

REINHARDT ASSOCIATES

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Date: February 26, 2007

To: Victoria A Mario
Assistant Engineer
Town of Swampscott
Swampscott, MA

Reference: Elihu Thomson Administration Building
Revised Geothermal Study

Dear Victoria:

Reinhardt Associates is pleased to submit the attached **revised study** that reflects the estimated additional equipment cost and years estimated operating cost with simple payback in years for the installation of Geothermal heating and cooling systems in lieu of the Conventional heating and cooling systems as presently reflected on the design documents. Please note the yearly operating cost difference reflected in the revised summaries for the Conventional and Geothermal systems. This operating yearly cost adjustments reflected in the revised systems summaries is due to the yearly lighting adjustments also indicated in the yearly cost summaries.

Yearly operating cost was prepared through the use of the Carrier HAP E20-11 Hourly Analysis and System Simulation Program. The RSMeans Mechanical Cost Data, 29th Annual Edition, 2006 were used to estimate equipment cost for the Conventional Heating and Cooling Equipment, and the Geothermal Equipment Cost to include the horizontal closed geothermal loops using trenches was acquired through Geothermal Equipment Suppliers.

Also included is a written description of the Geothermal Process for those whom are not familiar with the operation of Geothermal Systems.

If you have any questions regarding this study or if additional information is needed, please do not hesitate to contact our office.

Sincerely

Ned Trumbull
Mechanical Design Engineer

Cc: John MacMillan - RAI
Douglas C Goodman - RAI

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GEOHERMAL STUDY SUMMATION

ADDITIONAL ESTIMATED COST SUMMATION

Geothermal system estimated cost: ----- \$130,000.00

Conventional system estimated cost: ----- \$ 73,500.00

Additional equipment cost for Geothermal Equipment ----- \$ 56,500.00

Engineering Fees to redesign system ----- \$ 11,000.00

Total Estimated Additional Cost for Geothermal ----- \$ 67,500.00

OPERATING ESTIMATED COST SAVINGS

Conventional system estimated yearly operating cost ----- \$16,020.00

Geothermal system estimated yearly operating cost ----- \$10,465.00

Total Estimated Operating Yearly Cost Savings ----- \$ 5,555.00

SIMPLE PAYBACK IN YEARS ----- 12.10 YEARS

GEOHERMAL HEATING
AND
COOLING SYSTEM
DESCRIPTION

Before we review our findings, we are providing a general overview of a geothermal system and how it operates.

Geothermal System Process:

The geothermal process is based on a simple premise: Below the frost line – usually about four feet deep, the earth is a constant temperature of about 50 degrees Fahrenheit all year long.

During the winter, the heat pump absorbs heat from the ground and uses it to warm the air in your facility. In the warmer summer months, the process is reversed, taking heat from your facility and transferring it back into the ground.

The basic elements of a geothermal system include:

- Underground loops of plastic piping;
- A liquid antifreeze solution;
- A heat pump or pumps; and
- An air distribution system or systems.

The loops of piping are buried in the ground near your facility, either vertically or horizontally. That ground loop is connected to a pumping module inside your facility.

The pump circulates a mixture of water and the antifreeze through the ground loop, where it absorbs heat from the earth. When the heated liquid reaches the heat pump inside your facility, the heat is multiplied and used to warm the air inside the air-handling system. A blower sends the warmed air throughout the building through a duct distribution system.

Energy Efficiency

In general, energy efficiency is calculated as the “useful work” or “energy delivered” divided by the amount of energy supplied to do that work. With heat pumps, energy efficiency is measured in two different ways.

Heating Efficiency is expressed as a Coefficient of Performance (COP). The higher the COP, the more efficient the system.

For Example, a standard-sized geothermal system might have a COP of 3.4 or higher, meaning for every one unit of energy use to power the system, more than three units are put back into your facility as heat. This compares to efficiencies of 0.92 for a high-efficiency natural gas furnace.

Cooling Efficiency is measured as an Energy Efficiency Ratio (EER). The higher the EER, the more efficient the system. Keep in mind that both COP and EER are dependent on many factors, and that high-efficiency equipment comes with a higher price tag, but the energy savings can pay back the difference in just a few years.

Loop Fluids:

A good heat transfer fluid is vital to the operation of geothermal heat pump systems. In most areas, geothermal contractors use a corrosion-inhibited antifreeze solution with a freeze point of 10 degrees or more below the minimum expected temperature.

The antifreeze solutions used are biodegradable, non-toxic, non-corrosive and have properties that will minimize pumping power needed.

- Glycols, specifically ethylene or propylene, are relatively safe and generally non-corrosive, have fair heat transfer and medium cost.
- Alcohol and Water Mixtures, including methyl (methanol), isopropyl or ethyl (ethanol), are relatively non corrosive, have fair heat transfer and medium cost.

Ordinary water can be used in warmer climates where the ground temperature stays warm and the heat pump's heat exchanger refrigerant temperature does not drop below freezing but it is not recommended in this climate.

ESTIMATED EQUIPMENT COST AND SIMPLE PAYBACK

The following is a preliminary cost comparison and simple payback period showing the difference between the conventional heating and cooling system as presently designed and a geothermal heating and cooling system. The added cost reflected below also includes the Engineering Fees to implement a new geothermal system.

The equipment which would be replaced with the geothermal system and associated estimated cost is as follows:

(2) 12 ton air cooled condensers	\$12,000.00
(1) 10 ton air cooled condenser	\$ 7,500.00
(2) 12 ton air handling units	\$15,000.00
(1) 10 ton air handling unit	\$10,000.00
(1) 7.5 ton packaged roof top unit	\$14,000.00
Refrigerant piping	\$ 6,500.00
Replacement gas fired burner	<u>\$ 8,500.00</u>
Total Estimated Cost	\$73,500.00

Due to the geothermal equipment limitations in regards to capacity, additional geothermal heat pumps will be required to meet the same heating and cooling loads as the conventional equipment. The associated cost for the Geothermal System Equipment is as follows:

(6) geothermal heat pumps would be required to match the heating and cooling loads	\$42,000.00
Additional outside air louvers for heat pumps located In the Basement Areas	8,000.00
Horizontal ground loops using trenches	\$76,000.00
Reseed disturbed lawn areas and maintain	<u>\$ 4,000.00</u>
Total Estimated Geothermal Equipment Cost	\$130,000.00
Engineering Design Fee @10%	\$ 11,000.00
Total associated cost for the Geothermal System	\$141,000.00

The above estimated cost does not reflect installation of the geothermal heat pumps or conventional heating equipment, nor does it reflect unknown conditions such as ledge when excavating for the ground loops. Those dollars indicated are strictly equipment cost. The cost reflected for the horizontal ground loops does reflect trenching and backfilling.

The additional cost estimated to convert the present conventional heating and cooling system to a geothermal system is \$67,500.00.

Using the simple payback method; additional cost as reflected above divided by yearly operating cost savings, which is the difference between the yearly operating cost for a geothermal system (\$10,465.00) verses a conventional system (\$16,020.00), equates to the following:

Additional Cost = \$67,500 / Operating Cost saving = \$5,555.00 reflects a payback period of 12.10 years.

Additional Considerations:

1. The average life expectancy for geothermal heat pumps is Approximately 15 years +/-.
2. The Mechanical Systems as designed would need to be modified to accommodate the additional equipment. The additional redesign cost would encompass the following:

Horizontal closed loop systems – The trenching for the loop systems will be approximately twenty-five hundred (2500) square feet in area.

Redesign of the duct distribution systems to accommodate the additional required heat pumps.

Additional areas for heat pumps will be required in the Basement Areas of the Annex and Main Building. This will also require the installation of additional outside air louvers for ventilation air.

The duct distribution system will require redesign to accommodate the additional equipment.

The Temperature control systems will require modification to accommodate the additional equipment.

3. The geothermal system do not accommodate fin tube radiation as presently provided. Eliminating perimeter radiation will reduce comfort levels along the exterior walls.
4. Due to the additional equipment, maintenance cost will be slightly higher.

CONVENTIONAL HEATING AND COOLING SYSTEM OPERATING COST ANALYSIS

OPERATING COST SUMMATION = \$16,020.00 PER YEAR

**ELECTRIC RATES USED TO ESTABLISH OPERATING COST
.15 CENTS/KWH**

**NATURAL GAS RATE USED TO ESTABLISH OPERATING COST
\$2.30/THERM**

Annual Cost Summary

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
10:10AM

Table 1. Annual Costs

Component	BLOCK LOAD(1) (\$)
Air System Fans	3,796
Cooling	3,478
Heating	8,565
Pumps	180
Cooling Tower Fans	0
HVAC Sub-Total	16,020
Lights	9,266
Electric Equipment	7,186
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	16,452
Grand Total	32,472

Table 2. Annual Cost per Unit Floor Area

Component	BLOCK LOAD(1) (\$/ft²)
Air System Fans	0.227
Cooling	0.208
Heating	0.512
Pumps	0.011
Cooling Tower Fans	0.000
HVAC Sub-Total	0.957
Lights	0.554
Electric Equipment	0.429
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	0.983
Grand Total	1.940
Gross Floor Area (ft²)	16741.0
Conditioned Floor Area (ft²)	16741.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	BLOCK LOAD(1) (%)
Air System Fans	11.7
Cooling	10.7
Heating	26.4
Pumps	0.6
Cooling Tower Fans	0.0
HVAC Sub-Total	49.3
Lights	28.5
Electric Equipment	22.1
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	50.7
Grand Total	100.0

Annual Energy and Emissions Summary

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
10:10AM

Table 1. Annual Costs

Component	BLOCK LOAD(1) (\$)
HVAC Components	
Electric	7,455
Natural Gas	8,565
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Remote CW	0
HVAC Sub-Total	16,020
Non-HVAC Components	
Electric	16,452
Natural Gas	0
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Non-HVAC Sub-Total	16,452
Grand Total	32,472

Table 2. Annual Energy Consumption

Component	BLOCK LOAD(1)
HVAC Components	
Electric (kWh)	41,416
Natural Gas (Therm)	3,724
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0
Non-HVAC Components	
Electric (kWh)	91,400
Natural Gas (Therm)	0
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Totals	
Electric (kWh)	132,816
Natural Gas (Therm)	3,724
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0

Annual Energy and Emissions Summary

Swampscott Geothermal
Reinhardt Associates, Inc.

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Table 3. Annual Emissions

Component	BLOCK LOAD(1)
CO2 (lb)	0
SO2 (kg)	0
NOx (kg)	0

Table 4. Annual Cost per Unit Floor Area

Component	BLOCK LOAD(1) (\$/ft ²)
HVAC Components	
Electric	0.445
Natural Gas	0.512
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Remote CW	0.000
HVAC Sub-Total	0.957
Non-HVAC Components	
Electric	0.983
Natural Gas	0.000
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Non-HVAC Sub-Total	0.983
Grand Total	1.940
Gross Floor Area (ft ²)	16741.0
Conditioned Floor Area (ft ²)	16741.0

Note: Values in this table are calculated using the Gross Floor Area.

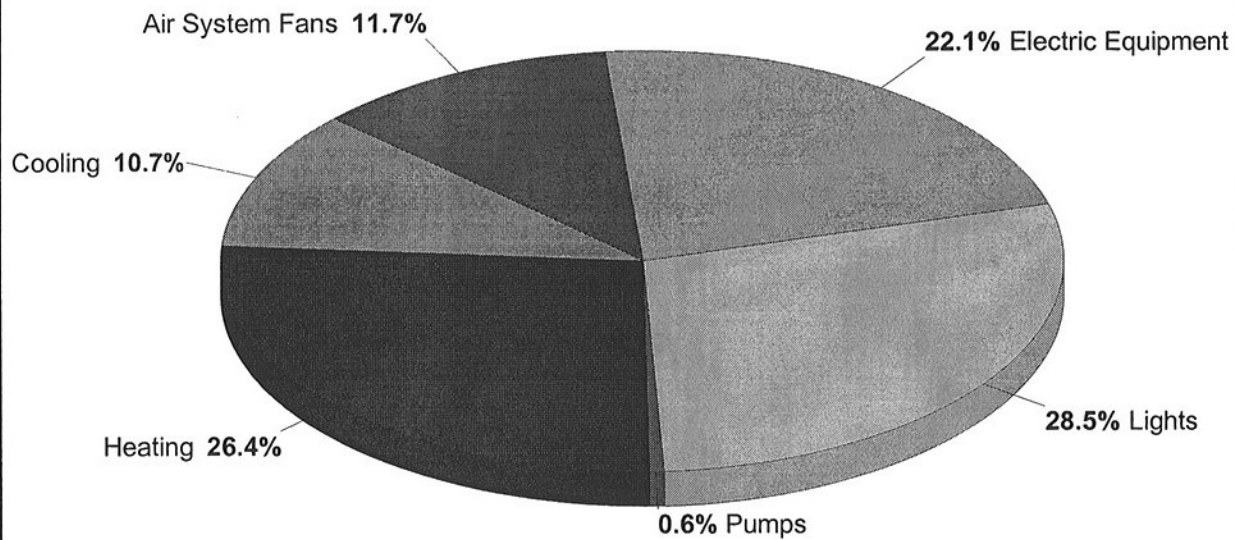
Table 5. Component Cost as a Percentage of Total Cost

Component	BLOCK LOAD(1) (%)
HVAC Components	
Electric	23.0
Natural Gas	26.4
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Remote CW	0.0
HVAC Sub-Total	49.3
Non-HVAC Components	
Electric	50.7
Natural Gas	0.0
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Non-HVAC Sub-Total	50.7
Grand Total	100.0

Annual Component Costs - BLOCK LOAD(1)

Swampscott Geothermal
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1. Annual Costs

Component	Annual Cost (\$)	(\$/ft²)	Percent of Total (%)
Air System Fans	3,796	0.227	11.7
Cooling	3,478	0.208	10.7
Heating	8,565	0.512	26.4
Pumps	180	0.011	0.6
Cooling Tower Fans	0	0.000	0.0
HVAC Sub-Total	16,020	0.957	49.3
Lights	9,266	0.554	28.5
Electric Equipment	7,186	0.429	22.1
Misc. Electric	0	0.000	0.0
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	16,452	0.983	50.7
Grand Total	32,472	1.940	100.0

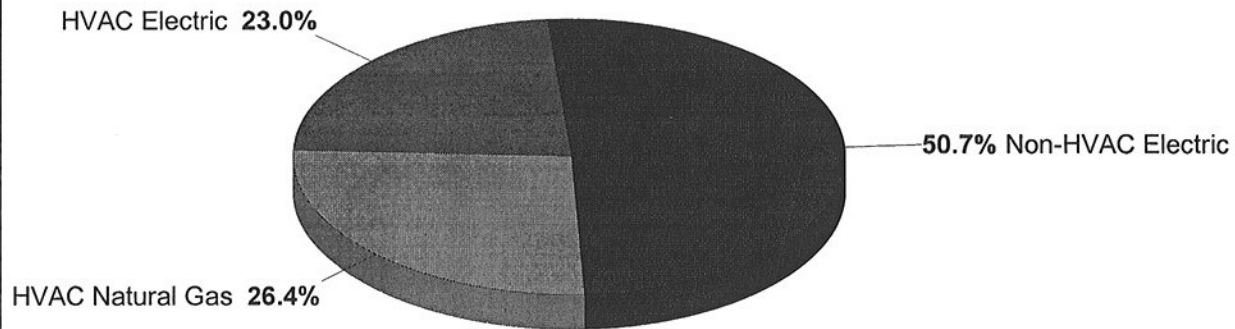
Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area 16741.0 ft²
Conditioned Floor Area 16741.0 ft²

Annual Energy Costs - BLOCK LOAD(1)

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Reinhardt Associates, Inc.

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1. Annual Costs

Component	Annual Cost (\$/yr)	(\$/ft²)	Percent of Total (%)
HVAC Components			
Electric	7,455	0.445	23.0
Natural Gas	8,565	0.512	26.4
Fuel Oil	0	0.000	0.0
Propane	0	0.000	0.0
Remote Hot Water	0	0.000	0.0
Remote Steam	0	0.000	0.0
Remote Chilled Water	0	0.000	0.0
HVAC Sub-Total	16,020	0.957	49.3
Non-HVAC Components			
Electric	16,452	0.983	50.7
Natural Gas	0	0.000	0.0
Fuel Oil	0	0.000	0.0
Propane	0	0.000	0.0
Remote Hot Water	0	0.000	0.0
Remote Steam	0	0.000	0.0
Non-HVAC Sub-Total	16,452	0.983	50.7
Grand Total	32,472	1.940	100.0

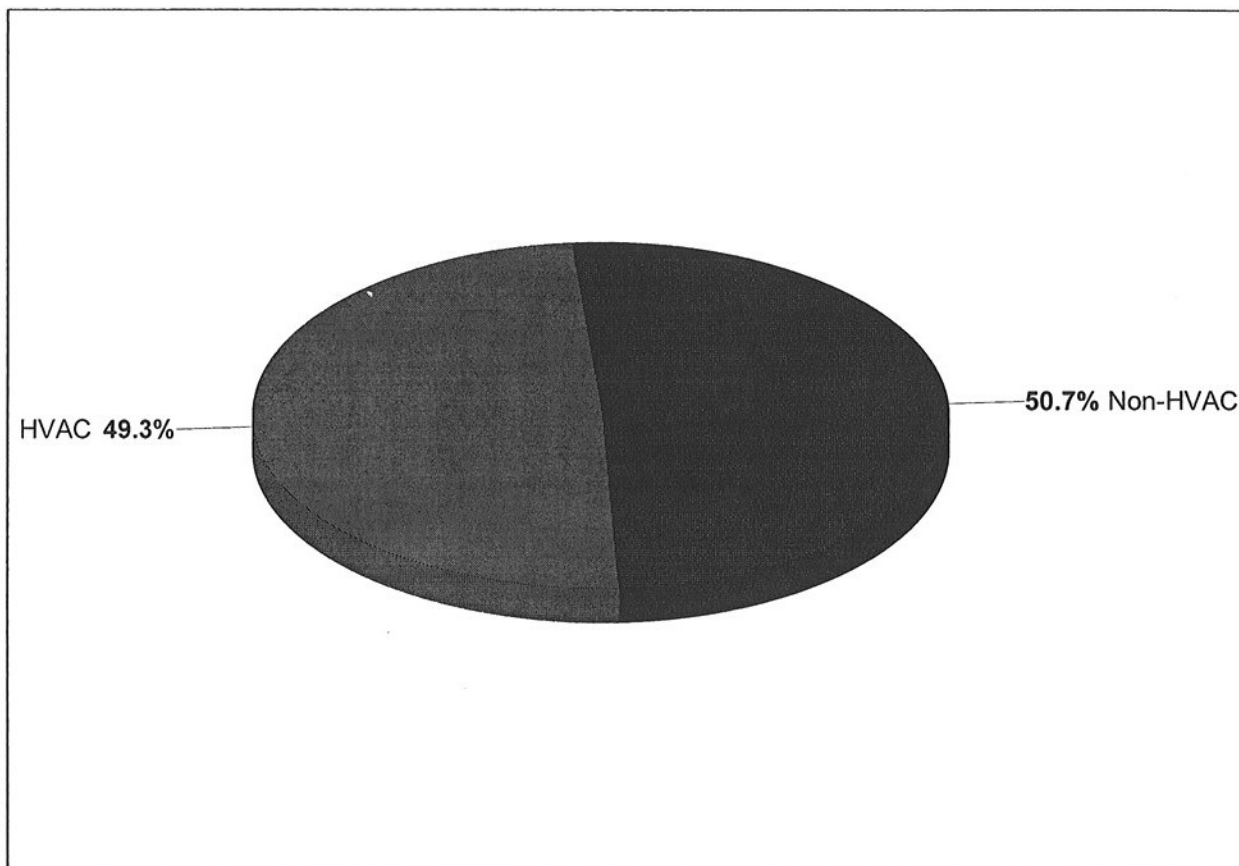
Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area 16741.0 ft²
Conditioned Floor Area 16741.0 ft²

Annual HVAC & Non-HVAC Cost Totals - BLOCK LOAD(1)

Swampscott Geothermal
Reinhardt Associates, Inc.

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1. Annual Costs

Component	Annual Cost (\$/yr)	(\$/ft²)	Percent of Total (%)
HVAC	16,020	0.957	49.3
Non-HVAC	16,452	0.983	50.7
Grand Total	32,472	1.940	100.0

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area 16741.0 ft²
Conditioned Floor Area 16741.0 ft²

Energy Budget by System Component - BLOCK LOAD(1)

Swampscott Geothermal
Reinhardt Associates, Inc.

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1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/ft ²)
Cooling Coil Loads	189,244	11.304
Heating Coil Loads	301,184	17.991
Grand Total	490,428	29.295

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/ft ²)	Source Energy (kBTU)	Source Energy (kBTU/ft ²)
Air System Fans	71,962	4.299	257,009	15.352
Cooling	65,932	3.938	235,473	14.066
Heating	372,391	22.244	372,391	22.244
Pumps	3,417	0.204	12,205	0.729
Cooling Towers	0	0.000	0	0.000
HVAC Sub-Total	513,703	30.685	877,077	52.391
Lights	175,645	10.492	627,305	37.471
Electric Equipment	136,216	8.137	486,484	29.059
Misc. Electric	0	0.000	0	0.000
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	311,861	18.629	1,113,789	66.531
Grand Total	825,564	49.314	1,990,866	118.922

Notes:

- 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
- 'Heating Coil Loads' is the sum of all air system heating coil loads.
- Site Energy is the actual energy consumed.
- Source Energy is the site energy divided by the electric generating efficiency (28.0%).
- Source Energy for fuels equals the site energy value.
- Energy per unit floor area is based on the gross building floor area.
Gross Floor Area **16741.0** ft²
Conditioned Floor Area **16741.0** ft²

Energy Budget by Energy Source - BLOCK LOAD(1)

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
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1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/ft²)
Cooling Coil Loads	189,244	11.304
Heating Coil Loads	301,184	17.991
Grand Total	490,428	29.295

2. Energy Consumption by Energy Source

Component	Site Energy (kBTU)	Site Energy (kBTU/ft²)	Source Energy (kBTU)	Source Energy (kBTU/ft²)
HVAC Components				
Electric	141,312	8.441	504,687	30.147
Natural Gas	372,391	22.244	372,391	22.244
Fuel Oil	0	0.000	0	0.000
Propane	0	0.000	0	0.000
Remote Hot Water	0	0.000	0	0.000
Remote Steam	0	0.000	0	0.000
Remote Chilled Water	0	0.000	0	0.000
HVAC Sub-Total	513,703	30.685	877,078	52.391
Non-HVAC Components				
Electric	311,856	18.628	1,113,770	66.530
Natural Gas	0	0.000	0	0.000
Fuel Oil	0	0.000	0	0.000
Propane	0	0.000	0	0.000
Remote Hot Water	0	0.000	0	0.000
Remote Steam	0	0.000	0	0.000
Non-HVAC Sub-Total	311,856	18.628	1,113,770	66.530
Grand Total	825,559	49.314	1,990,848	118.921

Notes:

1. 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
2. 'Heating Coil Loads' is the sum of all air system heating coil loads.
3. Site Energy is the actual energy consumed.
4. Source Energy is the site energy divided by the electric generating efficiency (28.0%).
5. Source Energy for fuels equals the site energy value.
6. Energy per unit floor area is based on the gross building floor area.
 Gross Floor Area 16741.0 ft²
 Conditioned Floor Area 16741.0 ft²

GEOHERMAL HEATING AND COOLING SYSTEM OPERATING COST ANALYSIS

OPERATING COST SUMMATION = \$10,465.00

**ELECTRIC RATES USED TO ESTABLISH OPERATING COST
.15 CENTS/KWH**

**NATURAL GAS RATE USED TO ESTABLISH OPERATING COST
\$2.30/THERM**

Annual Cost Summary

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
10:12AM

Table 1. Annual Costs

Component	BLOCK LOAD(2A) (\$)
Air System Fans	3,033
Cooling	2,134
Heating	5,464
Pumps	142
Cooling Tower Fans	0
HVAC Sub-Total	10,773
Lights	9,266
Electric Equipment	7,186
Misc. Electric	0
Misc. Fuel Use	0
Non-HVAC Sub-Total	16,452
Grand Total	27,225

Table 2. Annual Cost per Unit Floor Area

Component	BLOCK LOAD(2A) (\$/ft ²)
Air System Fans	0.181
Cooling	0.128
Heating	0.326
Pumps	0.009
Cooling Tower Fans	0.000
HVAC Sub-Total	0.644
Lights	0.554
Electric Equipment	0.429
Misc. Electric	0.000
Misc. Fuel Use	0.000
Non-HVAC Sub-Total	0.983
Grand Total	1.626
Gross Floor Area (ft ²)	16741.0
Conditioned Floor Area (ft ²)	16741.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	BLOCK LOAD(2A) (%)
Air System Fans	11.1
Cooling	7.8
Heating	20.1
Pumps	0.5
Cooling Tower Fans	0.0
HVAC Sub-Total	39.6
Lights	34.0
Electric Equipment	26.4
Misc. Electric	0.0
Misc. Fuel Use	0.0
Non-HVAC Sub-Total	60.4
Grand Total	100.0

Annual Energy and Emissions Summary

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
10:12AM

Table 1. Annual Costs

Component	BLOCK LOAD(2A) (\$)
HVAC Components	
Electric	5,309
Natural Gas	5,464
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Remote CW	0
HVAC Sub-Total	10,773
Non-HVAC Components	
Electric	16,452
Natural Gas	0
Fuel Oil	0
Propane	0
Remote HW	0
Remote Steam	0
Non-HVAC Sub-Total	16,452
Grand Total	27,226

Table 2. Annual Energy Consumption

Component	BLOCK LOAD(2A)
HVAC Components	
Electric (kWh)	29,495
Natural Gas (Therm)	2,876
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0
Non-HVAC Components	
Electric (kWh)	91,401
Natural Gas (Therm)	0
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Totals	
Electric (kWh)	120,896
Natural Gas (Therm)	2,876
Fuel Oil (na)	0
Propane (na)	0
Remote HW (na)	0
Remote Steam (na)	0
Remote CW (na)	0

Annual Energy and Emissions Summary

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
10:12AM

Table 3. Annual Emissions

Component	BLOCK LOAD(2A)
CO2 (lb)	0
SO2 (kg)	0
NOx (kg)	0

Table 4. Annual Cost per Unit Floor Area

Component	BLOCK LOAD(2A) (\$/ft ²)
HVAC Components	
Electric	0.317
Natural Gas	0.326
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Remote CW	0.000
HVAC Sub-Total	0.644
Non-HVAC Components	
Electric	0.983
Natural Gas	0.000
Fuel Oil	0.000
Propane	0.000
Remote HW	0.000
Remote Steam	0.000
Non-HVAC Sub-Total	0.983
Grand Total	1.626
Gross Floor Area (ft ²)	16741.0
Conditioned Floor Area (ft ²)	16741.0

Note: Values in this table are calculated using the Gross Floor Area.

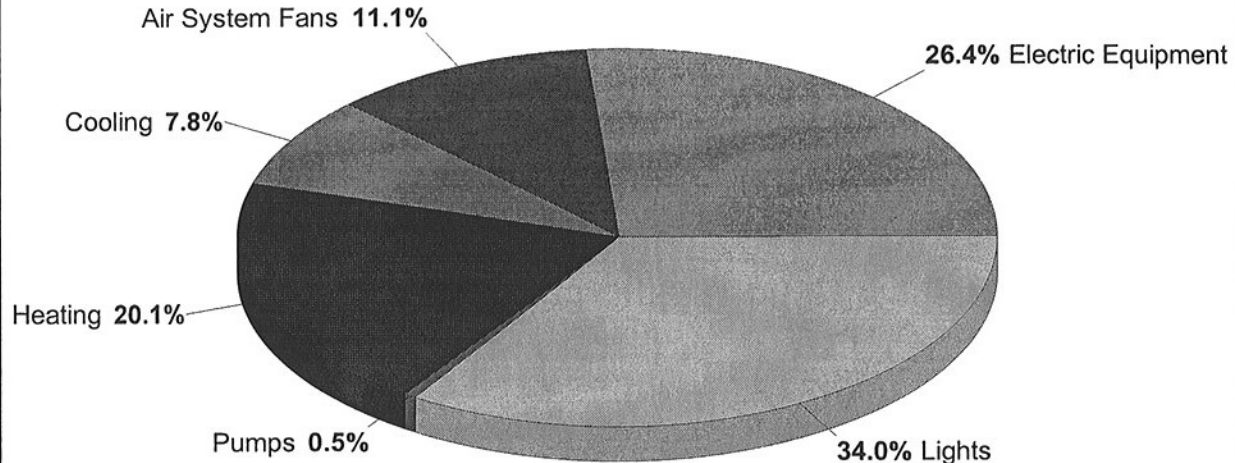
Table 5. Component Cost as a Percentage of Total Cost

Component	BLOCK LOAD(2A) (%)
HVAC Components	
Electric	19.5
Natural Gas	20.1
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Remote CW	0.0
HVAC Sub-Total	39.6
Non-HVAC Components	
Electric	60.4
Natural Gas	0.0
Fuel Oil	0.0
Propane	0.0
Remote HW	0.0
Remote Steam	0.0
Non-HVAC Sub-Total	60.4
Grand Total	100.0

Annual Component Costs - BLOCK LOAD(2A)

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
10:12AM



1. Annual Costs

Component	Annual Cost (\$)	(\$/ft²)	Percent of Total (%)
Air System Fans	3,033	0.181	11.1
Cooling	2,134	0.128	7.8
Heating	5,464	0.326	20.1
Pumps	142	0.009	0.5
Cooling Tower Fans	0	0.000	0.0
HVAC Sub-Total	10,773	0.644	39.6
Lights	9,266	0.554	34.0
Electric Equipment	7,186	0.429	26.4
Misc. Electric	0	0.000	0.0
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	16,452	0.983	60.4
Grand Total	27,225	1.626	100.0

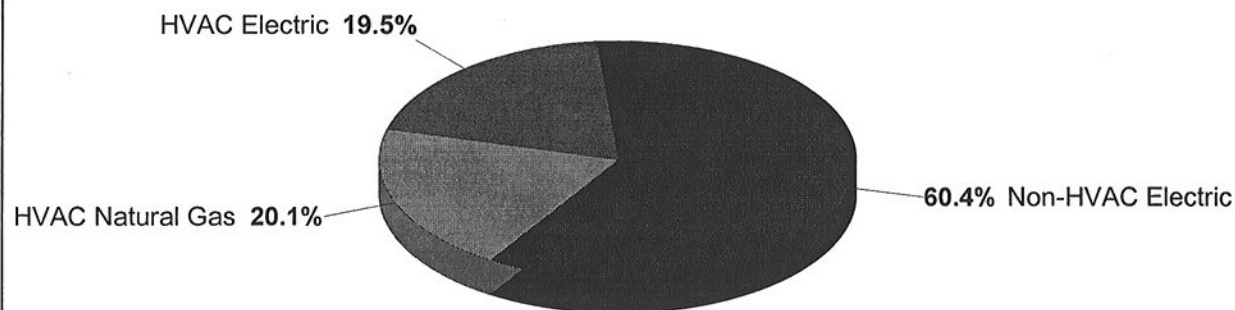
Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area 16741.0 ft²
Conditioned Floor Area 16741.0 ft²

Annual Energy Costs - BLOCK LOAD(2A)

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
10:12AM



1. Annual Costs

Component	Annual Cost (\$/yr)	(\$/ft²)	Percent of Total (%)
HVAC Components			
Electric	5,309	0.317	19.5
Natural Gas	5,464	0.326	20.1
Fuel Oil	0	0.000	0.0
Propane	0	0.000	0.0
Remote Hot Water	0	0.000	0.0
Remote Steam	0	0.000	0.0
Remote Chilled Water	0	0.000	0.0
HVAC Sub-Total	10,773	0.644	39.6
Non-HVAC Components			
Electric	16,452	0.983	60.4
Natural Gas	0	0.000	0.0
Fuel Oil	0	0.000	0.0
Propane	0	0.000	0.0
Remote Hot Water	0	0.000	0.0
Remote Steam	0	0.000	0.0
Non-HVAC Sub-Total	16,452	0.983	60.4
Grand Total	27,226	1.626	100.0

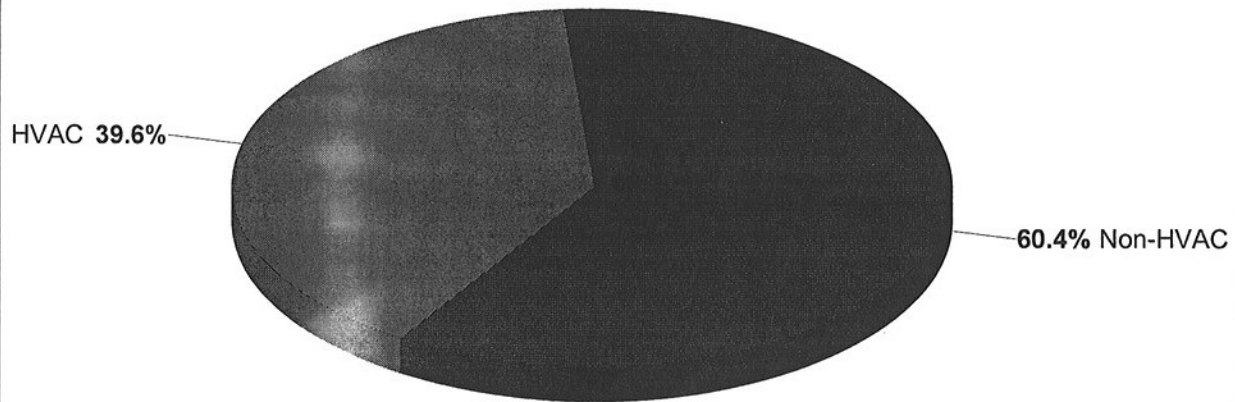
Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area 16741.0 ft²
Conditioned Floor Area 16741.0 ft²

Annual HVAC & Non-HVAC Cost Totals - BLOCK LOAD(2A)

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
10:12AM



1. Annual Costs

Component	Annual Cost (\$/yr)	(\$/ft ²)	Percent of Total (%)
HVAC	10,773	0.644	39.6
Non-HVAC	16,452	0.983	60.4
Grand Total	27,225	1.626	100.0

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area 16741.0 ft²
Conditioned Floor Area 16741.0 ft²

Energy Budget by System Component - BLOCK LOAD(2A)

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
10:12AM

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/ft²)
Cooling Coil Loads	174,172	10.404
Heating Coil Loads	232,605	13.894
Grand Total	406,777	24.298

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/ft²)	Source Energy (kBTU)	Source Energy (kBTU/ft²)
Air System Fans	57,492	3.434	205,327	12.265
Cooling	40,451	2.416	144,469	8.630
Heating	287,590	17.179	287,590	17.179
Pumps	2,695	0.161	9,624	0.575
Cooling Towers	0	0.000	0	0.000
HVAC Sub-Total	388,228	23.190	647,010	38.648
Lights	175,645	10.492	627,303	37.471
Electric Equipment	136,214	8.137	486,480	29.059
Misc. Electric	0	0.000	0	0.000
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	311,859	18.629	1,113,783	66.530
Grand Total	700,087	41.819	1,760,793	105.179

Notes:

1. 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
2. 'Heating Coil Loads' is the sum of all air system heating coil loads.
3. Site Energy is the actual energy consumed.
4. Source Energy is the site energy divided by the electric generating efficiency (28.0%).
5. Source Energy for fuels equals the site energy value.
6. Energy per unit floor area is based on the gross building floor area.
 Gross Floor Area 16741.0 ft²
 Conditioned Floor Area 16741.0 ft²

Energy Budget by Energy Source - BLOCK LOAD(2A)

Swampscott Geothermal
Reinhardt Associates, Inc.

02/26/2007
10:12AM

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/ft²)
Cooling Coil Loads	174,172	10.404
Heating Coil Loads	232,605	13.894
Grand Total	406,777	24.298

2. Energy Consumption by Energy Source

Component	Site Energy (kBTU)	Site Energy (kBTU/ft²)	Source Energy (kBTU)	Source Energy (kBTU/ft²)
HVAC Components				
Electric	100,638	6.011	359,420	21.469
Natural Gas	287,590	17.179	287,590	17.179
Fuel Oil	0	0.000	0	0.000
Propane	0	0.000	0	0.000
Remote Hot Water	0	0.000	0	0.000
Remote Steam	0	0.000	0	0.000
Remote Chilled Water	0	0.000	0	0.000
HVAC Sub-Total	388,228	23.190	647,010	38.648
Non-HVAC Components				
Electric	311,860	18.629	1,113,787	66.531
Natural Gas	0	0.000	0	0.000
Fuel Oil	0	0.000	0	0.000
Propane	0	0.000	0	0.000
Remote Hot Water	0	0.000	0	0.000
Remote Steam	0	0.000	0	0.000
Non-HVAC Sub-Total	311,860	18.629	1,113,787	66.531
Grand Total	700,088	41.819	1,760,797	105.179

Notes:

- 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
- 'Heating Coil Loads' is the sum of all air system heating coil loads.
- Site Energy is the actual energy consumed.
- Source Energy is the site energy divided by the electric generating efficiency (28.0%).
- Source Energy for fuels equals the site energy value.
- Energy per unit floor area is based on the gross building floor area.
Gross Floor Area 16741.0 ft²
Conditioned Floor Area 16741.0 ft²

BUILDING HEATING
AND
COOLING LOAD
ANALYSIS

Air System Sizing Summary for BLD'G BLOCK LOADS(1)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:49PM

Air System Information

Air System Name BLD'G BLOCK LOADS(1)
Equipment Class SPLT AHU
Air System Type VVT

Number of zones 1
Floor Area 9473.0 ft²
Location Boston, Massachusetts

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM Peak zone sensible load
Space CFM Individual peak space loads

Calculation Months Jan to Dec
Sizing Data Calculated

Central Cooling Coil Sizing Data

Total coil load 20.7 Tons
Total coil load 248.3 MBH
Sensible coil load 221.4 MBH
Coil CFM at Jul 1500 8545 CFM
Max block CFM at Jul 1500 8545 CFM
Sum of peak zone CFM 8545 CFM
Sensible heat ratio 0.891
ft²/Ton 457.7
BTU/(hr-ft²) 26.2
Water flow @ 10.0 °F rise N/A

Load occurs at Jul 1500
OA DB / WB 90.5 / 72.9 °F
Entering DB / WB 80.1 / 64.6 °F
Leaving DB / WB 56.1 / 54.7 °F
Coil ADP 53.4 °F
Bypass Factor 0.100
Resulting RH 43 %
Design supply temp. 58.0 °F
Zone T-stat Check 0 of 1 OK
Max zone temperature deviation 2.5 °F

Central Heating Coil Sizing Data

Max coil load 217.3 MBH
Coil CFM at Des Htg 4536 CFM
Max coil CFM 8545 CFM
Water flow @ 20.0 °F drop 21.74 gpm

Load occurs at Des Htg
BTU/(hr-ft²) 22.9
Ent. DB / Lvg DB 63.7 / 108.1 °F

Supply Fan Sizing Data

Actual max CFM at Jul 1500 8545 CFM
Standard CFM 8536 CFM
Actual max CFM/ft² 0.90 CFM/ft²

Fan motor BHP 6.85 BHP
Fan motor kW 5.11 kW
Fan static 2.75 in wg

Outdoor Ventilation Air Data

Design airflow CFM 825 CFM
CFM/ft² 0.09 CFM/ft²

CFM/person 18.32 CFM/person

Zone Sizing Summary for BLD'G BLOCK LOADS(1)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:49PM

Air System Information

Air System Name **BLD'G BLOCK LOADS(1)**
Equipment Class **SPLT AHU**
Air System Type **VVT**

Number of zones **1**
Floor Area **9473.0** ft²
Location **Boston, Massachusetts**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM **Peak zone sensible load**
Space CFM **Individual peak space loads**

Calculation Months **Jan to Dec**
Sizing Data **Calculated**

Zone Sizing Data

Zone Name	Maximum Cooling Sensible (MBH)	Design Air Flow (CFM)	Minimum Air Flow (CFM)	Time of Peak Load	Maximum Heating Load (MBH)	Zone Floor Area (ft ²)	Zone CFM/ft ²
Zone 1	156.7	8545	825	Jul 1500	179.4	9473.0	0.90

Zone Terminal Sizing Data

No Zone Terminal Sizing Data required for this system.

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft ²)	Space CFM/ft ²
Zone 1							
2nd Engineering #218	1	8.5	Aug 1500	462	9.3	315.0	1.47
2nd Hall / Stair 2B #236	1	2.8	Jul 1500	162	6.3	525.0	0.31
2nd Plan Room #230	1	4.3	Jul 1600	237	8.6	172.0	1.38
2nd Sel/Meet #225	1	9.6	Aug 1500	523	7.8	215.0	2.43
2nd Stair 3	1	2.6	Jul 1800	141	3.1	84.0	1.68
2nd Stair 3 at Unix #23	1	1.2	Jul 1800	63	2.2	96.0	0.66
2nd Storage #229(deleted)	1	2.3	Jul 1800	134	5.2	92.0	1.46
2nd Town Adm #222	1	6.7	Aug 1500	363	9.3	238.0	1.52
2nd Unisex Toilet #234	1	1.7	Jul 1800	94	2.5	74.0	1.27
3rd Fl Office #310	1	3.3	Aug 1500	181	2.1	185.0	0.98
3rd FL Corridor at stair	1	1.5	Jun 1500	81	0.6	60.0	1.35
3rd FL Corridor(E-W)	1	0.5	Jul 1500	28	0.3	110.0	0.25
3rd FL Corridor(N-S)	1	0.4	Jul 1500	23	0.3	79.0	0.29
3rd Fl. CLO #313	1	0.4	Jul 0100	39	1.5	11.0	3.52
3rd Fl. Closet #312	1	0.1	Jul 1400	3	0.1	25.0	0.13
3rd Fl. Closet #314	1	0.1	Jul 1500	4	0.1	12.0	0.31
3rd Fl. Closet #319	1	0.1	Jul 1500	7	0.1	23.0	0.30
3rd Fl. Mech #318	1	3.1	Jul 1500	168	3.7	279.0	0.60
3rd Fl. Office #311	1	6.9	Aug 1500	378	4.0	370.0	1.02
3rd Fl. Office #319	1	5.0	Jul 1500	273	2.6	400.0	0.68
3rd Fl. Office 315	1	2.9	Aug 1200	158	1.9	168.0	0.94
3rd Fl. Office 316	1	2.8	Jul 1500	151	2.1	198.0	0.76
3rd Fl. Office Vide #322	1	2.7	Jul 1500	145	1.9	182.0	0.80
3rd Fl. Stair #S04	1	0.1	Jul 1500	8	0.1	27.0	0.30
3rd Fl. Stair S02	1	0.4	Jul 1500	24	0.3	84.0	0.28
3rd Fl. Storage #309	1	0.4	Jul 1500	42	1.6	34.0	1.24
3rd Fl.Off #311(orig,ref)	1	8.4	Aug 1500	459	3.7	693.0	0.66
Annex Bsmt Stair #S01	1	0.4	Jan 1500	23	0.3	111.0	0.21
Annex Bsmt Storage #B01	1	3.3	Jan 1500	178	2.6	861.0	0.21
Annex Bsmt Storage #B02	1	1.1	Jan 1500	59	0.9	285.0	0.21
Anx 1st Assesor Dir #101	1	3.0	Aug 1200	162	3.1	142.0	1.14
Anx 1st Bldg Dpt #103	1	12.7	Jul 1500	693	16.8	575.0	1.20
Anx 1st Stair 1A	1	0.9	Jul 1500	49	1.9	164.0	0.30

Zone Sizing Summary for BLD'G BLOCK LOADS(1)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:49PM

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
Anx 1st Tax Assessor#102	1	15.3	Aug 1500	832	13.0	402.0	2.07
Anx 1st Vault 1A #100	1	2.3	Jul 0800	198	7.7	165.0	1.20
Anx 2nd Assist.Off. #210	1	6.6	Jul 1500	361	9.1	283.0	1.28
Anx 2nd Closet Area #210	1	1.9	Jul 1600	104	3.9	83.0	1.25
Anx 2nd Corridor #211	1	0.4	Jan 1500	24	0.0	118.0	0.21
Anx 2nd Data #204	1	7.3	Sep 1200	398	3.2	223.0	1.79
Anx 2nd Server Spec.#203	1	4.1	Jul 1500	224	1.7	228.0	0.98
Anx 2nd Stair 2A	1	2.0	Jul 1500	106	3.6	103.0	1.03
Anx 2nd Town Acct. #202	1	8.6	Aug 1500	467	10.8	223.0	2.10
Anx 2nd Town Treas.#201	1	5.1	Sep 1200	278	4.5	126.0	2.20
Anx 2nd Vault 2A	1	2.2	Jul 0000	179	6.9	165.0	1.08
Anx 3rd Closet #302	1	0.3	Aug 1500	17	0.4	37.0	0.45
Anx 3rd Corr @ stair S01	1	0.3	Jul 1400	19	0.2	74.0	0.25
Anx 3rd Corridor #306(E)	1	0.6	Jul 1500	30	0.4	108.0	0.28
Anx 3rd Corridor(N)	1	0.2	Jul 1500	11	0.1	39.0	0.29
Anx 3rd Corridor(S)(Mech	1	2.2	Sep 1500	121	2.2	93.0	1.30
Anx 3rd Mech #301	1	2.6	Jul 1800	140	4.9	114.0	1.23

Ventilation Sizing Summary for BLD'G BLOCK LOADS(1)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:50PM

1. Summary

Ventilation Sizing Method	Sum of Space OA Airflows
Design Ventilation Airflow Rate	825 CFM

2. Space Ventilation Analysis Table

Ventilation Sizing Summary for BLD'G BLOCK LOADS(1)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
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Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft³)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
2nd Engineering #218	1	315.0	2.0	461.7	20.00	0.00	0.0	0.0	40.0
2nd Hall / Stair 2B #236	1	525.0	0.0	162.0	0.00	0.05	0.0	0.0	26.3
2nd Plan Room #230	1	172.0	2.0	237.2	0.00	0.00	0.0	0.0	0.0
2nd Sel/Meet #225	1	215.0	10.0	522.6	20.00	0.00	0.0	0.0	200.0
2nd Stair 3	1	84.0	0.0	141.3	0.00	0.05	0.0	0.0	4.2
2nd Stair 3 at Unix #23	1	96.0	0.0	63.5	20.00	0.00	0.0	0.0	0.0
2nd Storage #229(deleted)	1	92.0	0.0	134.4	0.00	0.05	0.0	0.0	4.6
2nd Town Adm #222	1	238.0	1.0	362.6	20.00	0.00	0.0	0.0	20.0
2nd Unisex Toilet #234	1	74.0	0.0	93.9	20.00	0.00	0.0	0.0	0.0
3rd Fl Office #310	1	185.0	1.0	181.3	0.00	0.05	0.0	0.0	9.3
3rd FL Corridor at stair	1	60.0	0.0	80.9	0.00	0.05	0.0	0.0	3.0
3rd FL Corridor(E-W)	1	110.0	0.0	27.7	0.00	0.05	0.0	0.0	5.5
3rd FL Corridor(N-S)	1	79.0	0.0	22.6	0.00	0.05	0.0	0.0	4.0
3rd Fl. CLO #313	1	11.0	0.0	38.7	0.00	0.05	0.0	0.0	0.6
3rd Fl. Closet #312	1	25.0	0.0	3.3	0.00	0.05	0.0	0.0	1.3
3rd Fl. Closet #314	1	12.0	0.0	3.7	0.00	0.05	0.0	0.0	0.6
3rd Fl. Closet #319	1	23.0	0.0	6.8	0.00	0.05	0.0	0.0	1.2
3rd Fl. Mech #318	1	279.0	0.0	167.5	0.00	0.05	0.0	0.0	14.0
3rd Fl. Office #311	1	370.0	3.0	378.2	0.00	0.05	0.0	0.0	18.5
3rd Fl. Office #319	1	400.0	3.0	272.6	0.00	0.05	0.0	0.0	20.0
3rd Fl. Office 315	1	168.0	1.0	158.1	0.00	0.05	0.0	0.0	8.4
3rd Fl. Office 316	1	198.0	1.0	150.6	0.00	0.05	0.0	0.0	9.9
3rd Fl. Office Vide #322	1	182.0	1.0	144.9	0.00	0.05	0.0	0.0	9.1
3rd Fl. Stair #S04	1	27.0	0.0	8.0	0.00	0.05	0.0	0.0	1.4
3rd Fl. Stair S02	1	84.0	0.0	23.5	0.00	0.05	0.0	0.0	4.2
3rd Fl. Storage #309	1	34.0	0.0	42.2	0.00	0.05	0.0	0.0	1.7
3rd Fl.Off #311(orig,ref	1	693.0	4.0	459.4	0.00	0.05	0.0	0.0	34.7
Annex Bsmt Stair #S01	1	111.0	0.0	23.0	0.00	0.05	0.0	0.0	5.6
Annex Bsmt Storage #B01	1	861.0	0.0	178.3	0.00	0.05	0.0	0.0	43.1
Annex Bsmt Storage #B02	1	285.0	0.0	59.0	0.00	0.05	0.0	0.0	14.3
Annex 1st Assesor Dir #101	1	142.0	1.0	162.4	20.00	0.00	0.0	0.0	20.0
Anx 1st Bldg Dpt #103	1	575.0	5.0	692.9	20.00	0.00	0.0	0.0	100.0
Anx 1st Stair 1A	1	164.0	0.0	48.5	0.00	0.05	0.0	0.0	8.2
Anx 1st Tax Assessor#102	1	402.0	4.0	831.6	20.00	0.00	0.0	0.0	80.4
Anx 1st Vault 1A #100	1	165.0	0.0	197.9	0.00	0.00	0.0	0.0	0.0
Anx 2nd Assist.Off. #210	1	283.0	2.0	361.2	20.00	0.00	0.0	0.0	40.0
Anx 2nd Closet Area #210	1	83.0	0.0	103.6	0.00	0.00	0.0	0.0	0.0
Anx 2nd Corridor #211	1	118.0	0.0	24.4	0.00	0.05	0.0	0.0	5.9
Anx 2nd Data #204	1	223.0	0.0	398.3	20.00	0.00	0.0	0.0	0.0
Anx 2nd Server Spec#203	1	228.0	1.0	223.5	0.00	0.00	0.0	0.0	0.0

Ventilation Sizing Summary for BLD'G BLOCK LOADS(1)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
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Anx 2nd Stair 2A	1	103.0	0.0	106.5	0.00	0.05	0.0	0.0	5.2
Anx 2nd Town Acct. #202	1	223.0	2.0	467.3	20.00	0.00	0.0	0.0	40.0
Anx 2nd Town Treas.#201	1	126.0	1.0	277.6	20.00	0.00	0.0	0.0	20.0
Anx 2nd Vault 2A	1	165.0	0.0	178.7	0.00	0.00	0.0	0.0	0.0
Anx 3rd Closet #302	1	37.0	0.0	16.5	20.00	0.00	0.0	0.0	0.0
Anx 3rd Corr @ stair S01	1	74.0	0.0	18.8	20.00	0.00	0.0	0.0	0.0
Anx 3rd Corridor #306(E)	1	108.0	0.0	30.4	20.00	0.00	0.0	0.0	0.0
Anx 3rd Corridor(N)	1	39.0	0.0	11.2	20.00	0.00	0.0	0.0	0.0
Anx 3rd Corridor(S)(Mech	1	93.0	0.0	120.8	20.00	0.00	0.0	0.0	0.0
Anx 3rd Mech #301	1	114.0	0.0	140.1	20.00	0.00	0.0	0.0	0.0
Totals (incl. Space Multipliers)				9021.6					824.6

Air System Design Load Summary for BLD'G BLOCK LOADS(1)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:50PM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 90.5 °F / 72.9 °F			HEATING OA DB / WB 7.0 °F / 4.9 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	844 ft²	37230	-	844 ft²	-	-
Wall Transmission	4392 ft²	16249	-	4392 ft²	82748	-
Roof Transmission	3611 ft²	6391	-	3611 ft²	10863	-
Window Transmission	835 ft²	9816	-	835 ft²	51524	-
Skylight Transmission	9 ft²	68	-	9 ft²	355	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	2954 ft²	590	-	2954 ft²	5635	-
Partitions	460 ft²	285	-	460 ft²	1494	-
Ceiling	1325 ft²	3138	-	1325 ft²	10443	-
Overhead Lighting	12147 W	32351	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	9210 W	28349	-	0	0	-
People	45	8007	9229	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	14247	923	10%	16306	0
>> Total Zone Loads	-	156721	10152	-	179368	0
Zone Conditioning	-	193715	10152	-	176839	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	8545 CFM	0	-	7743 CFM	0	-
Ventilation Load	825 CFM	10255	16787	825 CFM	56444	0
Supply Fan Load	8545 CFM	17421	-	7743 CFM	-15949	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	221390	26939	-	217334	0
Central Cooling Coil	-	221390	26958	-	0	0
Central Heating Coil	-	0	-	-	217272	-
>> Total Conditioning	-	221390	26958	-	217272	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

Zone Design Load Summary for BLD'G BLOCK LOADS(1)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:50PM

Zone 1	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 90.5 °F / 72.9 °F			HEATING OA DB / WB 7.0 °F / 4.9 °F		
	OCCUPIED T-STAT 75.0 °F			OCCUPIED T-STAT 74.0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	844 ft²	37230	-	844 ft²	-	-
Wall Transmission	4392 ft²	16249	-	4392 ft²	82748	-
Roof Transmission	3611 ft²	6391	-	3611 ft²	10863	-
Window Transmission	835 ft²	9816	-	835 ft²	51524	-
Skylight Transmission	9 ft²	68	-	9 ft²	355	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	2954 ft²	590	-	2954 ft²	5635	-
Partitions	460 ft²	285	-	460 ft²	1494	-
Ceiling	1325 ft²	3138	-	1325 ft²	10443	-
Overhead Lighting	12147 W	32351	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	9210 W	28349	-	0	0	-
People	45	8007	9229	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	14247	923	10%	16306	0
>> Total Zone Loads	-	156721	10152	-	179368	0

System Psychrometrics for BLD'G BLOCK LOADS(1)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:50PM

July DESIGN COOLING DAY, 1500

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°F)	Specific Humidity (lb/lb)	Airflow (CFM)	CO2 Level (ppm)	Sensible Heat (BTU/hr)	Latent Heat (BTU/hr)
Ventilation Air	Inlet	90.5	0.01330	825	400	10255	16787
Vent - Return Mixing	Outlet	80.1	0.00942	8545	907	-	-
Central Cooling Coil	Outlet	56.1	0.00876	8545	907	221390	26958
Central Heating Coil	Outlet	108.1	0.00942	0	907	0	-
Supply Fan	Outlet	58.0	0.00942	8545	907	17421	-
Cold Supply Duct	Outlet	58.0	0.00876	8545	907	-	-
Zone Air	-	79.0	0.00901	8545	961	193715	10152
Return Plenum	Outlet	79.0	0.00901	8545	961	0	-
Bypass Air	Outlet	0.0	0.00943	0	907	-	-
Return Duct	Outlet	79.0	0.00901	8545	961	-	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1.080; At site altitude = 1.079 BTU/(hr-CFM-F)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 4746.6; At site altitude = 4741.5 BTU/(hr-CFM)

Site Altitude = 30.0 ft

TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (BTU/hr)	T-stat Mode	Zone Cond (BTU/hr)	Zone Temp (°F)	Zone Airflow (CFM)	CO2 Level (ppm)	Terminal Heating Coil (BTU/hr)	Zone Heating Unit (BTU/hr)
Zone 1	156721	Cooling	193715	79.0	8545	961	0	0

System Psychrometrics for BLD'G BLOCK LOADS(1)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:50PM

WINTER DESIGN HEATING

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°F)	Specific Humidity (lb/lb)	Airflow (CFM)	CO2 Level (ppm)	Sensible Heat (BTU/hr)	Latent Heat (BTU/hr)
Ventilation Air	Inlet	7.0	0.00055	825	400	-56444	0
Vent - Return Mixing	Outlet	63.7	0.00055	7743	483	-	-
Central Cooling Coil	Outlet	56.1	0.00055	0	483	0	0
Central Heating Coil	Outlet	108.1	0.00055	4536	483	217272	-
Supply Fan	Outlet	58.0	0.00055	7743	483	15949	-
Hot Supply Duct	Outlet	110.0	0.00055	4536	0	0	-
Zone Air	-	73.2	0.00055	4923	493	-176839	0
Return Plenum	Outlet	73.2	0.00055	4923	493	0	-
Bypass Air	Outlet	65.6	0.00055	2820	483	-	-
Return Duct	Outlet	70.5	0.00055	7743	493	-	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1.080; At site altitude = 1.079 BTU/(hr-CFM-F)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 4746.6; At site altitude = 4741.5 BTU/(hr-CFM)

Site Altitude = 30.0 ft

TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (BTU/hr)	T-stat Mode	Zone Cond (BTU/hr)	Zone Temp (°F)	Zone Airflow (CFM)	CO2 Level (ppm)	Terminal Heating Coil (BTU/hr)	Zone Heating Unit (BTU/hr)
Zone 1	-179368	Heating	-176839	73.2	4923	493	0	0

Air System Sizing Summary for BLD'G BLOCK LOADS(2A)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:52PM

Air System Information

Air System Name BLD'G BLOCK LOADS(2A)
Equipment Class SPLT AHU
Air System Type VVT

Number of zones 1
Floor Area 7268.0 ft²
Location Boston, Massachusetts

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM Peak zone sensible load
Space CFM Individual peak space loads

Calculation Months Jan to Dec
Sizing Data Calculated

Central Cooling Coil Sizing Data

Total coil load 22.8 Tons
Total coil load 273.6 MBH
Sensible coil load 231.1 MBH
Coil CFM at Jul 1500 8901 CFM
Max block CFM at Jul 1500 8901 CFM
Sum of peak zone CFM 8901 CFM
Sensible heat ratio 0.845
ft²/Ton 318.7
BTU/(hr-ft²) 37.6
Water flow @ 10.0 °F rise N/A

Load occurs at Jul 1500
OA DB / WB 90.5 / 72.9 °F
Entering DB / WB 80.5 / 65.4 °F
Leaving DB / WB 56.4 / 55.0 °F
Coil ADP 53.7 °F
Bypass Factor 0.100
Resulting RH 45 %
Design supply temp. 58.0 °F
Zone T-stat Check 0 of 1 OK
Max zone temperature deviation 2.2 °F

Central Heating Coil Sizing Data

Max coil load 216.6 MBH
Coil CFM at Des Htg 3588 CFM
Max coil CFM 8901 CFM
Water flow @ 20.0 °F drop 21.68 gpm

Load occurs at Des Htg
BTU/(hr-ft²) 29.8
Ent. DB / Lvg DB 52.4 / 108.4 °F

Supply Fan Sizing Data

Actual max CFM at Jul 1500 8901 CFM
Standard CFM 8891 CFM
Actual max CFM/ft² 1.22 CFM/ft²

Fan motor BHP 6.04 BHP
Fan motor kW 4.50 kW
Fan static 2.50 in wg

Outdoor Ventilation Air Data

Design airflow CFM 1308 CFM
CFM/ft² 0.18 CFM/ft²

CFM/person 20.19 CFM/person

Zone Sizing Summary for BLD'G BLOCK LOADS(2A)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:52PM

Air System Information

Air System Name BLD'G BLOCK LOADS(2A)
Equipment Class SPLT AHU
Air System Type VVT

Number of zones 1
Floor Area 7268.0 ft²
Location Boston, Massachusetts

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM Peak zone sensible load
Space CFM Individual peak space loads

Calculation Months Jan to Dec
Sizing Data Calculated

Zone Sizing Data

Zone Name	Maximum Cooling Sensible (MBH)	Design Air Flow (CFM)	Minimum Air Flow (CFM)	Time of Peak Load	Maximum Heating Load (MBH)	Zone Floor Area (ft ²)	Zone CFM/ft ²
Zone 1	163.2	8901	1308	Jul 1500	156.2	7268.0	1.22

Zone Terminal Sizing Data

No Zone Terminal Sizing Data required for this system.

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft ²)	Space CFM/ft ²
Zone 1							
1FI Conn. Conf Rm #126	1	9.9	Jul 1500	542	7.9	272.0	1.99
1FI Conn. Corr #104 (N)	1	4.5	Jul 1700	245	6.3	208.0	1.18
1FI Conn. Corr #104 (S)	1	7.0	Aug 1600	381	10.4	125.0	3.05
1FI Conn. Corr#104(middl	1	0.4	Jul 1500	22	0.0	113.0	0.20
1FI Conn. Corridor	1	6.7	Jul 1600	364	6.5	428.0	0.85
1FI Conn. Entr. Vst #109	1	2.9	Jul 1500	158	6.3	63.0	2.50
1FI Conn. Jan Cl # 105	1	0.4	Aug 1500	24	1.1	22.0	1.11
1FI Conn. M Toilet #106	1	1.7	Jul 1500	91	0.2	109.0	0.84
1FI Conn. Sto Cl#108	1	0.1	Jul 1500	7	0.0	32.0	0.23
1FI Conn. W Toilet #107	1	1.9	Jul 1500	104	1.4	109.0	0.96
1FI Conn.Conf Rm #1	1	6.2	Jul 1700	341	5.3	132.0	2.58
1FI Conn.Conf Rm #2	1	3.9	Jul 1500	210	3.0	135.0	1.56
1st FI Elections #124	1	5.3	Aug 1500	291	4.3	233.0	1.25
1st FI Entry Vest.	1	1.0	Jul 0800	54	1.3	42.0	1.28
1st FI Main Hall #116	1	2.5	Jul 1500	139	0.4	610.0	0.23
1st FI Meeting Rm #112	1	9.9	Sep 1500	542	6.2	239.0	2.27
1st FI Toilet #117	1	1.2	Aug 1100	66	1.7	35.0	1.88
1st FI Vault 1B #110	1	0.4	Jul 1500	23	0.1	99.0	0.23
1st FI Vault 1C&1D	1	0.9	Jul 1500	58	2.6	112.0	0.52
1st FI Vestibule #118	1	1.9	Jul 1700	105	4.8	62.0	1.69
1st Health & Rec Dpt#111	1	6.6	Aug 1500	361	6.7	336.0	1.07
1st Selectmen Meet#113	1	9.0	Aug 1500	492	8.6	318.0	1.55
1st Tax Collector #121	1	3.6	Jul 1500	197	5.9	116.0	1.70
1st Town Clerk #120	1	9.0	Aug 1500	489	4.6	360.0	1.36
1st Vault #122	1	0.8	Jul 1500	45	1.4	84.0	0.54
1st Vault (#121)	1	0.9	Jul 1500	48	1.6	84.0	0.57
1st Vest #123	1	1.0	Jul 1500	81	3.7	64.0	1.26
2FI Conn. Asst Eng #237	1	3.4	Jul 1400	187	3.5	145.0	1.29
2FI Conn. Corr #212(midd	1	0.6	Jul 1500	31	0.1	113.0	0.27
2FI Conn. Corr #212(N)	1	1.7	Jul 1400	94	1.0	210.0	0.45
2FI Conn. Corr #212(S)	1	5.2	Sep 1500	281	3.1	120.0	2.34
2FI Conn. Jan #213	1	0.3	Aug 1400	16	0.3	22.0	0.71
2FI Conn. M Toilet# 214	1	0.5	Jul 1500	27	0.1	109.0	0.25

Zone Sizing Summary for BLD'G BLOCK LOADS(2A)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
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Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
2FI Conn. Sto #216	1	0.2	Jul 1500	10	0.0	39.0	0.25
2FI Conn. W Toilet #215	1	2.5	Jul 1600	138	3.1	109.0	1.27
2FI Conn. Town Plann #238	1	4.5	Jul 1500	243	4.7	145.0	1.67
2FI Health Dept	1	7.4	Sep 1200	405	4.6	317.0	1.28
2FI Vault 2B	1	0.2	Jul 1600	13	0.0	95.0	0.14
2fl Veteran/Conservation	1	5.8	Aug 1500	315	4.3	250.0	1.26
2nd Adm Asst #220	1	9.8	Sep 1500	535	6.7	239.0	2.24
2nd Break Room #230(dele	1	7.0	Jul 1500	384	3.0	84.0	4.57
2nd Closet #219	1	0.1	Jul 1500	3	0.1	8.0	0.39
2nd Closet #221	1	0.1	Jul 1500	3	0.1	8.0	0.39
2nd Closet #223	1	0.1	Jul 1500	5	0.1	12.0	0.39
2nd Closet #224	1	0.1	Jul 1500	6	0.1	15.0	0.39
2nd Closet #226	1	0.1	Jul 1500	6	0.1	16.0	0.39
2nd Closet #228	1	0.2	Jul 1500	11	0.2	28.0	0.39
2nd Closet #229	1	2.6	Jul 1600	144	5.4	92.0	1.57
2nd DPW #227	1	7.5	Aug 1500	411	4.9	325.0	1.26
2nd DPW Super#232	1	9.7	Jul 1500	531	8.1	225.0	2.36

Ventilation Sizing Summary for BLD'G BLOCK LOADS(2A)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:52PM

1. Summary

Ventilation Sizing Method	Sum of Space OA Airflows	
Design Ventilation Airflow Rate	1308	CFM

2. Space Ventilation Analysis Table

Ventilation Sizing Summary for BLD'G BLOCK LOADS(2A)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
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Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
1FI Conn. Conf Rm #126	1	272.0	13.0	542.2	20.00	0.00	0.0	0.0	260.0
1FI Conn. Corr #104 (N)	1	208.0	0.0	245.2	20.00	0.00	0.0	0.0	0.0
1FI Conn. Corr #104 (S)	1	125.0	0.0	381.0	20.00	0.00	0.0	0.0	0.0
1FI Conn. Corr#104(middl	1	113.0	0.0	22.1	20.00	0.00	0.0	0.0	0.0
1FI Conn. Corridor	1	428.0	4.3	363.6	20.00	0.00	0.0	0.0	85.6
1FI Conn. Entr. Vst #109	1	63.0	0.0	157.7	0.00	0.05	0.0	0.0	3.2
1FI Conn. Jan Cl # 105	1	22.0	0.2	24.5	0.00	0.05	0.0	0.0	1.1
1FI Conn. M Toilet #106	1	109.0	1.1	91.1	20.00	0.00	0.0	0.0	21.8
1FI Conn. Sto Cl#108	1	32.0	0.0	7.4	20.00	0.00	0.0	0.0	0.0
1FI Conn. W Toilet #107	1	109.0	1.1	104.3	20.00	0.00	0.0	0.0	21.8
1FI Conn. Conf Rm #1	1	132.0	1.0	340.7	20.00	0.00	0.0	0.0	20.0
1FI Conn. Conf Rm #2	1	135.0	1.0	210.5	20.00	0.00	0.0	0.0	20.0
1st FI Elections #124	1	233.0	2.0	290.5	20.00	0.00	0.0	0.0	40.0
1st FI Entry Vest.	1	42.0	0.4	53.9	20.00	0.00	0.0	0.0	8.4
1st FI Main Hall #116	1	610.0	0.0	139.0	0.00	0.05	0.0	0.0	30.5
1st FI Meeting Rm #112	1	239.0	2.0	541.7	20.00	0.00	0.0	0.0	40.0
1st FI Toilet #117	1	35.0	0.0	65.9	20.00	0.00	0.0	0.0	0.0
1st FI Vault 1B #110	1	99.0	0.0	22.6	0.00	0.00	0.0	0.0	0.0
1st FI Vault 1C&1D	1	112.0	0.0	58.0	0.00	0.00	0.0	0.0	0.0
1st FI Vestibule #118	1	62.0	0.0	105.0	20.00	0.00	0.0	0.0	0.0
1st Health & Rec Dpt#111	1	336.0	3.0	360.9	20.00	0.00	0.0	0.0	60.0
1st Selectmen Meet#113	1	318.0	15.0	491.7	20.00	0.00	0.0	0.0	300.0
1st Tax Collector #121	1	116.0	1.0	197.1	20.00	0.00	0.0	0.0	20.0
1st Town Clerk #120	1	360.0	3.0	488.7	20.00	0.00	0.0	0.0	60.0
1st Vault #122	1	84.0	1.0	45.5	0.00	0.00	0.0	0.0	0.0
1st Vault (#121)	1	84.0	1.0	48.0	0.00	0.00	0.0	0.0	0.0
1st Vest #123	1	64.0	0.0	80.9	0.00	0.05	0.0	0.0	3.2
2FI Conn. Asst Eng #237	1	145.0	1.0	187.3	20.00	0.00	0.0	0.0	20.0
2FI Conn. Corr #212(midd	1	113.0	0.0	30.5	0.00	0.05	0.0	0.0	5.7
2FI Conn. Corr #212(N)	1	210.0	0.0	94.5	20.00	0.00	0.0	0.0	0.0
2FI Conn. Corr #212(S)	1	120.0	0.0	281.3	0.00	0.05	0.0	0.0	6.0
2FI Conn. Jan #213	1	22.0	0.0	15.6	0.00	0.05	0.0	0.0	1.1
2FI Conn. M Toilet# 214	1	109.0	0.0	27.4	0.00	0.00	0.0	0.0	0.0
2FI Conn. Sto #216	1	39.0	0.0	9.7	0.00	0.05	0.0	0.0	2.0
2FI Conn. W Toilet #215	1	109.0	0.0	138.2	20.00	0.00	0.0	0.0	0.0
2FI Conn. Town Plann #238	1	145.0	1.0	242.9	20.00	0.00	0.0	0.0	20.0
2FI Health Dept	1	317.0	3.2	405.2	20.00	0.00	0.0	0.0	63.4
2FI Vault 2B	1	95.0	0.0	13.2	0.00	0.00	0.0	0.0	0.0
2FI Veteran/Conservation	1	250.0	2.5	314.7	20.00	0.00	0.0	0.0	50.0
2nd Adm Asst #220	1	239.0	2.0	535.2	20.00	0.00	0.0	0.0	40.0

Ventilation Sizing Summary for BLD'G BLOCK LOADS(2A)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

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2nd Break Room #230(delete)	1	84.0	0.0	383.6	0.00	0.00	0.0	0.0	0.0
2nd Closet #219	1	8.0	0.0	3.1	0.00	0.05	0.0	0.0	0.4
2nd Closet #221	1	8.0	0.0	3.1	0.00	0.05	0.0	0.0	0.4
2nd Closet #223	1	12.0	0.0	4.7	0.00	0.05	0.0	0.0	0.6
2nd Closet #224	1	15.0	0.0	5.9	0.00	0.05	0.0	0.0	0.8
2nd Closet #226	1	16.0	0.0	6.3	0.00	0.05	0.0	0.0	0.8
2nd Closet #228	1	28.0	0.0	11.0	0.00	0.05	0.0	0.0	1.4
2nd Closet #229	1	92.0	0.0	144.4	0.00	0.00	0.0	0.0	0.0
2nd DPW #227	1	325.0	3.0	410.5	20.00	0.00	0.0	0.0	60.0
2nd DPW Super#232	1	225.0	2.0	530.8	20.00	0.00	0.0	0.0	40.0
Totals (incl. Space Multipliers)				9278.9					1308.0

Air System Design Load Summary for BLD'G BLOCK LOADS(2A)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:52PM

ZONE LOADS	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 90.5 °F / 72.9 °F			HEATING OA DB / WB 7.0 °F / 4.9 °F		
	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	987 ft²	41831	-	987 ft²	-	-
Wall Transmission	5018 ft²	16683	-	5018 ft²	74032	-
Roof Transmission	819 ft²	2599	-	819 ft²	3092	-
Window Transmission	987 ft²	9953	-	987 ft²	47568	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	42 ft²	2241	-	42 ft²	2033	-
Floor Transmission	4937 ft²	1799	-	4937 ft²	2223	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	2416 ft²	8817	-	2416 ft²	3117	-
Overhead Lighting	9539 W	25406	-	0	0	-
Task Lighting	300 W	899	-	0	0	-
Electric Equipment	7840 W	24132	-	0	0	-
People	65	11520	13278	0	0	0
Infiltration	-	2522	2849	-	9901	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	14840	1613	10%	14197	0
>> Total Zone Loads	-	163241	17740	-	156162	0
Zone Conditioning	-	199066	17740	-	153647	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	8901 CFM	0	-	7838 CFM	0	-
Ventilation Load	1308 CFM	16666	24766	1308 CFM	76915	0
Supply Fan Load	8901 CFM	15358	-	7838 CFM	-13678	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	231090	42506	-	216884	0
Central Cooling Coil	-	231090	42536	-	0	0
Central Heating Coil	-	0	-	-	216640	-
>> Total Conditioning	-	231090	42536	-	216640	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

Zone Design Load Summary for BLD'G BLOCK LOADS(2A)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:52PM

Zone 1	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 90.5 °F / 72.9 °F			HEATING OA DB / WB 7.0 °F / 4.9 °F		
	OCCUPIED T-STAT 75.0 °F			OCCUPIED T-STAT 68.0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	987 ft²	41831	-	987 ft²	-	-
Wall Transmission	5018 ft²	16683	-	5018 ft²	74032	-
Roof Transmission	819 ft²	2599	-	819 ft²	3092	-
Window Transmission	987 ft²	9953	-	987 ft²	47568	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	42 ft²	2241	-	42 ft²	2033	-
Floor Transmission	4937 ft²	1799	-	4937 ft²	2223	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	2416 ft²	8817	-	2416 ft²	3117	-
Overhead Lighting	9539 W	25406	-	0	0	-
Task Lighting	300 W	899	-	0	0	-
Electric Equipment	7840 W	24132	-	0	0	-
People	65	11520	13278	0	0	0
Infiltration	-	2522	2849	-	9901	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	14840	1613	10%	14197	0
>> Total Zone Loads	-	163241	17740	-	156162	0

System Psychrometrics for BLD'G BLOCK LOADS(2A)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:52PM

July DESIGN COOLING DAY, 1500

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°F)	Specific Humidity (lb/lb)	Airflow (CFM)	CO2 Level (ppm)	Sensible Heat (BTU/hr)	Latent Heat (BTU/hr)
Ventilation Air	Inlet	90.5	0.01330	1308	400	16666	24766
Vent - Return Mixing	Outlet	80.5	0.00990	8901	809	-	-
Central Cooling Coil	Outlet	56.4	0.00889	8901	809	231090	42536
Central Heating Coil	Outlet	108.4	0.00990	0	809	0	-
Supply Fan	Outlet	58.0	0.00990	8901	809	15358	-
Cold Supply Duct	Outlet	58.0	0.00889	8901	809	-	-
Zone Air	-	78.7	0.00931	8901	879	199066	17740
Return Plenum	Outlet	78.7	0.00931	8901	879	0	-
Bypass Air	Outlet	0.0	0.00993	0	809	-	-
Return Duct	Outlet	78.7	0.00931	8901	879	-	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1.080; At site altitude = 1.079 BTU/(hr-CFM-F)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 4746.6; At site altitude = 4741.5 BTU/(hr-CFM)

Site Altitude = 30.0 ft

TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (BTU/hr)	T-stat Mode	Zone Cond (BTU/hr)	Zone Temp (°F)	Zone Airflow (CFM)	CO2 Level (ppm)	Terminal Heating Coil (BTU/hr)	Zone Heating Unit (BTU/hr)
Zone 1	163241	Cooling	199066	78.7	8901	879	0	0

System Psychrometrics for BLD'G BLOCK LOADS(2A)

Project Name: Swampscott Geothermal
Prepared by: Reinhardt Associates, Inc.

02/26/2007
02:52PM

WINTER DESIGN HEATING

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°F)	Specific Humidity (lb/lb)	Airflow (CFM)	CO2 Level (ppm)	Sensible Heat (BTU/hr)	Latent Heat (BTU/hr)
Ventilation Air	Inlet	7.0	0.00055	1308	400	-76915	0
Vent - Return Mixing	Outlet	52.4	0.00055	7838	445	-	-
Central Cooling Coil	Outlet	52.4	0.00055	0	445	0	0
Central Heating Coil	Outlet	108.4	0.00055	3588	445	216640	-
Supply Fan	Outlet	54.0	0.00055	7838	445	13678	-
Hot Supply Duct	Outlet	110.0	0.00055	3588	0	0	-
Zone Air	-	67.4	0.00055	4369	454	-153647	0
Return Plenum	Outlet	67.4	0.00055	4369	454	0	-
Bypass Air	Outlet	54.1	0.00055	3470	445	-	-
Return Duct	Outlet	61.5	0.00055	7838	454	-	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1.080; At site altitude = 1.079 BTU/(hr-CFM-F)

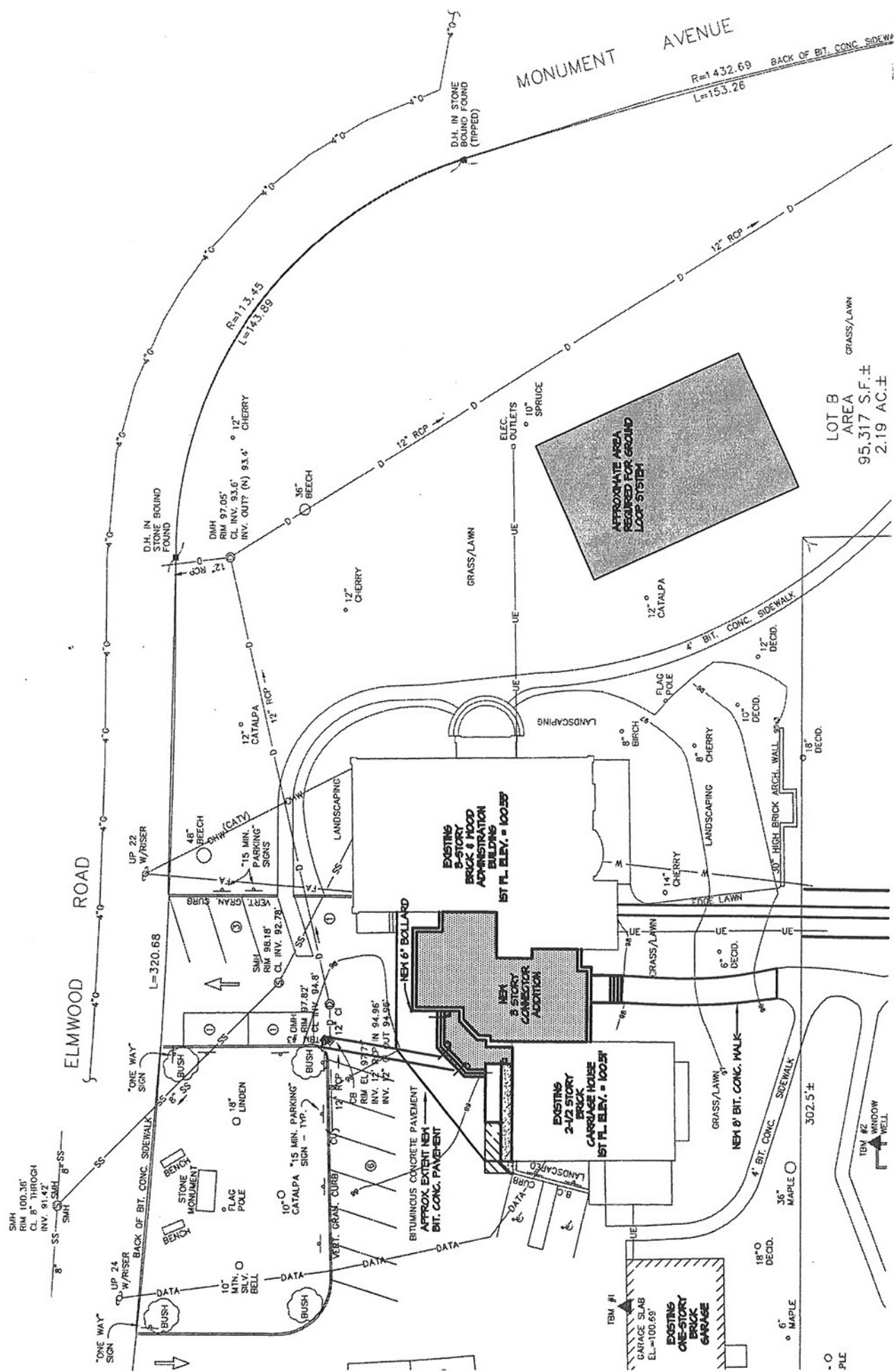
Air Density x Heat of Vaporization x Conversion Factor: At sea level = 4746.6; At site altitude = 4741.5 BTU/(hr-CFM)

Site Altitude = 30.0 ft

TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (BTU/hr)	T-stat Mode	Zone Cond (BTU/hr)	Zone Temp (°F)	Zone Airflow (CFM)	CO2 Level (ppm)	Terminal Heating Coil (BTU/hr)	Zone Heating Unit (BTU/hr)
Zone 1	-156162	Heating	-153647	67.4	4369	454	0	0

PROPOSED SITE PLAN



REINHARDT ASSOCIATES, INC.

430 Main Street
AGAWAM, MA 01001

Reed Construction Data
30 Technology Park South, Suite 500
Norcross, GA 30092

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REINHARDT ASSOCIATES, INC.

430 Main Street
AGAWAM, MA 01001

F.W. Dodge Plan Room
24 Hartwell Avenue
Lexington, MA 02421

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