

MODULAIR™ BY COLMAC COIL FLUID COOLERS

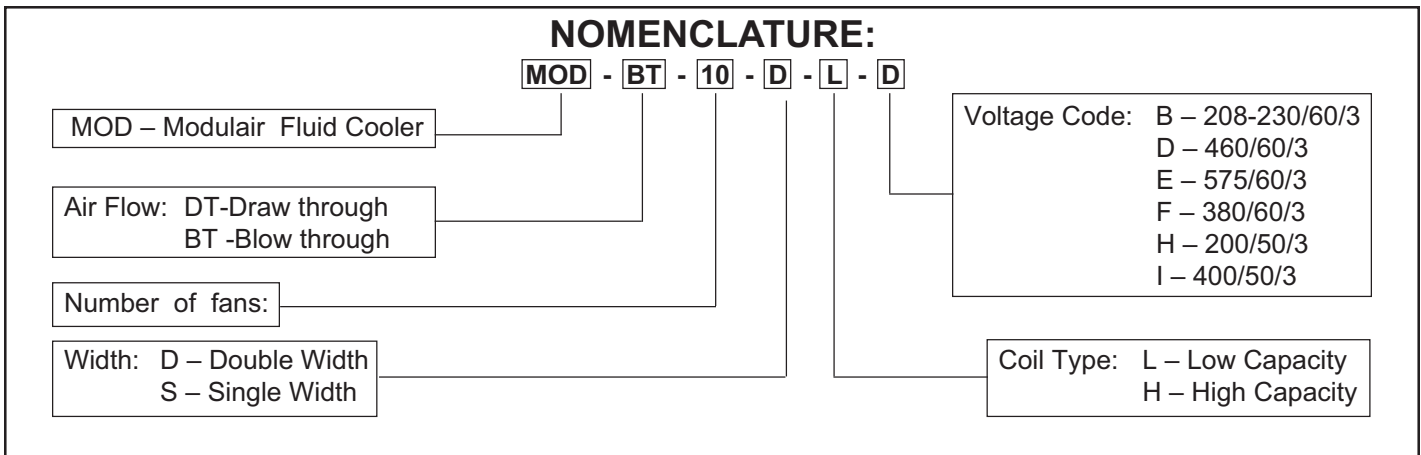
8 Models
Capacities to 3,000 MBtu/h



“The Heat Transfer Experts”

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STANDARD FEATURES:

Modulair air cooled fluid coolers are designed to provide cooling of Water, Ethylene Glycol/ Water and Propylene Glycol /Water solutions in a variety of closed loop applications. The compact plate fin heat transfer surface provides a compact and efficient air cooler suitable for many power generation cooling applications.

Modulair air cooled fluid coolers are available in a series of standard modules for either forced or induced draft to simplify selection. Any cooling load can be accommodated by connecting the required number of standard modules in parallel to a common pump skid.

- Wide range of sizes and fin spacing to match any cooling load and temperature.
- Seamless 5/8 inch copper tubes with high efficiency aluminum plate fins with self spacing collars.
- Copper headers designed for 150 psig @ 200° F with carbon steel 150# ANSI RF flanges.
- Independent fan compartments to prevent short circuiting of air during sequential fan operation.
- Corrosion resistant construction, 14-gauge galvanized steel cabinets, powder coated steel OSHA fan guards, galvanized steel fan blades.
- Heavy duty rigid foot mounted direct drive totally enclosed fan motors with moisture protected rainshields (slingers). Motor insulation is Class F rated for 154° F (67° C). Motors are 710 RPM for 50 HZ and 850 RPM for 60 HZ operation.
- Weatherproof NEMA 4 electrical enclosures located at the end of each cooling module provide single point field wiring for each cooling module.
- Built in lifting connections and easy to install legs simplify lifting and installation.

OPTIONS:

- Polycoat aluminum fins for added corrosion protection.
- Copper fins with copper tubes.
- Tin coated copper tubes with marine grade aluminum fins for severe corrosion service.
- Stainless steel cabinet, side frame, fan blades and hardware.
- Factory wired fused disconnect switch for each fan motor.
- Factory wired starters for each fan motor with overload protection and alarm contact.
- Coil block built in accordance with the requirements of the ASME Boiler and Pressure Vessel Code.

SELECTION PROCEDURE:

The selection procedure for eight standard Modulair cooler sizes is provided. Cooling capacity charts are shown in Figures 1 to 8 based on the flow rate of 50% ethylene glycol-water and the approach temperature °F with forced draft air flow (blow through). The approach temperature is the difference between the leaving fluid temperature and the inlet air temperature. The pressure drop for 50% ethylene glycol-water is shown in Figure 9 and the pressure drop correction for water instead of 50% ethylene glycol-water is shown in Figure 10.

Figures 11 to 13 provide rating factors for other conditions that are applied to the cooling capacities from Figures 1 to 8. The rating reduction factor for induced draft (draw through) air flow is shown in Figure 11. Figure 12 shows the rating increase to apply when water is used instead of 50% ethylene glycol-water. The cooling capacity charts are based on 1000 feet elevation (305 meters) and rating capacity factors for elevations above 1000 feet are shown in Figure 13. Figures 14 and 15 are the rating reduction factors to apply to the nominal cooling capacity when excess surface is required. Figures 16 and 17 provide the equivalent percentage excess surface conversion for inside fouling factors (hr.ft².°F/Btu).

For operating conditions that are markedly different than the conditions used for the cooling capacity charts please contact your Modulair representative or factory staff to check a standard Modulair selection or to prepare a custom design selection.

EXAMPLE:

A gas turbine installation has a design cooling load of 3,800,000 Btu/h to cool 1600 gpm of 50% ethylene glycol-water to 120 °F with 95 °F ambient air at 2,000 feet elevation. The specification calls for 15% excess surface and induced draft (draw through) fan arrangement.

The approach temperature is $120 - 95 = 25$ °F. The rating factor for induced draft for this approach temperature is 0.94 from Figure 11 and the rating factor for 2,000 feet elevation is 0.97 from Figure 13. As the rating charts are in MBtu/h divide the given cooling duty by 1,000. If the cooling conditions are given in kW and l/min multiply kW by 3.412 to convert to MBtu/h and divide l/min by 3.785 to obtain gpm. Next review the rating charts to estimate the number of cooling modules required. Select either two or three of the larger units and calculate the flow per unit for a trial run.

Trial number of coolers	2	3	
Ethylene glycol-water flow per cooler	$1600/2 = 800$	$1600/3 = 533$	gpm
Nominal cooling capacity required	$3800/2 = 1900$	$3800/3 = 1267$	MBtu/h
Trial coolers selected	BT-10-D-H (Figure 1)	BT-8-D-L (Figure 4)	
Cooling capacity from chart	2270	1650	MBtu/h
Design cooling capacity	$.94 \times .97 \times 2270 = 2070$	$.94 \times .97 \times 1650 = 1504$	MBtu/h
Excess surface rating factor	.95 (Figure 14)	.923 (Figure 15)	
Design cooling capacity	$.95 \times 2070 = 1966$	$.923 \times 1504 = 1388$	MBtu/h

Both trial selections will provide adequate cooling but the two larger coolers will be a more economical selection. The pressure drop from Figure 9 is 15 feet (4.57 m) liquid head.

The selection is two MOD-DT-10-D-H Modulair air cooled fluid coolers 10 fan double width. Note the second term is the letters "DT" to designate draw through fan arrangement. From Table 2 for 800 gpm each cooler will have 2-6" inlets and 2-6" outlet connections with 150# ANSI flanges. The overall dimensions and footing dimensions are shown in Figure 19. The two coolers may be arranged end to end with the pump skid at the center or side by side with the pump skid at the connection end.

MODULAIR COOLER SELECTION CHARTS

FIGURE 1
MODULAR RATING CURVE MOD - BT - 10 - D - H

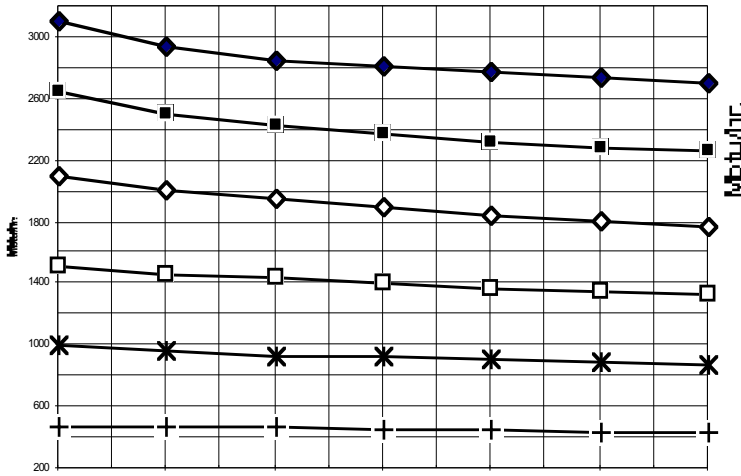


FIGURE 3
MODULAR RATING CURVE MOD - BT - 10 - D - L

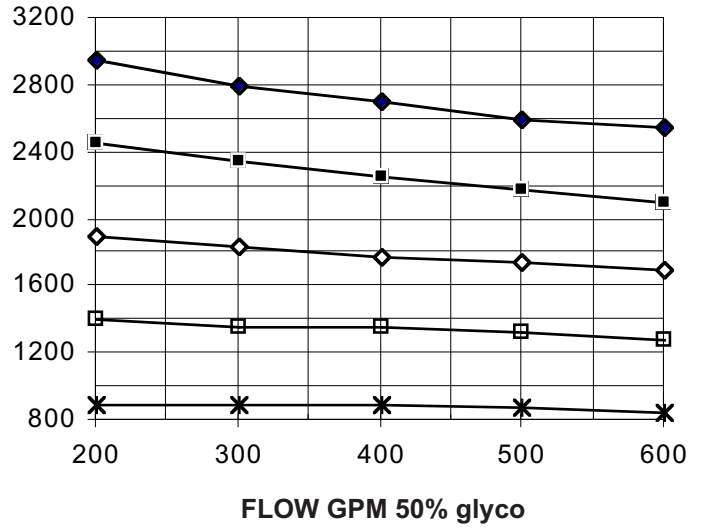


FIGURE 2
MODULAR RATING CURVE MOD - BT - 8 - D - H

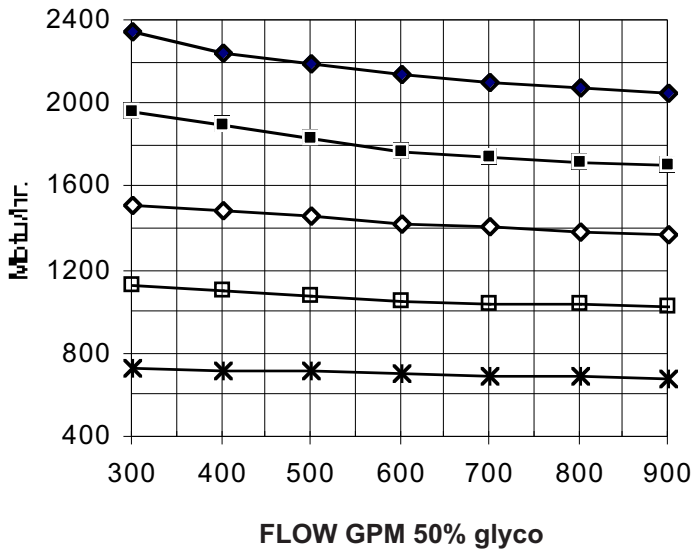
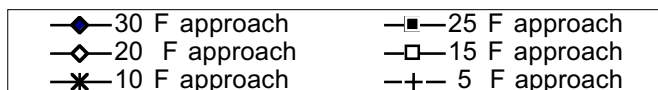
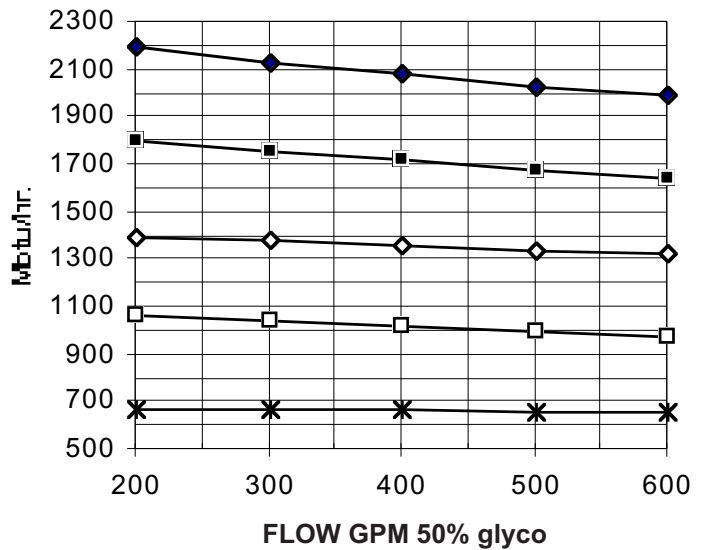
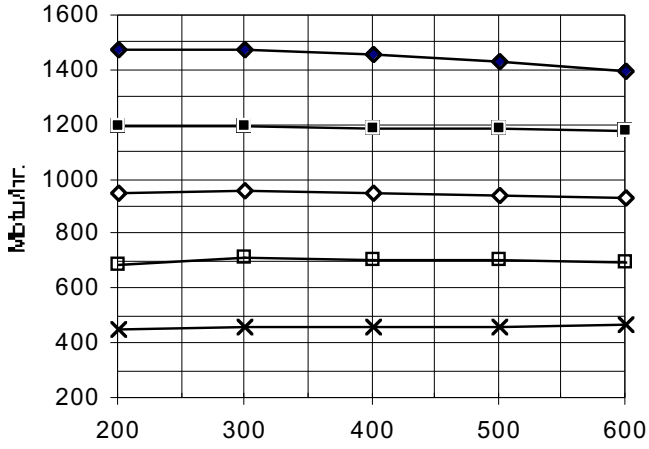


FIGURE 4
MODULAR RATING CURVE MOD - BT - 8 - D - L



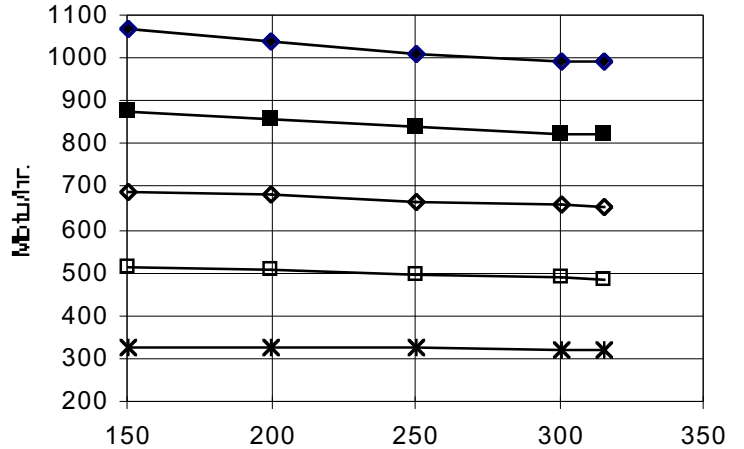
MODULAIR COOLER SELECTION CHARTS

MODULAR RATING CURVE MOD - BT - 6 - D - H



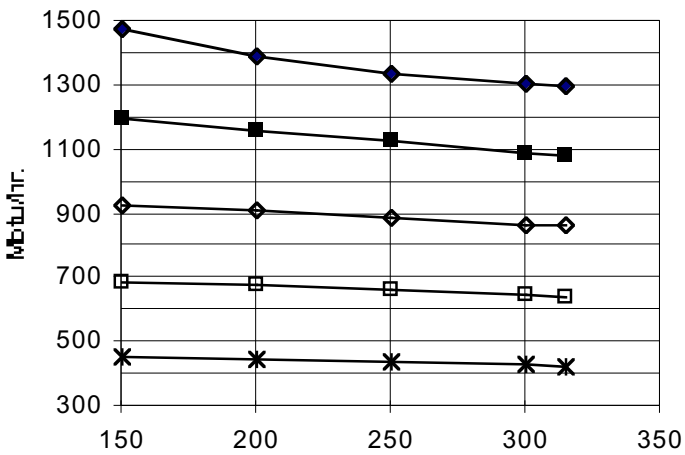
FLOW GPM 50% glyco
Figure 5

MODULAR RATING CURVE MOD - BT - 4 - S - L



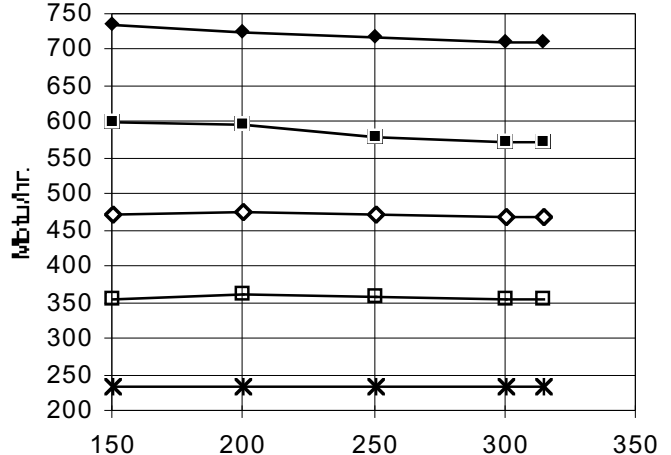
FLOW GPM 50% glyco
Figure 7

MODULAR RATING CURVE MOD - BT - 5 - S - L

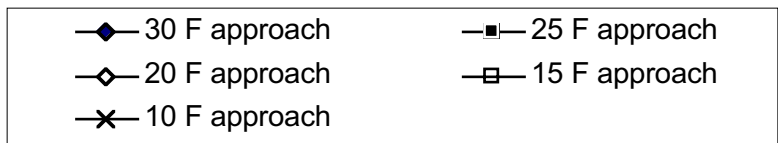


FLOW GPM 50% glyco
Figure 6

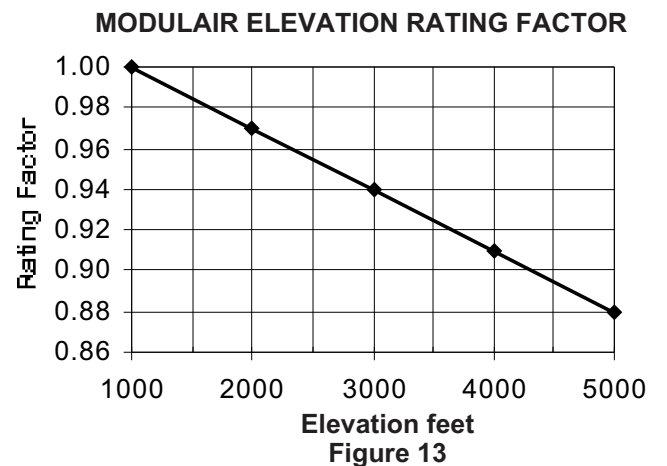
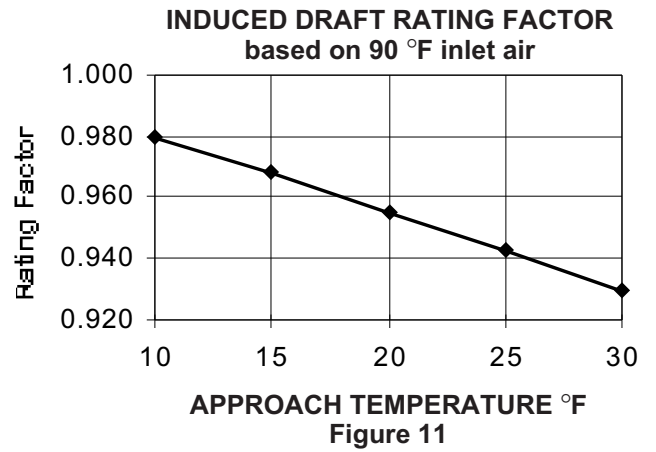
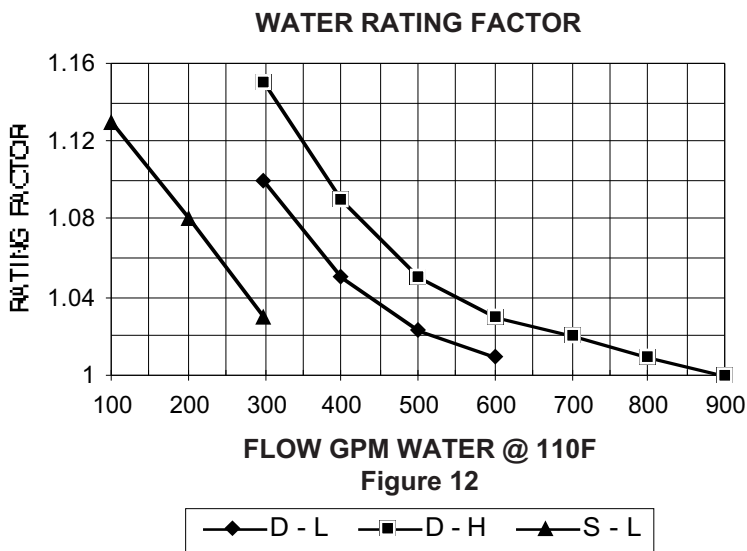
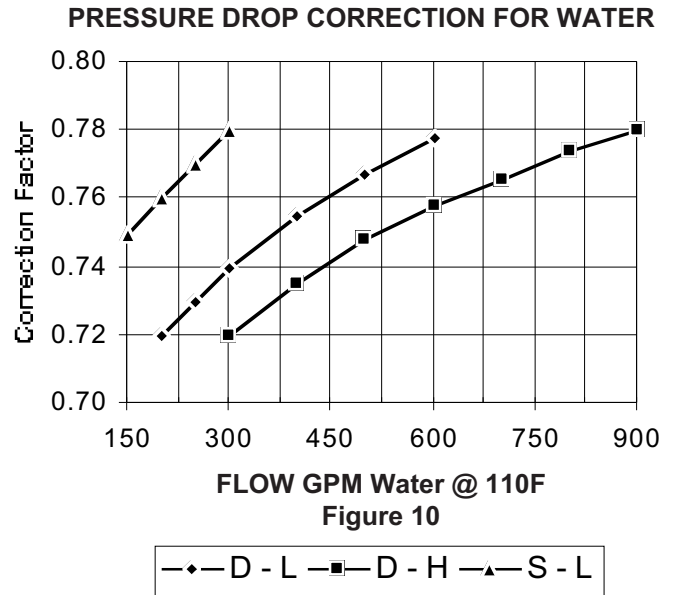
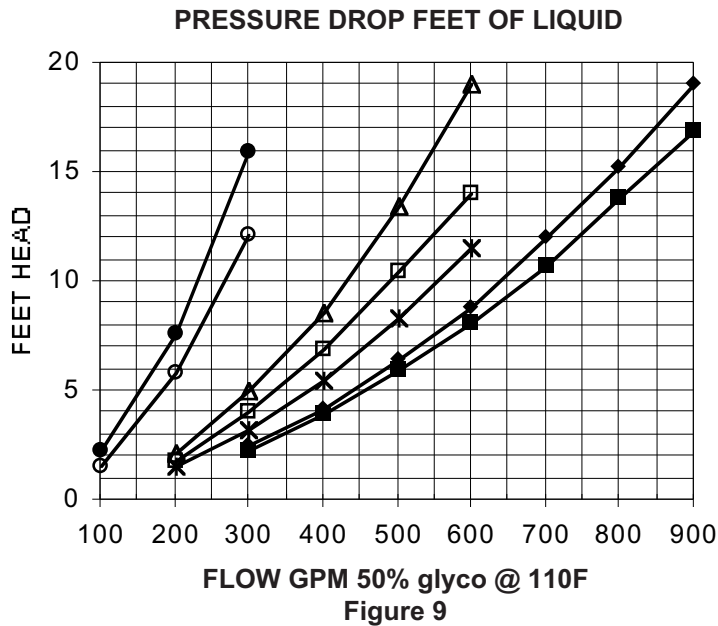
MODULAR RATING CURVE MOD - BT - 3 - S - L



FLOW GPM 50% glyco
Figure 8



MODULAIR COOLER SELECTION CHARTS



MODULAIR COOLER SELECTION CHARTS

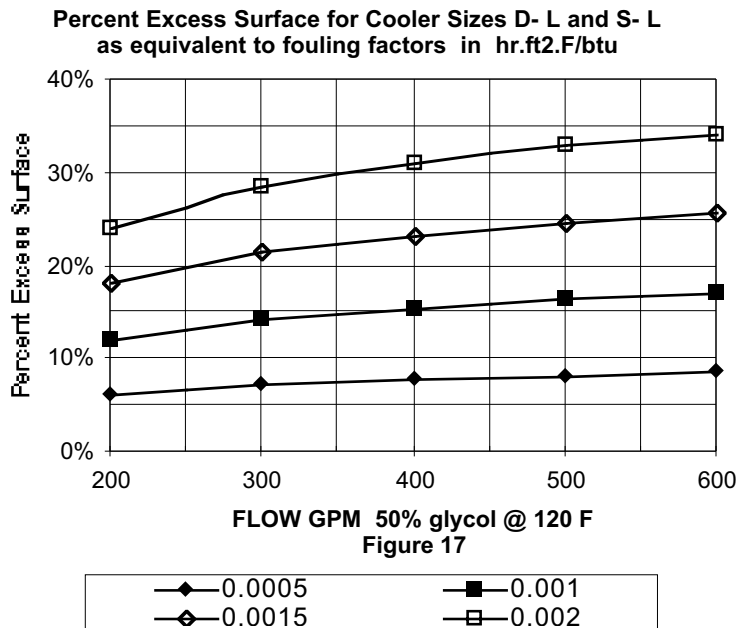
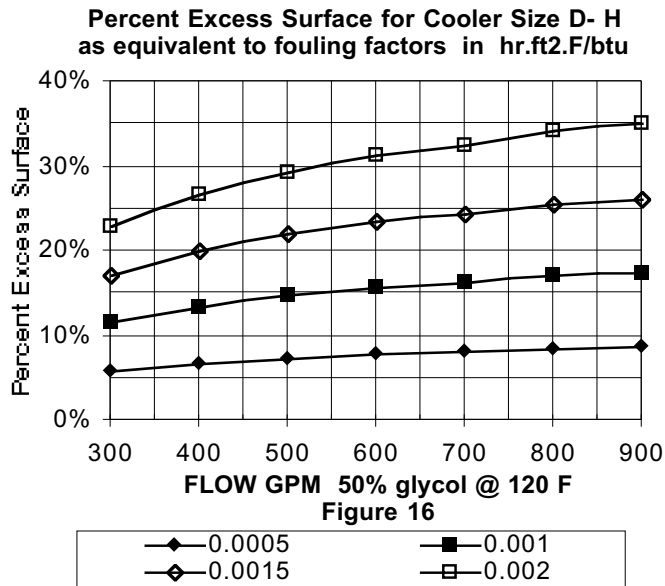
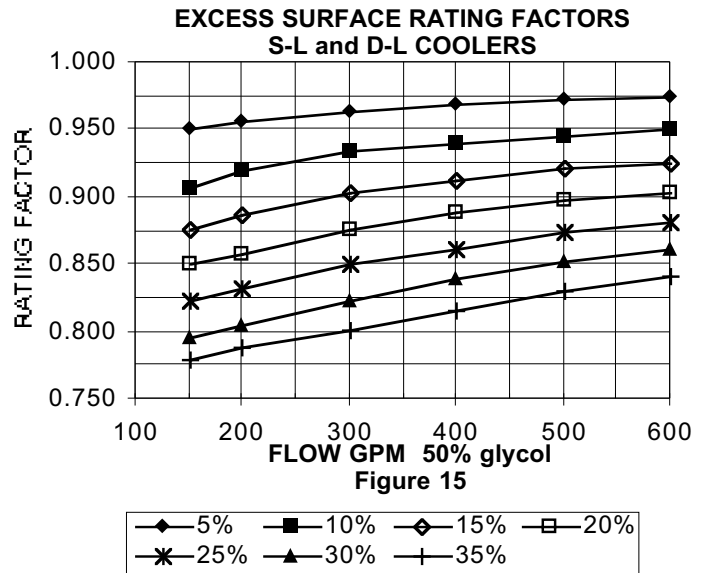
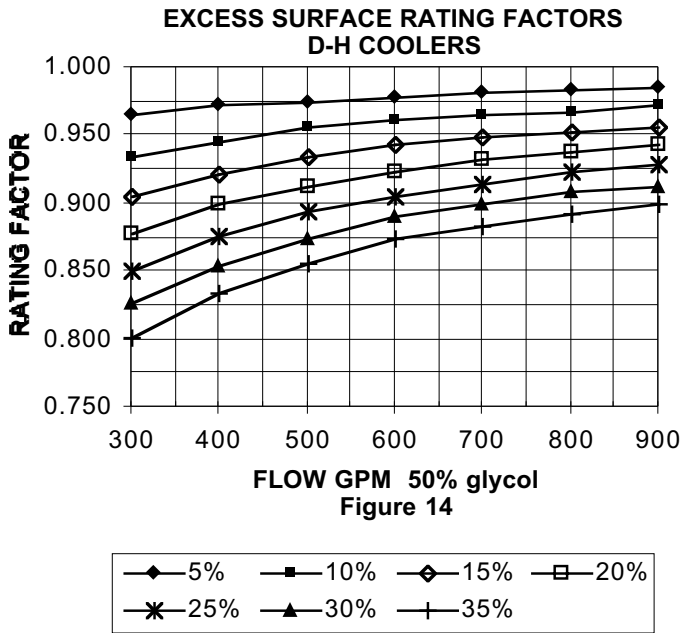


TABLE 1: PHYSICAL SPECIFICATIONS

Model	No. of Fans	Overall Dim'n.		Wt. of 50% glycol	Dry Wt. lbs.
		Width	Length		
BT-3-S-L	3	49 5/8	174 inches	196	1358
BT-4-S-L	4	49 5/8	228	261	1728
BT-5-S-L	5	49 5/8	282	326	2165
BT-6-D-L	6	95	174	391	2607
BT-8-D-L	8	95	228	522	3351
BT-8-D-H	8	95	228	783	3970
BT-10-D-L	10	95	282	654	4756
BT-10-D-H	10	95	282	977	5532

TABLE 2: COOLER CONNECTION SIZES

GPM per Cooler	Single Width		Double Width	
	Inlet	Outlet	Inlet	Outlet
under 230	1 - 4	1 - 4		
230 – 460	2 - 4	2 - 4	2 - 4	2 - 4
Over 460	NA	NA	2 - 6	2 - 6
Connection sizes shown are inches				
Standard Flanges are C. Steel ANSI 150# RF				

Note: Dry weights in lbs. are based on 5/8" x .025" copper. Dimensions are in inches

SOUND LEVELS:

Sound levels are free field dbA (A weighted) values with no reflecting surfaces near the cooler. Sound levels are the average of readings at five foot intervals five feet from the perimeter of the cooler and five feet above grade. Installed coolers may vary by + or - 2 dB.

TABLE 3: APPROX. SOUND LEVELS, dBA

Number of fans	3	4	5	6	8	10
60 Hz 870 rpm	80	81	82	83	84	85
50 Hz 710 rpm	78	79	80	81	82	83

TYPICAL COOLER SPECIFICATION:

Fluid coolers shall be air cooled dry surface coolers of standard modules with single speed direct drive multiple fans and vertical air discharge. Coolers shall be compact fin construction utilizing plate fin heat transfer surface with spacing collars. Tube shall be seamless copper 5/8 inch diameter minimum .025 inches thick with brazed end bends. Headers shall be copper with carbon steel ANSI 150# flanged nozzle connections.

Fan motors shall be heavy duty rigid foot mount totally enclosed with vertical shaft and moisture rain shield. Each fan motor shall be factory wired to a common weatherproof electrical enclosure located at the connection end of each cooler. Fan guards shall be of carbon steel construction powder coated or hot dip galvanized and meet OSHA standards.

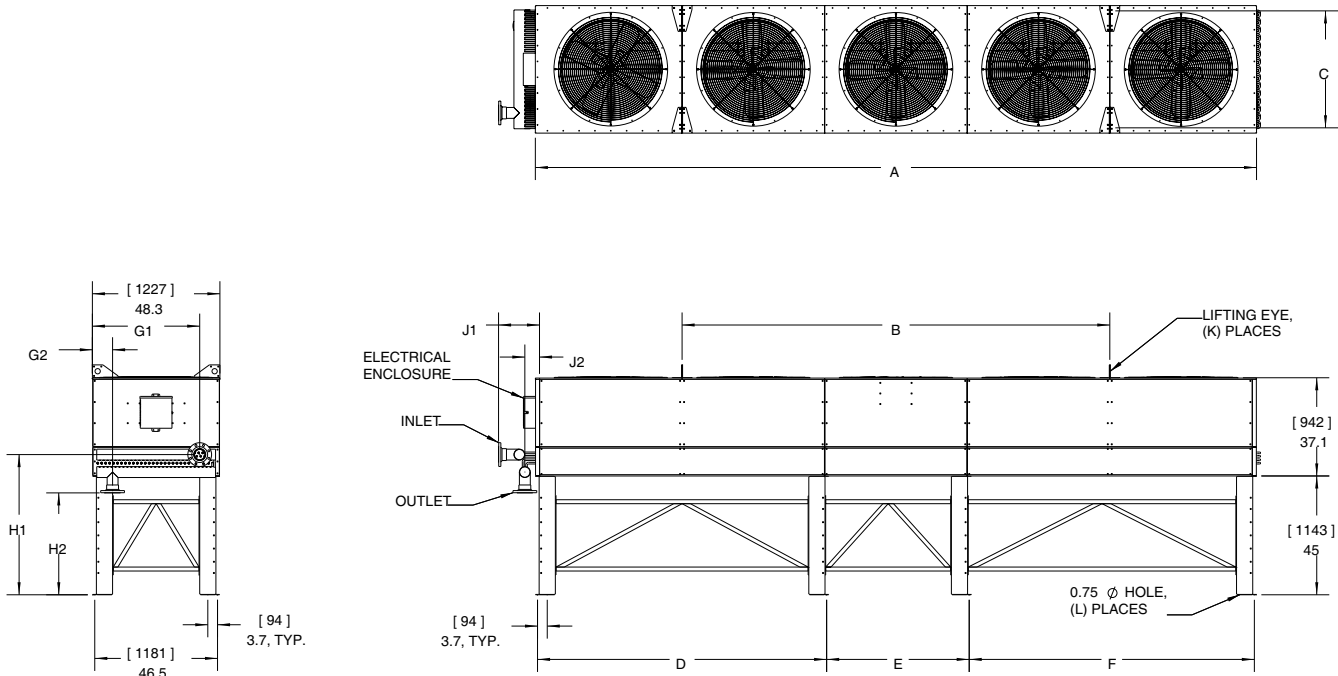
Fan cabinets shall be 14 gauge galvanized sheet steel with independent fan compartments to prevent short circuiting of air. Hardware shall be Grade 5 plated steel minimum.

Coolers shall be designed for 150 psig at 200 °F and pressure tested at 225 psig.

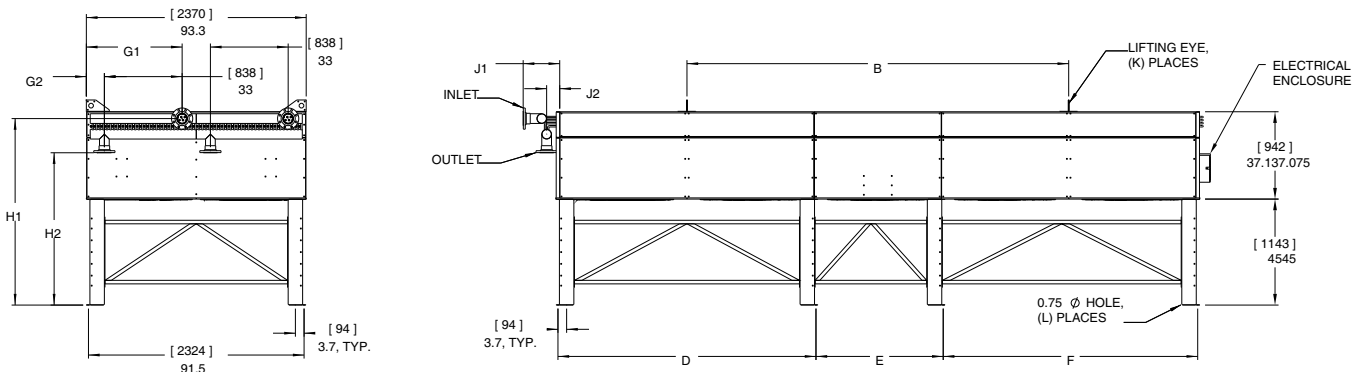
Cooler support legs shall be galvanized carbon steel with two electrical grounding locations per cooler. Coolers shall be designed to withstand 100 mph winds and seismic load of 0.1 g horizontal or vertical.

Supplier shall provide approval drawings showing dimensions and electrical power requirements. I.O.M. instructions shall be provided as required.

**FIGURE 18
DIMENSIONS - SINGLE WIDTH COOLERS**



TYPE DT - DRAW THRU (INDUCED DRAFT)

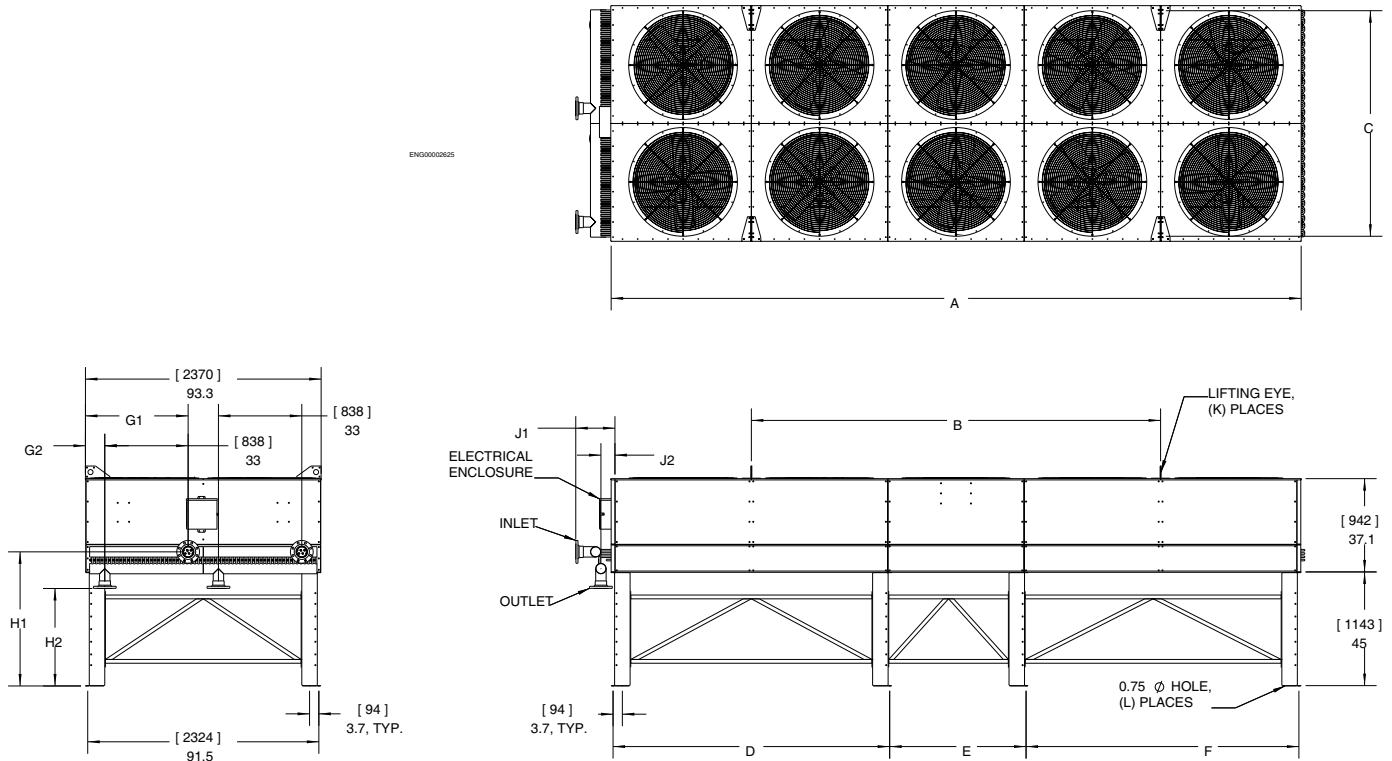


TYPE BT - BLOW THRU (FORCED DRAFT)

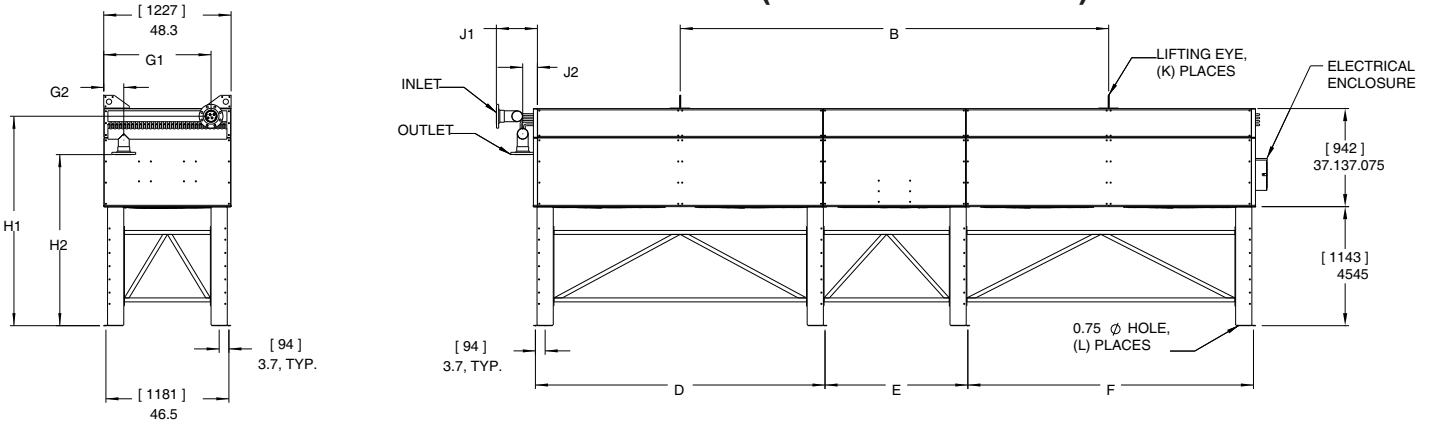
Single Width Models		No. of Fans	Footing Dimensions - In. (mm)							
Blow	Draw		A	B	C	D	E	F	K	L
B-5-S	D-5-S	5	273.3 (6942)	162 (4115)	44.3 (1125)	109.5 (2781)	54 (1372)	108 (2743)	4	16
B-4-S	D-4-S	4	219.3 (5570)	108 (2743)	44.3 (1125)	109.5 (2781)	-	108 (2743)	4	12
B-3-S	D-3-S	3	165.3 (4199)	164.8 (4186)	44.3 (1125)	109.5 (2781)	54 (1372)	-	4	12

Air Flow	Connection Dimensions - In. (mm)					
	G1	G2	H1	H2	J1	J2
Blow	40.5 (1029)	7.5 (190)	79.2 (2012)	59 (1499)	20 (508)	7 (178)
Draw	40.5 (1029)	7.5 (190)	53.1 (1349)	32.9 (836)	20 (508)	7 (178)

**FIGURE 19
DIMENSIONS - DOUGLE WIDTH COOLERS**



TYPE DT - DRAW THRU (INDUCED DRAFT)



TYPE BT - BLOW THRU (FORCED DRAFT)

Double Width Models		No. of Fans	Footing Dimensions - In. (mm)							
Blow	Draw		A	B	C	D	E	F	K	L
B-10-D	D-10-D	10	273.3 (6942)	162 (4115)	89.3 (2268)	109.5 (2781)	54 (1372)	108 (2743)	4	16
B-8-D	D-8-D	8	219.3 (5570)	108 (2743)	89.3 (2268)	109.5 (2781)	-	108 (2743)	4	12
B-6-D	D-6-D	6	165.3 (4199)	164.8 (4186)	89.3 (2268)	109.5 (2781)	54 (1372)	-	4	12

Air Flow	Connection Dimensions - In. (mm)					
	G1	G2	H1	H2	J1	J2
Blow	40.5 (1029)	7.5 (190)	79.2 (2012)	59 (1499)	20 (508)	7 (178)
Draw	40.5 (1029)	7.5 (190)	53.1 (1349)	32.9 (836)	20 (508)	7 (178)



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