GEO CONNECTIONS

Basic Design Service Report

John's Plumbing & Heating

Project: Example Residence

Prepared: January 1, 2009

Prepared by: Jared Horn

April 29, 2009

John's Plumbing & Heating
Attn: John Doe
123 Lincoln Ave
Boston, MA 02101
Office: (800) 888-0001
Fax: (800) 888-0002

RE: Final GSHP System Design Report for Example Residence

Section 1: Manual J Loads, GSHP Schedule, & Operating Cost Comparisons

According to the information provided, the peak loads for the residence were calculated to be as listed in the following table. Several assumptions were employed to estimate the loads, such as internal gain (due to occupancy levels and appliance use), infiltration levels, etc. All loads assume 70/75/50 (heating temp/cooling temp/%-RH) thermostat set points and 0.31 ACH infiltration levels in heating and 0.15 ACH infiltration levels in cooling (average house construction levels). Total conditioned floor area was found to be approximately 4670 ft^2 (assumed use of a forced-air system on all floors, 3 zones).

Table 1. Peak Loads

Building Zone	Heating Load	Cooling Load (Sens)	Zone SHF
Basement	16,363 Btu/hr	6,823 Btu/hr	0.804
Main Level	18,562 Btu/hr	15,085 Btu/hr	0.857
Upper Level	22,605 Btu/hr	16,224 Btu/hr	0.854
Totals	57,530 Btu/hr	38,132 Btu/hr	0.846

All loads calculated using software in compliance with ACCA Manual J and are based on provided construction of the building (insulation levels, window quality, etc.) The loads provided in the table include ventilation loads (assumed use of an energy recovery ventilator (ERV) for provision of 150 cfm outside AFV with 60% effectiveness).

Based on the calculated peak equipment loads, the recommended heat pump schedule is as follows:

Table 2. Recommended GSHP Equipment Schedule

Space	*Brand/Model*	*Ht.g Cap.*	*%-Sizing*	*Water Flow*	*Air Flow*
Basement & Main Level	Climate Master TT049	37.9 MBH	109%	12.0	1650
Upper Level	Climate Master TT026	19.4 MBH	86%	8.0	950

- *Equipment water flow rate measured in gallons per minute (gpm)*
- *Equipment air flow rate measured in cubic feet per minute (cfm)*
- *Equipment capacities based on 30˚F minimum EWT from the loopfield and 70˚F EAT from the space in heating*
- *Equipment capacities in cooling not listed because of heating dominance for the home*
- *Dual capacity equipment specified for optimum performance at part-load conditions during the majority of the year in heating in addition to superior dehumidification in low-capacity in cooling mode*
- *Installation of 10-kW backup electric resistance heat recommended for emergency heating capabilities*

The ACCA Manual J peak heating and cooling load calculations as well as the GSHP equipment selection information for the residence are displayed in the following pages. The operating cost calculations were based on an estimated electric rate of $0.12/kWh.

Building Analysis
Basement
Geoconnections, Inc.

302 E. Warehouse St., Elkton, SD 57026 Phone: 605-542-5261 Fax: 605-542-1303

Job: Example Residence
Date: 1 Jan 2008
By: JMH

Project Information

For: John Doe
123 Lincoln Ave, Boston, MA 20101
Phone: (888) 800-0001 Fax: (888) 800-0002

Design Conditions

Location:
Boston, MA, US
Elevation: 30 ft
Latitude: 42 °N

Outdoor:	**Heating**	**Cooling**
Dry bub (°F)	12	87
Daily range (°F)	-	15 (L)
Wet bulb (°F)	-	71
Wind speed (mph)	15.0	7.5

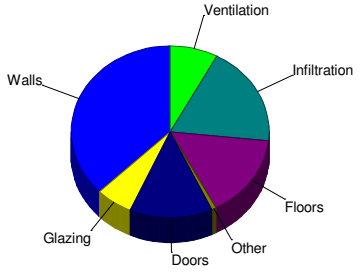
Indoor:	**Heating**	**Cooling**
Indoor temperature (°F)	70	75
Design TD (°F)	58	12
Relative humidity (%)	50	50
Moisture difference (gr/lb)	46.7	25.7

Infiltration:

Method	Simplified
Construction quality	Average
Fireplaces	2 (Average)

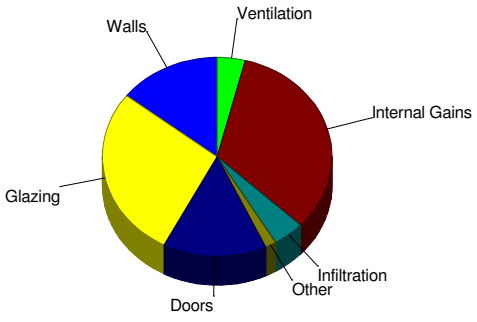
Heating

Component	Btuh/ft²	Btuh	% of load
Walls	3.5	6104	37.3
Glazing	23.8	991	6.1
Doors	15.1	2217	13.5
Ceilings	1.5	123	0.8
Floors	1.6	2566	15.7
Infiltration	2.9	3087	18.9
Ducts		0	0.0
Piping		0	0.0
Humidification		0	0.0
Ventilation		1275	7.8
Adjustments		0	
Total		**16363**	**100.0**



Cooling

Component	Btuh/ft²	Btuh	% of load
Walls	0.6	984	14.4
Glazing	45.7	1906	27.9
Doors	6.8	996	14.6
Ceilings	1.3	105	1.5
Floors	0.0	0	0.0
Infiltration	0.3	304	4.5
Ducts		0	0.0
Ventilation		268	3.9
Internal gains		2260	33.1
Blower		0	0.0
Adjustments		0	
Total		**6823**	**100.0**



Overall U-value = 0.055 Btuh/ft²-°F

WARNING: window to floor area ratio = 2.5% - less than 5%.

Building Analysis
Main Level
Geoconnections, Inc.

302 E. Warehouse St., Elkton, SD 57026 Phone: 605-542-5261 Fax: 605-542-1303

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Date: 1 Jan 2008
By: JMH

Project Information

For: John Doe
123 Lincoln Ave, Boston, MA 20101
Phone: (888) 800-0001 Fax: (888) 800-0002

Design Conditions

Location:
Boston, MA, US
Elevation: 30 ft
Latitude: 42 °N

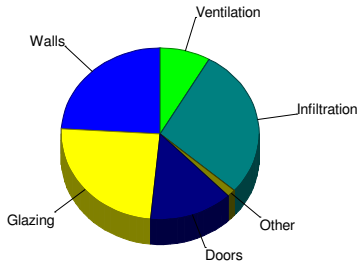
Outdoor:	**Heating**	**Cooling**
Dry bub (°F)	12	87
Daily range (°F)	-	15 (L)
Wet bulb (°F)	-	71
Wind speed (mph)	15.0	7.5

Indoor:	**Heating**	**Cooling**
Indoor temperature (°F)	70	75
Design TD (°F)	58	12
Relative humidity (%)	50	50
Moisture difference (gr/lb)	46.7	25.7

Infiltration:	
Method	Simplified
Construction quality	Average
Fireplaces	2 (Average)

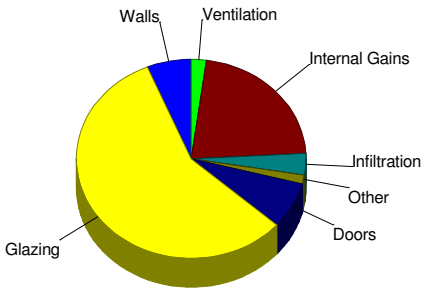
Heating

Component	Btuh/ft²	Btuh	% of load
Walls	3.0	4469	24.1
Glazing	23.8	4525	24.4
Doors	15.1	2533	13.6
Ceilings	1.5	260	1.4
Floors	0.0	0	0.0
Infiltration	2.9	5245	28.3
Ducts		0	0.0
Piping		0	0.0
Humidification		0	0.0
Ventilation		1530	8.2
Adjustments		0	
Total		**18562**	**100.0**



Cooling

Component	Btuh/ft²	Btuh	% of load
Walls	0.6	944	6.3
Glazing	45.3	8622	57.2
Doors	6.8	1138	7.5
Ceilings	1.3	222	1.5
Floors	0.0	0	0.0
Infiltration	0.3	517	3.4
Ducts		0	0.0
Ventilation		322	2.1
Internal gains		3320	22.0
Blower		0	0.0
Adjustments		0	
Total		**15085**	**100.0**



Overall U-value = 0.101 Btuh/ft²-°F

Data entries checked.

GSHP Selection Information for Basement & Main Level:

Print Zone 1

Basement & Main Level

PEAK LOAD INFORMATION

Heating			Cooling		
Peak Heating Load	34,925	Btu/hr (@12˚F OAT)	Peak Cooling Load (Total)	26,095	Btu/hr (@87˚F OAT)
T-Stat Set Point	70	˚F	T-Stat Set Point	75	˚F
			Zone SHF	0.84	

HEAT PUMP SELECTION

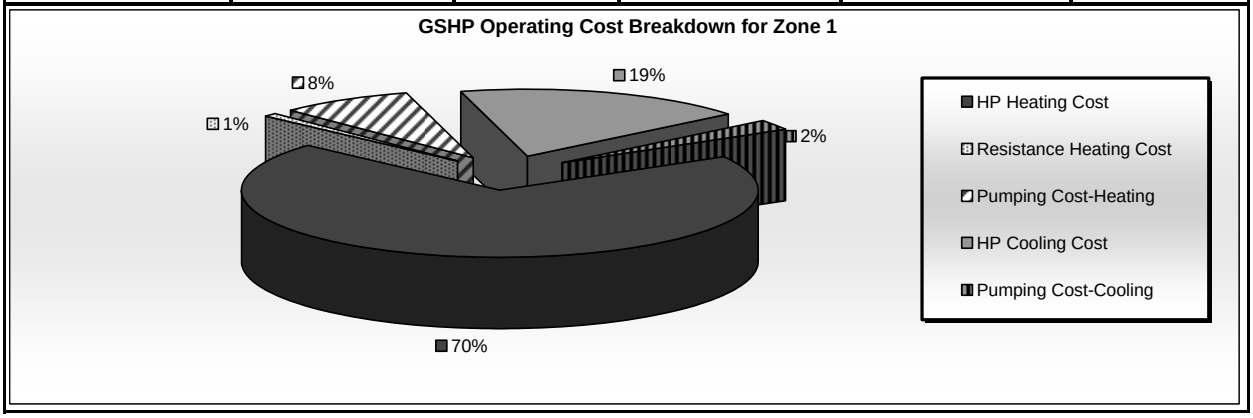
Heat Pump Type	☑ Water-Air ☐ Water-Water	1-/2-CAP	Dual Capacity
Brand	Climate Master	Model / Unit SHF	Tranquility TT049
Htg CAP Correction Factor	1.000	Total Clg CAP Correction Factor	1.000
Htg DMD Correction Factor	1.000	Sensible Clg CAP Correction Factor	1.000
No. of Units	1	Clg DMD Correction Factor	1.000

INSTALLED CAPACITY CHECK

Heating (EWTmin = 30˚F)			Cooling (EWTmax = 90˚F)		
Installed Capacity	37,900 Btu/hr		Installed Capacity (SC)	36,075 Btu/hr	
%-Sizing	109%		%-Oversizing (SC)	+65% --> High Cap	(+23% --> Low Cap)
Installed COP_h	3.79		Installed EER_c	14.49	
System Flowrate	12 gpm		System Flowrate	12 gpm	
Installed CAP/COP Based on 70˚F EAT, 1650 cfm, & 12 gpm			Installed CAP/EER Based on 80/67˚F EAT, 1650 cfm, & 12 gpm		

ENERGY ANALYSIS SUMMARY - ZONE 1

Heating				Cooling			
HP Energy	5,065	kWh		HP Energy	1,344	kWh	
Resistance Energy	68	kWh			--		
Low-Cap Run-Time	1,934	hrs		Low-Cap Run-Time	656	hrs	
High-Cap Run-Time	275	hrs		High-Cap Run-Time	0	hrs	
Resistance Run-Time	51	hrs			--		
HP Operating Cost	$607.78		Specify Elec. Rate	HP Operating Cost	$161.23		Specify Elec. Rate
Resistance Operating Cost	$8.10				--		
Pump Energy	583	kWh		Pump Energy	173	kWh	
Pumping Cost	$69.98			Pumping Cost	$20.77		
Total Heating Cost	$685.87	(Elec. Rate=$0.12/kWh)		**Total Cooling Cost**	$182.00	(Elec. Rate=$0.12/kWh)	
Heating Ground Load (HE)	55,352,707	Btu		Cooling Ground Load (HR)	-27,733,781	Btu	



Building Analysis
Upper Level
Geoconnections, Inc.

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Date: 1 Jan 2008
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Daily range (°F)	-	15 (L)
Wet bulb (°F)	-	71
Wind speed (mph)	15.0	7.5

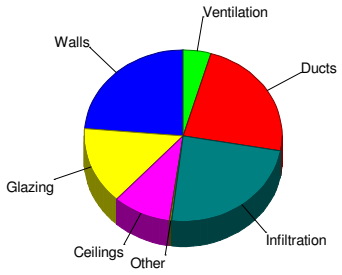
Indoor:	**Heating**	**Cooling**
Indoor temperature (°F)	70	75
Design TD (°F)	58	12
Relative humidity (%)	50	50
Moisture difference (gr/lb)	46.7	25.7

Infiltration:

Method	Simplified
Construction quality	Average
Fireplaces	2 (Average)

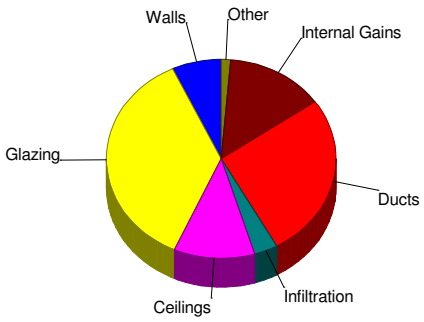
Heating

Component	Btuh/ft²	Btuh	% of load
Walls	3.0	5341	23.6
Glazing	23.8	3294	14.6
Doors	0.0	0	0.0
Ceilings	1.5	2164	9.6
Floors	1.6	78	0.3
Infiltration	2.9	5444	24.1
Ducts		5265	23.3
Piping		0	0.0
Humidification		0	0.0
Ventilation		1020	4.5
Adjustments		-0	
Total		**22605**	**100.0**



Cooling

Component	Btuh/ft²	Btuh	% of load
Walls	0.6	1128	7.0
Glazing	42.6	5903	36.4
Doors	0.0	0	0.0
Ceilings	1.3	1848	11.4
Floors	0.0	0	0.0
Infiltration	0.3	537	3.3
Ducts		4333	26.7
Ventilation		214	1.3
Internal gains		2260	13.9
Blower		0	0.0
Adjustments		-0	
Total		**16224**	**100.0**



Overall U-value = 0.055 Btuh/ft²-°F

Data entries checked.

GSHP Selection Information for Upper Level:

Print Zone 2

Upper Level

PEAK LOAD INFORMATION

Heating			Cooling		
Peak Heating Load	22,605	Btu/hr (@12˚F OAT)	Peak Cooling Load (Total)	18,990	Btu/hr (@87˚F OAT)
T-Stat Set Point	70	˚F	T-Stat Set Point	75	˚F
			Zone SHF	0.85	

HEAT PUMP SELECTION

Heat Pump Type: ☑ Water-Air ☐ Water-Water

Brand: Climate Master

1-/2-CAP: Dual Capacity

Model / Unit SHF: Tranquility TT026

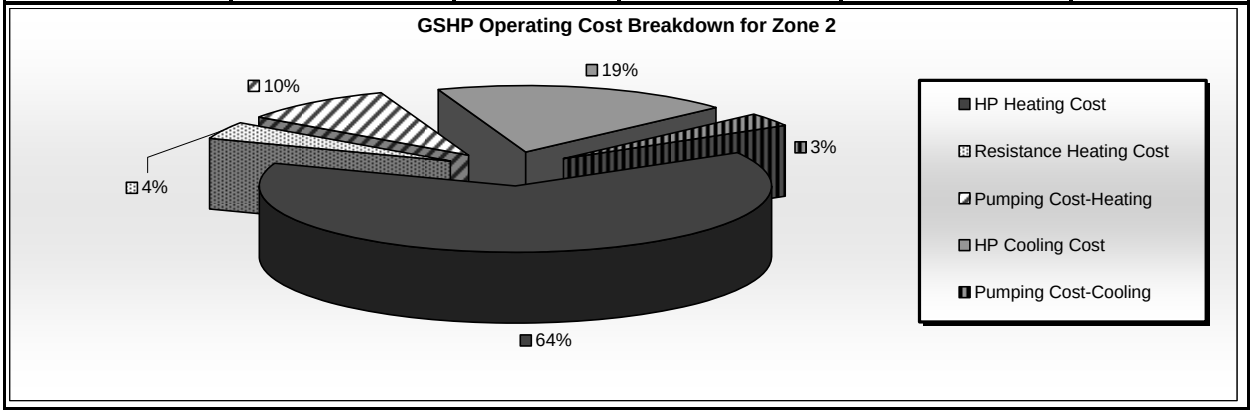
Htg CAP Correction Factor	1.000	Clg CAP Correction Factor	1.000
Htg DMD Correction Factor	1.000	Sensible Clg CAP Correction Factor	1.000
No. of Units	1	Clg DMD Correction Factor	1.000

INSTALLED CAPACITY CHECK

Heating (EWTmin = 30˚F)		Cooling (EWTmax = 90˚F)		
Installed Capacity	19,400 Btu/hr	Installed Capacity (TC)	21,521 Btu/hr	
%-Sizing	86%	%-Oversizing (SC)	+17% --> High Cap	(-12% --> Low Cap)
Installed COP_h	3.82	Installed EER_c	14.82	
System Flowrate	8 gpm	System Flowrate	8 gpm	
Installed CAP/COP Based on 70˚F EAT, 950 cfm, & 8 gpm		Installed CAP/EER Based on 80/67˚F EAT, 950 cfm, & 8 gpm		

ENERGY ANALYSIS SUMMARY - ZONE 2

Heating			Cooling		
HP Energy	3,109	kWh	HP Energy	923	kWh
Resistance Energy	197	kWh		--	
Low-Cap Run-Time	2,026	hrs	Low-Cap Run-Time	813	hrs
High-Cap Run-Time	552	hrs	High-Cap Run-Time	48	hrs
Resistance Run-Time	136	hrs		--	
HP Operating Cost	$373.04	Specify Elec. Rate	HP Operating Cost	$110.73	Specify Elec. Rate
Resistance Operating Cost	$23.68			--	
Pump Energy	473	kWh	Pump Energy	158	kWh
Pumping Cost	$56.81		Pumping Cost	$18.98	
Total Heating Cost	$453.54	(Elec. Rate=$0.12/kWh)	**Total Cooling Cost**	$129.71	(Elec. Rate=$0.12/kWh)
Heating Ground Load (HE)	35,766,622	Btu	Cooling Ground Load (HR)	-20,071,913	Btu



Annual energy usage to heat and cool the building was estimated via the bin analysis. Operating cost comparison calculations were performed based on the utility rates and system efficiencies listed in the table below:

Operating Cost Comparisons:

Return to Operating Cost Info | **Operating Cost Summary** | Payback Calculator | Print Summary

Location & Building Load Assumptions

Selected Location		Peak Loads		Analysis Period --- Annual	
State	Massachusetts	Heating Load	57.53 MBH	Design Htg Temp	12°F
City	Boston	Cooling Load	45.09 MBH	Design Clg Temp	87°F

Energy Cost Assumptions

Standard Elec Rate	0.120	$/kWh	Gas Rate	2.00	$/ccf
GSHP Elec Rate	0.120	$/kWh	Propane Rate	2.50	$/gal
ASHP Elec Rate	0.120	$/kWh	Fuel Oil Rate	2.50	$/gal

Specify System Efficiencies

System Performance Assumptions

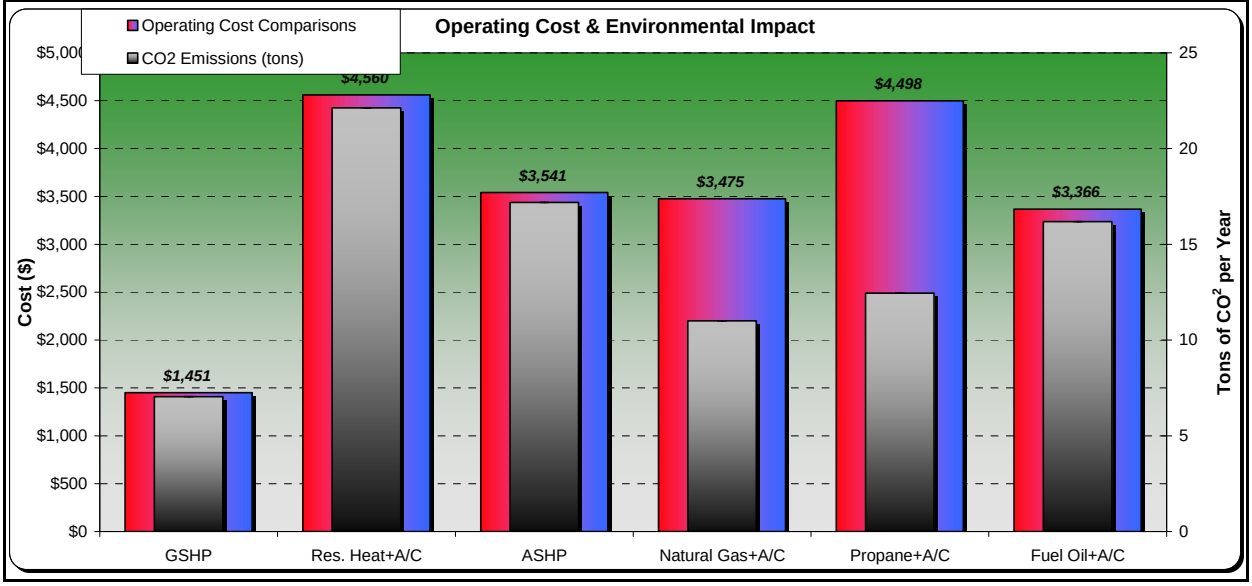
-----Comparisons Made Against GSHP System with a Seasonal COP = 3.7 and a Seasonal EER = 15.43-----

Alternative System Type	Heating Efficiency		Cooling Efficiency	
Resistance Heat & Central A/C	COP	1.00	SEER	14.00
ASHP	HSPF	4.50	SEER	14.00
Natural Gas Furnace & Central A/C	Rated Efficiency	88%	SEER	14.00
Propane Furnace & Central A/C	Rated Efficiency	90%	SEER	14.00
Fuel Oil Furnace & Central A/C	Rated Efficiency	80%	SEER	14.00

Operating Costs

System Type	Heating $	Cooling $	Total $	Incremental $ (vs GSHP)
GSHP	$1,139.41	$311.71	$1,451.11	**N/A**
Res. Heat+A/C	$4,216.04	$343.48	$4,559.52	**+ $3108.41**
ASHP	$3,197.63	$343.48	$3,541.12	**+ $2090.01**
Natural Gas+A/C	$3,131.97	$343.48	$3,475.45	**+ $2024.34**
Propane+A/C	$4,154.38	$343.48	$4,497.87	**+ $3046.76**
Fuel Oil+A/C	$3,022.56	$343.48	$3,366.05	**+ $1914.94**

Operating Cost Comparisons



Section 2: Horizontally-Trenched Ground Loop & Interior Piping Design

As requested, a horizontally-trenched slinky loopfield design and was performed based on peak equipment loads, selected heat pump efficiencies, & predicted equivalent equipment full-load run-time. The geothermal horizontally-trenched slinky loopfield sizing recommendations are as follows:

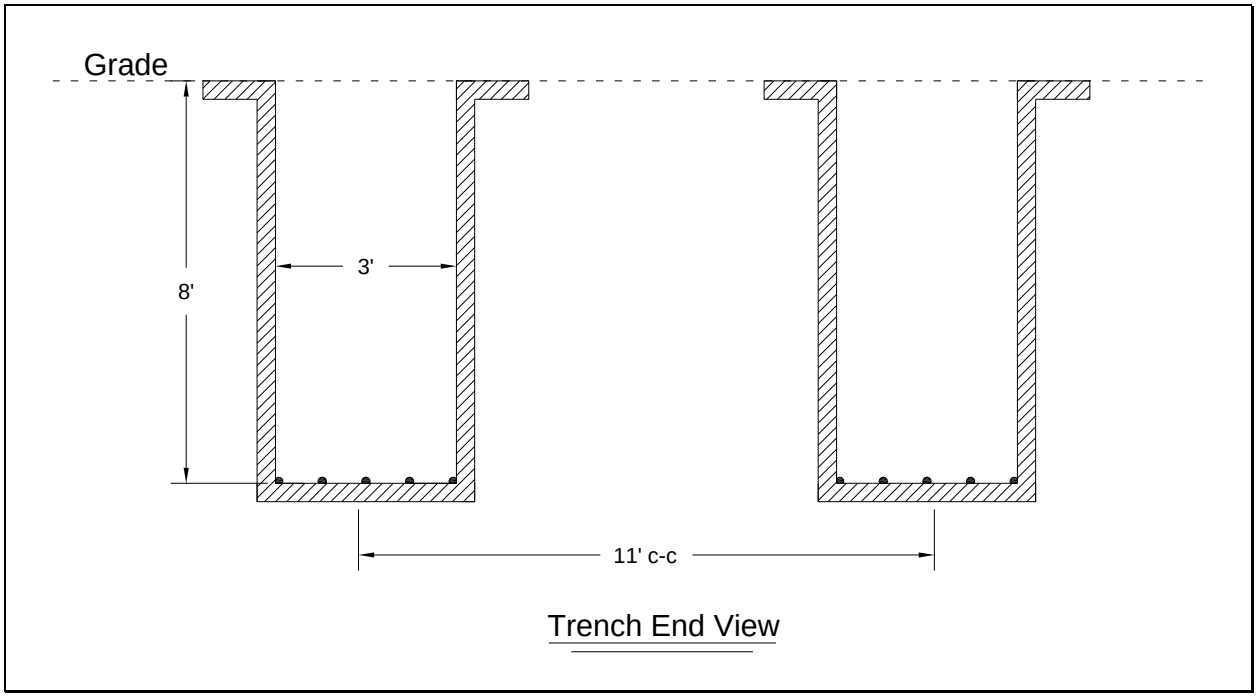
Horizontally-Trenched Slinky Ground Loop Recommendations

Horizontal Trench Layout	6 Trenches – 11' c-c Spacing, Single Flow Path/Trench
Horizontal Trench Dimensions	8' Deep x 3' Wide x 120' Long
GHEX Configuration	Laying 5-pipe (36" pitch x 36" dia. slinky x 600' coil)
GHEX Pipe Diameter	0.75 in (nominal)
Supply-Return Piping Details	Inside-the-Builder Header Method Used

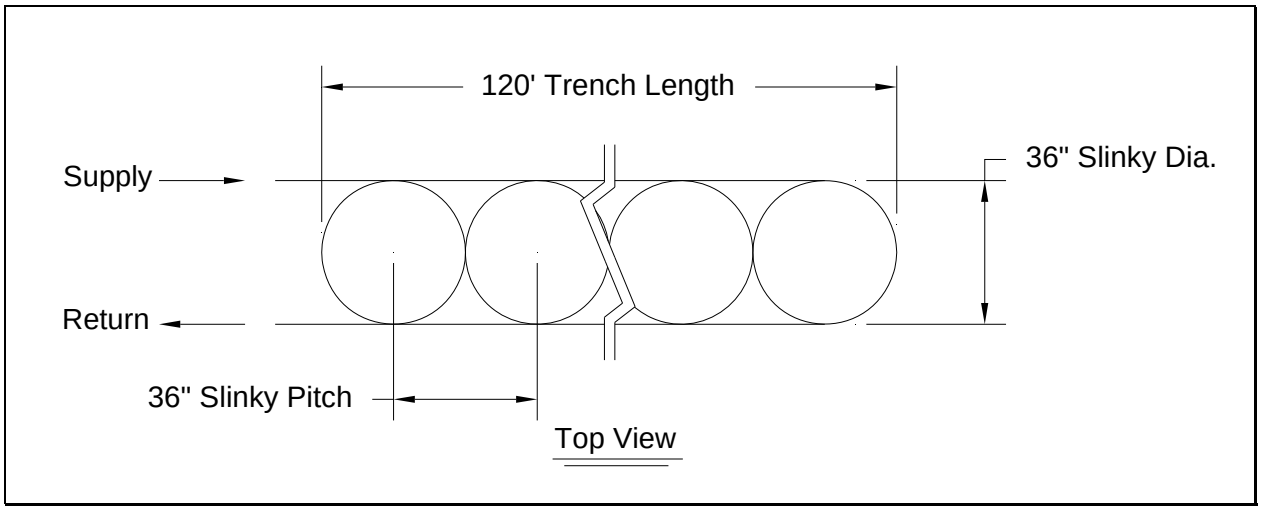
- *Loopfield lengths based on HEATING mode*
- *Average soil temperature at the surface assumed to be 51˚F*
- *Annual soil temperature swing assumed to be 21˚F*
- *Soil thermal conductivity assumed to be 0.75 Btu/hr-ft-˚F*
- *Soil thermal diffusivity assumed to be 0.50 ft^2/day*
- *Entering water temperatures will reach a maximum temperature of 70-75˚F under worst-case conditions in cooling*
- *Entering water temperatures are designed to reach a minimum temperature of 30˚F under worst-case conditions in heating*
- *Loopfield freeze protection to 17˚F (10˚F below the average loop temperature under design conditions) utilizing 20% propylene glycol by volume (or equivalent) is recommended*

The trench details and slinky construction details are shown below:

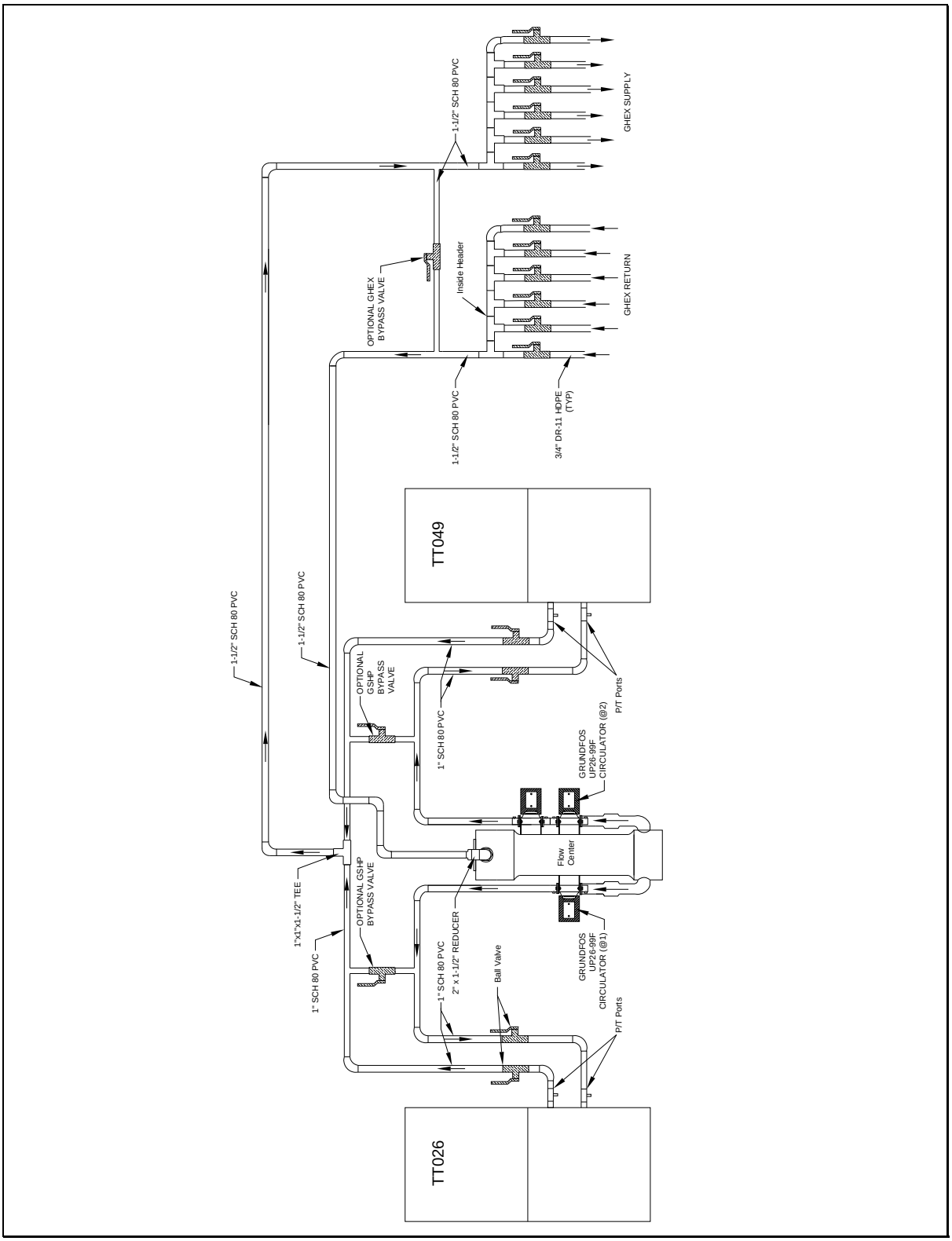
Trench Details:



Slinky Construction Details:



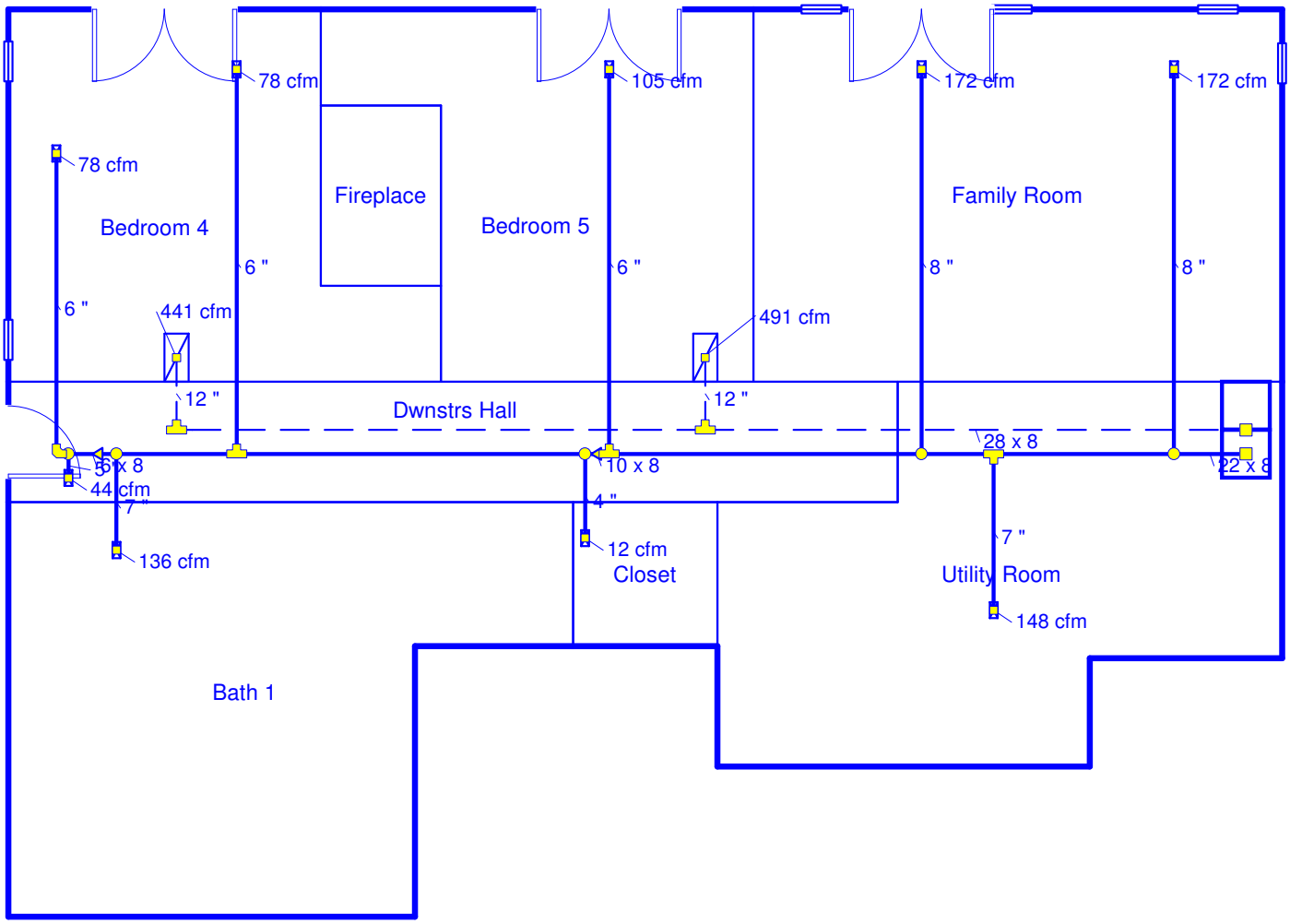
For this system, use of a QT 2-Circuit non-pressurized flow center (manufactured by B&D MFG) in conjunction with the inside-the-building header method is recommended (displayed on the next page):


1-1/2" SCH 80 PVC
GHEX SUPPLY
OPTIONAL GHEX BYPASS VALVE
Inside Header
GHEX RETURN
1-1/2" SCH 80 PVC
3/4" DR-11 HDPE (TYP)
TT049
1-1/2" SCH 80 PVC
1-1/2" SCH 80 PVC
OPTIONAL GSHP BYPASS VALVE
1" SCH 80 PVC
P/T Ports
GRUNDFOS UP26-99F CIRCULATOR (@2)
Flow Center
1"x1"x1-1/2" TEE
OPTIONAL GSHP BYPASS VALVE
1" SCH 80 PVC
1" SCH 80 PVC
2" x 1-1/2" REDUCER
Ball Valve
GRUNDFOS UP26-99F CIRCULATOR (@1)
P/T Ports
TT026

Section 3: Ductwork Design

Ductwork layout recommendations & details for the residence are displayed in the following pages. All ductwork design was performed in accordance with ACCA Manual D.

Basement



Job #: Example Residence **Performed by JMH for:** John Doe 123 Lincoln Ave Boston, MA 20101 Phone: (888) 800-0001 Fax: (888) 800-0002	**Geoconnections, Inc.** 302 E. Warehouse St. Elkton, SD 57026 Phone: 605-542-5261 Fax: 605-542-1303	Scale: 1 : 88 Page 1 Right-Suite Residential 6.0.79 RSR47311 2009-Apr-29 16:24:57 C:\Documents and Settings\Ryan.GEO...

Duct System Summary
Basement

Geoconnections, Inc.

302 E. Warehouse St., Elkton, SD 57026 Phone: 605-542-5261 Fax: 605-542-1303

Job: Example Residence
Date: 1 Jan 2008
By: JMH

Project Information

For: John Doe
123 Lincoln Ave, Boston, MA 20101
Phone: (888) 800-0001 Fax: (888) 800-0002

	Heating	Cooling
External static pressure	0.25 in H2O	0.25 in H2O
Pressure losses	0.00 in H2O	0.00 in H2O
Available static pressure	0.25 in H2O	0.25 in H2O
Supply / return available pressure	0.14 / 0.11 in H2O	0.14 / 0.11 in H2O
Lowest friction rate	0.059 in/100ft	0.059 in/100ft
Actual air flow	775 cfm	***775*** cfm
Total effective length (TEL)	426 ft	

Supply Branch Detail Table

Name		Design (Btuh)	Htg (cfm)	Clg (cfm)	Design FR	Diam (in)	Rect Size (in)	Duct Matl	Actual Ln (ft)	Ftg.Eqv Ln (ft)	Trunk
Bedroom 4-A	h	1524	78	77	0.068	6	0x 0	ShMt	58.0	150.0	st3A
Bedroom 4	h	1524	78	77	0.075	6	0x 0	ShMt	62.0	125.0	st3B
Bedroom 5	h	2038	105	82	0.082	6	0x 0	ShMt	42.5	130.0	st3
Family Room-A	c	1454	105	172	0.067	8	0x 0	ShMt	19.0	190.0	st3
Family Room	c	1454	105	172	0.071	8	0x 0	ShMt	29.5	170.0	st3
Utility Room	c	1249	112	148	0.084	7	0x 0	ShMt	17.0	150.0	st3
Dwnstrs Hall	h	863	44	21	0.059	5	0x 0	ShMt	50.0	190.0	st3B
Bath 1	h	2645	136	26	0.064	7	0x 0	ShMt	51.0	170.0	st3A
Closet	h	227	12	0	0.064	4	0x 0	ShMt	31.0	190.0	st3A

Supply Trunk Detail Table

Name	Trunk Type	Htg (cfm)	Clg (cfm)	Design FR	Veloc (fpm)	Diam (in)	Rect Duct Size (in)	Duct Material	Trunk
st3	Peak AVF	775	775	0.059	634	14	8 x 22	ShtMetl	
st3A	Peak AVF	348	202	0.059	627	10	8 x 10	ShtMetl	st3
st3B	Peak AVF	123	99	0.059	368	7	8 x 6	ShtMetl	st3A

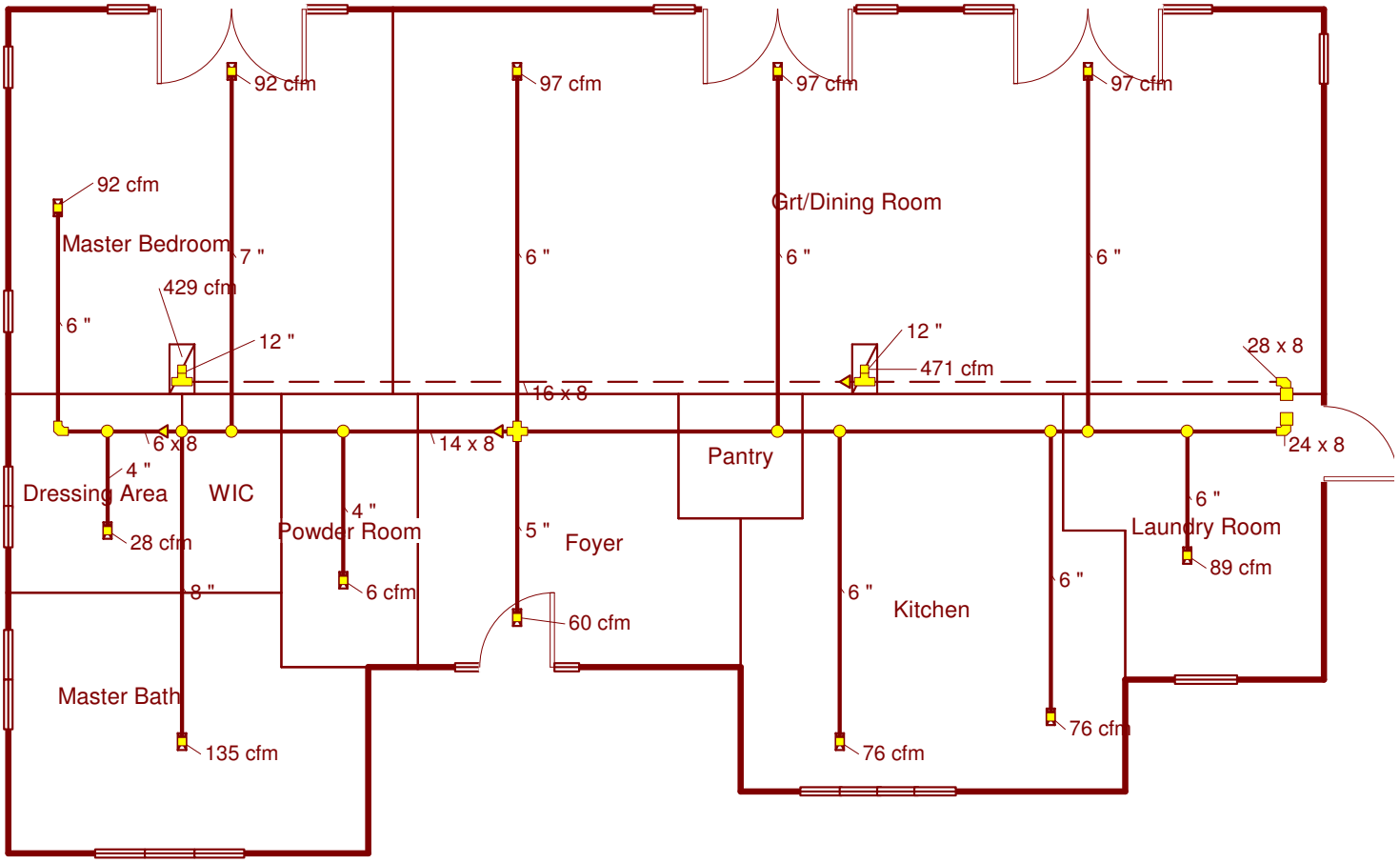
Return Branch Detail Table

Name	Grill Size (in)	Htg (cfm)	Clg (cfm)	TEL (ft)	Design FR	Veloc (fpm)	Diam (in)	RectSize (in)	Stud/Joist Opening (in)	Duct Matl	Trunk
rb1	0x 0	334	491	185.5	0.059	626	12	0x 0		ShMt	rt3
rb4	0x 0	441	284	177.5	0.061	562	12	0x 0		ShMt	rt3

Return Trunk Detail Table

Name	Trunk Type	Htg (cfm)	Clg (cfm)	Design FR	Veloc (fpm)	Diam (in)	Rect Duct Size (in)	Duct Material	Trunk
rt3	Peak AVF	775	775	0.059	498	16	8 x 28	ShtMetl	

1st Floor



Job #: Example Residence **Performed by JMH for:** John Doe 123 Lincoln Ave Boston, MA 20101 Phone: (888) 800-0001 Fax: (888) 800-0002	**Geoconnections, Inc.** 302 E. Warehouse St. Elkton, SD 57026 Phone: 605-542-5261 Fax: 605-542-1303	Scale: 1 : 88 Page 2 Right-Suite Residential 6.0.79 RSR47311 2009-Apr-29 16:24:57 C:\Documents and Settings\Ryan.GEO...

Duct System Summary
Main Level

Geoconnections, Inc.

302 E. Warehouse St., Elkton, SD 57026 Phone: 605-542-5261 Fax: 605-542-1303

Job: Example Residence
Date: 1 Jan 2008
By: JMH

Project Information

For: John Doe
123 Lincoln Ave, Boston, MA 20101
Phone: (888) 800-0001 Fax: (888) 800-0002

	Heating	Cooling
External static pressure	0.25 in H2O	0.25 in H2O
Pressure losses	0.00 in H2O	0.00 in H2O
Available static pressure	0.25 in H2O	0.25 in H2O
Supply / return available pressure	0.15 / 0.10 in H2O	0.15 / 0.10 in H2O
Lowest friction rate	0.046 in/100ft	0.046 in/100ft
Actual air flow	875 cfm	***875*** cfm
Total effective length (TEL)	543 ft	

Supply Branch Detail Table

Name		Design (Btuh)	Htg (cfm)	Clg (cfm)	Design FR	Diam (in)	Rect Size (in)	Duct Matl	Actual Ln (ft)	Ftg.Eqv Ln (ft)	Trunk
Master Bedroom	c	1555	84	92	0.047	7	0x 0	ShMt	57.5	265.0	st2A
Master Bedroom-A	c	1555	84	92	0.054	6	0x 0	ShMt	59.0	220.0	st2B
Laundry Room	c	1497	86	89	0.064	6	0x 0	ShMt	9.5	225.0	st2
Kitchen-A	c	1288	57	76	0.065	6	0x 0	ShMt	21.5	210.0	st2
Kitchen	c	1288	57	76	0.065	6	0x 0	ShMt	31.0	200.0	st2
Foyer	h	1170	60	35	0.069	5	0x 0	ShMt	39.0	180.0	st2
Powder Room	h	123	6	1	0.047	4	0x 0	ShMt	44.5	275.0	st2A
Dressing Area	h	539	28	9	0.046	4	0x 0	ShMt	52.0	275.0	st2B
Master Bath	h	2638	135	112	0.048	8	0x 0	ShMt	57.5	255.0	st2A
Grt/Dining Room-A	c	1643	92	97	0.063	6	0x 0	ShMt	23.0	215.0	st2
Grt/Dining Room	c	1643	92	97	0.067	6	0x 0	ShMt	35.5	190.0	st2
Grt/Dining Room-B	c	1643	92	97	0.067	6	0x 0	ShMt	46.0	180.0	st2

Supply Trunk Detail Table

Name	Trunk Type	Htg (cfm)	Clg (cfm)	Design FR	Veloc (fpm)	Diam (in)	Rect Duct Size (in)	Duct Material	Trunk
st2	Peak AVF	875	875	0.046	656	15	8 x 24	ShtMetl	
st2A	Peak AVF	337	307	0.046	433	11	8 x 14	ShtMetl	st2
st2B	Peak AVF	111	102	0.046	334	7	8 x 6	ShtMetl	st2A

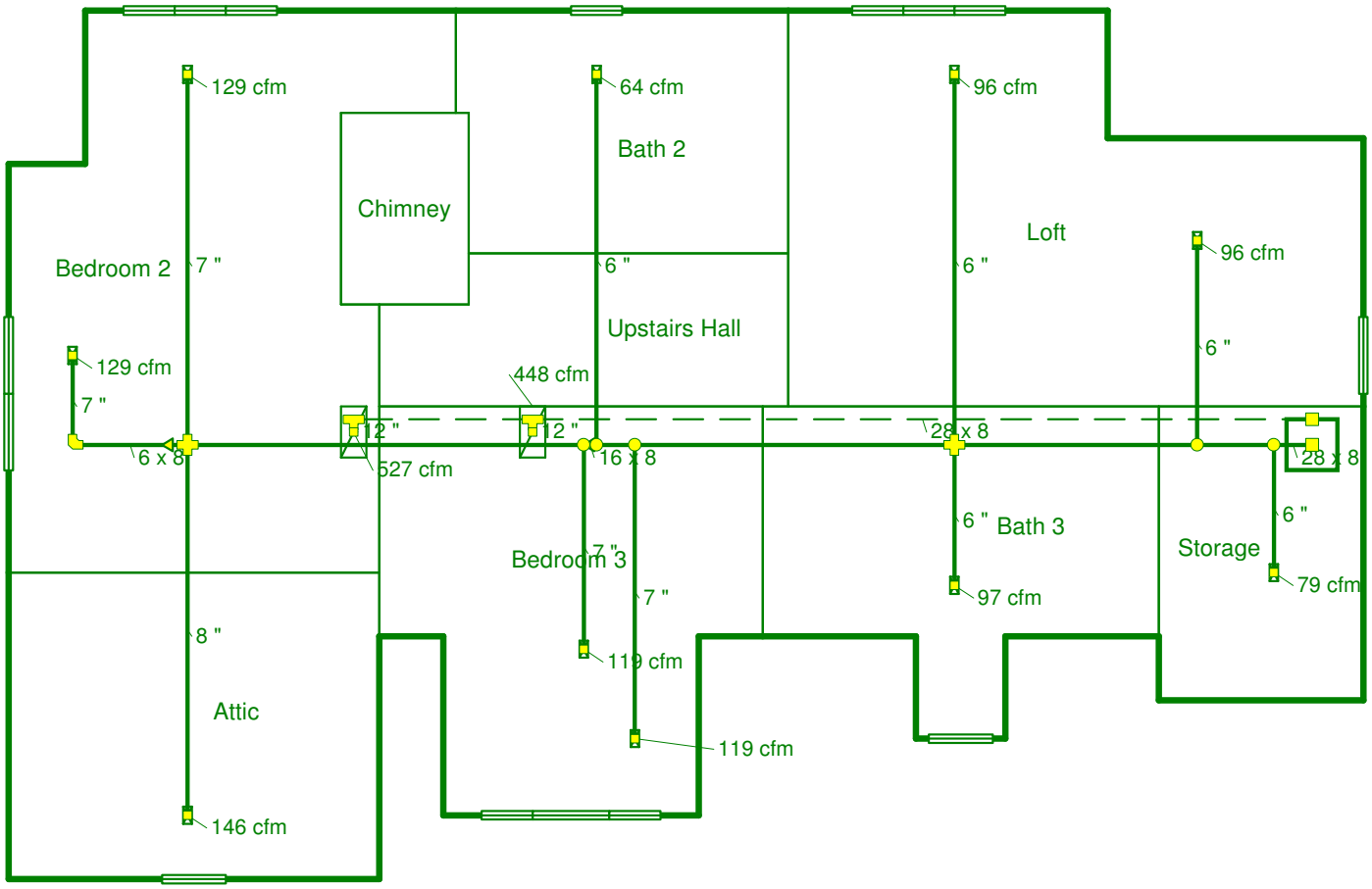
Return Branch Detail Table

Name	Grill Size (in)	Htg (cfm)	Clg (cfm)	TEL (ft)	Design FR	Veloc (fpm)	Diam (in)	RectSize (in)	Stud/Joist Opening (in)	Duct Matl	Trunk
rb2	0x 0	446	471	198.0	0.050	599	12	0x 0		ShMt	rt2
rb5	0x 0	429	404	215.5	0.046	546	12	0x 0		ShMt	rt2A

Return Trunk Detail Table

Name	Trunk Type	Htg (cfm)	Clg (cfm)	Design FR	Veloc (fpm)	Diam (in)	Rect Duct Size (in)	Duct Material	Trunk
rt2	Peak AVF	875	875	0.046	563	16	8 x 28	ShtMetl	
rt2A	Peak AVF	429	404	0.046	483	12	8 x 16	ShtMetl	rt2

2nd Floor



Job #: Example Residence **Performed by JMH for:** John Doe 123 Lincoln Ave Boston, MA 20101 Phone: (888) 800-0001 Fax: (888) 800-0002	**Geoconnections, Inc.** 302 E. Warehouse St. Elkton, SD 57026 Phone: 605-542-5261 Fax: 605-542-1303	Scale: 1 : 88 Page 3 Right-Suite Residential 6.0.79 RSR47311 2009-Apr-29 16:24:57 C:\Documents and Settings\Ryan.GEO...

Duct System Summary
Upper Level

Geoconnections, Inc.

302 E. Warehouse St., Elkton, SD 57026 Phone: 605-542-5261 Fax: 605-542-1303

Job: Example Residence
Date: 1 Jan 2008
By: JMH

Project Information

For: John Doe
123 Lincoln Ave, Boston, MA 20101
Phone: (888) 800-0001 Fax: (888) 800-0002

	Heating	Cooling
External static pressure	0.25 in H2O	0.25 in H2O
Pressure losses	0.00 in H2O	0.00 in H2O
Available static pressure	0.25 in H2O	0.25 in H2O
Supply / return available pressure	0.16 / 0.09 in H2O	0.16 / 0.09 in H2O
Lowest friction rate	0.047 in/100ft	0.047 in/100ft
Actual air flow	950 cfm	***950*** cfm
Total effective length (TEL)	528 ft	

Supply Branch Detail Table

Name	Design (Btuh)	Htg (cfm)	Clg (cfm)	Design FR	Diam (in)	Rect Size (in)	Duct Matl	Actual Ln (ft)	Ftg.Eqv Ln (ft)	Trunk
Loft	h 2186	96	91	0.079	6	0x 0	ShMt	12.5	190.0	st1
Loft-A	h 2186	96	91	0.077	6	0x 0	ShMt	28.5	180.0	st1
Bath 2	h 1449	64	62	0.056	6	0x 0	ShMt	42.5	245.0	st1
Bedroom 2	c 2181	107	129	0.051	7	0x 0	ShMt	58.5	255.0	st1A
Bedroom 2-A	c 2181	107	129	0.047	7	0x 0	ShMt	52.0	285.0	st1B
Attic	h 3310	146	88	0.051	8	0x 0	ShMt	58.5	255.0	st1A
Bedroom 3-A	c 2004	79	119	0.053	7	0x 0	ShMt	36.5	265.0	st1A
Bedroom 3	c 2004	79	119	0.054	7	0x 0	ShMt	38.0	255.0	st1
Storage	h 1805	79	66	0.079	6	0x 0	ShMt	6.5	195.0	st1
Bath 3	h 2215	97	57	0.080	6	0x 0	ShMt	19.5	180.0	st1

Supply Trunk Detail Table

Name	Trunk Type	Htg (cfm)	Clg (cfm)	Design FR	Veloc (fpm)	Diam (in)	Rect Duct Size (in)	Duct Material	Trunk
st1	Peak AVF	950	950	0.047	611	16	8 x 28	ShtMetl	
st1A	Peak AVF	438	466	0.047	524	12	8 x 16	ShtMetl	st1
st1B	Peak AVF	107	129	0.047	388	7	8 x 6	ShtMetl	st1A

Return Branch Detail Table

Name	Grill Size (in)	Htg (cfm)	Clg (cfm)	TEL (ft)	Design FR	Veloc (fpm)	Diam (in)	RectSize (in)	Stud/Joist Opening (in)	Duct Matl	Trunk
rb3	0x 0	502	527	168.0	0.054	671	12	0x 0		ShMt	rt1
rb6	0x 0	448	423	191.0	0.047	571	12	0x 0		ShMt	rt1

Return Trunk Detail Table

Name	Trunk Type	Htg (cfm)	Clg (cfm)	Design FR	Veloc (fpm)	Diam (in)	Rect Duct Size (in)	Duct Material	Trunk
rt1	Peak AVF	950	950	0.047	611	16	8 x 28	ShtMetl	