

Chilled Water Plant Costs Estimated

Water chillers (with starters)

Centrifugal:		
300 to 600 tons		\$250/ton
600 to 1400 tons		\$240/ton
1500 to 2500 tons		\$230/ton
Absorption		
1 stage	90 to 1600 tons	\$350/ton
2 stage	350 to 1000 tons	\$500/ton
direct-fired	100 to 1100 tons	\$525/ton
Rotary Screw		
water cooled	70 to 130 tons	\$300/ton
water cooled	150 to 450 tons	\$240/ton
air cooled	70 to 400 tons	\$420/ton
Setting, rigging, installation		\$60/ton
Add 4160 volt motor		\$25/kW
Add 0.035 tubes		\$7/ton
Add Gas Engine		\$450/kW - \$500/kW

Pumps (not including VFD or starter)

Cooling Tower	\$200/HP - \$300/HP
Normal	\$20/gpm - \$40/gpm
Permanent	\$40/gpm - \$75/gpm
Piping	see chart
Controls	\$30/ton - \$60/ton
Electrical	\$130/kW - \$360/kW
Plate and Frame Heat exchanger	
unit only	\$30/ton - \$60/ton
complete installation with piping and simple auto control	\$80/ton - \$140/ton

Note: These prices are typical construction costs for normal access applications. For total project cost, add fees, testing and contingencies.

Useful Formulas

Pump Hp = (GPM x Total Head in ft. water) / (Pump Eff. x 3960)

kW/ton = 3.516/COP
kW/ton = 12/EER

1 Ton = 12,000 BTU/HR
Tons = (GPM x ΔT x specific heat* x specific gravity*) / 24
* for fluids other than water

GPM ∝ RPM
Head ∝ RPM²
Power ∝ RPM³ ∝ GPM³

Example:
Pump HP @ 5,000 gpm = 26.1 HP* x (5,000GPM / 4,000GPM)³
* pump hp @ 4,000 gpm from water piping capacity chart

Specification Bid Form

Energy cost savings of a high efficiency chiller can be accredited to the chiller in the bid process. The lifetime (or any other span of time) can be used to calculate cost savings for every 0.01 kW/ton better than the base bid chiller.

kW/ton	Purchase Price	Cost Savings	Comparative Cost	
.60 kW/Ton	From vendor	none	base bid	Choose the Best Value
.59 kW/Ton	"	\$ savings	(base bid) - (\$ savings)	
.58 kW/Ton	"	2 x \$ savings	(base bid) - (2 x \$ savings)	
.57 kW/Ton	"	3 x \$ savings	(base bid) - (3 x \$ savings)	
*	"	*	*	
*.50 kW/Ton	From vendor	9 x \$ savings	(base bid) - (9 x \$ savings)	

Energy Cost Savings = 0.01 kW/ton x Chiller Tons x \$ / kWh
x Equivalent Full Load Hours (per year) x Chiller Lifetime (years)

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Quick Reference for Efficient Chiller System Design





Water Piping Capacity (Tons)

			Chilled Water					
Pipe Size	GPM		20°ΔT	18°ΔT	16°ΔT	14°ΔT	12°ΔT	10°ΔT
	Price*	Pump**	1.2 GPM/Ton	1.33 GPM/Ton	1.5 GPM/Ton	1.7 GPM/Ton	2 GPM/Ton	2.4 GPM/Ton
48	60,000 GPM		50,000	45,000	40,000	35,000	30,000	25,000
	\$450/ft	195 HP	40,000	36,000	32,000	28,000	24,000	20,000
42	40,000 GPM		33,300	30,000	26,600	23,300	20,000	16,600
	\$400/ft	115 HP	26,600	24,000	21,300	18,600	16,000	13,300
36	30,000 GPM		25,000	22,500	20,000	17,500	15,000	12,500
	\$350/ft	110 HP	20,000	18,000	16,000	14,000	12,000	10,000
30	20,000 GPM		16,600	15,000	13,300	11,600	10,000	8,300
	\$300/ft	80 HP	13,300	12,000	10,650	9,300	8,000	6,600
24	12,000 GPM		10,000	9,000	8,000	7,000	6,000	5,000
	\$250/ft	45 HP	8,000	7,200	6,400	5,600	4,800	4,000
20	8,000 GPM		6,650	6,000	5,300	4,650	4,000	3,300
	\$225/ft	32.2 HP	5,300	4,800	4,250	3,700	3,200	2,650
18	7,000 GPM		5,800	5,250	4,650	4,050	3,500	2,900
	\$200/ft	37.6 HP	4,650	4,200	3,700	3,250	2,800	2,300
16	6,000 GPM		5,000	4,500	4,000	3,500	3,000	2,500
	\$175/ft	43.5 HP	4,000	3,600	3,200	2,800	2,400	2,000
14	4,000 GPM		3,300	3,000	2,650	2,300	2,000	1,650
	\$150/ft	26.1 HP	2,650	2,400	2,100	1,860	1,600	1,300
12	3,600 GPM		3,000	2,700	2,400	2,100	1,800	1,500
	\$125/ft	29.4 HP	2,400	2,160	1,920	1,680	1,440	1,200
10	2,400 GPM		2,000	1,800	1,600	1,400	1,200	1,000
	\$115/ft	22.8 HP	1,600	1,440	1,280	1,120	960	800
8	1,500 GPM		1,250	1,125	1,000	875	750	625
	\$100/ft	18.3 HP	1,000	900	800	700	600	500
6	700 GPM		585	525	460	400	350	290
	\$90/ft	7.9 HP	465	420	375	325	280	230
5	460 GPM		385	345	300	270	230	190
	\$80/ft	5.9 HP	305	275	245	215	185	150
4	260 GPM		215	200	175	150	130	100
	\$75/ft	3.5 HP	175	155	140	120	105	85
3	130 GPM		110	100	85	75	65	50
	\$70/ft	1.9 HP	85	80	70	60	50	40
Pipe Size	Price* GPM	Pump**	20°ΔT	18°ΔT	16°ΔT	14°ΔT	12°ΔT	10°ΔT
			1.5 GPM/Ton	1.66 GPM/Ton	1.88 GPM/Ton	2.14 GPM/Ton	2.5 GPM/Ton	3 GPM/Ton

Condenser Water

Pipe sizes in inches.

GPMs were selected to maintain water velocities below 10 fps for pipe size 8 inch and larger.

Smaller size pipes were selected to maintain water velocities below 7 fps.

*Total estimated installed cost per linear ft of piping (buried) for typical applications.

Price includes trenching, insulation, fittings, backfill and moderate amounts of surfacing repairs.

** HP values to pump water through 1000' of pipe calculated using: $HP = (GPM \times Pump\ Head) / 3960 \times .70$

For chiller capacity when given **chilled water** pipe size, GPM or ΔT, **read chart down in dark blue.**

For chiller capacity when given **condenser water** pipe size, GPM or ΔT, **read chart up in light blue.**

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Brochure concept inspired by:



Tucson, Arizona
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