mechanically Expanded)

LENGTHS: VR11 thru VR16 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

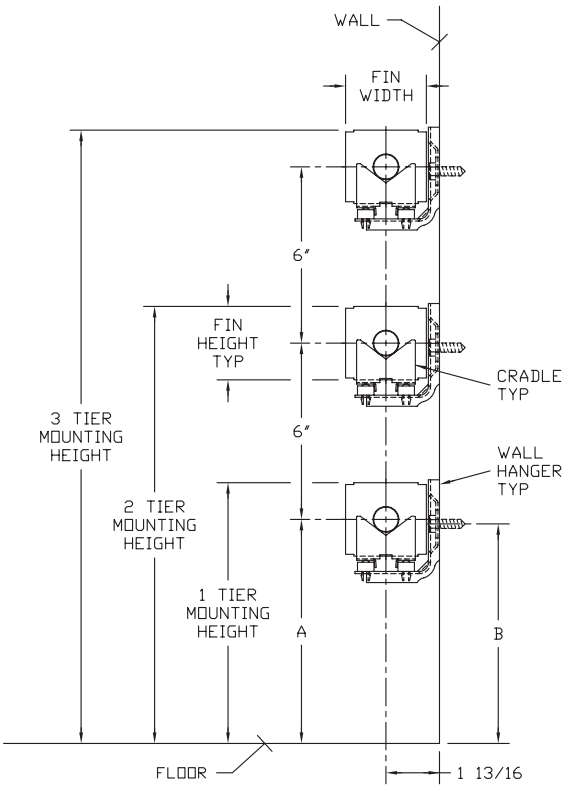
BRACKETS:

☐ Wall Mtd B.B. Hngr

Bare Element “2”

☐ 2-1/4" Wide Fin B.B. Hanger Wall “2”
☐ 2-3/4" Wide Fin B.B. Hanger Wall “2”

TUBE SIZE	FIN SIZE HEIGHT x WIDTH	CRADLE NUMBER	A	B	1 TIER MOUNTING HEIGHT
3/4 COPPER	2 1/2 x 2 1/4	1	7 5/8	7 1/2	8 7/8
	2 1/2 x 2 3/4	1			
	3 3/4 x 2 3/4	2	7"	6 3/16	
1" COPPER	2 1/2 x 2 3/4	1	7 5/8	7 5/16	
	3 3/4 x 2 3/4	2	7"	6"	
	5" x 2 3/4	3A	7 1/2	6 1/8	10"
1 1/4 COPPER	3 3/4 x 2 3/4	2	7"	5 7/8	8 7/8
	5" x 2 3/4	3A	7 1/2	5 15/16	10"
1" STEEL	3 3/4 x 2 3/4	2	7"	5 7/8	8 7/8
	5" x 2 3/4	3A	7 1/2	6"	10"
1 1/4 STEEL	3 3/4 x 2 3/4	2	7"	5 11/16	8 7/8
	5" x 2 3/4	3A	7 1/2	5 3/4	10"



CAT-69647-1B

Vulcan RADIATOR
260 North Elm St., Westfield, MA 01085
(413) 568-9571
www.vulcanrad.com

4/26

PROJECT: _____ **DATE:** _____

LOCATION: _____

ARCHITECT: _____

ENGINEER: _____

CONTRACTOR: _____

PO NUMBER: _____

STYLE “2” BARE ELEMENT

COPPER/ALUMINUM ELEMENTS

ALL RATINGS ARE IN BTU/HR/LIN 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								
							1.00	0.86	0.78	0.69	0.61	0.53	0.45	.40	.33	.26
3/4"	VR01	2-1/2" x 2-1/4"	50	.011	1	8-7/8	800	690	620	550	490	420	360	320	260	210
					2-6CL	14-7/8	1370	1180	1070	950	840	730	620	550	450	360
					3-6CL	20-7/8	1870	1610	1460	1290	1140	990	840	750	620	490
3/4"	VR02	2-1/2" x 2-3/4"	60	.010	1	8-7/8	950	820	740	660	580	500	430	380	310	250
					2-6CL	14-7/8	1630	1400	1270	1120	990	860	730	650	540	420
					3-6CL	20-7/8	2240	1930	1750	1550	1370	1190	1010	900	740	580
1"	VR03	2-1/2" x 2-3/4"	55	.011	1	8-7/8	930	800	730	640	570	490	420	370	310	240
					2-6CL	14-7/8	1610	1380	1260	1110	980	850	720	640	530	420
					3-6CL	20-7/8	2210	1900	1720	1520	1350	1170	990	880	730	570
3/4"	VR04	3-3/4" x 2-3/4"	50	.014	1	8-7/8	1130	970	880	780	690	600	510	450	370	290
					2-6CL	14-7/8	1930	1660	1510	1330	1180	1020	870	770	640	500
					3-6CL	20-7/8	2650	2280	2070	1830	1620	1400	1190	1060	870	690
1"	VR05	3-3/4" x 2-3/4"	50	.014	1	8-7/8	1120	960	870	770	680	590	500	450	370	290
					2-6CL	14-7/8	1910	1640	1490	1320	1170	1010	860	760	630	500
					3-6CL	20-7/8	2630	2260	2050	1810	1600	1390	1180	1050	870	680
1"	VR07	5" x 2-3/4"	50	.020	1	10	1260	1080	980	870	770	670	570	500	420	330
					2-6CL	16	2100	1810	1640	1450	1280	1110	950	840	690	550
					3-6CL	22	2870	2470	2240	1980	1750	1520	1290	1150	950	750
1-1/4"	VR08	3-3/4" x 2-3/4"	50	.020	1	8-7/8	1070	920	830	740	650	570	480	430	350	280
					2-6CL	14-7/8	1830	1570	1430	1260	1120	970	820	730	600	480
					3-6CL	20-7/8	2560	2200	2000	1770	1560	1360	1150	1020	840	670
1-1/4"	VR10	5" x 2-3/4"	50	.020	1	10	1230	1060	960	850	750	650	550	490	410	320
					2-6CL	16	2070	1780	1610	1430	1260	1100	930	830	680	540
					3-6CL	22	2850	2450	2220	1970	1740	1510	1280	1140	940	740

Note: Copper tube furnished flared one end standard.

STEEL ELEMENTS

ALL RATINGS ARE IN BTU/HR/LIN 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								
							1.00	0.86	0.78	0.69	0.61	0.53	0.45	.40	.33	.26
1"	VR11	3-3/4" x 2-3/4"	40	.024	1	8-7/8	880	760	690	610	540	470	400	350	290	230
					2-6CL	14-7/8	1540	1320	1200	1060	940	820	690	620	510	400
					3-6CL	20-7/8	2150	1850	1680	1480	1310	1140	970	860	710	560
1"	VR15	5" x 2-3/4"	50	.024	1	10	940	810	730	650	570	500	420	380	310	240
					2-6CL	16	1630	1400	1270	1120	990	860	730	650	540	420
					3-6CL	22	2260	1940	1760	1560	1380	1200	1020	900	750	590
1-1/4"	VR16	5" x 2-3/4"	50	.024	1	10	960	830	750	660	590	510	430	380	320	250
					2-6CL	16	1650	1420	1290	1140	1010	870	740	660	540	430
					3-6CL	22	2280	1960	1780	1570	1390	1210	1030	910	750	590

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

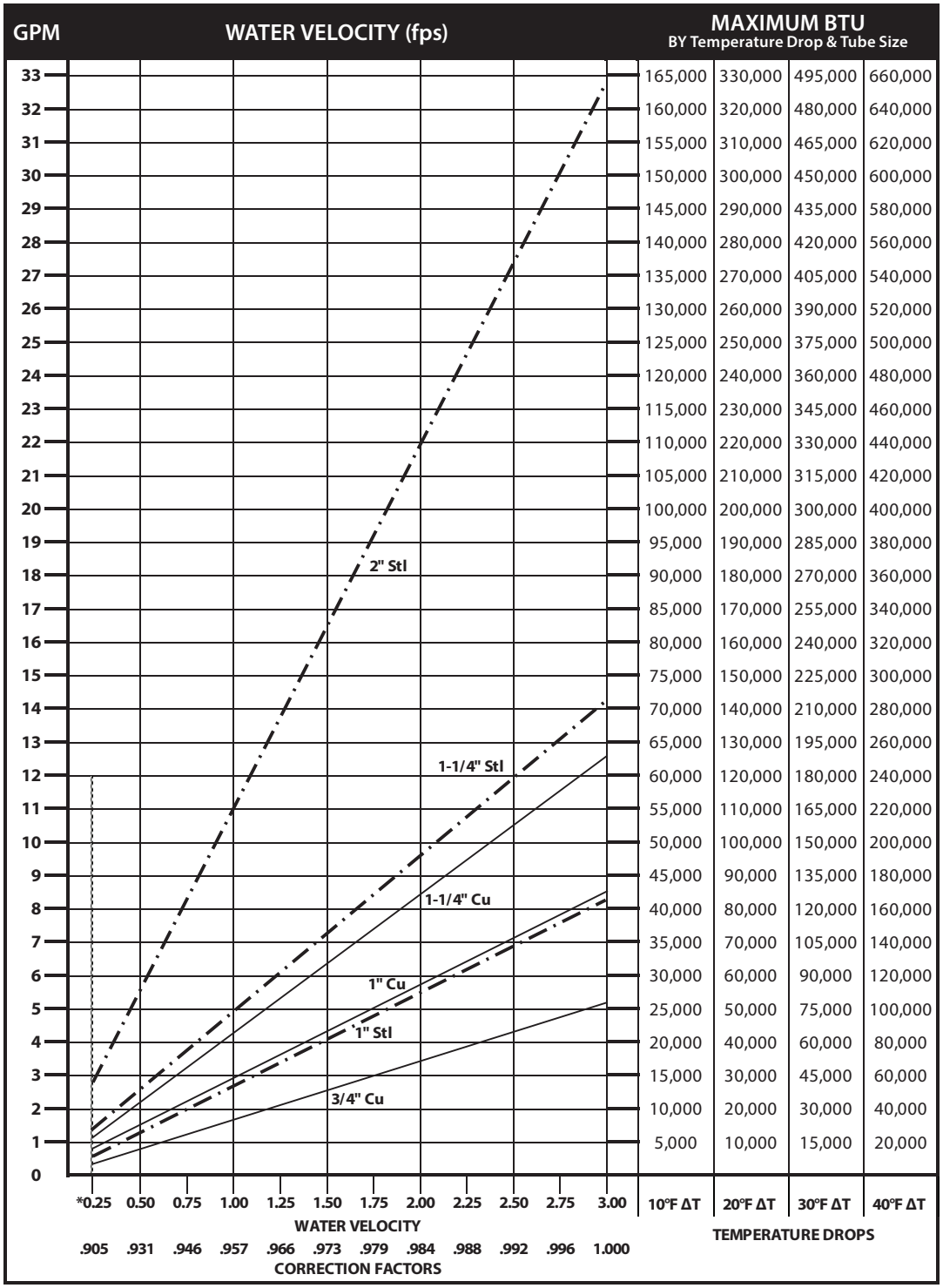
CORRECTION FACTORS FOR STEAM PRESSURES AND AIR TEMPERATURES OTHER THAN STANDARD

STEAM PRESSURE		TEMP. °F	ENTERING AIR TEMPERATURE °F												
GAUGE	ABS. PSI		45	55	STD 65	70	75	80	85	90	100	110	120	130	140	150
(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 ½"drop over 20-foot run.

Design Data



*Do not design below .25 fps.

DYNAMIC FORMULAS

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

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

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

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

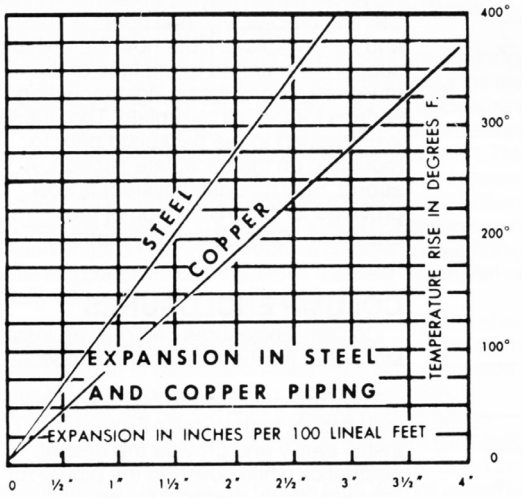
GUARANTEED WORKING PRESSURES

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

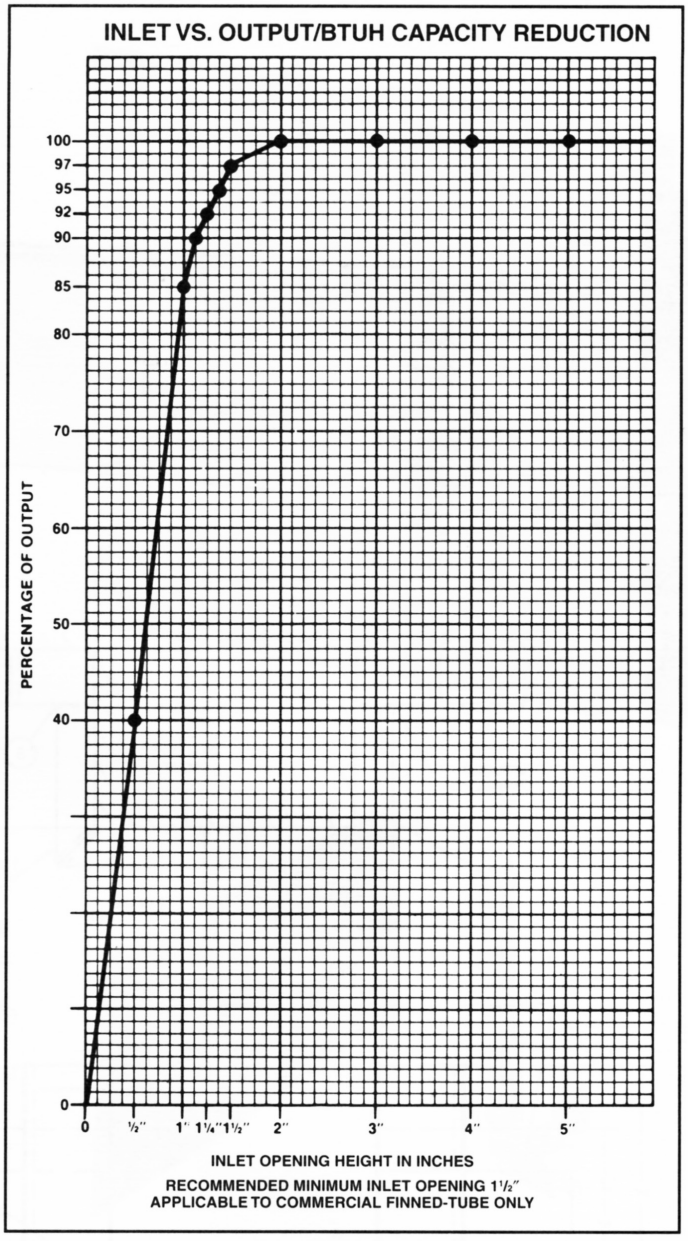
% Solution	Ethylene Glycol	Propylene Glycol
20	.952	.988
30	.921	.968
40	.888	.943
50	.852	.912

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



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