COLMAC COIL
Manufacturing Inc.

STEAM HEATING COILS
5/8” OD TUBE

• Standard • Heavy Duty • Steam Distributing

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“The Heat Transfer Experts”

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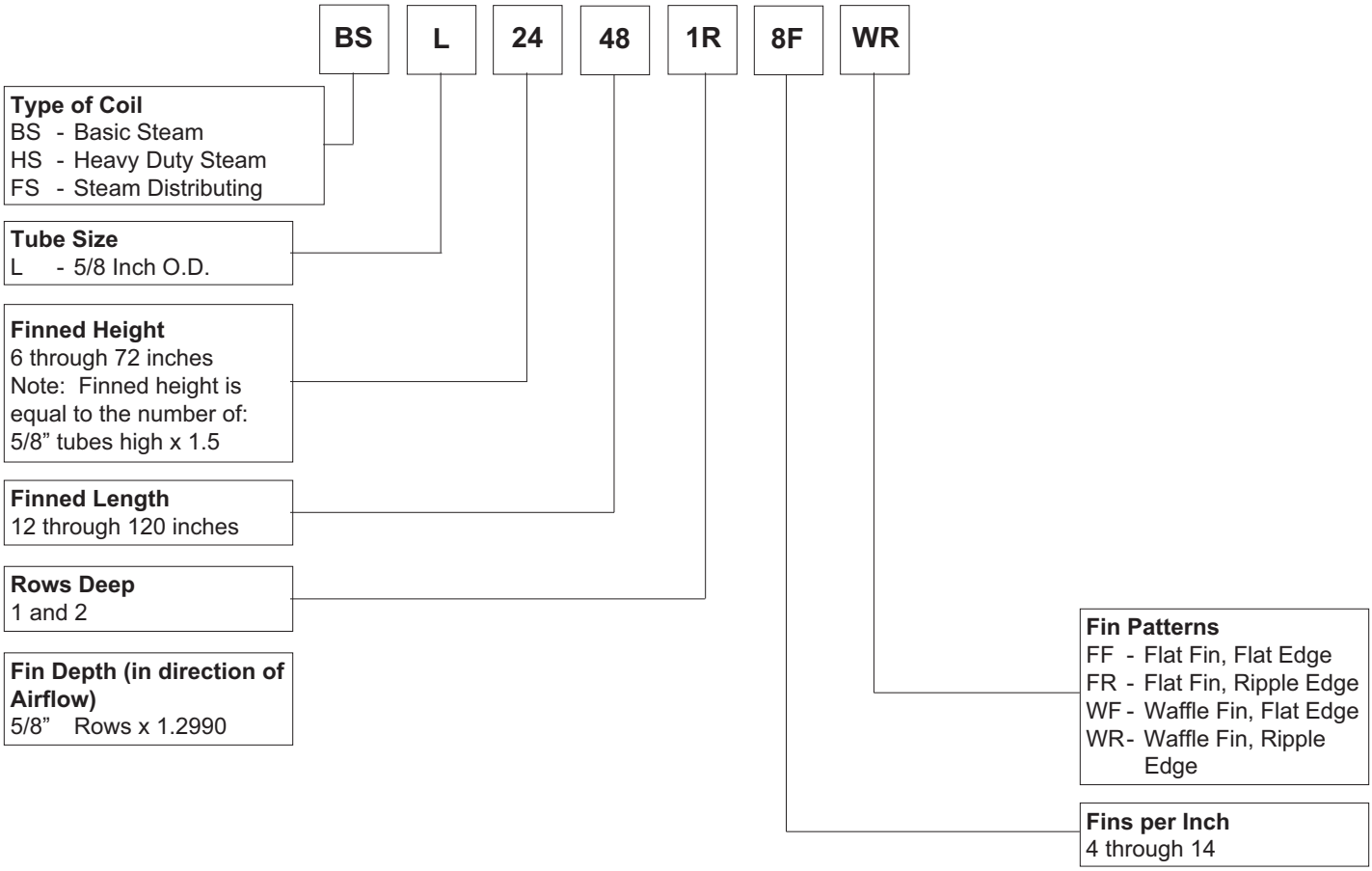
COIL NOMENCLATURE

Ordering Data



FEATURES — Colmac Steam Coils are available with 5/8" O.D. diameter tubes in one and two row configurations. The tubes have 1-1/2 inch spacing and the two row coils have a staggered tube pattern for efficient heat transfer.

FINS — The Fins are plate type aluminum (copper optional), die formed with a waffle surface and ripple edges. Each fin has formed self-spacing collars completely covering the tube. The collars automatically and precisely space the fins in a uniform manner. Fin spacing of 4 to 14 fins per inch are available. WF and WR fin patterns ARI certified. Minimum fin thickness for 8-14 FPI is .006". Minimum fin thickness for 4-7 FPI or less is .010".

TUBES — The seamless 5/8" diameter copper tubes (cupro-nickel available) are expanded into fin collars to form a rigid mechanical bond. Heavy wall tubing is available for high pressure applications. Copper to copper joints are made with a high temperature brazing alloy, steel joints are made with a bronze brazing alloy.

HEADERS — Inlet and outlet headers are made from heavy wall seamless copper tubing. Headers have die formed collars to provide a strong durable brazing joint. Connectors are wrought copper.

CASING — Mill galvanized casings have die formed extrusions to eliminate wear from expansion and contraction. Pre-punched slots are provided on top, bottom, and sides of coil. Stacking flanges are optional.

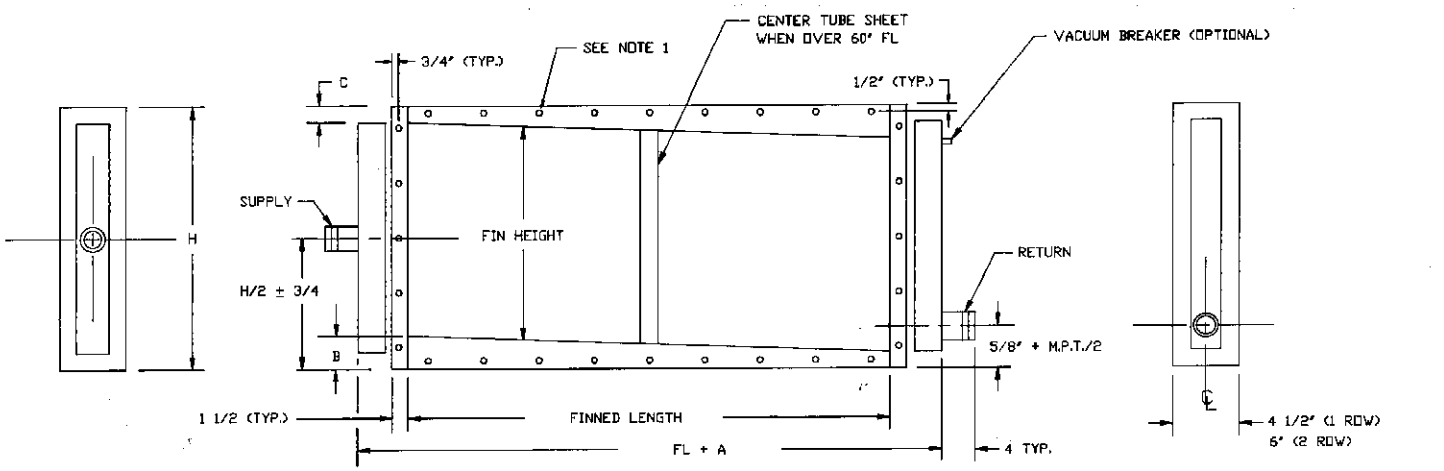
TESTING — All tubes are tested at a minimum of 1500 PSIG. The coil assembly is leak tested at 350 PSIG (BSL), 175 PSIG (FSL) under warm water.

BASIC STEAM — Basic Steam coils are suitable for up to 175 PSIG steam pressure. Supply and return connections are at opposite ends. When tubes are installed vertically the Basic Steam coil provides excellent freeze protection. With tubes horizontal, the Basic Steam coil is used primarily for re-heat applications.

STEAM DISTRIBUTING — 3/8" inner steam distributing tubes provide uniform steam distribution throughout the face of the coil. Supply and return connections are on the same end. When finned length exceeds 72", a second supply connection is provided on the opposite end.

Dimensions For Steam Coils

5/8" Basic, Heavy Duty Steam Heating Coil

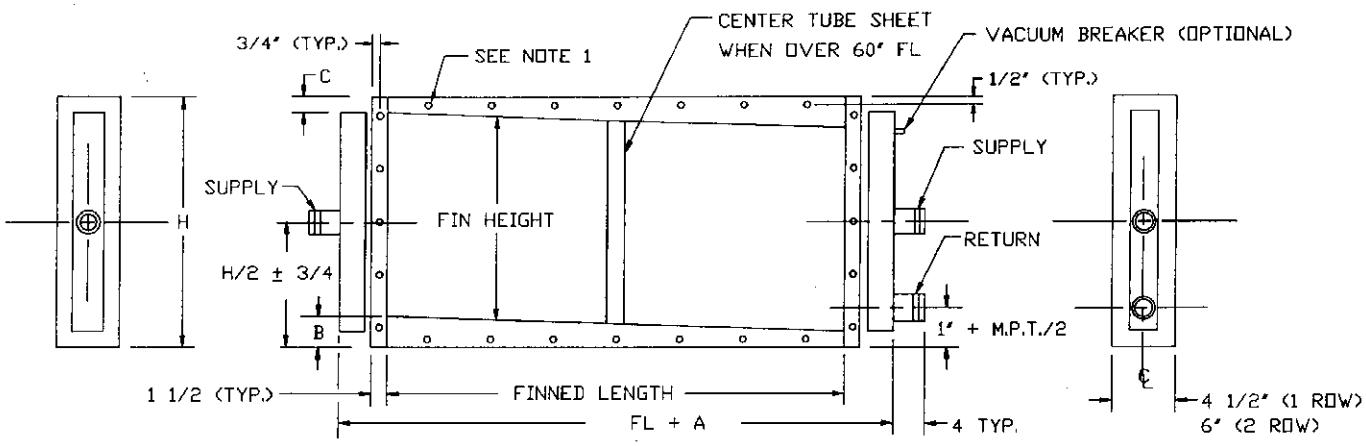


FIN HEIGHT	TUBES HIGH	1 ROW 12-72 FIN LENGTH			1 ROW 73-120 FINNED LENGTH			2 ROW 12-72 FIN LENGTH			2 ROW 73-120 FINNED LENGTH		
		A	SUPPLY	RETURN	A	SUPPLY	RETURN	A	SUPPLY	RETURN	A	SUPPLY	RETURN
9-18	6-12	7	1 1/4 MPT	1 MPT	7 3/4	1 1/2 MPT	1 1/4 MPT	10 1/4	1 1/2 MPT	1 1/4 MPT	10 1/4	2 MPT	1 1/2 MPT
21-30	14-21	7 3/4	1 1/2 "	1 1/4 "	8 3/4	2 "	1 1/2 "	10 1/4	2 "	1 1/2 "	10 3/4	2 1/2 "	2 "
33-45	22-30	8 3/4	2 "	1 1/2 "	9 3/4	2 1/2 "	2 "	10 3/4	2 1/2 "	2 "	11 1/4	3 "	2 "

FINNED LENGTH	DIM'S B PLUS C
12" - 30"	3 1/8
31" - 60"	3 3/4
61" - 102"	4 3/4
103" - 120"	5

NOTE:
1. 5/16" DIA HOLES ON 3" CTRS FROM CENTERLINE OF CASING.
2. COIL PITCHED IN CASING TOWARD RETURN END 1/4" PER FOOT OF FINNED LENGTH. B DIM PLUS C DIM PLUS FIN HEIGHT EQUALS H.

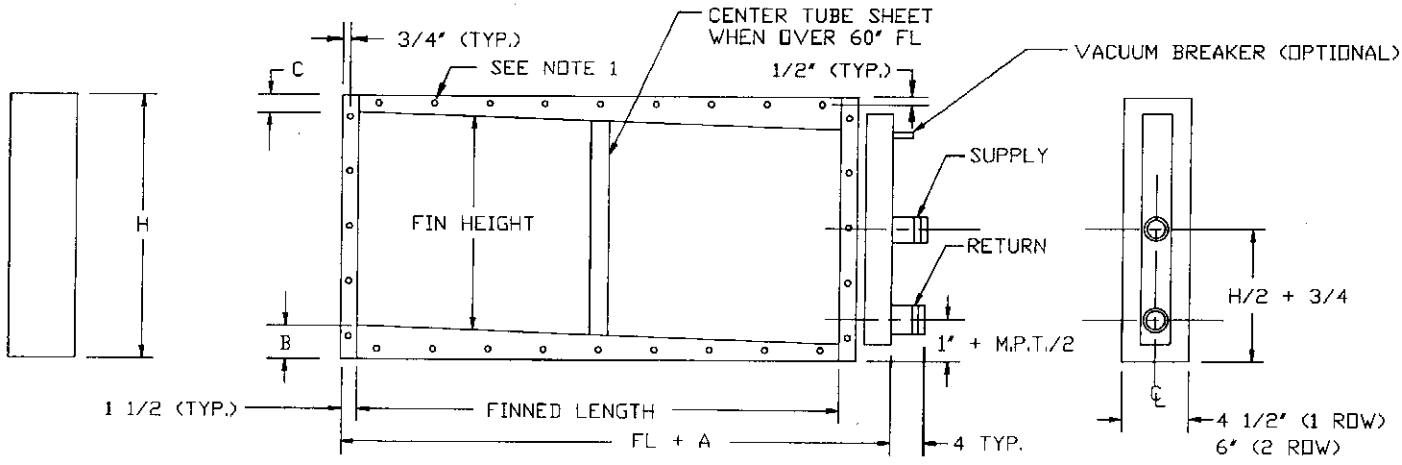
5/8" Steam Distributing Coil Over 72" (2 Supplies Required)



FIN HEIGHT	TUBES HIGH	1 ROW			2 ROW		
		73-120 FINNED LENGTH			73-120 FINNED LENGTH		
		A	SUPPLY	RETURN	A	SUPPLY *	RETURN
9-18	6-12	9 3/8	1 1/2 MPT	1 1/4 MPT	10 5/8	2 MPT	1 1/2 MPT
21-30	14-21	10 5/8	2 "	1 1/2 "	10 7/8	2 1/2 "	2 "
33-45	22-30	11 7/8	2 1/2 "	2 "	13 1/4	3 "	2 "

NOTE:
1. 5/16" DIA HOLES ON 3" CTRS FROM CENTERLINE OF CASING.
2. COIL IS PITCHED IN CASING TOWARD RETURN END 1/4" PER FOOT OF FINNED LENGTH. B DIM PLUS C DIM PLUS FIN HEIGHT EQUALS H.
3. MINIMUM C DIM IS 1". B = FL/60 + 1" MINIMUM FOR COIL PITCH.

5/8" Steam Distributing Coil Under 71"



FIN HEIGHT	TUBES HIGH	1 ROW			2 ROW		
		12 -72 FIN LENGTH			12 - 72 FIN LENGTH		
		A	SUPPLY	RETURN	A	SUPPLY *	RETURN
9 - 18	6 - 12	5 3/4	1 1/4 MPT	1 MPT	7	1 1/2 MPT	1 1/4 MPT
21 - 30	14 - 21	6 1/2	1 1/2 "	1 1/4 "	7	2 "	1 /12 "
33 - 45	22 - 30	7 1/2	2 "	1 1/2 "	7 3/4	2 1/2 "	2 "

NOTE:
1. 5/16" DIA HOLES ON 3" CTRS FROM CENTERLINE OF CASING.
2. COIL IS PITCHED IN CASING TOWARD RETURN END 1/4" PER FOOT OF FINNED LENGTH. B DIM PLUS C DIM PLUS FIN HEIGHT EQUALS H.
3. MINIMUM C DIM IS 1". B = FL/60 + 1" MINIMUM FOR COIL PITCH.

* SUPPLY HEADER SIZE IS ONE SIZE LARGER THE ADAPTER SIZE.

Table 1

Temperature Conversion Factor — (A)

Temp. °F	Factor (A)	(T) Temp. °F	Factor (A)
0	1.15	60	1.02
10	1.13	70	1.00
20	1.10	80	.98
30	1.08	90	.96
40	1.06	100	.95
50	1.04	110	.93

For Other Temperatures — $(A) = \frac{530}{(T) + 460}$

Table 2

Altitude Conversion Factor — (B)

Alt.—Ft.	Factor (B)	Alt.—Ft.	Factor (B)
0	1.000	3000	.895
500	.982	4000	.864
1000	.965	5000	.832
1500	.947	6000	.802
2000	.930	7000	.771
2500	.921	8000	.743

Convert 8500 CFM at 40°F and 300 Ft. Altitude To SCFM

SCFM = 8500 x 1.06 x .985 = 8060 SCFM

Use 8060 SCFM when Capacity and Pressure Drop Tables are used.

Formulae

Air Flow (CFM) = Feet Per Minute

(SCFM) = CFM x Air Density Conversion Factors.

Note: Standard Air Has Density of .075 Lb./Cu. Ft.

Air Velocity (FPM) = CFM/Coil Face Area (Sq. Ft.)

(SFPM) = SCFM/Coil Face Area (Sq. Ft.)

Air Temperature Rise (TR) = Leaving Dry Bulb (LDB) —Entering Dry Bulb (EDB)

Temperature Difference: = TD = Sat. Steam Temperature (Table 6) —Entering Dry Bulb (EDB)

Capacity: = Btuh = 1.085 x SCFM x TR

Condensate Rate (LB/HR) = Btuh/Steam Latent Heat (BTU/LB)

Air Pressure Drop (APD) = Inches of Water

EXAMPLE

Selection Procedure Using Table Rating (Table 3):
Given 6000 SCFM, 510,000 BTUH, 25 PSIG Steam, 800 SFPM Face Velocity, 70°F Entering Dry Bulb.

Example

1. Determine Coil Face Velocity (SFPM) $= \frac{\text{SCFM}}{\text{Face Area Sq. Ft.}}$

$$800 \text{ SFPM} = \frac{6000 \times 1.00}{\text{Sq. Ft.}}$$

Sq. Ft. = 7.50

Select: 15 x 72 or
18 x 60 or
30 x 36

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2. Calculate TR

$$TR = \frac{\text{Btuh}}{1.085 \times \text{SCFM}}$$

$$= \frac{510{,}000}{1.085 \times 6000}$$

$$= 78.34°F$$

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3. Convert To Standard Rating Conditions of 5 PSIG Steam, 0°F Entering Dry Bulb

Use Air Temperature Correction Factor (Table 5) To Convert To Standard Conditions:

$$TR \text{ @ 5 PSIG, 0°EDB} = \frac{78.34}{.876} = 90.36F$$

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4. Select Row-Fin for Coil

Enter Table 3 at 800 SFPM, And Select Coil with Temperature Rise of 90.4 or Greater Select 210. Note Coil Selected is 2 Row 10 Fins Per Inch.

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5. Calculate Condensate Load

$$\text{Condensate Load, lbs/hr} = \frac{\text{Btuh}}{\text{Steam Latent Heat (Btu/lb)}}$$

$$= \frac{510{,}000}{960.6} = 531 \text{ lbs/hr}$$

---

6. Calculate Condensate Load per Tube

NOTE: Maximum load allowable per tube is 40 lbs/hr•tube for Colmac Steam Distributing, type FS-L Coils, 68 for type BS-L coils.

For 30" FH x 36" FL x 2 Row Coil, Total no. of tubes

$$= \frac{FH}{1.5} \times \text{Rows} = \frac{30}{1.5} \times 2 = 40$$

$$\text{Cond. Load per Tube} = \frac{\text{Cond. Load}}{\text{Total no. Tubes}}$$

$$= \frac{531}{40} = 13.3 \text{ lbs/hr•tube}$$

Table 3

Air Temperature Rise at 5 PSIG, 0° EDB

(WF or WR Alum. Fins)

Face Velocity, SFPM

Row Fin	200	400	600	800	1000	1200
104	49.7	37.6	31.8	27.8	25.3	23.2
106	68.1	51.1	42.9	37.7	34.1	31.5
108	77.9	58.1	48.2	42.0	37.8	34.7
110	87.0	64.5	53.0	46.1	41.1	37.2
112	95.0	70.0	57.6	49.6	43.9	39.7
206	115.8	90.8	77.4	69.0	62.7	58.1
208	138.5	109.0	93.1	82.9	74.9	69.0
210	156.9	124.9	106.7	94.3	85.2	78.6
212	171.5	138.1	118.1	104.2	93.9	86.3

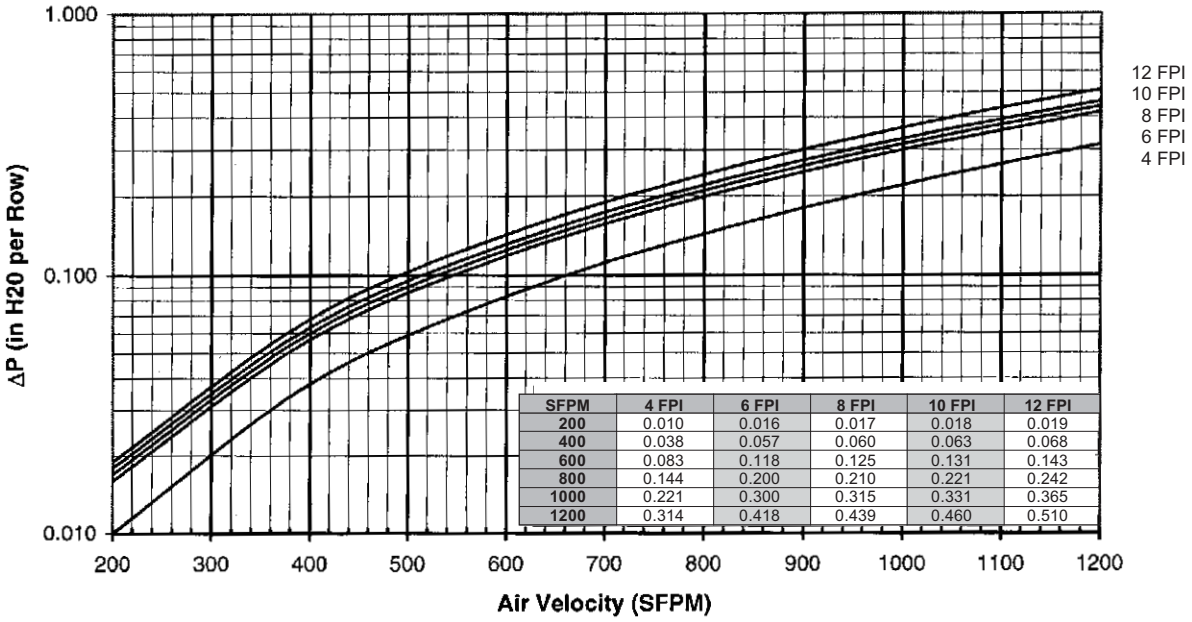
To determine capacity (BTUH) per sq. ft. of face area, multiply SFPM x 1.085 x Air temp. rise. To determine air temperature rise and capacity for other steam pressures and entering air temperatures, multiply rise and capacity at 5 PSIG and 0°F EDB by the appropriate temperature correction factor from table 5.

Figure 1

Air Pressure Drop per Row

1 & 2 Row Coils

Type WF or WR Fins



SFPM	4 FPI	6 FPI	8 FPI	10 FPI	12 FPI
200	0.010	0.016	0.017	0.018	0.019
400	0.038	0.057	0.060	0.063	0.068
600	0.083	0.118	0.125	0.131	0.143
800	0.144	0.200	0.210	0.221	0.242
1000	0.221	0.300	0.315	0.331	0.365
1200	0.314	0.418	0.439	0.460	0.510

Table 5

Air Temperature Rise Correction Factor															
Entering Air Temp. °F	Steam Pressure, Pounds Per Square Inch Guage														
	0	2	5	10	15	20	25	30	40	50	60	80	100	150	200
-40	1.110	1.139	1.177	1.231	1.276	1.316	1.352	1.383	1.439	1.488	1.530	1.603	1.665	1.788	1.885
-30	1.066	1.095	1.187	1.232	1.187	1.272	1.307	1.339	1.395	1.444	1.486	1.559	1.621	1.744	1.841
-20	1.022	1.051	1.089	1.143	1.188	1.228	1.263	1.295	1.351	1.400	1.442	1.515	1.577	1.700	1.796
-10	0.978	1.007	1.044	1.099	1.144	1.184	1.219	1.251	1.307	1.356	1.398	1.471	1.533	1.656	1.752
0	0.934	0.963	1.000	1.055	1.100	1.140	1.175	1.207	1.263	1.311	1.354	1.427	1.489	1.612	1.708
10	0.890	0.919	0.956	1.011	1.056	1.096	1.131	1.163	1.219	1.267	1.310	1.383	1.444	1.568	1.664
20	0.846	0.874	0.912	0.967	1.012	1.052	1.087	1.119	1.175	1.223	1.266	1.339	1.400	1.524	1.620
30	0.802	0.830	0.868	0.922	0.968	1.008	1.043	1.075	1.131	1.179	1.222	1.295	1.356	1.480	1.576
40	0.758	0.786	0.824	0.878	0.924	0.964	0.999	1.031	1.087	1.135	1.178	1.251	1.312	1.436	1.532
50	0.714	0.742	0.780	0.834	0.880	0.920	0.955	0.987	1.043	1.091	1.133	1.207	1.268	1.392	1.488
60	0.670	0.698	0.736	0.790	0.836	0.876	0.911	0.943	0.999	1.047	1.089	1.163	1.224	1.348	1.444
70	0.626	0.654	0.692	0.746	0.792	0.832	0.876	0.899	0.955	1.003	1.045	1.119	1.180	1.304	1.400
80	0.581	0.610	0.648	0.702	0.748	0.788	0.823	0.855	0.911	0.959	1.001	1.074	1.136	1.259	1.356
90	0.537	0.566	0.604	0.658	0.704	0.744	0.779	0.811	0.867	0.915	0.957	1.030	1.092	1.215	1.312
100	0.493	0.522	0.560	0.614	0.659	0.700	0.735	0.767	0.822	0.871	0.913	0.986	1.048	1.171	1.268
110	0.449	0.478	0.516	0.570	0.615	0.656	0.691	0.722	0.778	0.827	0.869	0.942	1.004	1.127	1.224
120	0.405	0.434	0.472	0.526	0.571	0.611	0.647	0.678	0.734	0.783	0.825	0.898	0.960	1.083	1.180
130	0.361	0.390	0.428	0.482	0.527	0.567	0.603	0.634	0.690	0.739	0.781	0.854	0.916	1.039	1.136
140	0.317	0.346	0.384	0.438	0.483	0.523	0.559	0.590	0.646	0.695	0.737	0.810	0.872	0.995	1.092
150	0.273	0.302	0.340	0.394	0.439	0.479	0.515	0.546	0.602	0.651	0.693	0.766	0.828	0.951	1.048

Correction Factor = (Steam Temperature — Entering Air Temperature) ÷ 227.1

Table 6

Properties Of Steam		
PSIG	Sat. Temp. °F	Latent Heat (Btu/lbs.)
2	218.0	966.1
5	227.1	960.6
10	239.4	952.6
15	249.7	945.7
20	258.8	939.6
25	266.8	934.0
30	274.0	929.0
40	286.7	919.9
50	297.7	911.8
60	307.3	904.7
70	316.0	898.0
80	323.9	891.9
90	331.2	886.2
100	337.9	880.8
125	352.9	868.3
150	365.9	857.2
175	377.4	846.9
200	387.8	837.5

Example

Selection Procedure Using Curves (Figure 1)

Given 12,000 CFM, 40°F Entering Dry Bulb, 130°F Leaving Dry Bulb, 10 PSIG Steam, 36" x 72" Duct Size.

Procedure	Example
1. Calculate Coil Face Velocity, SFPM Note: Use A and B Factors From Table 1, 2.	$SFPM = \frac{SCFM}{Sq.\ Ft.} = \frac{12{,}000 \times 1.06}{3.0 \times 6.0}$ $SFPM = 706.7$
2. Calculate $\frac{TR}{TD}$	$\frac{TR}{TD} = \frac{Air\ Temp.\ Rise}{Steam\ Temp.\text{-}EDB}$ $= \frac{130\text{-}40}{239.4\text{-}40} = .451$
3. Select Row-Fin For Coil	Enter Figure at 706.7 SFPM. Select Row Fin Having TR/TD Factor Equal or Greater Than .451. Select 212. Note Coil Selected is 2 Row-12 Fins per inch.

4. Calculate Condensate Load

$$\text{Condensate Load, lbs/hr} = \frac{Btuh}{\text{Steam Latent Heat (Btu/lb)}} = \frac{1.085 \times 12{,}000 \times 1.06 \times (130\text{-}40)}{952.6} = 1304 \text{ lbs/hr}$$

5. Calculate Condensate Load per Tube

Note: Maximum load allowable per tube is 40 lbs/hr•tube for Colmac Steam Distributing type FS-L coils.

$$\text{For 36" x 72" x 2 Row coil, total no. of tubes} = \frac{FH}{1.5} \times \text{Rows} = \frac{36}{1.5} \times 2 = 48 \text{ tubes}$$

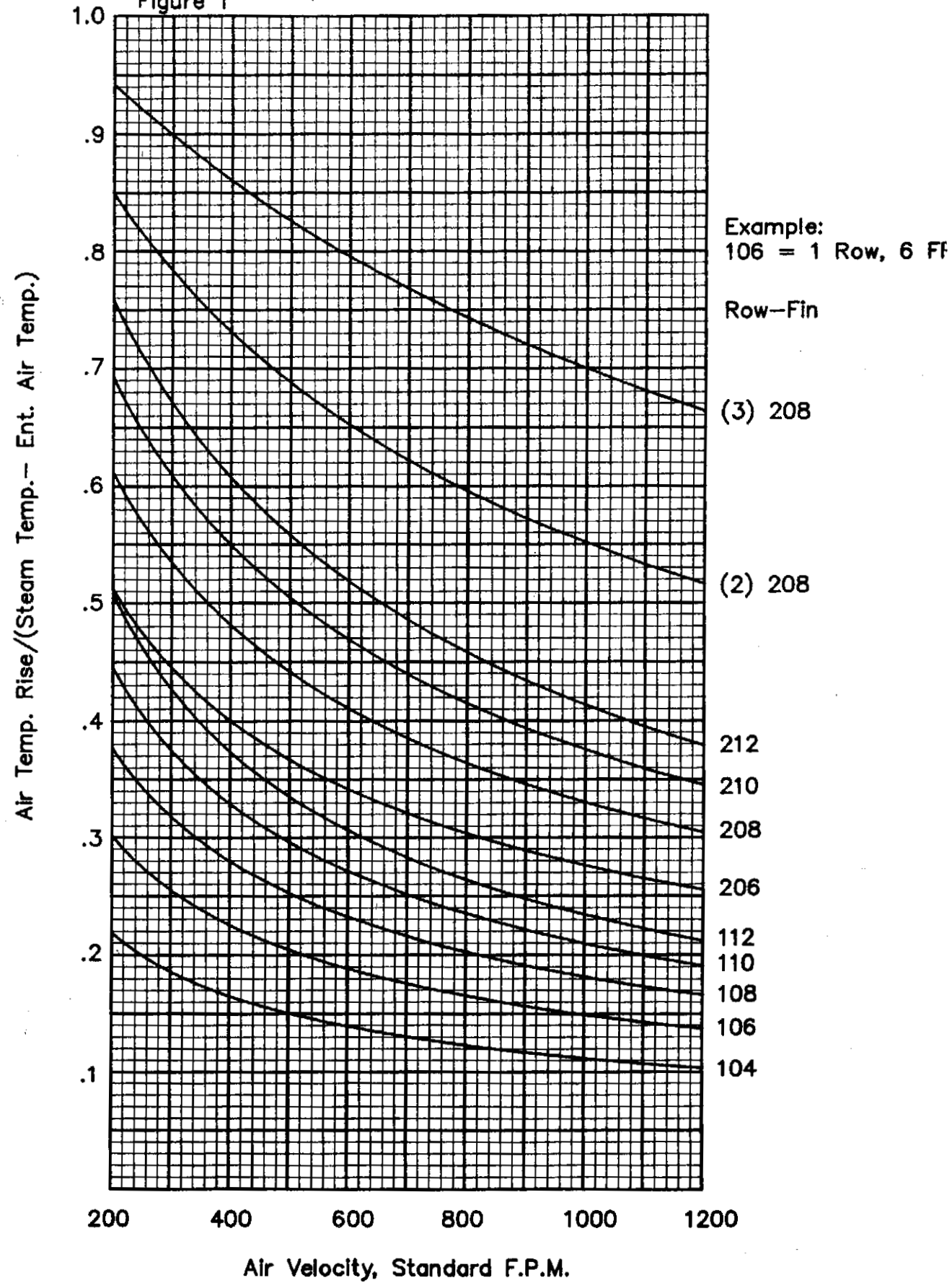
$$\text{Cond. Load per Tube} = \frac{\text{Cond. Load}}{\text{Total No. Tubes}} = \frac{1304}{48} = 27.2 \text{ lbs/hr•tube}$$

Type BS—L, HS—L, and FS—L
Coil Effectiveness

(WF or WR Alum. Fins)

Rev A
3-15-87

Figure 1



COIL WEIGHTS — DRY — POUNDS (Cu. Tubes, Alum. Fins)

1 ROW

Fin Height	FINNED LENGTH												
	6	12	18	24	30	36	48	60	72	84	96	108	120
6	25	28	32	38	43	50	57	71	83	93	105	115	128
12	—	36	40	46	51	58	68	79	91	101	113	123	134
18	—	—	48	54	59	67	80	94	106	118	132	145	157
24	—	—	—	66	71	80	96	114	126	140	155	173	192
30	—	—	—	—	85	93	112	131	147	164	182	200	218
36	—	—	—	—	—	109	129	150	170	189	206	232	250
42	—	—	—	—	—	—	147	168	190	213	234	264	280

2 ROW

Fin Height	FINNED LENGTH												
	6	12	18	24	30	36	48	60	72	84	96	108	120
12	—	30	36	42	48	54	67	80	93	106	—	—	—
18	—	—	47	55	63	73	90	108	125	142	160	178	196
24	—	—	—	69	80	92	114	137	158	180	202	224	247
36	—	—	—	—	—	130	164	197	229	259	293	328	358
42	—	—	—	—	—	—	200	242	279	317	361	401	437

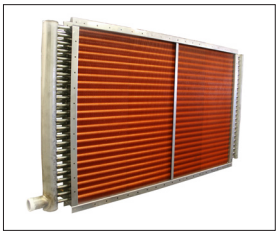
NOTES: 1. Weights based on 8 FPI, AL Fin Coils.
2. Shipping weight will be 40% greater than dry weight for individually shipped coils, and 20% greater for 2 or more per crate.

Application Recommendations

- Install and pipe coils in accordance with standard industry practice and applicable national and local codes.
- Support all piping independant of coil.
- Provide swing joints to absorb thermal expansion and contraction of coil tubes.
- Make return line piping to drop leg same size as coil outlet (do not bush).
- Install drip trap in steam mains ahead of coil.
- Trap each coil independently and locate trap a minimum of 12 inches below return connection of coil.
- In order to handle the high condensate load during initial start up period, traps should be sized 2-3 times the rated condensate load of the coil(s).
- Install strainers ahead of valves, traps and steam distributing coils to catch dirt and scale.
- Coils should be provided with a continuous method of eliminating non condensible gases, either by automatic or continuous vents.
- Minimum operating pressure recommended is 5 psig.
- Coils must be installed so tubes are pitched at least 1/4 inch per foot toward return header.
- When using automatic control valves, the condensate must not be lifted into overhead return mains, or drained into return mains in which a pressure is maintained.
- Do not oversize control valves, whether automatic or manually operated. Control valves should be selected from the actual steam consumption and not from the size of the coil supply connections.
- Check valves should only be installed in horizontal lines. Only15° check valves should be used since they open under a lower head of water.
- When starting up a steam coil, the steam should be admitted at least 15 minutes before the fans are started or fresh air dampers are opened with outside air entering at 40°F or lower.
- Install a vacuum breaker at the coil outlet to prevent back filling of coil with condensate during periods of low load or at shut-down.
- Do not design Colmac type FS-L steam distributing coils with condensate loads of more than 40 lbs/hr•tube (see examples).

COLMAC COIL
Manufacturing Inc.

Other Quality Products From Colmac Coil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Heat Pipes for Heat Recovery


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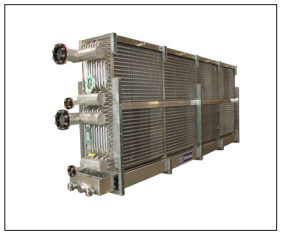
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Air Cooled Condensers

CE(PED) Certification, ASME Sec. VIII, Canadian Registration Number, UL508, Canadian Standards Association

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