



**Operating Cost Summary**  
**Entire House**  
**Evergreen Home Heating & Energy**

Job: 311250  
 Date: 9/15/2010  
 By: John Mott

727 South Kenyon Street, Seattle, WA 98108 Phone: 206-290-1993 Email: johnm@evergreenhvac.com Web: evergreenhomeheatingandenergy.com

**Project Information**

For: Valued Customer  
 123 Main Street, Seattle, WA 98108  
 Phone: 206-555-1212

Notes: Oil Furnace to Heat Pump Conversion

**System Annual Fuel Cost Comparison**

	Base System	Investment 1	Investment 2	Investment 3
System Name:				
Cooling \$:	0	53.88	49.22	75.26
Heating \$:	2685.35	629.20	573.19	596.88
Hot Water \$:	0	0	0	0
Total \$:	2685.35	683.08	622.41	672.14

**Long-term Operating Cost Comparison**

\*REFERENCE\*

	Cost	Savings	Cost	Savings	Cost	Savings	Cost	Savings
Year 1 \$:	2685	0	683	2002	622	2063	672	2013
Year 2 \$:	5371	0	1366	4005	1245	4126	1344	4026
Year 3 \$:	8056	0	2049	6007	1867	6189	2016	6040
Year 4 \$:	10741	0	2732	8009	2490	8252	2689	8053
Year 5 \$:	13427	0	3415	10011	3112	10315	3361	10066
Year 10 \$:	26854	0	6831	20023	6224	20629	6721	20132
Payback: yrs	0		4.1		5.2		6.4	
ROI: %	0		9.4		6.7		4.6	
Savings: \$/mo	0		166.86		171.91		167.77	

*Note: Actual costs and savings may differ due to weather, operating conditions, maintenance, and construction.*



**Operating Cost Details**  
**Entire House**  
**Evergreen Home Heating & Energy**

Job: 311250  
 Date: 9/15/2010  
 By: John Mott

727 South Kenyon Street, Seattle, WA 98108 Phone: 206-290-1993 Email: johnm@evergreenhvac.com Web: evergreenhomeheatingandenergy.com

**Design Conditions**

Weather Location: Seattle Boeing Field, WA, US  
 Heating Hours: 2500 Cooling Hours: 500  
 Heating Load (Btuh): 30719 Cooling Load (Btuh): 15539

**Equipment**

Base System:  
 Cooling: none  
 Heating: Generic AFUE 64

Investment 1:  
 Heat pump: York LX SERIES YHJF24S41S1  
 Backup: Elec strip

Investment 2:  
 Heat pump: York AFFINITY 8T YZH02411  
 Backup: Elec strip

Investment 3:  
 Heat pump: Daikin Inverter Ducted RZQ24  
 Backup: Elec strip

**Equipment Specifications**

	Base System	Investment 1	Investment 2	Investment 3
System type				
Clg Capacity (Btuh)	0	22800	23600	23200
Htg Capacity (Btuh)	30719	22200	24000	27000
Clg Efficiency	? Eff	12.5 EER, 15 SEER	13.6 EER, 16.4 SEER	12.5 EER, 18 SEER
Htg Efficiency	64 AFUE	8.5 HSPF	9.6 HSPF	8.9 HSPF
BU Efficiency		100 EFF	100 EFF	100 EFF
DWH Efficiency				

**Fuel Unit Costs**

		0.11 \$/kWh	0.11 \$/kWh	0.11 \$/kWh	0.11 \$/kWh
Cooling	Unit cost:	0.11 \$/kWh	0.11 \$/kWh	0.11 \$/kWh	0.11 \$/kWh
	Escalation:	0.00 %	0.00 %	0.00 %	0.00 %
Heating	Unit cost:	4.00 \$/gal	0.11 \$/kWh	0.11 \$/kWh	0.11 \$/kWh
	Escalation:	0.00 %	0.00 %	0.00 %	0.00 %
Backup	Unit cost:				
	Escalation:				
HotWater	Unit cost:				
	Escalation:				

# Heating and Air Conditioning Economic Analysis

## For Future / Existing Home Of

Valued Customer  
123 Main Street  
Seattle, WA 98108  
206-555-1212

## Conducted By

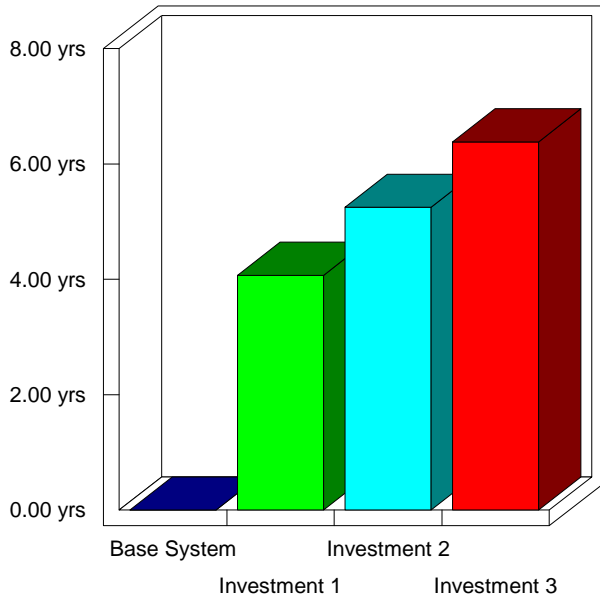
John Mott  
727 South Kenyon Street  
Seattle, WA 98108  
206-290-1993

## Wrightsoft Corporation

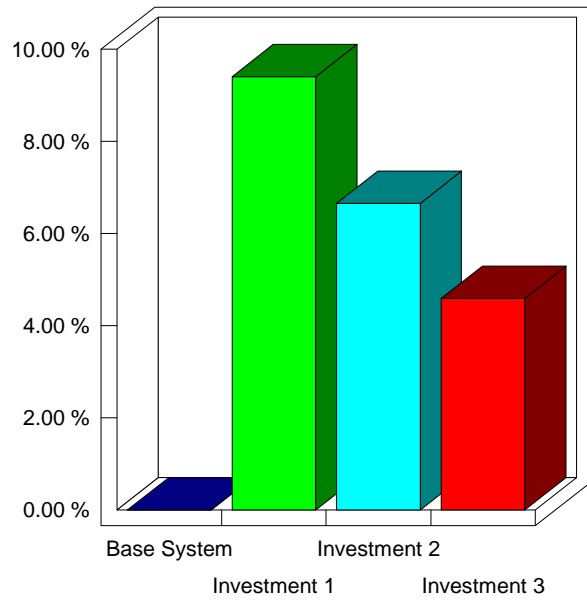
*Note: Actual costs and savings may differ due to weather, operating conditions, maintenance, and construction.*

**Bar Charts**

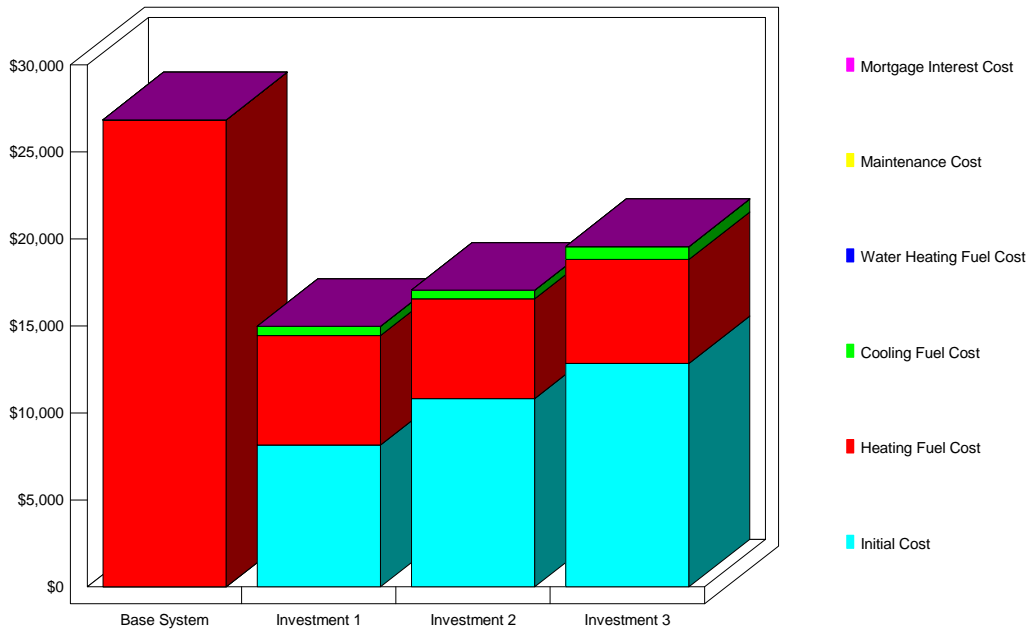
Payback



Return on Investment



Cost Breakdown for 10 Years



### Project Information

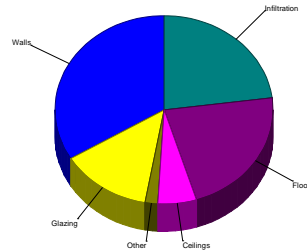
For: Valued Customer  
123 Main Street, Seattle, WA 98108  
Phone: 206-555-1212

### Design Conditions

<b>Location:</b> Seattle Boeing Field, WA, US Elevation: 20 ft Latitude: 48 N		<b>Indoor:</b> Indoor temperature (°F) 70 Design TD (°F) 51 Relative humidity (%) 30 Moisture difference (gr/lb) 21.1		<b>Heating</b> 70	<b>Cooling</b> 75
<b>Outdoor:</b> Dry bulb (°F) 19 Daily range (°F) - Wet bulb (°F) - Wind speed (mph) 15.0	<b>Heating</b> 19	<b>Cooling</b> 93	<b>Infiltration:</b> Method 18 ( M ) Construction quality Simplified Fireplaces 1 (Average)	21.1	13.2

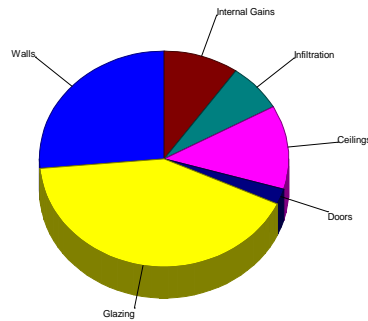
### Heating

Component	Btuh/ft²	Btuh	% of load
Walls	5.6	10341	33.7
Glazing	28.9	4161	13.5
Doors	27.4	575	1.9
Ceilings	1.6	1765	5.7
Floors	6.3	6819	22.2
Infiltration	4.8	7057	23.0
Ducts		0	0
Piping		0	0
Humidification		0	0
Ventilation		0	0
Adjustments		0	0
<b>Total</b>		<b>30719</b>	<b>100.0</b>



### Cooling

Component	Btuh/ft²	Btuh	% of load
Walls	2.1	3944	26.4
Glazing	43.4	6249	41.8
Doors	16.4	344	2.3
Ceilings	1.7	1875	12.5
Floors	0	0	0
Infiltration	0.7	1076	7.2
Ducts		0	0
Ventilation		0	0
Internal gains		1460	9.8
Blower		0	0
Adjustments		0	0
<b>Total</b>		<b>14949</b>	<b>100.0</b>



Latent Cooling Load = 889 Btuh  
Overall U-value = 0.106 Btuh/ft²·°F

Data entries checked.

## Project Information

For: Valued Customer  
 123 Main Street, Seattle, WA 98108  
 Phone: 206-555-1212

## Design Conditions

<b>Location:</b> Seattle Boeing Field, WA, US Elevation: 20 ft Latitude: 48 N		<b>Indoor:</b> Indoor temperature (F) 70 Design TD (F) 51 Relative humidity (%) 30 Moisture difference (gr/lb) 21.1	<b>Heating</b> 70 51 30 21.1	<b>Cooling</b> 75 18 50 13.2
<b>Outdoor:</b> Dry bulb (F) 19 Daily range (F) - Wet bulb (F) - Wind speed (mph) 15.0	<b>Heating</b> 19 - - 15.0	<b>Cooling</b> 93 18 ( M ) 71 7.5		
		<b>Infiltration:</b> Method Simplified Construction quality Semi-loose Fireplaces 1 (Average)		

### Construction descriptions

#### Walls

12A-4sw: Frm wall, vnl ext, 3/8" wood shth, 1/2" gypsum board int fnsh, r-4 ext bd ins, 2"x4" wood frm

	Or	Area ft <sup>2</sup>	U-value Btuh/ft <sup>2</sup> -F	Insul R ft <sup>2</sup> -F/Btuh	Htg HTM Btuh/ft <sup>2</sup>	Loss Btuh	Clg HTM Btuh/ft <sup>2</sup>	Gain Btuh
12A-4sw: Frm wall, vnl ext, 3/8" wood shth, 1/2" gypsum board int fnsh, r-4 ext bd ins, 2"x4" wood frm	n	216	0.135	4.0	6.84	1478	3.77	815
	e	116	0.135	4.0	6.84	794	3.77	438
	s	163	0.135	4.0	6.84	1116	3.77	615
	w	284	0.135	4.0	6.84	1944	3.77	1072
15C11-0w-4: Bg wall, light dry soil, 2"x4" wood int frm, concrete wall, r-11 cav ins, 6" thk, 1/2" gypsum board int fnsh	all	779	0.135	4.0	6.84	5332	3.77	2939
	n	232	0.070	11.0	4.65	1079	0.92	213
	e	300	0.070	11.0	4.67	1402	0.94	282
	s	240	0.070	11.0	4.69	1126	0.95	228
	w	300	0.070	11.0	4.67	1402	0.94	282
all	1072	0.070	11.0	4.67	5009	0.94	1005	

#### Partitions

(none)

#### Windows

1D-c2ov: 2 glazing, clr outr, air gas, vnl frm mat, clr innr, 1/4" gap, 1/8" thk

1D-c2ov: 2 glazing, clr outr, air gas, vnl frm mat, clr innr, 1/4" gap, 1/8" thk	n	24	0.570	0	28.9	694	20.6	495
	n	8	0.570	0	28.9	231	20.6	165
	e	28	0.570	0	28.9	809	62.0	1737
	e	4	0.570	0	28.9	116	62.0	248
	s	56	0.570	0	28.9	1618	37.8	2115
	w	20	0.570	0	28.9	578	62.0	1241
	w	4	0.570	0	28.9	116	62.0	248
	all	144	0.570	0	28.9	4161	43.4	6249

#### Doors

11G0: Door, wd pnl type

11G0: Door, wd pnl type	s	21	0.540	0	27.4	575	16.4	344
-------------------------	---	----	-------	---	------	-----	------	-----

#### Ceilings

16B-30ad: Attic ceiling, asphalt shingles roof mat, r-30 ceil ins, 1/2" gypsum board int fnsh

16B-30ad: Attic ceiling, asphalt shingles roof mat, r-30 ceil ins, 1/2" gypsum board int fnsh		1088	0.032	30.0	1.62	1765	1.72	1875
---	--	------	-------	------	------	------	------	------

#### Floors

22A-cpl: Bg floor, light dry soil, carpet flr fnsh

22A-cpl: Bg floor, light dry soil, carpet flr fnsh		136	0.989	0	50.1	6819	0	0
--	--	-----	-------	---	------	------	---	---

## Project Information

For: Valued Customer  
 123 Main Street, Seattle, WA 98108  
 Phone: 206-555-1212

Notes: Oil Furnace to Heat Pump Conversion

## Design Information

Weather: Seattle Boeing Field, WA, US

### Winter Design Conditions

Outside db 19 °F  
 Inside db 70 °F  
 Design TD 51 °F

### Summer Design Conditions

Outside db 93 °F  
 Inside db 75 °F  
 Design TD 18 °F  
 Daily range M  
 Relative humidity 50 %  
 Moisture difference 13 gr/lb

### Heating Summary

Structure 30719 Btuh  
 Ducts 0 Btuh  
 Central vent (0 cfm) 0 Btuh  
 Humidification 0 Btuh  
 Piping 0 Btuh  
 Equipment load 30719 Btuh

### Sensible Cooling Equipment Load Sizing

Structure 14949 Btuh  
 Ducts 0 Btuh  
 Central vent (0 cfm) 0 Btuh  
 Blower 0 Btuh

Use manufacturer's data n  
 Rate/swing multiplier 0.98  
 Equipment sensible load 14650 Btuh

### Infiltration

Method Simplified  
 Construction quality Semi-loose  
 Fireplaces 1 (Average)

	Heating	Cooling
Area (ft <sup>2</sup> )	2176	2176
Volume (ft <sup>3</sup> )	13056	13056
Air changes/hour	0.58	0.25
Equiv. AVF (cfm)	127	54

### Latent Cooling Equipment Load Sizing

Structure 889 Btuh  
 Ducts 0 Btuh  
 Central vent (0 cfm) 0 Btuh  
 Equipment latent load 889 Btuh

Equipment total load 15539 Btuh  
 Req. total capacity at 0.70 SHR 1.7 ton

### Heating Equipment Summary

Make Generic  
 Trade  
 Model AFUE 64  
 GAMA ID

Efficiency 64 AFUE  
 Heating input 47998 Btuh  
 Heating output 30719 Btuh  
 Temperature rise 50 °F  
 Actual air flow 559 cfm  
 Air flow factor 0.018 cfm/Btuh  
 Static pressure 0 in H<sub>2</sub>O  
 Space thermostat

### Cooling Equipment Summary

Make n/a  
 Trade n/a  
 Cond n/a  
 Coil n/a  
 ARI ref no. n/a

Efficiency n/a  
 Sensible cooling 0 Btuh  
 Latent cooling 0 Btuh  
 Total cooling 0 Btuh  
 Actual air flow 680 cfm  
 Air flow factor 0.045 cfm/Btuh  
 Static pressure 0 in H<sub>2</sub>O  
 Load sensible heat ratio 0.94

## Project Information

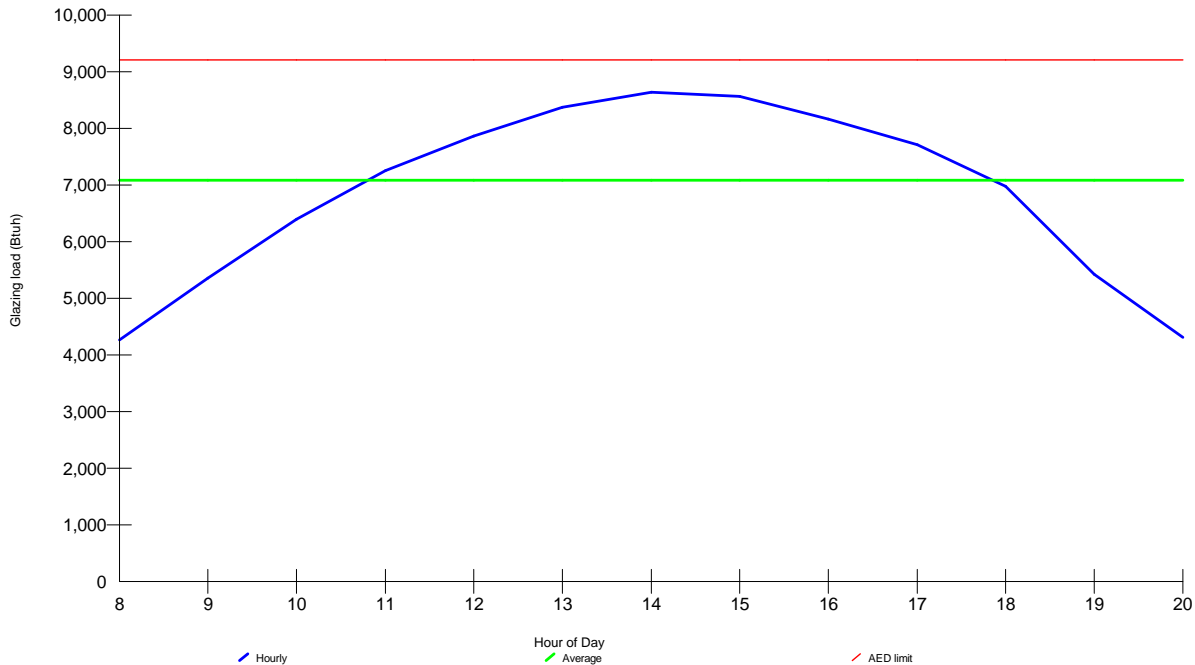
For: Valued Customer  
123 Main Street, Seattle, WA 98108  
Phone: 206-555-1212

## Design Conditions

<b>Location:</b>		<b>Indoor:</b>		<b>Heating</b>	<b>Cooling</b>
Seattle Boeing Field, WA, US		Indoor temperature (°F)		70	75
Elevation: 20 ft		Design TD (°F)		51	18
Latitude: 48 N		Relative humidity (%)		30	50
		Moisture difference (gr/lb)		21.1	13.2
<b>Outdoor:</b>	<b>Heating</b>	<b>Cooling</b>	<b>Infiltration:</b>		
Dry bulb (°F)	19	93			
Daily range (°F)	-	18 ( M )			
Wet bulb (°F)	-	71			
Wind speed (mph)	15.0	7.5			

## Test for Adequate Exposure Diversity

Hourly Glazing Load



**Maximum hourly glazing load exceeds average by 21.9%.**

**House has adequate exposure diversity (AED), based on AED limit of 30%.**

**AED excursion: 0 Btuh**

**Right-J® Worksheet**  
**Entire House**  
**Evergreen Home Heating & Energy**

**Job:** 311250  
**Date:** 9/15/2010  
**By:** John Mott

727 South Kenyon Street, Seattle, WA 98108 Phone: 206-290-1993 Email: johnm@evergreenhvac.com Web: evergreenhomeheatingandenergy.com

1 Room name				Entire House				Main Floor						
2 Exposed wall				252.0 ft				116.0 ft						
3 Ceiling height				8.0 ft				8.0 ft						
4 Room dimensions				d				1.0 x 1088.0 ft						
5 Room area				2176.0 ft²				1088.0 ft²						
	Ty	Construction number	U-value (Btuh/ft²·F)	Or	HTM (Btuh/ft²)		Area (ft²) or perimeter (ft)		Load (Btuh)		Area (ft²) or perimeter (ft)		Load (Btuh)	
					Heat	Cool	Gross	N/P/S	Heat	Cool	Gross	N/P/S	Heat	Cool
6	W	12A-4sw	0.135	n	6.84	3.77	240	216	1478	815	240	216	1478	815
	G	1D-c2ov	0.570	n	28.90	20.61	24	0	694	495	24	0	694	495
	W	15C11-0w-4	0.115	n	4.65	0.92	240	232	1079	213	0	0	0	0
	G	1D-c2ov	0.570	n	28.90	20.61	8	0	231	165	0	0	0	0
11	W	12A-4sw	0.135	e	6.84	3.77	144	116	794	438	144	116	794	438
	G	1D-c2ov	0.570	e	28.90	62.05	28	0	809	1737	28	0	809	1737
	W	15C11-0w-4	0.115	e	4.67	0.94	304	300	1402	282	0	0	0	0
	G	1D-c2ov	0.570	e	28.90	62.05	4	0	116	248	0	0	0	0
	W	12A-4sw	0.135	s	6.84	3.77	240	163	1116	615	240	163	1116	615
	G	1D-c2ov	0.570	s	28.90	37.77	56	0	1618	2115	56	0	1618	2115
	D	11G0	0.540	s	27.38	16.39	21	21	575	344	21	21	575	344
	W	15C11-0w-4	0.115	s	4.69	0.95	240	240	1126	228	0	0	0	0
	W	12A-4sw	0.135	w	6.84	3.77	304	284	1944	1072	304	284	1944	1072
	G	1D-c2ov	0.570	w	28.90	62.05	20	0	578	1241	20	0	578	1241
	W	15C11-0w-4	0.115	w	4.67	0.94	304	300	1402	282	0	0	0	0
	G	1D-c2ov	0.570	w	28.90	62.05	4	0	116	248	0	0	0	0
	C	16B-30ad	0.032	-	1.62	1.72	1088	1088	1765	1875	1088	1088	1765	1875
	F	22A-cpl	0.989	-	50.14	0.00	1088	136	6819	0	0	0	0	0
6	c) AED excursion									0				0
	Envelope loss/gain								23662	12413			11371	10747
12	a) Infiltration								7057	1076			4449	679
	b) Room ventilation								0	0			0	0
13	Internal gains:		Occupants @	230		2				460	2			460
			Appliances/other							1000				1000
	Subtotal (lines 6 to 13)								30719	14949			15820	12885
	Less external load								0	0			0	0
	Less transfer								0	0			0	0
	Redistribution								0	0			0	0
14	Subtotal								30719	14949			15820	12885
15	Duct loads								0	0			0	0
	Total room load								30719	14949			15820	12885
	Air required (cfm)								559	680			288	586

Printout certified by ACCA to meet all requirements of Manual J 8th Ed.

# Right-J® Worksheet

## Entire House

### Evergreen Home Heating & Energy

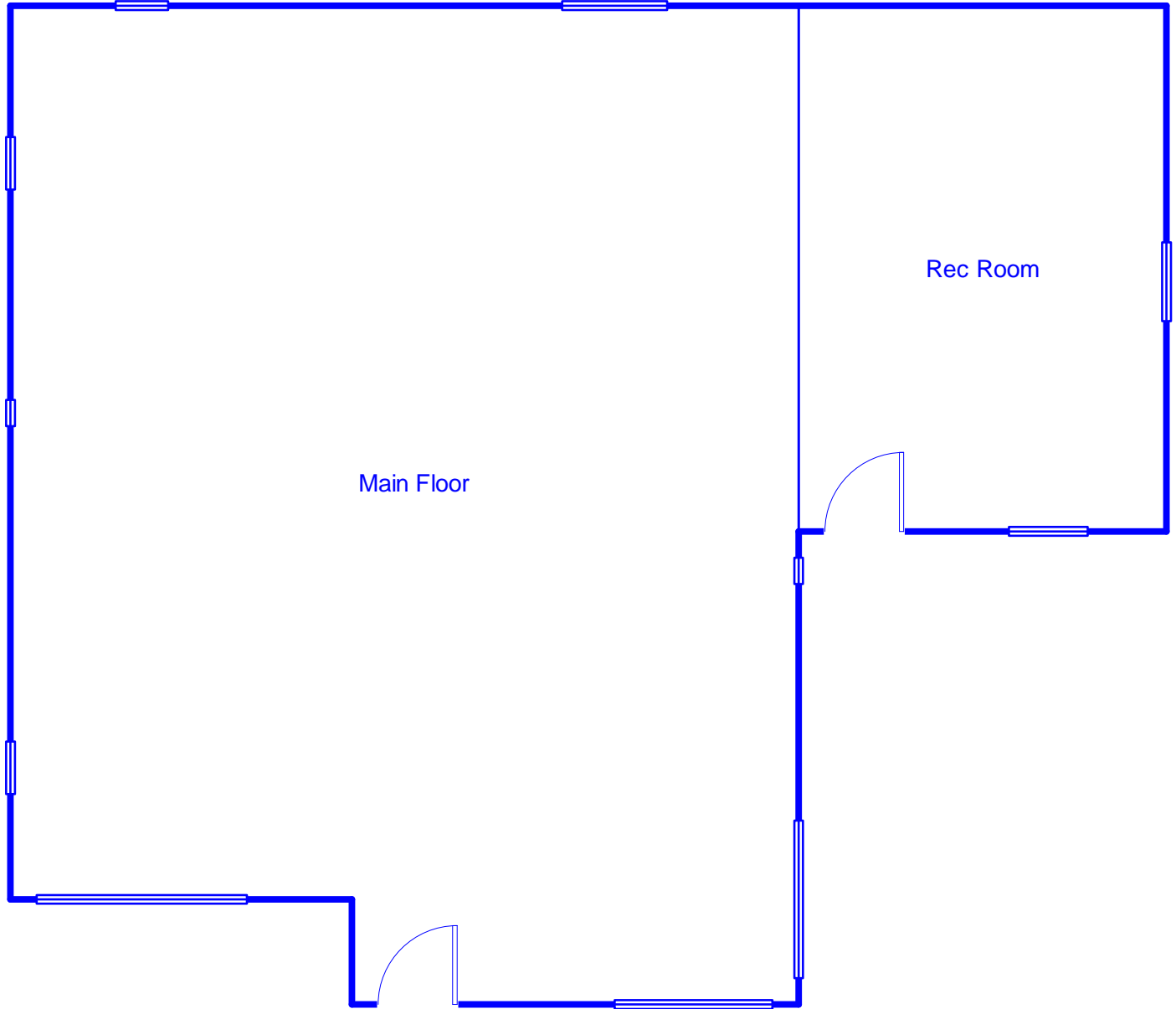
Job: 311250  
 Date: 9/15/2010  
 By: John Mott

727 South Kenyon Street, Seattle, WA 98108 Phone: 206-290-1993 Email: johnm@evergreenhvac.com Web: evergreenhomeheatingandenergy.com

1 Room name				Basement										
2 Exposed wall				136.0 ft										
3 Ceiling height				8.0 ft				heat/cool						
4 Room dimensions				1.0 x 1088.0 ft										
5 Room area				1088.0 ft <sup>2</sup>										
	Ty	Construction number	U-value (Btuh/ft <sup>2</sup> -F)	Or	HTM (Btuh/ft <sup>2</sup> )		Area (ft <sup>2</sup> ) or perimeter (ft)		Load (Btuh)		Area or perimeter		Load	
					Heat	Cool	Gross	N/P/S	Heat	Cool	Gross	N/P/S	Heat	Cool
6	W	12A-4sw	0.135	n	6.84	3.77	0	0	0	0				
	G	1D-c2ov	0.570	n	28.90	20.61	0	0	0	0				
	W	15C11-0w-4	0.115	n	4.65	0.92	240	232	1079	213				
	G	1D-c2ov	0.570	n	28.90	20.61	8	0	231	165				
11	W	12A-4sw	0.135	e	6.84	3.77	0	0	0	0				
	G	1D-c2ov	0.570	e	28.90	62.05	0	0	0	0				
	W	15C11-0w-4	0.115	e	4.67	0.94	304	300	1402	282				
	G	1D-c2ov	0.570	e	28.90	62.05	4	0	116	248				
	W	12A-4sw	0.135	s	6.84	3.77	0	0	0	0				
	G	1D-c2ov	0.570	s	28.90	37.77	0	0	0	0				
	D	11G0	0.540	s	27.38	16.39	0	0	0	0				
	W	15C11-0w-4	0.115	s	4.69	0.95	240	240	1126	228				
	W	12A-4sw	0.135	w	6.84	3.77	0	0	0	0				
	G	1D-c2ov	0.570	w	28.90	62.05	0	0	0	0				
	W	15C11-0w-4	0.115	w	4.67	0.94	304	300	1402	282				
	G	1D-c2ov	0.570	w	28.90	62.05	4	0	116	248				
	C	16B-30ad	0.032	-	1.62	1.72	0	0	0	0				
	F	22A-cpl	0.989	-	50.14	0.00	1088	136	6819	0				
6	c) AED excursion									0				
	Envelope loss/gain								12291	1666				
12	a) Infiltration								2608	398				
	b) Room ventilation								0	0				
13	Internal gains:		Occupants @	230			0			0				
			Appliances/other							0				
	Subtotal (lines 6 to 13)								14899	2064				
	Less external load								0	0				
	Less transfer								0	0				
	Redistribution								0	0				
14	Subtotal								14899	2064				
15	Duct loads						-0%	0%	0	0				
	Total room load								14899	2064				
	Air required (cfm)								271	94				

Printout certified by ACCA to meet all requirements of Manual J 8th Ed.

**Level 2**



Main Floor

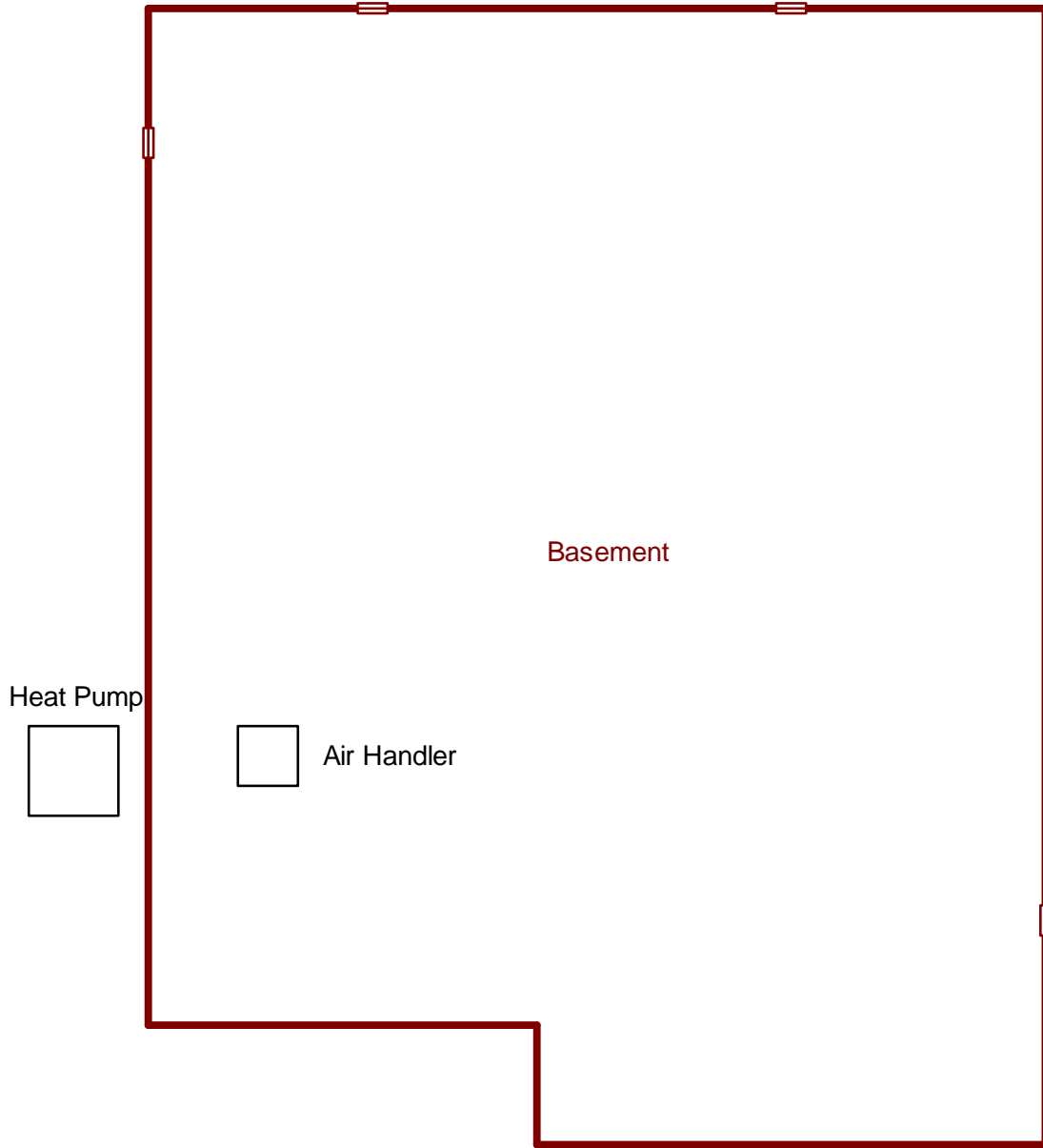
Rec Room

**Job #: 311250**  
**Performed by John Mott for:**  
Valued Customer  
123 Main Street  
Seattle, WA 98108  
Phone: 206-555-1212

**Evergreen Home Heating & Energy**  
727 South Kenyon Street  
Seattle, WA 98108  
Phone: 206-290-1993  
evergreenhomeheatingandenergy.com johnm@eve...

Scale: 1 : 73  
Page 1  
Right-Suite® Universal  
7.1.25 RSU11611  
2011-Sep-16 06:57:07  
...alcs\Stephens Heat Loss Calc.rup

**Level 1**



**Job #: 311250**  
**Performed by John Mott for:**  
Valued Customer  
123 Main Street  
Seattle, WA 98108  
Phone: 206-555-1212

**Evergreen Home Heating & Energy**  
727 South Kenyon Street  
Seattle, WA 98108  
Phone: 206-290-1993  
evergreenhomeheatingandenergy.com johnm@eve...

Scale: 1 : 73  
Page 2  
Right-Suite® Universal  
7.1.25 RSU11611  
2011-Sep-16 06:57:07  
...alcs\Stephens Heat Loss Calc.rup