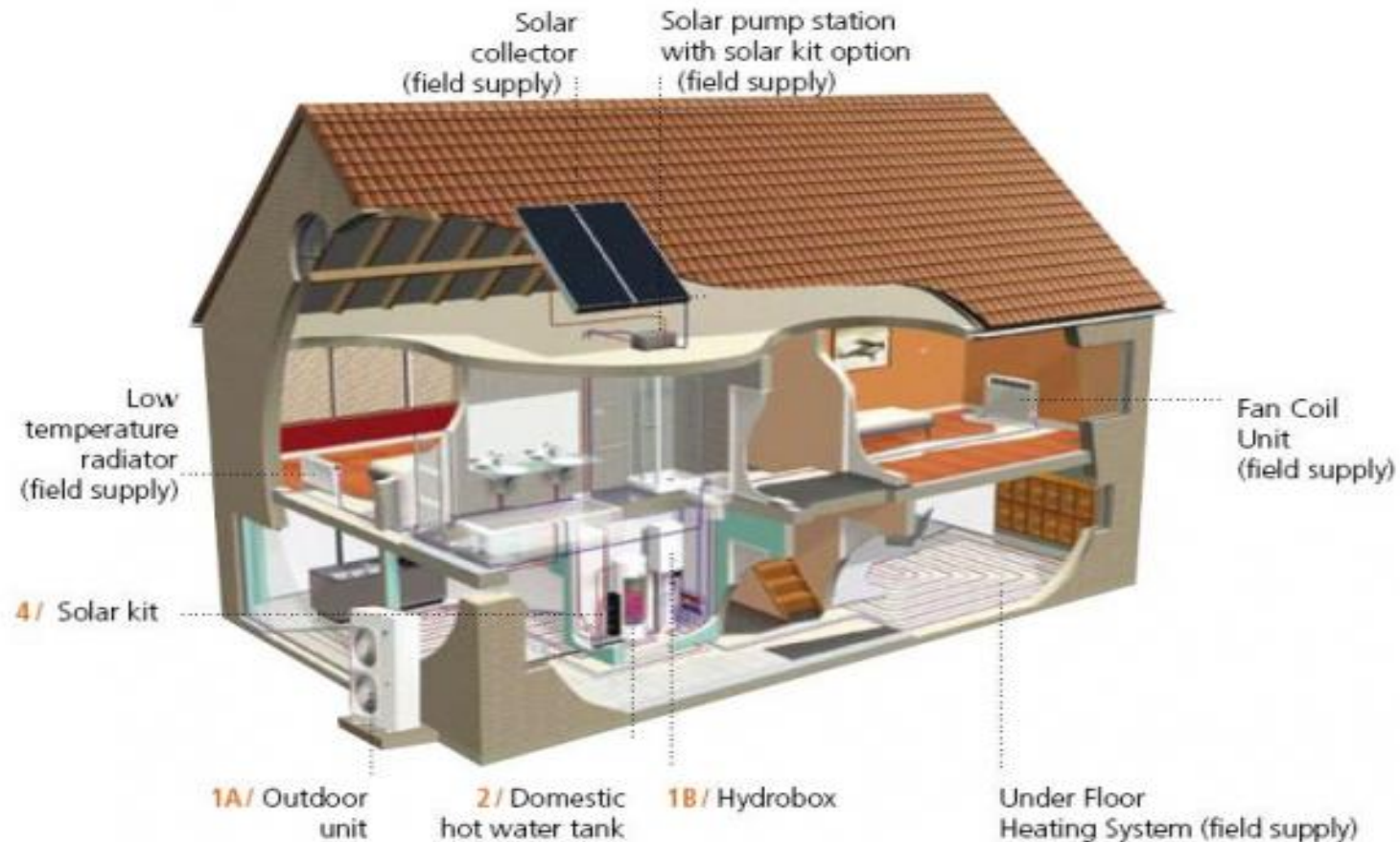


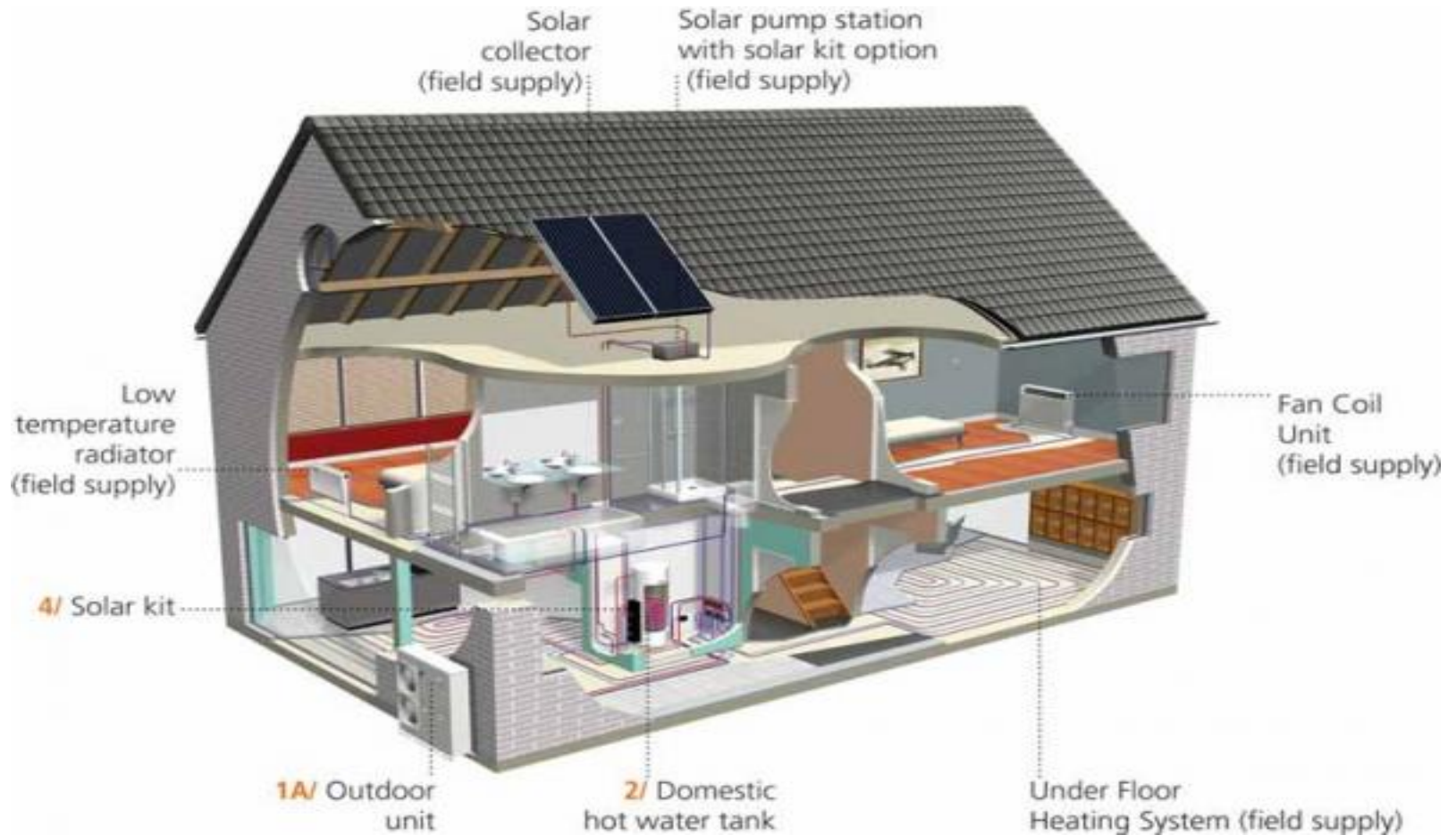
Daikin Altherma

- The Daikin Altherma is low-medium temperature air to water heat pump system.
- The Altherma system heats water to 131 degrees at -4 outdoor ambient. **With some limitations.**
- The Altherma system also heats domestic water
- The Altherma system is ideal in any low-medium water temperature system

Split System Configuration



Monobloc Configuration



What does low to medium temperature mean?

- Uses a supply water temperature (SWT) between 85 and 130 degrees.
- A typical Juneau oil-fired baseboard system is set up at 160 – 180 degrees.
- On any hydronic heating system, the lower the SWT, the more efficient the system will be.
- Here are some applications:

Low Temperature Baseboard



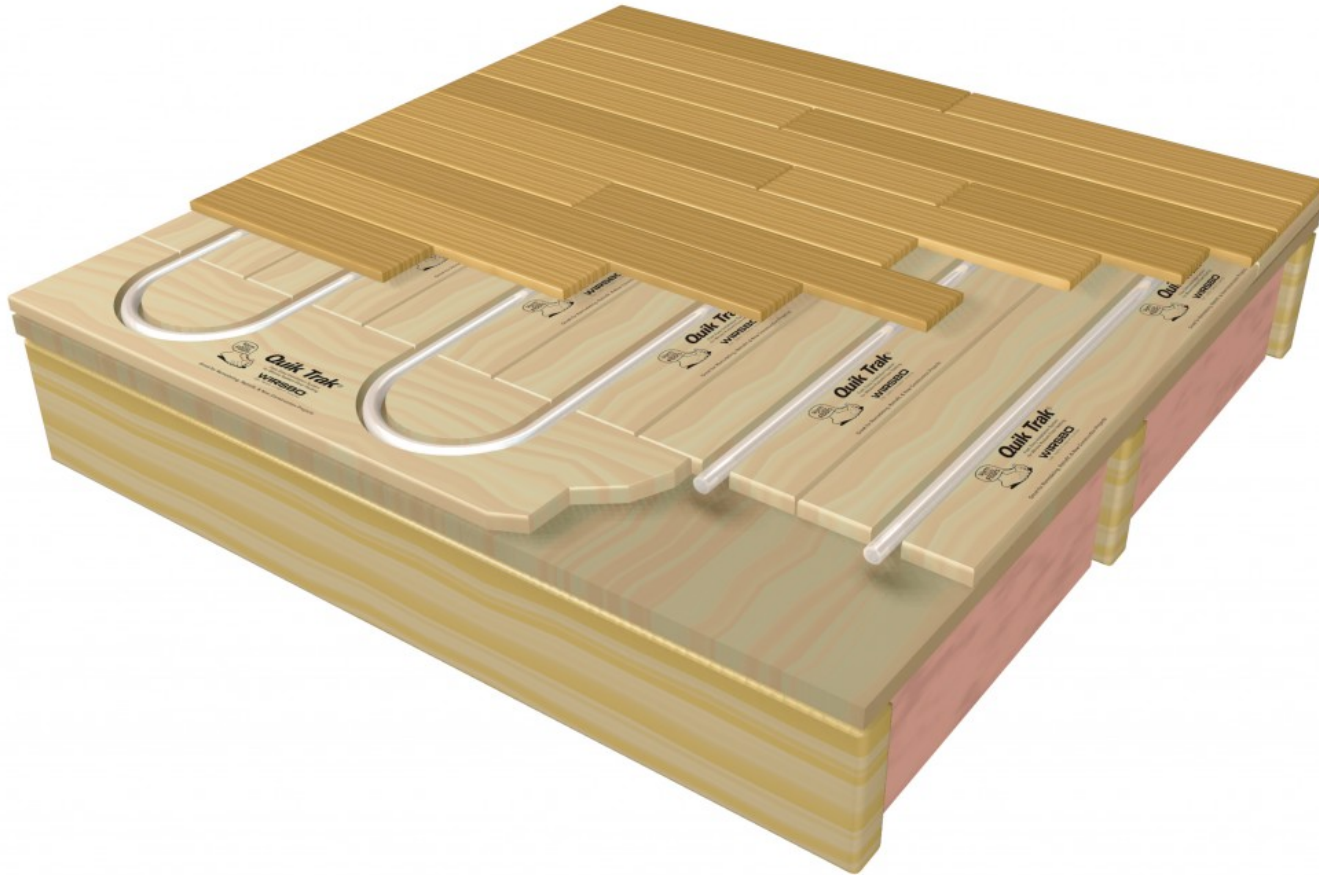
Low Temperature Radiators



Radiant Heating



Quik Trak



Staple Up



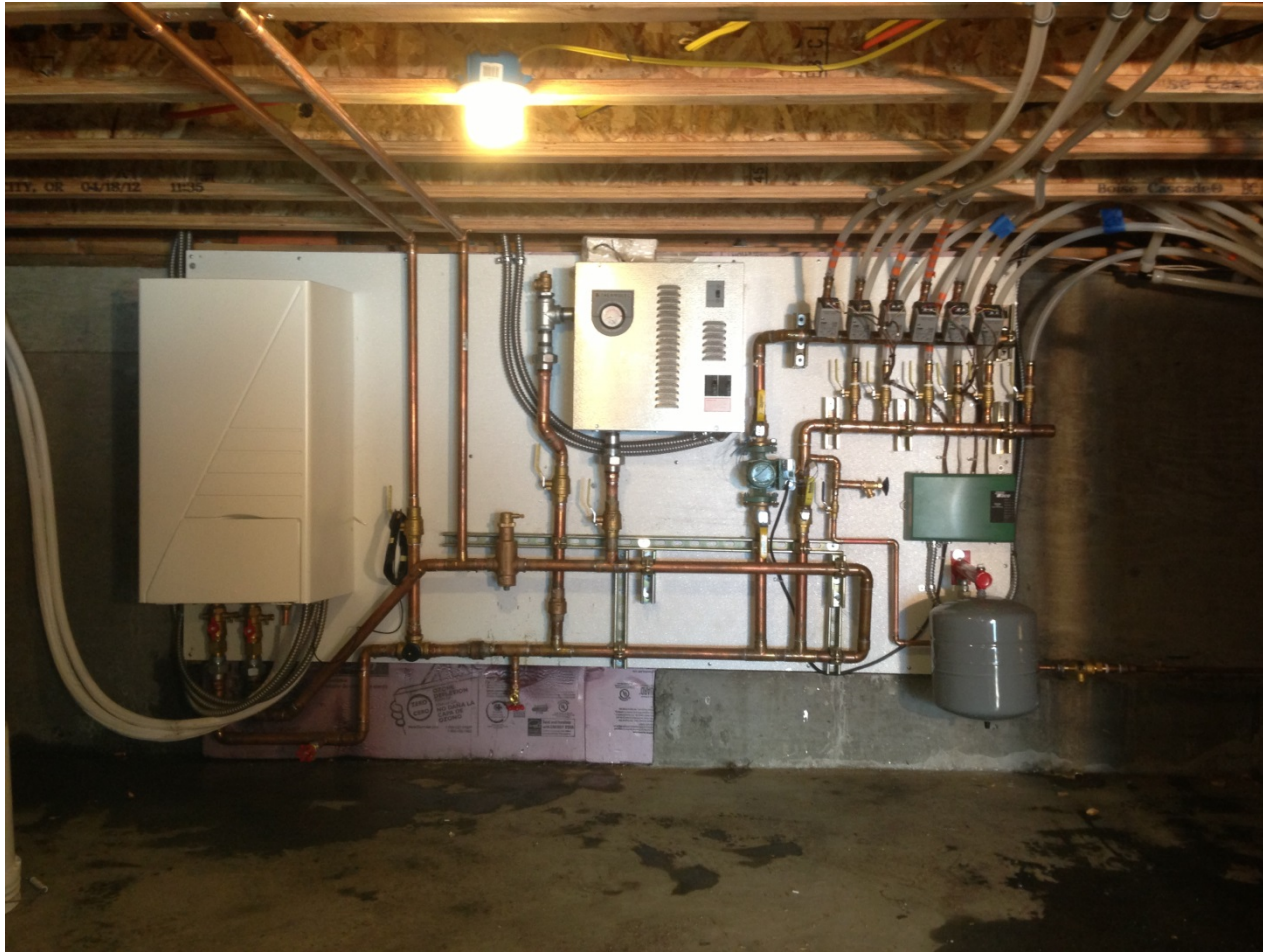
Warmboard



Forced Air



Multiple Zones



More Zoning



The Outdoor Section



Daikin 80 Gallon Water Heater



Lets Talk COP

- COP is Coefficient Of Performance
- COP is an efficiency ratio for heat pumps, whether air to water, water to water, water to air, or air to air. It's typically used in reference to using water as a heat transfer fluid.
- A COP of 1.0 means if you input one kilowatt of energy (3413 btuh) you get one kilowatt of heat.
- A COP of 3.0 means one kilowatt yields 10,239 btuh, or 3kw.

How Does COP Tie In To Design and Sizing?

3. Capacity Tables - Split System

3.1 Heating

MAXIMUM HEATING CAPACITY - PEAK VALUE																			
MODEL	LWC (°F/°C) T _{amb} (°F/°C)	86/30			95/35			104/40			113/45			122/50			131/55		
		HC kBTU/h	PI (kBTU/h)	COP	HC kBTU/h	PI (kBTU/h)	COP	HC kBTU/h	PI (kBTU/h)	COP	HC kBTU/h	PI (kBTU/h)	COP	HC kBTU/h	PI (kBTU/h)	COP	HC kBTU/h	PI (kBTU/h)	COP
ERLQ068BAVJU	-4/-20	19.30	7.01	2.75	18.70	8.00	2.34	15.60	9.42	1.66									
	5/-15	22.10	8.02	2.76	21.30	8.74	2.44	21.10	9.60	2.20									
	19/-7.2	27.40	8.09	3.39	26.40	8.84	2.99	26.00	9.73	2.67	25.60	10.77	2.38						
	25/-3.9	31.30	8.07	3.88	30.20	8.86	3.41	29.70	9.78	3.04	29.20	10.80	2.70	27.90	11.91	2.34			
	36/2.2	34.80	8.02	4.34	33.50	8.84	3.79	33.00	9.77	3.38	32.60	10.85	3.00	31.10	11.94	2.60	29.80	13.26	2.25
	45/7.2	39.50	7.95	4.97	35.20	8.80	4.00	36.70	9.78	3.75	35.30	10.84	3.26	33.90	12.07	2.81	32.50	13.44	2.42
	54/12.2	44.80	7.85	5.71	43.20	8.70	4.97	41.70	9.69	4.30	40.10	10.79	3.72	38.60	12.04	3.21	37.10	13.42	2.76
	59/15	48.20	7.77	6.20	46.50	8.05	5.78	44.90	9.63	4.66	43.30	10.74	4.03	41.70	12.00	3.48	40.10	13.40	2.99
ERLQ048BAVJU	68/20	54.30	7.64	7.11	52.50	8.51	6.17	50.70	9.49	5.34	49.00	10.64	4.61	47.20	11.01	4.29	45.40	13.33	3.41
	-4/-20	24.70	9.74	2.54	24.40	10.60	2.30												
	5/-15	27.00	9.93	2.72	27.30	10.82	2.52	26.80	11.84	2.26									
	19/-7.2	34.30	10.10	3.40	33.40	11.03	3.03	32.40	12.12	2.67	31.60	13.34	2.37						
	25/-3.9	39.10	10.20	3.83	37.90	11.12	3.41	37.70	12.25	3.08	36.40	13.16	2.77	35.30	14.52	2.43			
	36/2.2	43.30	10.20	4.25	42.00	11.19	3.75	41.70	12.32	3.38	40.30	13.24	3.04	39.00	14.83	2.63	37.80	16.16	2.34
	45/7.2	49.20	10.25	4.80	47.80	11.25	4.25	48.20	12.38	3.89	44.80	13.65	3.28	43.30	15.09	2.87	41.90	16.69	2.51
	54/12.2	55.80	10.25	5.44	54.10	11.26	4.80	52.40	12.40	4.23	50.70	13.71	3.70	49.10	15.17	3.24	47.50	16.78	2.83
054BAVJU	59/15	60.10	10.27	5.85	58.20	11.27	5.16	56.40	12.44	4.53	54.70	13.74	3.98	52.90	15.20	3.48	51.20	16.82	3.04
	68/20	67.80	10.30	6.58	65.80	11.32	5.81	63.80	12.48	5.11	61.80	13.79	4.48	59.90	15.28	3.92	57.90	16.89	3.43
	-4/-20	28.50	11.53	2.47	28.40	12.52	2.27												
	5/-15	32.00	11.78	2.72	31.80	12.81	2.48	31.70	14.00	2.26									
	19/-7.2	39.00	12.00	3.25	38.40	13.13	2.92	37.80	14.40	2.63	37.20	15.82	2.35						

Versus Geo?

Performance Data — TMW036 - Heating

SOURCE				LOAD																									
EWT °F	Flow			EWT °F	Flow 4.5 GPM								Flow 6.8 GPM								Flow 9.0 GPM								
	GPM	WPD			HC Mbtuh	Power KW	HE Mbtuh	LWT °F	COP	WPD		HC Mbtuh	Power KW	HE Mbtuh	LWT °F	COP	WPD		HC Mbtuh	Power KW	HE Mbtuh	LWT °F	COP	WPD					
		PSI	FT							PSI	FT						PSI	FT						PSI	FT				
20	9.0	7.7	17.9	60	26.1	1.53	20.9	71.6	5.0	0.5	1.2	26.4	1.45	21.5	67.8	5.3	1.3	3.1	26.5	1.41	21.7	65.9	5.5	2.5	5.8				
				80	25.7	1.96	19.0	91.4	3.8	0.4	0.9	25.9	1.86	19.6	87.7	4.1	1.2	2.8	25.9	1.81	19.8	85.8	4.2	2.3	5.4				
				100	25.0	2.56	16.3	111.1	2.9	0.3	0.7	25.0	2.42	16.7	107.4	3.0	1.1	2.5	24.9	2.36	16.9	105.5	3.1	2.1	4.9				
				120	24.3	3.24	13.8	131.2	2.2	0.2	0.5	24.3	3.08	14.2	127.4	2.3	0.9	2.1	24.3	3.04	14.3	125.5	2.4	1.8	4.3				
	4.5	1.7	4.0	60	27.1	1.54	21.9	72.1	5.2	0.5	1.2	27.5	1.45	22.5	68.1	5.5	1.3	3.1	27.6	1.42	22.7	66.1	5.7	2.5	5.8				
				80	26.7	1.97	20.0	91.9	4.0	0.4	0.9	27.0	1.86	20.6	88.0	4.2	1.2	2.8	27.0	1.81	20.8	86.0	4.4	2.3	5.4				
				100	26.1	2.56	17.3	111.6	3.0	0.3	0.7	26.1	2.43	17.8	107.7	3.2	1.1	2.5	26.0	2.36	18.0	105.8	3.2	2.1	4.9				
				120	25.1	3.32	13.8	131.2	2.2	0.2	0.5	24.9	3.14	14.2	127.4	2.3	0.9	2.1	24.7	3.06	14.3	125.5	2.4	1.8	4.3				
	6.8	4.1	9.4	60	28.4	1.54	23.2	72.6	5.4	0.5	1.2	28.8	1.46	23.8	68.5	5.8	1.3	3.1	28.9	1.42	24.1	66.4	6.0	2.5	5.8				
				80	27.9	1.97	21.2	92.4	4.2	0.4	0.9	28.2	1.87	21.8	88.4	4.4	1.2	2.8	28.2	1.82	22.0	86.3	4.6	2.3	5.4				
				100	27.1	2.57	18.3	112.0	3.1	0.3	0.7	27.2	2.43	18.9	108.0	3.3	1.1	2.5	27.1	2.37	19.0	106.0	3.4	2.1	4.9				
				120	25.9	3.33	14.6	131.5	2.3	0.2	0.5	25.7	3.15	15.0	127.6	2.4	0.9	2.1	25.6	3.07	15.1	125.7	2.4	1.8	4.3				
9.0	7.1	16.4	60	29.2	1.54	23.9	73.0	5.5	0.5	1.2	29.6	1.46	24.6	68.8	5.9	1.3	3.1	29.7	1.42	24.8	66.6	6.1	2.5	5.8					
			80	28.6	1.98	21.9	92.7	4.2	0.4	0.9	28.9	1.87	22.5	88.6	4.5	1.2	2.8	28.9	1.82	22.7	86.4	4.7	2.3	5.4					
			100	27.7	2.58	18.9	112.3	3.2	0.3	0.7	27.8	2.44	19.5	108.2	3.3	1.1	2.5	27.7	2.37	19.6	106.2	3.4	2.1	4.9					
			120	26.4	3.34	15.0	131.7	2.3	0.2	0.5	26.2	3.16	15.4	127.8	2.4	0.9	2.1	26.1	3.08	15.6	125.8	2.5	1.8	4.3					
40	12.0	10.0	24.0	60	30.7	1.41	25.9	71.5	6.4	0.5	1.2	31.2	1.33	26.7	67.9	6.9	1.3	3.1	31.3	1.30	26.9	66.0	7.1	2.5	5.8				
				80	29.6	1.84	23.4	90.6	4.6	0.4	0.9	30.0	1.73	23.9	87.1	4.7	1.2	2.8	30.1	1.69	23.9	85.1	4.9	2.3	5.4				

How Much Heat Do You Need?

It all begins with heat loss calculations. If the system isn't sized correctly, it will not be efficient.

BTUH Output Per Square Foot

- ½" PEX tubing in 4" slab, 6" on center, 110 degree SWT, tile flooring nets 18 btuh/sf and a COP of about 2.6 at 25 degrees outdoor ambient.
- Low temp baseboard yields 300 btuh/lf at 120 degree SWT and a COP of 2.31 at 25 degrees outdoor ambient.
- Warmboard with laminate flooring or hardwood flooring with 100 degree SWT will net 19 btuh/sf and a COP of 3.0 at 25 degrees outdoor ambient.
- Climate Trak staple-up will supply 13 btuh/sf at 120 degree SWT with laminate/wood flooring and a COP of 2.31 at 25 degrees outdoor ambient.
- Quik Trak on a subfloor, 7" panels will yield 16 btuh/sf at 110 degree SWT with laminate/wood flooring and a COP of 2.6 at 25 degree outdoor ambient.

Cost Per Million BTUH, Juneau Commission on Sustainability

Fuel Type	Fuel Unit	Fuel Price Per Unit (dollars)	Fuel Heat Content Per Unit (Btu)	Fuel Price Per Million Btu (dollars)	Heating Appliance Type	Type of Efficiency Rating	Efficiency Rating or Estimate	Approx. Efficiency (%)	Heating Cost Per Million Btu (dollars)	Annual Cost to Heat an Average Juneau Alaska Home ⁸ (84 Million Btu /yr)
Fuel Oil (#2)	Gallon	\$4.00	138,690	\$28.84	Standard Furnace or Boiler	AFUE ⁴	78.0	78%	\$36.98	\$3,105.98
					Energy Star Furnace or Boiler	AFUE	85.0	85%	\$33.93	\$2,850.19
Fuel Oil (#1)	Gallon	\$4.10	136,000	\$30.15	Room Heater (Vented)	Estimate	87.0	87%	\$34.65	\$2,910.75
Propane	Gallon	\$3.01	91,333	\$32.96	Standard Furnace or Boiler	AFUE	78.0	78%	\$42.25	\$3,549.13
					Energy Star Furnace or Boiler	AFUE	85.0	85%	\$38.77	\$3,256.85
					Room Heater (Vented)	AFUE	65.0	65%	\$50.70	\$4,258.96
Wood (Pellets)	Ton	\$350.00	16,500,000	\$21.21	Central Heating System	AFUE	85.0	85%	\$24.96	\$2,096.26
					Room Heater (Vented)	Estimate	80.0	80%	\$26.52	\$2,227.27
Wood (Cord)	Cord ³	\$250.00	20,000,000	\$12.50	Wood Stove- Conventional	Estimate	54.0	54%	\$23.15	\$1,944.44
					Wood Stove- EPA Certified	EPA default	63.0	63%	\$19.84	\$1,666.67
					Outdoor Wood Boiler- Conventional	Estimate	45.0	45%	\$27.78	\$2,333.33
					Outdoor Wood Boiler-EPA Phase 2	Estimate	65.0	65%	\$19.23	\$1,615.38
Electricity	kilowatt hour ⁹	\$0.1144	3,412	\$33.53	Standard Furnace or Boiler	Estimate	95.0	95%	\$35.29	\$2,964.64
					Air-Source Heat Pump (ASHP)	HSPF ⁵	6.6	193%	\$17.33	\$1,456.00
					Ground Source Heat Pump (GSHP)	COP ⁶	2.5	250%	\$13.41	\$1,126.57
					Sea Water Source Heat Pump (SWHP)	COP ⁷	3.0	300%	\$11.18	\$938.80
					Baseboard/Room Heater	Estimate	100.0	100%	\$33.53	\$2,816.41

Do The Numbers Work?

15207 kilowatts @
.12 per kilowatt
equals a heating
bill of \$1,804.00
from September
16th – May 7th.

This is an 054
Altherma system
used in a forced air
installation in
Juneau.

