



Radiant Heating Tubing Requirements

All Climate Design Company

Job: 200 Sundance Ct. Unit B ...
Date: Oct 01, 2024
By: ACDC - MC
Plan: 200 Sundance Ct. Unit B ...

Phone: 970-640-2119 Email: allclimatedesigncompany@gmail.com

Project Information

For: Michael Chiartano, Chiartano Engineering
10186 M. Lincoln Dr., Colorado Springs, CO

Email: michael@chiartanoeg.com



Tubing Requirements

Roll 1: 2000 ft 1/2" PEX (Part # WX-PX4-2000)	12 lengths 18 ft waste	
Bedroom 3-A: 176 ft	Bedroom 3-B: 173 ft	Bedroom 3-C: 156 ft
Basement-A: 169 ft	Basement-B: 179 ft	Basement-C: 200 ft
Basement-D: 155 ft	Basement-E: 149 ft	Bedroom 2-A: 189 ft
Bedroom 2-B: 169 ft	Bedroom 2-C: 159 ft	Garage-F: 108 ft
Roll 2: 600 ft 1/2" PEX (Part # WX-PX4-600)	3 lengths 101 ft waste	
Bedroom 2-D: 163 ft	Utility rooms-A: 152 ft	Utility rooms-B: 184 ft
Roll 3: 600 ft 1/2" PEX (Part # WX-PX4-600)	3 lengths 37 ft waste	
Utility rooms-C: 165 ft	Garage-A: 204 ft	Garage-B: 194 ft
Roll 4: 600 ft 1/2" PEX (Part # WX-PX4-600)	3 lengths 83 ft waste	
Garage-C: 183 ft	Garage-D: 172 ft	Garage-E: 162 ft
Roll 5: 2000 ft 1/2" BPEX (Part # WX-BP4-2000)	9 lengths 10 ft waste	
Commons R-A: 231 ft	Commons R-B: 213 ft	Commons R-C: 234 ft
Master-A: 246 ft	Master-B: 231 ft	Master-C: 216 ft
Master-D: 232 ft	Commons M-A: 188 ft	Commons M-B: 199 ft
Roll 6: 600 ft 1/2" BPEX (Part # WX-BP4-600)	2 lengths 171 ft waste	
Commons M-C: 210 ft	Commons M-D: 220 ft	
Roll 7: 300 ft 1/2" BPEX (Part # WX-BP4-300)	1 length 70 ft waste	
Commons M-E: 230 ft		



Radiant Heating Design Summary

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Design Information

Total floor area:	4230 ft ²	Fluid:	Water
Radiantly heated area:	4230 ft ²	Design temperature:	-1 °F
Total panel area:	4183 ft ²	Maximum supply temperature:	130 °F
Total tubing area:	4147 ft ²	Total flow rate:	5.48 gpm
Total room load:	30448 Btu/h	Maximum head loss:	5.06 ft H ₂ O
Total panel output:	30448 Btu/h	Total tubing required:	6211 ft
Total supplemental heat:	0 Btu/h	Zones 8, Loops 33, Manifolds 10, Actuators 15, Zone Pumps 0, System Pumps 3, Mixing Valves 3, Injection Pumps 0	
Total back loss:	9045 Btu/h		
Boiler output required:	39493 Btu/h		

Space Heating Information

Room name	Room area (ft ²)	Air temp (°F)	Room load (Btu/h)	Supp. heat (Btu/h)	F/C	Panel area (ft ²)	Tubing area (ft ²)	Surf. temp. (°F)	Deliv. temp. (°F)	Panel output (Btu/h /ft ²)	Back loss (Btu/h /ft ²)
Basement	627	70	0	0	F	614	609	70	130	0.0	0.0
Garage	720	70	5732	0	F	720	716	74	91	8.0	2.5
Bedroom 2	516	70	3268	0	F	516	511	73	130	6.3	3.0
Bedroom 3	427	70	4459	0	F	417	413	76	130	10.7	4.2
Commons R	440	70	5620	0	F	428	425	78	130	13.1	2.9
Commons M	629	70	4114	0	F	629	624	74	107	6.5	1.5
Master	513	70	5453	0	F	501	497	76	125	10.9	2.4
Utility rooms	358	70	1801	0	F	358	354	72	86	5.0	1.5
Totals	4230		30448	0		4183	4147				

Hydronic Devices

Device Name	Device type	Load (Btu/h)	Flow (gpm)	Head (ft H ₂ O)	S/R tubing or Size,Cv	SWT Req. (°F)	SWT Spld (°F)
Manifold10	Manifold	0	0	0	3/4" BPEX	0	0
Manifold5	Manifold	7555	1.0	0.53	3/4" BPEX	91	91
Manifold3	Manifold	6658	0.9	0.73	3/4" BPEX	125	130
Manifold2	Manifold	5052	0.7	0.32	3/4" BPEX	107	130
Manifold4	Manifold	2336	0.3	0.18	3/4" BPEX	86	91
Manifold6	Manifold	0	0	0	3/4" BPEX	0	0
Manifold8	Manifold	0	0	0	3/4" BPEX	0	0
Manifold9	Manifold	0	0	0	3/4" BPEX	0	0
Manifold11	Manifold	0	0	0	3/4" BPEX	0	0

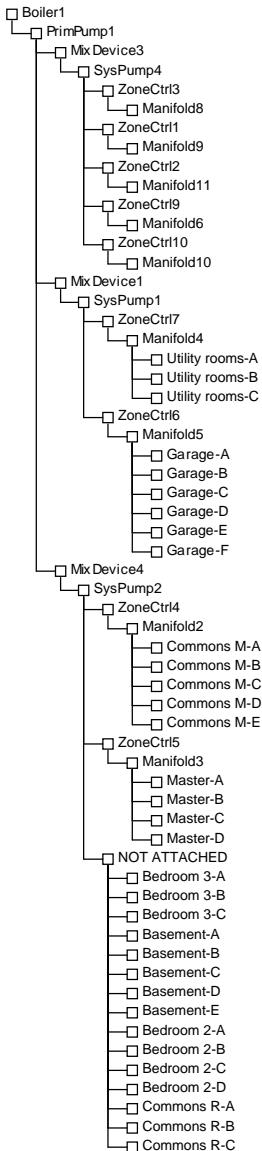


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NOT ATTACHED	Manifold	17891	2.6	5.06	3/4" BPEX	130	130
ZoneCtrl4	Zone Valve	5052	0.7	0		107	130
ZoneCtrl5	Zone Valve	6658	0.9	0		125	130
ZoneCtrl7	Zone Valve	2336	0.3	0		86	91
ZoneCtrl6	Zone Valve	7555	1.0	0		91	91
ZoneCtrl3	Zone Valve	0	0	0		0	0
ZoneCtrl1	Zone Valve	0	0	0		0	0
ZoneCtrl2	Zone Valve	0	0	0		0	0
ZoneCtrl9	Zone Valve	0	0	0		0	0
ZoneCtrl10	Zone Valve	0	0	0		0	0
MixDevice3	Tempering valve	0	0	0		0	0
MixDevice1	Tempering valve	9892	1.3	0		91	91
MixDevice4	Tempering valve	29601	4.2	0		130	130
SysPump4	System Pump	0	0	0	3/4" COPPER	0	0
SysPump1	System Pump	9892	1.3	0.53	3/4" COPPER	91	91
SysPump2	System Pump	29601	4.2	4.99	3/4" COPPER	130	130
PrimPump1	Primary Pump	39493	4.0	0	3/4" COPPER	180	180

Hydronic Navigator Tree





Pump Sizing Report
PrimPump1
All Climate Design Company

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Piping

Name	Tube size / type	Fluid	Num ftgs	1 Ftg EqLen	Ftg Cv	PipeLen (ft)	TotLen (ft)	Temp (°F)	Flow (gpm)	Head (ft H2O)
Pump piping	3/4" COPPER	Water	0	0	0	0	0	170	4.0	0

Pump Information

Make	Flow (gpm)	4.0
Model	Add Head (ft H2O)	0
	Head (ft H2O)	0

NOTE: All pipe sections assumed to be connected in series



Pump Sizing Report

SysPump4

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Piping

Name	Tube size / type	Fluid	Num ftgs	1 Ftg EqLen	Ftg Cv	PipeLen (ft)	TotLen (ft)	Temp (°F)	Flow (gpm)	Head (ft H2O)
Manifold8	3/4" BPEX	Water	0	0	0	0	0	0	0	0
Pump piping	3/4" COPPER	Water	0	0	0	0	0	0	0	0
MixDevice3	3/4" COPPER	Water	1	0	0	0	0	0	0	0
ZoneCtrl3	3/4" COPPER	Water	1	0	0	0	0	0	0	0

Pump Information

Make	Flow (gpm)	0
Model	Add Head (ft H2O)	0
	Head (ft H2O)	0

NOTE: All pipe sections assumed to be connected in series



Pump Sizing Report

SysPump1

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Piping

Name	Tube size / type	Fluid	Num ftgs	1 Ftg EqLen	Ftg Cv	PipeLen (ft)	TotLen (ft)	Temp (°F)	Flow (gpm)	Head (ft H2O)
Garage-A	1/2" PEX	Water	1	0	0	204	204	83.9	0.2	0.53
Manifold5	3/4" BPEX	Water	0	0	0	0	0	83.9	1.0	0
Pump piping	3/4" COPPER	Water	0	0	0	0	0	83.9	1.3	0
ZoneCtrl6	3/4" COPPER	Water	1	0	0	0	0	83.9	1.0	0
MixDevice1	3/4" COPPER	Water	1	0	0	0	0	83.9	1.3	0

Pump Information

Make	Flow (gpm)	1.3
Model	Add Head (ft H2O)	0
	Head (ft H2O)	0.5

NOTE: All pipe sections assumed to be connected in series



Pump Sizing Report

SysPump2

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Piping

Name	Tube size / type	Fluid	Num ftgs	1 Ftg EqLen	Ftg Cv	PipeLen (ft)	TotLen (ft)	Temp (°F)	Flow (gpm)	Head (ft H2O)
Commons R-C	1/2" BPEX	Water	1	0	0	234	234	126	0.7	4.99
NOT ATTACHED	3/4" BPEX	Water	0	0	0	0	0	123	2.6	0
Pump piping	3/4" COPPER	Water	0	0	0	0	0	123	4.2	0
MixDevice4	3/4" COPPER	Water	1	0	0	0	0	123	4.2	0

Pump Information

Make	Flow (gpm)	4.2
Model	Add Head (ft H2O)	0
	Head (ft H2O)	5.0

NOTE: All pipe sections assumed to be connected in series



Radiant Heating Manifold Summary

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For: Michael Chiartano, Chiartano Engineering
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Manifold name: Manifold5
Manifold location: Main level

	Loop number							
	1	2	3	4	5	6		
Name	Garage-A	Garage-B	Garage-C	Garage-D	Garage-E	Garage-F		
Heating zone	Z2 (GARAGE)	Z2 (GARAGE)	Z2 (GARAGE)	Z2 (GARAGE)	Z2 (GARAGE)	Z2 (GARAGE)		
Heated area (ft²)	144	137	129	121	114	75		
Room temperature (°F)	70	70	70	70	70	70		
Cover R (ft²·°F/Btuh)	0.80	0.80	0.80	0.80	0.80	0.80		
Surface temperature (°F)	74	74	74	74	74	74		
Radiant panel CST	44A0	44A0	44A0	44A0	44A0	44A0		
Radiant panel type	Slab embedded	Slab embedded	Slab embedded	Slab embedded	Slab embedded	Slab embedded		
Tube spacing (in)	8.0	8.0	8.0	8.0	8.0	8.0		
Tube type/size	1/2" PEX	1/2" PEX	1/2" PEX	1/2" PEX	1/2" PEX	1/2" PEX		
Distance to manifold (ft)	2	2	2	2	2	2		
Loop length (ft)	204	194	183	172	162	108		
Temperature drop (°F)	15.0	15.0	15.0	15.0	15.0	15.0		
Flow (gpm)	0.20	0.19	0.18	0.17	0.16	0.11		
Head loss (ft H2O)	0.53	0.46	0.39	0.33	0.28	0.09		
Supply temperature (°F)	91	91	91	91	91	91		
Balance valve (turns from closed)								

Totals for Manifold5

S/R tubing	3/4" BPEX	Total flow (gpm)	1.01
S/R Tubing length(ft)	0	Total panel output (Btuh)	5732
S/R Tubing head loss (ft H2O)	0	Total tubing required (ft)	1023
Max loop head loss (ft H2O)	0.53	Max supply temp. (°F)	91.4
Manifold head loss (ft H2O)	0		



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Manifold name: Manifold3
Manifold location: Main level

	Loop number							
	1	2	3	4				
Name	Master-A	Master-B	Master-C	Master-D				
Heating zone	Z3 (MASTER)	Z3 (MASTER)	Z3 (MASTER)	Z3 (MASTER)				
Heated area (ft²)	133	125	117	126				
Room temperature (°F)	70	70	70	70				
Cover R (ft²·°F/Btuh)	0.80	0.80	0.80	0.80				
Surface temperature (°F)	76	76	76	76				
Radiant panel CST	43C0	43C0	43C0	43C0				
Radiant panel type	Staple up	Staple up	Staple up	Staple up				
Tube spacing (in)	8.0	8.0	8.0	8.0				
Tube type/size	1/2" BPEX	1/2" BPEX	1/2" BPEX	1/2" BPEX				
Distance to manifold (ft)	2	2	2	2				
Loop length (ft)	246	231	216	232				
Temperature drop (°F)	15.4	15.0	14.6	15.0				
Flow (gpm)	0.23	0.22	0.22	0.22				
Head loss (ft H2O)	0.73	0.65	0.58	0.66				
Supply temperature (°F)	125	125	125	125				
Balance valve (turns from closed)								

Totals for Manifold3

S/R tubing	3/4" BPEX	Total flow (gpm)	0.90
S/R Tubing length(ft)	0	Total panel output (Btuh)	5453
S/R Tubing head loss (ft H2O)	0	Total tubing required (ft)	925
Max loop head loss (ft H2O)	0.73	Max supply temp. (°F)	125
Manifold head loss (ft H2O)	0		



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... list\200 Sundance Ct. Unit B #2509 Radiant.rup Calc = MJ8 Front Door faces: N



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Manifold name: Manifold2
Manifold location: Main level

	Loop number							
	1	2	3	4	5			
Name	Commons M-A	Commons M-B	Commons M-C	Commons M-D	Commons M-E			
Heating zone	Z4 (COMMONS)	Z4 (COMMONS)	Z4 (COMMONS)	Z4 (COMMONS)	Z4 (COMMONS)			
Heated area (ft²)	113	120	126	132	139			
Room temperature (°F)	70	70	70	70	70			
Cover R (ft²·°F/Btuh)	0.80	0.80	0.80	0.80	0.80			
Surface temperature (°F)	74	74	74	73	73			
Radiant panel CST	43C0	43C0	43C0	43C0	43C0			
Radiant panel type	Staple up	Staple up	Staple up	Staple up	Staple up			
Tube spacing (in)	8.0	8.0	8.0	8.0	8.0			
Tube type/size	1/2" BPEX	1/2" BPEX	1/2" BPEX	1/2" BPEX	1/2" BPEX			
Distance to manifold (ft)	1	1	1	1	1			
Loop length (ft)	188	199	210	220	230			
Temperature drop (°F)	14.7	14.8	15.0	15.2	15.3			
Flow (gpm)	0.13	0.13	0.14	0.14	0.15			
Head loss (ft H2O)	0.20	0.23	0.26	0.29	0.32			
Supply temperature (°F)	107	107	107	107	107			
Balance valve (turns from closed)								

Totals for Manifold2

S/R tubing	3/4" BPEX	Total flow (gpm)	0.68
S/R Tubing length(ft)	0	Total panel output (Btuh)	4114
S/R Tubing head loss (ft H2O)	0	Total tubing required (ft)	1047
Max loop head loss (ft H2O)	0.32	Max supply temp. (°F)	107
Manifold head loss (ft H2O)	0		



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Manifold name: Manifold4
Manifold location: Main level

	Loop number						
	1	2	3				
Name	Utility rooms-A	Utility rooms-B	Utility rooms-C				
Heating zone	Z1 (Owner Entry)	Z1 (Owner Entry)	Z1 (Owner Entry)				
Heated area (ft ²)	108	131	118				
Room temperature (°F)	70	70	70				
Cover R (ft ² -°F/Btuh)	0.80	0.80	0.80				
Surface temperature (°F)	72	72	72				
Radiant panel CST	44A0	44A0	44A0				
Radiant panel type	Slab embedded	Slab embedded	Slab embedded				
Tube spacing (in)	8.0	8.0	8.0				
Tube type/size	1/2" PEX	1/2" PEX	1/2" PEX				
Distance to manifold (ft)	1	1	1				
Loop length (ft)	152	184	165				
Temperature drop (°F)	15.0	15.0	15.0				
Flow (gpm)	0.09	0.11	0.10				
Head loss (ft H2O)	0.11	0.18	0.13				
Supply temperature (°F)	86	86	86				
Balance valve (turns from closed)							

Totals for Manifold4

S/R tubing	3/4" BPEX	Total flow (gpm)	0.31
S/R Tubing length(ft)	0	Total panel output (Btuh)	1801
S/R Tubing head loss (ft H2O)	0	Total tubing required (ft)	560
Max loop head loss (ft H2O)	0.18	Max supply temp. (°F)	86.0
Manifold head loss (ft H2O)	0		



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Manifold name: NOT ATTACHED

Manifold location:

	Loop number							
	1	2	3	4	5	6	7	8
Name	Bedroom 3-A	Bedroom 3-B	Bedroom 3-C	Basement-A	Basement-B	Basement-C	Basement-D	Basement-E
Heating zone	Z8 (BSMNT R)	Z8 (BSMNT R)	Z8 (BSMNT R)	Z7 (BSMNT M)	Z7 (BSMNT M)	Z7 (BSMNT M)	Z7 (BSMNT M)	Z7 (BSMNT M)
Heated area (ft²)	145	143	129	122	129	144	112	107
Room temperature (°F)	70	70	70	70	70	70	70	70
Cover R (ft²·°F/Btuh)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Surface temperature (°F)	76	76	76	70	70	70	70	70
Radiant panel CST	44A0	44A0	44A0	44A0	44A0	44A0	44A0	44A0
Radiant panel type	Slab embedded	Slab embedded	Slab embedded	Slab embedded	Slab embedded	Slab embedded	Slab embedded	Slab embedded
Tube spacing (in)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Tube type/size	1/2" PEX	1/2" PEX	1/2" PEX	1/2" PEX	1/2" PEX	1/2" PEX	1/2" PEX	1/2" PEX
Distance to manifold (ft)	0	0	0	0	0	0	0	0
Loop length (ft)	176	173	156	169	179	200	155	149
Temperature drop (°F)	59.6	59.6	59.6	0	0	0	0	0
Flow (gpm)	0.07	0.07	0.07	0	0	0	0	0
Head loss (ft H2O)	0.07	0.07	0.05	0	0	0	0	0
Supply temperature (°F)	130	130	130	130	130	130	130	130
Balance valve (turns from closed)								

Totals for NOT ATTACHED

S/R tubing	3/4" BPEX	Total flow (gpm)	2.58
S/R Tubing length(ft)	0	Total panel output (Btuh)	13348
S/R Tubing head loss (ft H2O)	0	Total tubing required (ft)	271.5
Max loop head loss (ft H2O)	5.06	Max supply temp. (°F)	130
Manifold head loss (ft H2O)	0		



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Manifold name: NOT ATTACHED

Manifold location:

	Loop number						
	9	10	11	12	13	14	15
Name	Bedroom 2-A	Bedroom 2-B	Bedroom 2-C	Bedroom 2-D	Commons R-A	Commons R-B	Commons R-C
Heating zone	Z6 (BSMT L)	Z6 (BSMT L)	Z6 (BSMT L)	Z6 (BSMT L)	Z5 (COMMONS)	Z5 (COMMONS)	Z5 (COMMONS)
Heated area (ft²)	143	128	120	124	146	135	148
Room temperature (°F)	70	70	70	70	70	70	70
Cover R (ft²·°F/Btuh)	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Surface temperature (°F)	73	73	73	73	78	78	78
Radiant panel CST	44A0	44A0	44A0	44A0	43C0	43C0	43C0
Radiant panel type	Slab embedded	Slab embedded	Slab embedded	Slab embedded	Staple up	Staple up	Staple up
Tube spacing (in)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Tube type/size	1/2" PEX	1/2" PEX	1/2" PEX	1/2" PEX	1/2" BPEX	1/2" BPEX	1/2" BPEX
Distance to manifold (ft)	0	0	0	0	0	0	0
Loop length (ft)	189	169	159	163	231	213	234
Temperature drop (°F)	59.6	59.6	59.6	59.6	6.5	5.8	6.6
Flow (gpm)	0.05	0.04	0.04	0.04	0.73	0.76	0.72
Head loss (ft H2O)	0.03	0.02	0.02	0.02	5.06	5.03	5.06
Supply temperature (°F)	130	130	130	130	130	130	130
Balance valve (turns from closed)							

Totals for NOT ATTACHED

S/R tubing	3/4" BPEX	Total flow (gpm)	2.58
S/R Tubing length(ft)	0	Total panel output (Btuh)	13348
S/R Tubing head loss (ft H2O)	0	Total tubing required (ft)	271.5
Max loop head loss (ft H2O)	5.06	Max supply temp. (°F)	130
Manifold head loss (ft H2O)	0		



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... list\200 Sundance Ct. Unit B #2509 Radiant.rup Calc = MJ8 Front Door f aces: N