

LINOVECTOR II

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

Submittal

Bare Element "SP"

Specification

ELEMENT:

TYPE: Cu/AL (Mechanically Expanded)
 LENGTHS: VR04R & VR05R 2'0" to 8'0"
 in 1'0" Increments
 VR07R, VR08R & 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: VR15R & VR16R 2'0" to 12'6"
 in 1" Increments
 NPT Thread both Ends (Std)
 Beveled Ends for Field Weld (Opt'l)

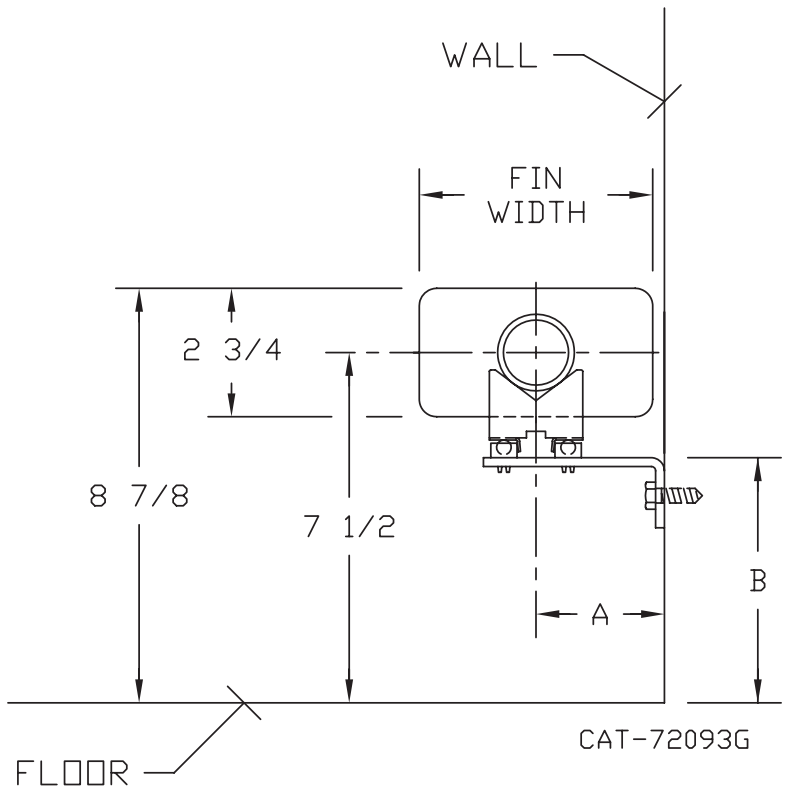
 See Catalog for Working
 Pressures

BRACKETS:

Wall Mtd B.B. Hngr

Bare Element "SP" - 3-3/4" Wide Fin B.B Hanger Wall "4"
 5" Wide Fin B.B. Hanger Wall "SP"

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



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PROJECT: _____ DATE: _____
 LOCATION: _____
 ARCHITECT: _____
 ENGINEER: _____
 CONTRACTOR: _____
 PO NUMBER: _____

STYLE "SP" 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								
3/4"	VR04R	2-3/4" x 3-3/4"	50	.014	1 2-6CL 3-6CL	8-7/8 14-7/8 20-7/8	1.00	0.86	0.78	0.69	0.61	0.53	0.45	.40	.33	.26
							1280	1100	1000	880	780	680	580	510	420	330
							2190	1880	1710	1510	1340	1160	990	880	720	570
1"	VR05R	2-3/4" x 3-3/4"	50	.014	1 2-6CL 3-6CL	8-7/8 14-7/8 20-7/8	1270	1090	990	880	770	670	570	510	420	330
							2180	1870	1700	1500	1330	1160	980	870	720	570
							2980	2560	2320	2060	1820	1580	1340	1190	980	770
1"	VR07R	2-3/4" x 5"	50	.020	1 2-6CL 3-6CL	8-7/8 14-7/8 20-7/8	1610	1380	1260	1110	980	850	720	640	530	420
							2510	2160	1960	1730	1530	1330	1130	1000	830	650
							3310	2850	2580	2280	2020	1750	1490	1320	1090	860
1-1/4"	VR08R	2-3/4" x 3-3/4"	50	.020	1 2-6CL 3-6CL	8-7/8 14-7/8 20-7/8	1250	1080	980	860	760	660	560	500	410	330
							1980	1700	1540	1370	1210	1050	890	790	650	510
							2620	2250	2040	1810	1600	1390	1180	1050	860	680
1-1/4"	VR10R	2-3/4" x 5"	50	.020	1 2-6CL 3-6CL	8-7/8 14-7/8 20-7/8	1600	1380	1250	1100	980	850	720	640	530	420
							2530	2180	1970	1750	1540	1340	1140	1010	830	660
							3310	2850	2580	2280	2020	1750	1490	1320	1090	860

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"	VR15R	2-3/4" x 5"	50	.024	1 2-6CL 3-6CL	8-7/8 14-7/8 20-7/8	1140	980	890	790	700	600	510	460	380	300
							2010	1730	1570	1390	1230	1070	900	800	660	520
							2810	2420	2190	1940	1710	1490	1260	1120	930	730
1-1/4"	VR16R	2-3/4" x 5"	50	.024	1 2-6CL 3-6CL	8-7/8 14-7/8 20-7/8	1170	1010	910	810	710	620	530	470	390	300
							2040	1750	1590	1410	1240	1080	920	820	670	530
							2830	2430	2210	1950	1730	1500	1270	1130	930	740

- 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

Correction Factor Chart for Non-Standard Mounting Heights

MOUNTING HEIGHT (Inches)	ENCLOSURE STYLE						
	BARE FIN ALL SIZES	FRONT OUTLET	FT (FRONT & TOP)		SLOPE		
			3 1/4" FINS	4 1/4" FINS	2 3/4" FINS	3 1/4" FINS	4 1/4" FINS
40 or more	1.000	1.000	1.000	1.000	1.000	1.000	1.000
38	1.000	1.000	1.000	1.000	1.000	1.000	1.003
36	1.000	1.004	1.005	1.005	1.006	1.007	1.009
34	1.010	1.014	1.011	1.010	1.012	1.013	1.016
32	1.020	1.024	1.017	1.015	1.019	1.020	1.025
30	1.030	1.039	1.029	1.024	1.031	1.033	1.039
29	1.040	1.049	1.035	1.029	1.038	1.040	1.045
28	1.050	1.059	1.041	1.034	1.045	1.047	1.052
27	1.060	1.069	1.046	1.039	1.051	1.053	1.059
26	1.070	1.079	1.052	1.044	1.058	1.060	1.065
25	1.080	1.089	1.058	1.049	1.065	1.067	1.072
24	1.090	1.099	1.064	1.054	1.071	1.073	1.079
23	1.100	1.109	1.070	1.059	1.078	1.080	1.085
22	1.110	1.119	1.076	1.064	1.085	1.087	1.092
21	1.120	1.129	1.082	1.069	1.091	1.093	1.099
20	1.130	1.139	1.088	1.074	1.098	1.100	1.100
19	1.140	1.149	1.089	1.075	1.100	1.100	1.100
18 or less	1.150	1.150	1.089	1.075	1.100	1.100	1.100

TOP OUTLET "T" IS NOT AFFECTED.

The AHRI Ratings cataloged include the factor shown for the recommended mounting height.

If the unit is to be installed at a different height than that recommended, the AHRI Rating (except for Top Outlet) must be adjusted as follows: AHRI Rating multiplied by

$$\frac{\text{Factor from Table Above for actual mounting height}}{\text{Factor from Table Above for recommended mounting height}}$$

FORMULA:

$$\text{Catalog Rating} \times \frac{\text{Factor at 30" Height}}{\text{Factor at 18" Height}}$$

$$\text{SOLUTION: } 1950 \times \frac{1.039}{1.150} = 1760 \text{ BTU/Hr.}$$

DYNAMIC FORMULAS

$$\text{BTU} = \text{GPM} \times 500 \times \text{TD}$$

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

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

Design Data

COMMERCIAL FINNED TUBE RATING CORRECTION CHARTS

CATALOG FINNED TUBE RATINGS ARE BASED UPON THE FOLLOWING CONDITIONS:

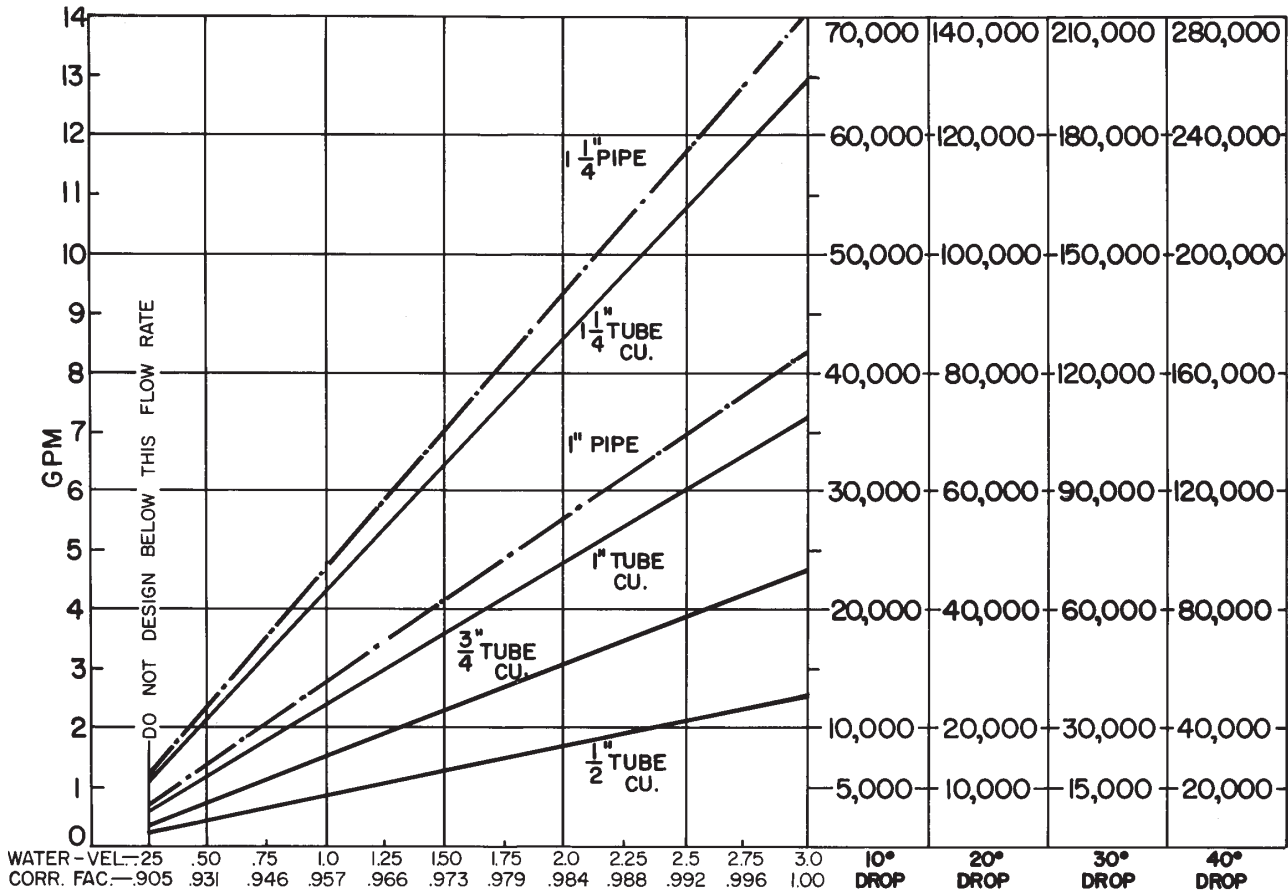
- 215°F AVERAGE WATER OR STEAM TEMPERATURE
- 65°F ENTERING AIR TEMPERATURE
- 3 FEET PER SECOND WATER FLOW RATE
- CATALOG MOUNTING HEIGHT

USE THE FOLLOWING CALCULATION WITH CORRECTION FACTORS FOR JOB CONDITIONS TO DETERMINE CORRECTED RATING:

$$\text{CORRECTED RATING} = (\text{215°F CATALOG RATING}) \times \left(\frac{\text{CORRECTION FACTOR FOR STEAM OR WATER AND AVERAGE AIR TEMP.}}{\text{CORRECTION FACTOR FOR MOUNTING HTG.-SEE CATALOG RATING}} \right) \times \left(\frac{\text{CORRECTION FACTOR FOR FLOW RATE}}{\text{CORRECTION FACTOR FOR MOUNTING HTG.-SEE CATALOG RATING}} \right)$$

USE THE FOLLOWING CHARTS TO SELECT CORRECTION FACTORS

CHART/WATER VEL./CORR. FACTOR / PRESS. DROP/TOTAL BTU.

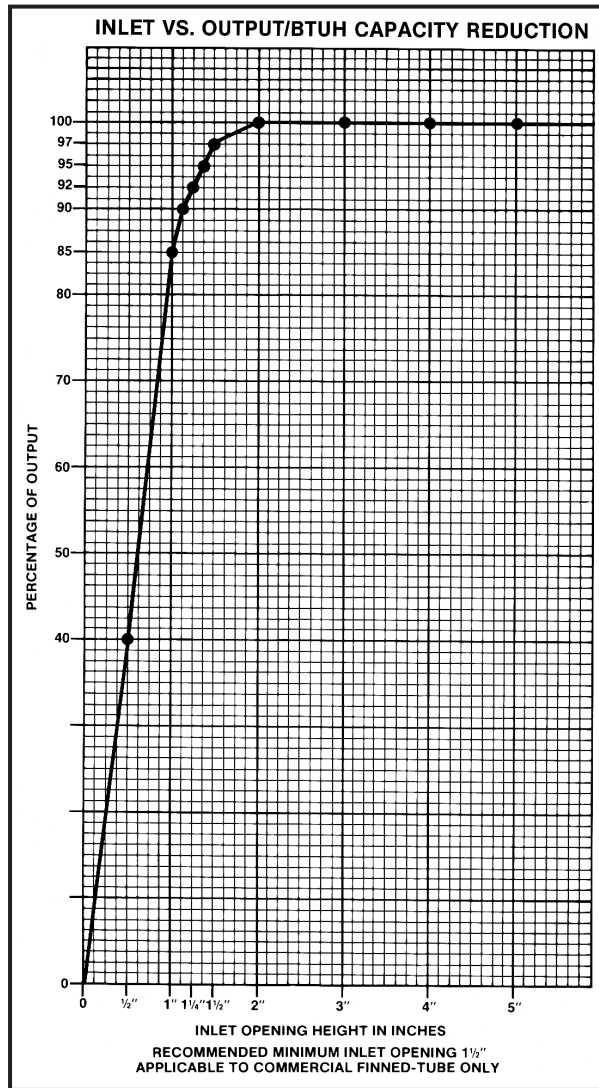


1/2" COP. ALUM.	1.80	2.33	5.33	9.16									
3/4" COP. ALUM.	.5	1.5	3.16	5.4	6.25								
1" COP. ALUM.	.233	.41	.83	1.45	2.16	2.83	3.66						
1" PIPE		.37	.79	1.3	2.00	2.70	3.70	4.80					
1 1/4" COP. ALUM.	.16	.33	.55	.79	1.08	1.33	1.8	2.25	2.26	2.91	3.3		
1 1/4" PIPE	.09	.18	.31	.5	.70	1.0	1.1	1.3	1.6	1.8	2.58	2.3	3.3

PRESSURE DROP PER 100 LINEAR FT., IN FEET OF HEAD

Design Data

INLET AIR CORRECTION FACTOR



GUARANTEED WORKING PRESSURES

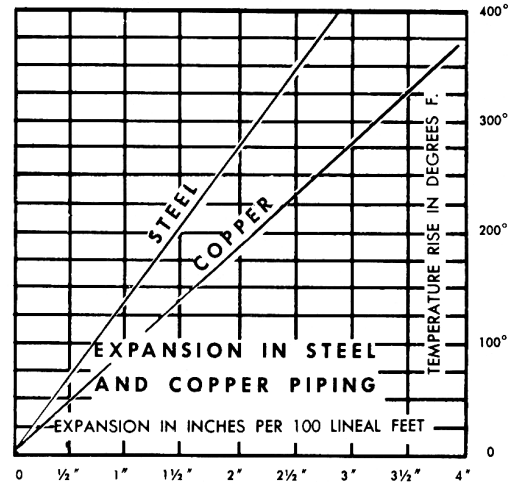
- 1" IPS — 780 AT TEMPERATURES UP TO 650°F.
 - 1 1/4" IPS — 660 AT TEMPERATURES UP TO 650°F.
 - 2" IPS — 405 AT TEMPERATURES UP TO 650°F.
 - 1 1/4" CU — 194 AT TEMPERATURES UP TO 300°F.
 - 1" CU — 204 AT TEMPERATURES UP TO 300°F.
 - 3/4" CU — 218 PSI AT TEMPERATURES UP TO 300°F.
- MAXIMUM PRESSURES AT OTHER TEMPERATURES ARE AVAILABLE UPON REQUEST.

RATE OF PITCH FOR STEAM 1/2" DROP OVER 20 FT. RUN.

PIPE WATER CAPACITIES AND QUANTITIES CIRCULATED AT VELOCITY OF 3* FEET PER SECOND			
Pipe Size	Gals. Per Linear Ft.	Gals./Min. @ 3' Sec. Vel.*	Lbs./Hr. @ 3' Sec. Vel.*
1/2"	.016	2.88	1440
3/4"	.023	4.14	2070
1"	.040	7.20	3600
1 1/4"	.063	11.34	5660
1 1/2"	.102	18.36	9160
2"	.170	30.60	15300
2 1/2"	.275	49.50	24850
3"	.390	70.20	35000

*3 Ft./Sec. Velocity is Basic for Hot Water Rating Factors Shown on this Page.

$$\text{VELOCITY FT./SEC.} = \frac{\text{LBS. PER HOUR}}{(\text{GALS. PER FT.}) (3600) (8.3)}$$



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

Design Data

CORRECTION FACTORS FOR STEAM PRESSURES AND AIR TEMPERATURES OTHER THAN STANDARD

STEAM		ENTERING AIR TEMPERATURE, °F														
Pressure		Temp.			STD											
Gauge	Abs. Psi	°F	45	55	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
(Vac) 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	258.8	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.

CORRECTION FACTORS FOR WATER TEMPERATURES AND AIR TEMPERATURES OTHER THAN STANDARD

AVERAGE WATER TEMP. °F	ENTERING AIR TEMPERATURE, °F														
	45	55	STD	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