Glycol Correction Factors

All Heat exchangers experience a capacity loss when the fluid is **a higher specific gravity** than water. Glycols are heavy, syrup like fluids at full concentration, and become thinner when mixed with water. However, the mixed solution of water-glycol **will be thicker, heavier, than the water alone was.** Thus, to achieve the same heat exchange inside the heat exchanger , requires **more surface area or a larger heat exchanger.**

American Chillers heat exchangers are engineered for full rated capacity with the use of 30% glycol solutions. Our heat exchangers **start out with 30% more surface area capacity** than the heat exchangers used by other manufacturers so you still have full capacity with 30% water-glycol solutions. If you are using glycol concentrations above 30%, consult factory prior to purchasing your chiller for chiller selection assistance.

Propylene Glycol

Leaving Temperature Degrees F	30%		40%		50%	
	Capacity Factor	Pressure Drop Factor	Capacity Factor	Pressure Drop Factor	Capacity Factor	Pressure Drop Factor
20	-	-	0.80	1.74	0.74	2.07
30	0.92	1.39	0.87	1.63	0.82	1.94
40	0.93	1.36	0.89	1.55	0.85	1.83
45	0.94	1.35	0.90	1.53	0.87	1.81
50	0.94	1.33	0.91	1.51	0.88	1.75
55	0.95	1.31	0.92	1.50	0.89	1.73
60	0.95	1.31	0.92	1.47	0.90	1.68
70	0.96	1.27	0.93	1.43	0.91	1.63
Minimum leaving fluid temperature	25°F		10°F		-10°F	
Minimum ambient	10°F		-4°F		-20°F	

Ethylene Glycol

Leaving Temperature Degrees F	30%		40%		50%	
	Capacity Factor	Pressure Drop Factor	Capacity Factor	Pressure Drop Factor	Capacity Factor	Pressure Drop Factor
20	0.92	1.39	0.89	1.61	0.86	1.86
30	0.96	1.34	0.93	1.53	0.90	1.78
40	0.96	1.33	0.94	1.52	0.92	1.74
45	0.96	1.33	0.94	1.51	0.93	1.72
50	0.96	1.31	0.95	1.49	0.93	1.69
55	0.96	1.31	0.95	1.47	0.94	1.67
60	0.97	1.31	0.96	1.47	0.94	1.65
70	0.97	1.27	0.96	1.49	0.95	1.62
Minimum leaving fluid temperature	20°F		5°F		-15°F	
Minimum ambients	5°F		-9°F		-28°F	

Glycol Capacities and Correction Tables

Propylene Glycol Capacity Correction Factor Table							
Percent Propylene Glycol by Weight	15%	20%	25%	30%	35%	40%	50%
Freezing Point In °F	24°	18°	15°	9°	5°	- 5°	- 30°
Capacity Factor Multiplier *	0.992	0.986	0.972	0.960	0.950	0.928	0.878
Pressure Drop Multiplier	1.04	1.08	1.13	1.21	1.26	1.47	2.79

Ethylene Glycol Capacity Correction Factor Table							
Percent Ethylene Glycol by Weight	10%	15%	20%	25%	30%	35%	40%
Freezing Point In °F	25°	21°	17°	11°	5°	0°	-10°
Capacity Factor Multiplier *	0.98	0.96	0.95	0.93	0.92	0.91	0.89
Pressure Drop Multiplier	1.08	1.11	1.16	1.21	1.27	1.32	1.38

* At standard ARI 590 conditions: 54°F entering fluid temperature, 44°F leaving fluid temperature, 95°F ambient temperature, 0.0005 fouling

The charts, above, illustrate the differences between propylene based and ethylene based glycol. Since we recommend propylene based glycols because of their non-hazardous nature, we must be aware of the effects on the standard refrigeration heat exchangers and pumps.

A 40% solution of propylene glycol will reduce the chiller heat exchanger's ability to chill by at least 7.2%. We know from experience, that some heat exchangers chilling abilities is reduced by 20%. This means the chiller with a 10 ton capacity for chilling water will have a capacity between 8 tons and 9.3 tons with 40% PG.

Most American Chillers have heat exchangers large enough to handle 30% PG without loss of capacity due to our "value-added" engineering practices. We can easily provide a chiller heat exchanger for even 50% PG at the customer request at time of order.

Capacity Reduction Factors

Adding glycol to the system will reduce the heat transfer (i.e. capacity) of the coil per the following table. Be sure to multiply the capacity in previous tables by the glycol multiplier. Glycol also has a different viscosity than water so be sure to multiply the water pressure drop in the previous tables by the multiplier below.

Performance Multipliers

	Capacity					Pressure Drop				
Glycol % by wt.	10	20	30	40	50	10	20	30	40	50
Propylene Glycol	0.94	0.85	0.83	0.81	0.79	0.94	0.88	1.10	1.42	2.04
Ethylene Glycol	0.96	0.90	0.83	0.83	0.78	1.05	0.97	0.90	1.41	1.86

The entering air temperature also affects the capacity of the coil. The capacity decreases as the air temperature decreases. The following table shows a range of dry and wet bulb temperatures. The wet bulb temperatures are determined by the dry bulb temperature with approximately 50% relative humidity. Be sure to multiply the capacity in previous tables by the air temperature multiplier as shown in the table.

Capacity Multipliers for Temperature Change

Dry/Wet Bulb Temperature, °F (°C)	70/58 (21/14)	75/63 (24/17)	80/67 (27/19)	85/71 (29/22)
Air Temperature Multiplier	0.58	0.80	1.00	1.22

Example. Consider a MC4860W in cooling mode with 10 GPM (0.63 L/s) at 1250 CFM (590 L/s) and with 45°F (7.2°C) entering water temperature. The capacity from the table is 55.1 MBH (16.2 kW). Using the capacity multipliers from the tables for a 20 percent mixture of propylene glycol with the water and entering air temperature of 75°F (24°C) dry bulb and 63°F (17°C) wet bulb, determine the capacity using the following equations:

$$\text{Capacity MBH} = 55.1*0.85*0.80$$

$$\text{Capacity kW} = 16.2*0.85*0.80$$

Therefore, the resulting capacity is 37.5 MBH (11.0 kW).

AntiMicrobial

Untreated water and glycol-water mixtures can promote microbial growth. To prevent this, use oxygen barrier PEX tubing, add an antimicrobial additive such as Dowicide®, or use at least 20% glycol.

ETHYLENE GLYCOL CORRECTION DATA

% E.G. BY WEIGHT	FREEZE POINT, °F	CAPACITY CORR. FACTOR	GPM CORR. FAC.	PD CORR. FAC.	SPFC. HEAT Cp	SPFC. GRVTY Sg
10	26	.90	1.005	1.04	.98	1.018
15	22	.87	1.015	1.06	.95	1.022
20	17	.83	1.025	1.08	.93	1.030
25	11	.80	1.040	1.10	.90	1.038
30	4	.76	1.055	1.13	.88	1.048
35	-3	.72	1.075	1.16	.85	1.055
40	-10	.68	1.100	1.19	.80	1.065
45	-20	.64	1.125	1.22	.75	1.076
50	-32	.60	1.150	1.26	.71	1.085

1. Correction data is based on 44°F - 50°F leaving glycol temperatures. For applications using other glycol temperatures, consult factory.

2. The GPM correction factor is the specific heat multiplied by the specific gravity.