



Enser Consulting, LLC
(303) 725-8836

Loop Details Report

Joe Builder

Job: Geothermal Ranch Sample
Date: May 17, 2007
By: Enser Consulting, LLC

Loop Name: Default Loop

For: Geothermal Ranch Sample, Joe Builder
Denver, CO

Pipe Length Details

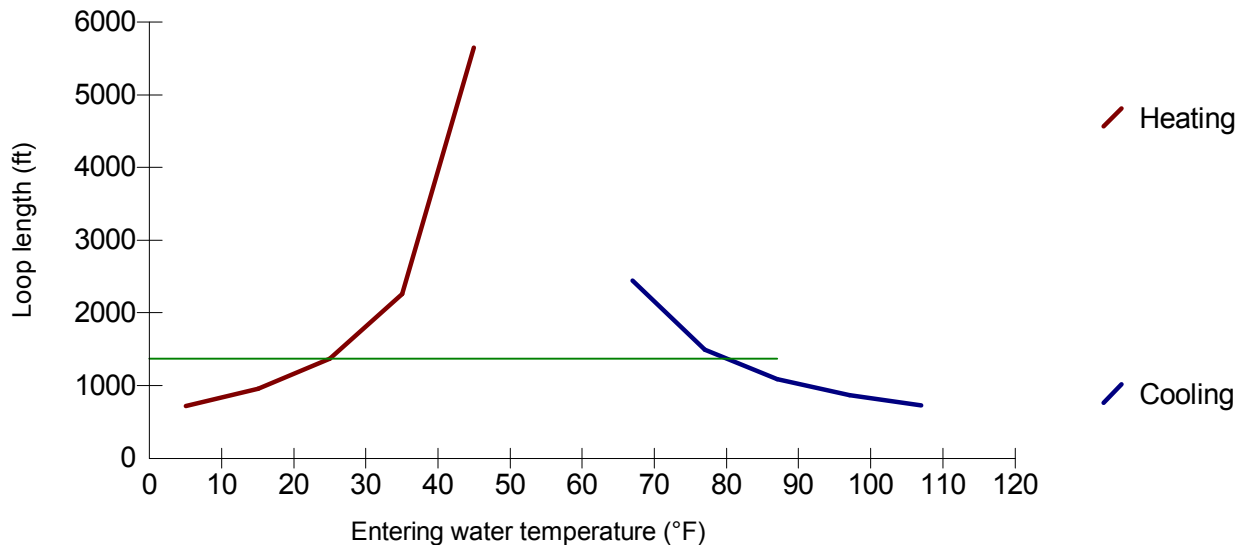
Minimum Reynolds Number:	2500	Soil Type:	Loam
Reynolds Number:	2684	Soil Diffusivity:	0.46 ft ² /day
Pipe Size:	0.75 in	Soil Conductivity:	0.52 Btuh/ft-°F
Pipe ID:	0.86 in	Design Ground Low Temp.:	52 °F
Pipe Type:	PE SDR-11	Design Ground High Temp.:	52 °F
Pipe Thermal Resistance:	0.096 ft-°F/Btuh	Design Heating EWT:	25 °F
		Design Cooling EWT:	87 °F
		Soil Therm. Resistance:	1.546 ft-°F/Btuh

Heating

Cooling

	EWT (°F)	Length (ft)	Capacity (Btuh)	COP	Run Fraction	EWT (°F)	Length (ft)	Capacity (Btuh)	EER	Run Fraction
Design	25	1371	28633	3.74	0.51	87	1087	39360	15.22	0.19
Actual	25	1371	28633	3.74	0.51	79	1371	39513	16.69	0.19

EWT - Loop Length Graph





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Loop Circulating Pump Report

Job: Geothermal Ranch Sample
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Joe Builder

Loop Name: Default Loop

For: Geothermal Ranch Sample, Joe Builder
Denver, CO

Pump Summary

Water coil head loss: 8.20 ft H2O at 8.00 gpm
Htg EWT (°F): 25 Clg EWT (°F): 87

Section	Pipe Sz (in)	Pipe Type	# Ftgs	Eq Ln (ft)	Pipe Ln (ft)	Total Eq Ln (ft)	Head Loss (ft H2O)
Connection Header	1.00	HOSE	8	3	50	74	4.10
	1.00	PE SDR-11	10	3	0	30	1.47
	0		0	0	0	0	0
	0		0	0	0	0	0
Ground Loop	0.75	PE SDR-11	15	3	457	502	10.73
Select pump output that is at least:							24.51

Pump Model: Sample Pump

Number of pumps: 2

Pump Details

Fluid: Methanol Density: 65.37 lb/ft³ Viscosity: 3.829 centipoise

Section	Pipe ID (in)	Reynolds Number	Pipe Length (ft)	Head Loss (ft H2O)	Fluid Vol (gal)	Velocity (fpm)
Connection Header	1.050	6594	74	4.098	2	3.0
	1.077	6429	30	1.473	0	2.8
	0	0	0	0	0	0
	0	0	0	0	0	0
Ground Loop	0.860	2684	502	10.735	14	1.5
Oversize (10%):					4	
Total Volume (gal):					48	

NOTE: Ground loop parallel branches assumed to be of equal length. All other sections assumed to be connected in series. Pipe lengths are actual lengths. Head Loss calculations are based on parallel loop lengths.



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Loop Field Installation Report

Joe Builder

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Loop Name: Default Loop

For: Geothermal Ranch Sample, Joe Builder
Denver, CO

Design Conditions

LOADS	Heating:	36468 Btuh	Cooling:	20175 Btuh
EWT	Min:	25 °F	Max:	87 °F
	Earth Data:	Denver	Soil:	Loam

Equipment

HEAT PUMP	Manufacturer:	Econar
	Trade Name:	GEOSOURCE VARA 2 PLUS
	Model:	GV380
	Indoor Coil:	GV380
	Supplemental Heat:	7835 Btuh (2.30 kW)
CIRC PUMP	The system requires	25 ft H2O at 8.000 gpm
	Use 2 pumps, Model #	Sample Pump Series: 0 Parallel: 2

Loop

PIPE Loop type: Vertical 2 pipe Total pipe length: 1371 ft
3 parallel 457 ft circuits, 3 bore(s), 229 ft depth each

Section	Pipe length	Pipe size and type
Connection	50 ft	1.00 in HOSE
Header	0 ft	1.00 in PE SDR-11
	0 ft	0 in
	0 ft	0 in
Ground Loop	457 ft	0.75 in PE SDR-11

HOLES Diameter: 4 in Separation: 10.0 ft
Grouted? _____ Static water level: _____ ft

ANTI-FREEZE Type: Methanol 20 %, freeze point: 11 °F
Coolant 10 gal + water 38 gal = 48 gal



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Loop Name:	Default Loop
For:	Geothermal Ranch Sample, Joe Builder Denver, CO

Weather City:	Fort Collins		
Bin Data City:	Denver/Buckley ANGB, CO		
Earth Temp. City:	Denver		
Winter Extreme Temperature:	-23 °F	Mean Earth Temperature:	52 °F
Summer Extreme Temperature:	97 °F	Annual Temperature Swing:	22 °F
Mean Air Temperature:	49 °F	Minimum Temperature Day:	37

Manufacturer:	Econar	Load (Btuh):	Heating	Cooling
Trade Name:	GEOSOURCE VARA 2 PLUS	EAT (°F):	36468	20175
Model:	GV380	EWT (°F):	70	80/67
Indoor Coil:	GV380	Capacity (Btuh):	25	79
		COP/EER:	28633	39513
		Input (kW):	3.74	16.69
			2.24	2.37

Loop Type:	Vertical 2 pipe	Coolant:	Methanol
Configuration:	14 # of bores: 3	Concentration:	20 %
		Water Volume (gal):	38
Soil Type:	Loam	Coolant Volume (gal):	10
Pipe:	PE SDR-11 0.75 in	Freezing Temp (°F):	11

Heating	Design EWT (°F):	25	Pipe Length (ft):	1371
	Pipe Length (ft):	1371	Bore hole depth, (ft):	229
Cooling	Design EWT (°F):	87	Flow (gpm):	8.000
	Pipe Length (ft):	1087	Minimum Head (ft H2O):	25