Energy Audit

With Funding From Liberty Utilities



Meriden Fire Station

Plainfield, New Hampshire

March 26, 2020

Audit Prepared by





Table of Contents

Introduction	3
Executive Summary	3-4
Exterior Photos-Reference	5
Historic Energy Data	6
Thermographic Images with ESM Notes	7-11
Wall Images	12
Heating Equipment	13
Appliances	14

Inputs and Assumptions: Rhvac Calcs

Existing Conditions	15-23
Following ESM 1	24-28
Following ESM 2	29-33
Following ESM 3	34-38
Following ESM 4	39-43
Following ESM 5	44-48
Elite Energy Audit Report	49-59



Introduction

This Energy Audit has been partially funded by Liberty Utilities. Funds may also be available to help reduce cost for eligible Energy Saving Measures (ESM) including weatherization efforts, lighting and equipment upgrades.

The purpose of an energy audit is to identify ESM in a building. Computer simulated and other energy models were developed for this project using multiple strategies and software. The models estimate predicted future energy consumption based on the local climate conditions, physical dimensions and characteristics of a building, mechanical systems, presumed lighting, equipment, and occupancy patterns, in addition to a number of other variables.

With the building modeled in existing conditions, energy savings can be estimated for improvements to the thermal envelope. The cost of those measures can then be analyzed in terms of predicted energy saved. The primary objective is to evaluate the level of investment warranted by energy and dollars saved from those specific measures. In many cases, as in this one, improving the thermal envelope is expected to yield 'non energy saving' benefits, such as improving occupant comfort and reducing the size of any future HVAC equipment.

This audit has been prepared with the best of intentions to assist the Town of Plainfield make informed decisions regarding energy improvements. We do not make any warranty, expressed or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product or process disclosed.

Executive Summary

The Meriden Fire Station is a wood framed, slab on grade building with three garage bays, a meeting room with kitchen and office, and an unconditioned storage room off the boiler room. The original building was constructed in the 1950's. Occupancy is periodic and unpredictable.

The walls and ceilings are insulated with fiberglass. At some point, the walls were re-sided with cement board over one inch polyiso. There are six double pane windows in wood frames. Three conditioned garage bays are accessed by three insulated overhead doors in relatively good condition. The building is heated hydronically by a fairly new Buderus oil fired boiler with Logamatic Controls.

A summary of the recommended ESM is in the table below. The total investment is estimated at \$6,876 and can be expected to save \$654 a year in heating costs at \$2.62 per gallon of oil. This would show a simple pay back of 10.3 years and an annualized Return on Investment (ROI) of 14% per year over the 25 year life of measures. Annual energy savings are estimated at 250 gallons of oil; 34.6 MMBtus; and 2.9 tons of GHG emissions

T (0) (Gallons	Energy	Simple	T .C. C	Invest-		
ESM #	ESM Target	Annual	Cost of	Oil Serred	Savings	Payback Vro	Life of	ment	POI	Annual
#	Alea	Savings	Measure	Saved		115	wieasure	Gam	KOI	KOI
	Air Sealing									
1	Package	\$216	\$851	82	11.4	3.9	15	\$11,911	1399.6%	19.8%
	Meeting Room									
2	Ceiling Chase	\$132	\$1,394	50	7.0	10.6	25	\$31,050	2399.5%	13.7%
	Bay Ceiling to									
3	R50	\$165	\$3,014	63	8.7	18.3	25	\$63,931	2399.8%	13.7%
	Meeting Room									
4	Ceiling to R50	\$68	\$1,058	26	3.6	15.6	25	\$25,392	2400.0%	13.7%
	Slab Edge									
5	Insulation	\$73	\$560	28	3.9	7.7	25	\$13,440	2400.0%	13.7%
	TOTALS	\$654	\$6,876	250	34.6	10.5	24	\$156,525	2276.4%	14.1%



ESM Notes and Descriptions

ESM PACKAGE #1

Air Sealing Package - Photos on page 7

Overhead Door Sealing: Robust weather-stripping for the bottom seal is available from American Garage Door Supply. It appears that vertical weatherstripping is in fairly good condition though several small sections have failed, so spot replacement is recommended.

Photo to the right shows the Ultra Rubber Bottom Seal at \$2.80 per foot from American Door Supply https://americandoorsupply.com/

Window and Door Weather-stripping: There are six double hung windows and two exterior doors in need of new weather-stripping.



"Thermodome": Access to the attic was found above the suspended ceiling on the southeast wall between the door and office. Comprehensive air sealing of the ceiling plane is part of ESM #2, but this measure allows for creating a functioning thermodome to access the attic floor.

ESM #2

Meeting Room Ceiling Chase— Photos on page 8 & 9

The target area of this ESM is the chase between the suspended ceiling and insulation layer of the attic. The goal is to air seal and insulate the wall perimeter of the chase with a minimum of 2" closed cell foam and tape seal the rigid material layer holding the fiberglass. The cost estimate of \$1394 is based on cutting t&g ends, then spraying 2" SPF on the exterior walls of the chase and labor involved in tape sealing all seams and penetration—securing the boards as necessary. A more costly option would be to remove the suspended ceiling altogether and install a new layer of drywall. This could be in conjunction with converting T8 lighting fixtures with LED. The expense of this ceiling upgrade is not justifiable on energy savings alone, but suggested for your consideration. LED conversion is recommended, however not part of this Audit due to the limited—and unknowable—hours that lighting is used.

ESM #3

Air Seal and Insulate Garage Bay Ceiling to R50 - Photos on page 10

Air seal all ceiling penetrations from below, then blow a minimum of 10" cellulose insulation above the existing insulation. NOTE: The existing insulation could not be inspected and may warrant removal if contaminated with rodent urine. Based on IR images, it does not appear to be compromised, with only a few voids. Ideally, fiberglass is always removed and new cellulose—or rockwool—blown in to even layers of at least 18". However, the cost of removal cannot easily be justified by energy savings, since the existing layers appear to be performing relatively well. The added material—and eliminating thermal bridging—is expect to bring the ceiling plane up to 2015 code levels.

ESM #4

Insulate Meeting Room Ceiling to R50 - Please refer to the description above for Garage Bay Ceiling.

ESM #5

Slab Edge Insulation-Photos on page 11

The goal of this measure is to extend exterior insulation from the existing polyiso layer on exposed slab edge to below grade on the perimeter of the meeting room. Costs reflect labor to dig a six inch trench, adhere Roxul comfort board, cover with metal flashing material and hand back fill.





Exterior Photos











Historic Energy Usage

The energy analysis below is based on an average of historic energy use for the years 2017 and 2019 and 2019 energy prices.

Energy	Units	Site Btus	Source Btus	\$Cost
Electric kWh	5,452	18,602,224	61,940,172	\$1,036
Heating Oil	900	124,650,000	143,347,500	\$2,358
Totals		143,252,224	205,287,672	\$3,394
EUI KBtu/FT2	2728	52.5	75.3	\$1.24

The Energy Utilization Index (EUI) offers a simple snapshot analysis of a building's energy use by looking at total amount of energy input (converted to Btu's) divided by the floor area of conditioned space. "Site Energy" refers to units of energy delivered to a site. Source energy includes transmission and total raw energy the building requires

Based on the information provided, the Fire Station's EUI is a relatively low 52.5 KBtu/ft2, with Source Energy EUI at 75.3 KBtu/FT2. Based on 2019 energy prices, the total energy costs at \$1.24 per sq ft.



As shown above, heating costs represent over 70% of the annual energy costs. The recommended ESM in this study focus mostly on reducing oil consumption by improving the thermal envelope, thereby conserving heating energy.

Converting all lighting to LED will save energy and reduce replacement maintenance costs. However the lights are used so infrequently, the simple payback may exceed 10 years.

Appliances are inventoried on page 14. The chest freezer is believed to be 19 years old. Newer chest freezers are far more efficient and could save 300-400 kWh a year at a minimum. However, the compressors don't last as long as older models (same goes for refrigerators), so replacing large units can be hard to justify based on dollar savings alone. As note on page 14, keeping them full also saves energy. Use gallon jugs of water or bags of ice to fill cabinet.

	Summary of Envelope Measures	Heating Load Btu/Hr	Heating Cost	Gallons	Design Load Btu/FT
Exist		52,079	\$2,370	904	19.1
ESM1	Weatherstripping doors and windows and install thermodome	46,970	\$2,154	822	17.2
ESM 2	Meeting room chase perimeter and air seal ceiling dry wall	43,847	\$2,022	771	16.1
ESM 3	Bays ceiling insulation to R50	39,927	\$1,857	708	14.6
ESM 4	Meeting Room insulation to R50	38,310	\$1,789	682	14.0
ESM 5	Slab Edge Insulation	36,584	\$1,716	655	13.4

Load calculations from Elite Rhvac; Reports included at the end of this report.

6



ESM 1 Air Sealing Measures

Add weatherstripping to bottom of all overhead doors and as needed to vertical rails.



















ESM 2 Meeting Room Ceiling and Chase Perimeter

The meeting room has ceiling tiles suspended below drywall, secured to ceiling joists with fiberglass batts between the bays. The drywall has penetrations, unsealed seams, and in some places, needs to be re-secured. Access above the drywall is through a hatch between the entry door and office. Full access up into the attic was not possible with the ladder available. However, it was clear by the condition of fiberglass that the hatch and surrounding area serves as an air pathway into the vented attic. Ideally, the fiberglass would be removed, the drywall secured and all seams and penetrations taped and sealed, and 16 inches of cellulose blown in, followed by a thermodome access hatch.

The exterior perimeter of the chase between the drywall and suspended ceiling is insulated with faced fiberglass but only partially enclosed with what appears to be tongue and groove paneling, or nothing at all. Replacing the fiberglass with closed cell foam would improve the thermal performance while also helping to air seal the cavity below. This would be especially beneficial as hot water pipes run the perimeter of exterior walls in this chase.









Dark areas indicate thermal bypasses to the outside.

Dark areas depict the transition from wall to the thermal barrier above the original ceiling. ESM 2 is intended to insulate the perimeter of the chase and establish an air and thermal barrier at this transition, as well as all seams of the ceiling itself





Unless mistaken, the photos below are of a recent upgrade between the two structures and steel beams are within the thermal boundary. Any steel on exterior walls should also be spray with a minimum 2" closed cell foam





S.E.E.D.S.



Garage Bay Ceiling

Insulation in between ceiling joists appears well installed with only a few voids (as shown). However thermal bridging at framing impacts total ceiling thermal performance and can result in "ghosting" as dirt particles adhere to cooler, even slightly condensing surfaces. Without access above the ceiling, total conditions could not be assessed.















Foundation Losses









Walls

The original structure—consisting of the three garage bays—is believed to have been constructed in the 1950's, with 2x4 wall framing. The 24' x 30' meeting room was added within the last 20-30 years, using 2x6 exterior framing.

All walls appear to have fiberglass batts in stud cavities. At some point when re-siding with cement boards, one inch foil faced polyisocyanurate was installed over sheathing, followed by Homeslicker for a drainage plane. The additional rigid foam layer significantly reduces thermal bridging and improves thermal performance for both wall eras.



Energy Audit



Heating Equipment

Buderus Model G215/5 with Logamatic Control Serial # 05178454-00-8205-2623













99 NORTH MAIN ST. • WEST LEBANON, NH 00	
603-298-7200	
Burner Service Record	
DATE TECH. REMARKS	
1-23-107- C15 150×800 Reitosnam 534 5	
Cune 87.4	
10-8-10 Sh Thise Broken Strow 140	
10-18-11CL Cts in Man. Makooked	
120/12 This were CNC For Meeting Room	1
1/213 DL CtS Repard Lower floder	
3/17/14 Dave C15	
1/23/05 De CO	
11/30/16 51102 (2)	

13



Appliances



Freezer manufactured in 2001 and is likely the largest load of all appliances. Keep filled with bags of ice. If this is frequently less than half full, consider replacing with two smaller Energy Star chest freezers, and turn one off when empty.



Fridge looks fairly new and based on the second letter of the Serial number, it was likely made in 2017—but if 2005, consider replacing with an Energy Star model.



Other than refrigeration, all other appliances and office equipment appear modest—necessary for operations—and used to infrequently to replace.





When replacing, consider a larger, 70 pint unit, which is typically more efficient than smaller, 30 pint units.





Meriden Fire Station Existing Conditions HVAC Load Calculations

for

Plainfield and Liberty Utilities





Prepared By:

Margaret Dillon S.E.E.D.S.

Thursday, March 26, 2020

Rhvac is an ACCA approved Manual J, D and S computer program. Calculations are performed per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D.

Rhvac - Residential & Light Commercial HVAC Loads S.E.E.D.S. Jaffrey, NH 03452

Elite Software Development, Inc. Meriden Fire Station Existing Conditions Page 2

Project Report

FIUJECT NEPUT							
General Project Inform	nation						
Project Title:	Mer	iden Fire Stat	ion Existing C	onditions			
Project Date:	Tue	sday, March 2	24, 2020				
Client Name:	Libe	erty and Town	of Plainfield				
Company Name:	Mar	garet Dillon					
Company Representa	tive: mdil	lon@myfairpo	oint.net				
Company E-Mail Addr	ress:						
Design Data			Lebanon. Nev	w Hampshire			
Reference City:			Front door fac	ces SE			
Building Orientation:			Medium				
Daily Temperature Ra	inge:						
Latitude:			43 Degrees	5			
Elevation:			906 ft.				
Altitude Factor:		0.9	968				
						- .	
	Outdoor	Outdoor	Outdoor	Indoor	Indoor	Grains	
	Dry Bulb	Wet Bulb	<u>Rel.Hum</u>	<u>Rel.Hum</u>	Dry Bulb	Difference	
Winter:	-3	-3.6	n/a	n/a	61	n/a	
Summer:	86	69	43%	50%	75	16	
Check Figures							
Total Building Supply	CEM		0	CEM P	er Square ft	•	0.000 *
Square ft of Room Ar	ea.		2 728	Square	ft Per Ton	•	0.000
Volume (ft ³):	00.	33	000***	Oqualo			5
* Based on area of ro	oms beina h	neated or cool	led (whicheve	r aoverns svs	tem) rather t	than entire floo	r area
** Based on area of ro	oms being (cooled		i govorno oyo			
***Indicated volume is	based on c	ustom buildin	a volume				
Building Loodo			g volumo.				
Total Heating Require	d Including	Ventilation Ai	r: 52 (70 Btub	52 079	MBH	
Total Heating Require			. 52,0	JI J DIUN	52.019		
Notos							
Rhyac is an ACCA an	proved Man		S computor pr	ogram			
Coloulations are parfe	proved islan		S computer pr	Vorsion 2 on			
	ro octimato	CA Mariuar	Join Edition,	$v \in S(0) \cap Z, and$		iual D.	
All computed results a	it that most	s as building t	a and latant la	iel may vary.	a to the mor	ufacturar'a par	formanaa data at
De sure lo select à un					g to the mar	iulacturer's per	ionnance data at
your design conditions	5.						



Miscellaneous Report

IVIISCEIIANEOUS RE	port						
System 1 Buderus G215/5	5	Outdoor	Outdoor	Outdoor	Indoor	Indoor	Grains
Input Data		Dry Bulb	Wet Bulb	Rel.Hum	Rel.Hum	Dry Bulb	Difference
Winter:		-3	-3.6	80%	n/a	61	n/a
Summer:		86	69	43%	50%	75	15.73
Duct Sizing Inputs							
	<u>Main Trunk</u>		Runc	<u>outs</u>			
Calculate:	No			No			
Use Schedule:	Yes			Yes			
Roughness Factor:	0.00300		0.01	000	00 ft		
Pressure Drop:	0.1000	In.wg./100 π.	0.1	000 In.wg./10	00 π.		
Maximum Velocity:	0	ft./min		0 ft./min			
Minimum Hoight:	900	in./min					
Maximum Height:	0	in. in		0 in.			
	0			0 111.			
Outside Air Data		Mintor		Summor			
Infiltration Specified:			r (rm	Summer			
minitation opeched.		0.507 Spec	ified)	0.250 AC	C/hr		
		279 CFM	inou)	138 CF	=M		
Infiltration Actual:		0.507 AC/h	r (rm	0.250 AC	C/hr		
Building Volumo:	×	22 000* Cu ft	ified)	22 000* C	, ft		
Building volume.	Δ_	<u>16 740</u> Cu.it	. <u>A</u>		u.n. u.ft./br		
	>	(0.0167	./111	0,200 00 X 0,0167	a.n.,/m		
Total Building Infiltration:	2	279 CFM	-	138 CF	=M		
Total Building Ventilation:		0 CFM		0 CF	-M		
*Indicated volume is base	d on custom	building volum	e.				
_		-					
System 1						T D'''	`
Infiltration & Ventilation Se	ensible Gain	Multiplier:	11.71 = (1.	10 X 0.968 X	11.00 Summer	Temp. Differer	nce)
Infiltration & Ventilation La	atent Gain M		10.35 = (0.10)	68 X 0.968 X	15.73 Grains D	Ifference)	a)
Minter Infiltration Specific		Multiplier:	68.13 = (1.	10 X 0.968 X	64.00 Winter Te	emp. Difference	e)
Summer Infiltration Specifie	u. 0.50	7 AC/III (IIII SPE 2 AC/br (138 CE	M) Constructio	ni), Construct		Ð	
Summer minitation Speci	ieu. 0.25		M), Construction		36		



Load Preview Report

Scope	Net Ton	ft.² /Ton	Area	Sen Gain	Lat Gain	Net Gain	Sen Loss	Sys Htg CFM	Sys Clg CFM	Sys Act CFM	Duct Size
Building	0.00	0	2,728	0	0	0	52,079	699	0	0	
System 1	0.00	0	2,728	0	0	0	52,079	699	0	0	0*
HW Piping							3,600				
Zone 1			2,728	0	0	0	48,479	699	0	699	
1-Meeting Room			616	0	0	0	13,231	191	0	191	20*
2-Bays			2,112	0	0	0	35,248	508	0	508	50*



Total Building Summary Loads

Total Dulluling Summary Loads						
Component	Ar	ea	Sen	Lat	Sen	Total
	Qu	an	LOSS	Gain	Gain	Gain
Meriden: Glazing-DP wood DH, U-value 0.37, SHGC 0.35	103	.5	2,451	0	0	0
11G: Door-Wood - Panel, U-value 0.54	38	.1	1,316	0	0	0
Overhead: Door-Overhead in front of Double, U-value 0.1	5)4	3,226	0	0	0
Meriden Meeting: Wall-Frame, Custom, 2x6 wall with FG and 1" Polyi rigid, U-value 0.042	612	.7	1,647	0	0	0
Meriden Meeting: Wall-Frame, Custom, 2x6 wall with FG	112	.5	900	0	0	0
12B-6sw: Wall-Frame, R-11 insulation in 2 x 4 stud cavity, R-6 board insulation, siding finish, wood studs. U-value 0.064	1487	.7	6,093	0	0	0
16B-15: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Vented Attic, No Radiant Barrier, Dark Asphalt Shingles or Dark Metal, Tar and Gravel or	6	16	2,405	0	0	0
 Membrane, R-15 insulation, U-value 0.061 16B-19: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Vented Attic, No Radiant Barrier, Dark Asphalt Shingles or Dark Metal, Tar and Gravel or Membrane, R-19 insulation, U-value 0.049 	21	12	6,623	0	0	0
 22A-pl: Floor-Slab on grade, No edge insulation, no insulation below floor, any floor cover, passive, light dry soil, U-value 0.989 		76	4,811	0	0	0
Subtotals for structure:			29,472	0	0	0
People:		0	,	0	0	0
Equipment:		•		0	0	0
Lighting:		0		Ũ	Ő	Ő
Ductwork:		0	0	0	0	0
Infiltration: Winter CEM: 270 Summer CEM: 129			10.007	0	0	0
Minitration: Winter CFM: 279, Summer CFM: 138			19,007	0	0	0
Ventilation: Winter CFM: 0, Summer CFM: 0			3 600	0	0	0
Total Building Load Totals:			52,079	0	0	0
Check Figures						
Total Building Supply CEM:	CI		Square ft	•		0.000 *
Square ft of Room Area: 2728	Sc	ularo ft	Per Ton:			0.000
Volumo (ft3): 22 000***	00					0
 * Based on area of rooms being heated or cooled (whiche ** Based on area of rooms being cooled. ***Indicated volume is based on custom building volume 	ever govern	s syste	em) rather	than entire floo	or area.	
Ruilding Loads						
Total Heating Required Including Ventilation Air: 5	2 079 Rtu	h	52 079	MBH		
Notes	2,015 Dlu		02.013			
Rhvac is an ACCA approved Manual J, D and S computer Calculations are performed per ACCA Manual J 8th Edition All computed results are estimates as building use and we Be sure to select a unit that meets both sensible and latent your design conditions.	program. n, Version ather may t loads acc	2, and a vary. ording	ACCA Mar to the mar	nual D. nufacturer's pe	rformance c	lata at







100.0%

**Indicated volume is based on custom building volume. -U-Item Area Htg Sen Clg Lat Sen Description Value Gain Gain Quantity HTM Loss HTM SE-Wall-Meriden Meeting 22 X 9 165.5 0.042 2.7 445 0.0 0 0 SW-Wall-Meriden Meeting 28 X 9 193.8 0.042 2.7 521 0.0 0 0 NW-Wall-Meriden Meeting 22 X 9 493 0 183.4 0.042 2.7 0.0 0 0 0 NE-Wall-Meriden Meeting 7 X 10 70 0.042 2.7 188 0.0 0 N -Wall-Meriden Meeting 75 X 1.5 0 112.5 0.125 8.0 900 0.0 0 SE-Door-11G 2.8 X 6.8 19 0.540 34.6 658 0.0 0 0 SE-Gls-Meriden shgc-0.35 0%S 13.4 0.370 23.7 318 0.0 0 SW-Gls-Meriden shgc-0.35 0%S (4) 0 0 58.2 0.370 23.7 1,380 0.0 NW-Gls-Meriden shqc-0.35 0%S 0 14.6 0.370 23.7 345 0.0 0 UP-Ceil-16B-15 616 X 1 0 0 616 0.061 3.9 2,405 0.0 Floor-22A-pl 30 ft..Per. 30 0.989 0 0 63.3 1,899 0.0 0 Subtotals for Structure: 9,552 0 Infil.: Win.: 54.0, Sum.: 0.0 831 4.430 0.000 0 0 3,679 0 0 Room Totals: 13,231

General Htg. only Calculation Mode: 1 Occurrences: Room Length: System Number: 1 n/a Room Width: Zone Number: 1 n/a Area: 616.0 sq.ft. Supply Air: 191 CFM Ceiling Height: 9.0 ft. Supply Air Changes: 2.1 AC/hr 5,544** cu.ft. Req. Vent. Clg: CFM Volume: 0 Number of Registers: 2 Actual Winter Vent .: 0 CFM Percent of Supply .: Runout Air: 0 CFM 0 % Actual Summer Vent .: CFM 0 Percent of Supply: 0 % Actual Winter Infil.: 54 CFM

Actual Summer Infil.:

Detailed Room Loads - Room 1 - Meeting Room

Rhvac - Residential & Light Commercial HVAC Loads

S.E.E.D.S.

Jaffrey, NH 03452

0 CFM

Detailed Room Loads - Room 2 - Bays

General					
Calculation Mode:	Htg. only		Occurrences:	1	
Room Length:	n/a		System Number:	1	
Room Width:	n/a		Zone Number:	1	
Area:	2,112.0	sq.ft.	Supply Air:	508	CFM
Ceiling Height:	13.0	ft.	Supply Air Changes:	1.1	AC/hr
Volume:	27,456**	cu.ft.	Req. Vent. Clg:	0	CFM
Number of Registers:	5		Actual Winter Vent .:	0	CFM
Runout Air:	0	CFM	Percent of Supply .:	0	%
			Actual Summer Vent.:	0	CFM
			Percent of Supply:	0	%
			Actual Winter Infil.:	225	CFM

Actual Summer Infil.:

**Indicated volume is based on custom building volume.

Item	Area	-U-	Htg	Sen	Clg	Lat	Sen
Description	Quantity	Value	HTM	Loss	HTM	Gain	Gain
SE-Wall-12B-6sw 46 X 13	76.7	0.064	4.1	314	0.0	0	0
NE-Wall-12B-6sw 44 X 13	553	0.064	4.1	2,265	0.0	0	0
NW-Wall-12B-6sw 46 X 13	598	0.064	4.1	2,449	0.0	0	0
N -Wall-12B-6sw 20 X 13	260	0.064	4.1	1,065	0.0	0	0
NE-Door-11G 2.8 X 6.8	19	0.540	34.6	658	0.0	0	0
SE-Door-Overhead 36 X 14	504	0.100	6.4	3,226	0.0	0	0
SE-Gls-Meriden shgc-0.35 0%S (12)	17.3	0.370	23.7	408	0.0	0	0
UP-Ceil-16B-19 2112 X 1	2112	0.049	3.1	6,623	0.0	0	0
Floor-22A-pl 46 ftPer.	46	0.989	63.3	2,912	0.0	0	0
Subtotals for Structure:				19,920		0	0
Infil.: Win.: 225.0, Sum.: 0.0	2,028		7.558	15,328	0.000	0	0
Room Totals:				35,248		0	0

0 CFM



System 1 Room Load Summary

			Htg	Htg	Run	Run	Clg	Clg	Clg	Air
	Room	Area	Sens	Rad	Duct	Duct	Sens	Lat	Nom	Sys
No	Name	SF	Btuh	Len	Size	Vel	Btuh	Btuh	CFM	CFM
Zo	ne 1									
1	Meeting Room	616	13,231	18.5	2-0	0	0	0	0	191
2	Bays	2,112	35,248	49.2	5-0	0	0	0	0	508
	HW Piping		3,600							
	System 1 total	2,728	52,079	72.6			0	0	0	0
Cooli	ing System Summary									
		Cooling	Sens	ible/Latent		Sensible		Latent		Total
		Tons		Split		Btuh		Btuh		Btuh
Net F	Required:	0.00		0% / 0%		0		0		0

Equipment Data		
	Heating System	Cooling System
Туре:	Fuel Oil Boiler	Standard Air Conditioner
Model:	G215/5	
Indoor Model:		
Brand:	Buderus	
Efficiency:	86 AFUE	0 SEER
Sound:	0	0
Capacity:	160,000 Btuh	0 Btuh
Sensible Capacity:	n/a	0 Btuh
Latent Capacity:	n/a	0 Btuh

Meriden Fire Station After ESM 1 HVAC Load Calculations

for

Liberty Utilities and Town of Plainfield





Prepared By:

Margaret Dillon S.E.E.D.S.

Thursday, March 26, 2020

Rhvac is an ACCA approved Manual J, D and S computer program. Calculations are performed per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D.

Rhvac - Residential & Light Cor S.E.E.D.S. Jaffrey, NH 03452		Elite Software Development, Inc. Meriden Fire Station After ESM 1 Page 2						
Project Report								
General Project Information								
Project Title: Project Date: Client Name: Company Name: Company Representative: Company E-Mail Address:	Meriden Fire Station After Tuesday, March 24, 2020 Plainfield and Liberty Margaret Dillon mdillon@myfairpoint.net	ESM 1						
Design Data	Lobanon N	low Hompshiro						
Reference City: Building Orientation: Daily Temperature Range: Latitude: Elevation: Altitude Factor:	Front door f Medium 43 Deg 906 ft. 0.968	faces SE						
Outo Dry I Winter: Summer:	door Outdoor Outdo <u>Bulb Wet Bulb Rel.Hu</u> -3 -3.6 r 86 69 43	oor Indoor um <u>Rel.Hum</u> n/a n/a 3% 50%	Indoor Gra <u>Dry Bulb</u> Differe 61 75	ains <u>nce</u> n/a 16				
Check Figures								
Total Building Supply CFM: 0 CFM Per Square ft.: 0.000 * Square ft. of Room Area: 2,728 Square ft. Per Ton: 0 ** Volume (ft³): 33,000*** * 0 ** * Based on area of rooms being heated or cooled (whichever governs system) rather than entire floor area. ** ** *** Based on area of rooms being cooled. *** **								
Building Loads								
Total Heating Required Inclu	iding Ventilation Air:	46,970 Btuh	46.970 MBH					
Notes								
Rhvac is an ACCA approved Calculations are performed p All computed results are esti Be sure to select a unit that your design conditions.	Manual J, D and S comput ber ACCA Manual J 8th Edit mates as building use and v meets both sensible and late	ter program. tion, Version 2, an weather may vary. ent loads accordir	d ACCA Manual D. g to the manufacture	er's performance data at				



Miscellaneous Report

System 1 Buderus C215/5		Our	tdoor	Outdoor	Outd	oor	Indoor	Indoor	Grains
Input Data		Dru	Rulh	Wot Bulb				Dry Bulb	Difforence
Wintor:			2	2.6		10/		<u>61</u>	
			-3	-3.0	0	J 70 D0/	F00/	01	11/a 15 70
Summer:			00	69	4,	3%	50%	75	15.73
Duct Sizing Inputs									
Δ	<u> Main Trunk</u>			<u>Runouts</u>	5				
Calculate:	No		No						
Use Schedule:	Yes			Yes	5				
Roughness Factor:	0.00300	0.01000							
Pressure Drop:	0.1000	in.wg./10	0 ft.	0.1000) in.wg	J./100 ft.			
Minimum Velocity:	0	ft./min		C) ft./mi	n			
Maximum Velocity:	900	ft./min		750) ft./mi	n			
Minimum Height:	0	in.		C) in.				
Maximum Height:	0	in.		C) in.				
Outside Air Data									
		Winter		Su	<u>immer</u>				
Infiltration Specified:		0.490	AC/hr		0.250	AC/hr			
•		270	CFM		138	CFM			
Infiltration Actual:		0.490	AC/hr		0.250	AC/hr			
Building Volume:	Х	33.000*	Cu.ft.	X 3	3.000*	Cu.ft.			
		16,170	Cu.ft./hr		8.250	Cu.ft./hr			
	>	(0.0167	•••••	ХС	0167	•••••			
Total Building Infiltration	£	270	CFM	<u>~~~</u>	138	CFM			
Total Building Ventilation			CFM		0	CFM			
*Indicated volume is based			Ŭ	0.111					
		i sananıy i	olamo.						

---System 1---

Infiltration & Ventilation Sensible Gain Multiplier:11.71= (1.10 X 0.968 X 11.00 Summer Temp. Difference)Infiltration & Ventilation Latent Gain Multiplier:10.35= (0.68 X 0.968 X 15.73 Grains Difference)Infiltration & Ventilation Sensible Loss Multiplier:68.13= (1.10 X 0.968 X 64.00 Winter Temp. Difference)Winter Infiltration Specified:0.490 AC/hr (270 CFM), Construction: Semi-LooseSummer Infiltration Specified:0.250 AC/hr (138 CFM), Construction: Semi-Loose



Total Building Summary Loads

Component	Area	Sen	Lat Gain	Sen Gain	Total
Meriden: Glazing-DR wood DH, Ll-value 0.37, SHGC 0.35	103.5	2 /51			
Menueni. Glazing-DF Wood DH, 0-Value 0.57, SHGC 0.55	103.5	2,401	0	0	0
11G: Dool-Wood - Panel, U-value 0.54	30.1	1,310	0	0	0
Overnead: Door-Overnead in front of Double, U-value 0.1	504	3,226	0	0	0
Meriden Meeting: Wall-Frame, Custom, 2x6 wall with FG	612.7	1,647	0	0	0
and 1" Polyi rigid, U-value 0.042 Meriden Meeting: Wall-Frame, Custom, 2x6 wall with EG	112 5	900	0	0	0
and 1" Polyi rigid, U-value 0.125	112.0		Ũ	0	0
12B-6sw: Wall-Frame, R-11 insulation in 2 x 4 stud cavity, R-6 board insulation, siding finish, wood studs, U-value 0.064	1487.7	6,093	0	0	0
16B-15: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Vented Attic, No Radiant Barrier, Dark	616	2,405	0	0	0
Asphalt Shingles or Dark Metal, Tar and Gravel or Membrane, R-15 insulation, U-value 0.061 16B-19: Roof/Ceiling-Under Attic with Insulation on Attic	2112	6,623	0	0	0
Floor (also use for Knee Walls and Partition Ceilings), Vented Attic, No Radiant Barrier, Dark Asphalt Shingles or Dark Metal, Tar and Gravel or Membrane, R-19 insulation, Levalue 0.049					
 22A-pl: Floor-Slab on grade, No edge insulation, no insulation below floor, any floor cover, passive, light druggill burghes 	76	4,811	0	0	0
Subtotals for structure:		29,472	0	0	0
People:	0		0	0	0
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 270, Summer CFM: 138		13,898	0	0	0
Ventilation: Winter CEM: 0. Summer CEM: 0		0	Õ	Õ	0 0
Hot Water Pining 50 ft Total		3 600	0	0 0	0 0
		0,000	0	0	0
Total Building Load Totals:		46,970	0	0	0
Check Figures					
Total Building Supply CFM: 0	CFN	Per Square ft	.:		0.000 *
Square ft. of Room Area: 2,728	Squa	are ft. Per Ton:			0 **
Volume (ft ³): 33,000***					
 * Based on area of rooms being heated or cooled (whichever ** Based on area of rooms being cooled. ***Indicated volume is based on custom building volume. 	/er governs	system) rather	than entire flo	oor area.	
Building Loads					
Total Heating Required Including Ventilation Air: 46	,970 Btuh	46.970	MBH		
Notes					
Rhvac is an ACCA approved Manual J, D and S computer Calculations are performed per ACCA Manual J 8th Edition All computed results are estimates as building use and wea Be sure to select a unit that meets both sensible and latent your design conditions.	program. , Version 2, ather may va loads accor	and ACCA Ma ry. ding to the ma	nual D. nufacturer's p	erformance	data at







100.0%

Meriden Fire Station After ESM 2 HVAC Load Calculations

for

Liberty Utilities and Town of Plainfield





Prepared By:

Margaret Dillon S.E.E.D.S.

Thursday, March 26, 2020

Rhvac is an ACCA approved Manual J, D and S computer program. Calculations are performed per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D.



Project Report

General Project Information	Meriden Fire Station After ESM 2	
Project Title:	Tuesday, March 24, 2020	
Project Date:	Liberty Utilities & Town of Plainfield	
Client Name:	S.E.E.D.S	
Company Name:	Margaret Dillon	
Company Representative:		
Company E-Mail Address:	mdillon@myfairpoint.net	
Design Data		
Reference City:	Lebanon, New Hampshire	
Building Orientation:	Front door faces SE	
Daily Temperature Range:	Medium	
Latitude:	43 Degrees	
Elevation:	906 ft.	
Altitude Factor:	0.968	
Out	door Outdoor Outdoor Indoor Indoor Grains	
Dry	Bulb Wet Bulb Rel.Hum Rel.Hum Dry Bulb Difference	
Winter:	-3 -3.6 n/a n/a 61 n/a	
Summer:	86 69 43% 50% 75 16	
Chock Figures		
Total Building Supply CEM:	0 CEM Por Square ft : 0.000) *
Square ft of Poom Area:	2 729 Square ft Por Top:)) **
Volumo (ft3):)
* Based on area of rooms h	55,000 paing heated or cooled (whichover governe system) rather than entire floor area	
** Pased on area of rooms b	poing cooled (Whichevel governs system) father than entire hour area.	
based off area of fouris t	d on custom building volume	
Indicated volume is base		
Building Loads		
Building Loads Total Heating Required Inclu	uding Ventilation Air: 43,847 Btuh 43.847 MBH	
Building Loads Total Heating Required Inclu	uding Ventilation Air: 43,847 Btuh 43.847 MBH	
Building Loads Total Heating Required Inclu Notes	uding Ventilation Air: 43,847 Btuh 43.847 MBH	
Building Loads Total Heating Required Inclusion Notes Rhvac is an ACCA approve	uding Ventilation Air: 43,847 Btuh 43.847 MBH	
Building Loads Total Heating Required Inclusion Notes Rhvac is an ACCA approve Calculations are performed	d Manual J, D and S computer program. per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D.	
Building Loads Total Heating Required Inclusion Notes Rhvac is an ACCA approve Calculations are performed All computed results are est	uding Ventilation Air: 43,847 Btuh 43.847 MBH d Manual J, D and S computer program. per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. timates as building use and weather may vary.	
Notes Rhvac is an ACCA approve Calculations are performed All computed results are est Be sure to select a unit that	uding Ventilation Air: 43,847 Btuh 43.847 MBH d Manual J, D and S computer program. per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. timates as building use and weather may vary. meets both sensible and latent loads according to the manufacturer's performance data at	
Building Loads Total Heating Required Inclusion Notes Rhvac is an ACCA approve Calculations are performed All computed results are est Be sure to select a unit that your design conditions.	uding Ventilation Air: 43,847 Btuh 43.847 MBH d Manual J, D and S computer program. per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. timates as building use and weather may vary. meets both sensible and latent loads according to the manufacturer's performance data at	
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Building Loads Total Heating Required Inclusion Notes Rhvac is an ACCA approve Calculations are performed All computed results are est Be sure to select a unit that your design conditions.	uding Ventilation Air: 43,847 Btuh 43.847 MBH d Manual J, D and S computer program. per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. timates as building use and weather may vary. meets both sensible and latent loads according to the manufacturer's performance data at	
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Building Loads Total Heating Required Inclusion Notes Rhvac is an ACCA approve Calculations are performed All computed results are est Be sure to select a unit that your design conditions.	uding Ventilation Air: 43,847 Btuh 43.847 MBH d Manual J, D and S computer program. per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. timates as building use and weather may vary. meets both sensible and latent loads according to the manufacturer's performance data at	
Building Loads Total Heating Required Inclu Notes Rhvac is an ACCA approved Calculations are performed All computed results are est Be sure to select a unit that your design conditions.	uding Ventilation Air: 43,847 Btuh 43.847 MBH d Manual J, D and S computer program. per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. timates as building use and weather may vary. meets both sensible and latent loads according to the manufacturer's performance data at	
Building Loads Total Heating Required Inclu Notes Rhvac is an ACCA approve Calculations are performed All computed results are est Be sure to select a unit that your design conditions.	uding Ventilation Air: 43,847 Btuh 43.847 MBH d Manual J, D and S computer program. per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. timates as building use and weather may vary. meets both sensible and latent loads according to the manufacturer's performance data at	
Building Loads Total Heating Required Inclu Notes Rhvac is an ACCA approve Calculations are performed All computed results are est Be sure to select a unit that your design conditions.	uding Ventilation Air: 43,847 Btuh 43.847 MBH d Manual J, D and S computer program. per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. timates as building use and weather may vary. meets both sensible and latent loads according to the manufacturer's performance data at	
Building Loads Total Heating Required Inclu Notes Rhvac is an ACCA approve Calculations are performed All computed results are est Be sure to select a unit that your design conditions.	uding Ventilation Air: 43,847 Btuh 43.847 MBH d Manual J, D and S computer program. per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. imates as building use and weather may vary. meets both sensible and latent loads according to the manufacturer's performance data at	



Miscellaneous Report

System 1 Buderus G215/5	;	Ou	tdoor	Outdoor	Outd	oor	Indoor	Indoor	Grains
Input Data		Dry	Bulb	Wet Bulb	Rel.H	um F	Rel.Hum	Dry Bulb	Difference
Winter:		-	-3	-3.6	8	0%	n/a	61	n/a
Summer:			86	69	43	3%	50%	75	15.73
Duct Sizing Inputs									
1	<u>Main Trunk</u>			<u>Runouts</u>	<u>5</u>				
Calculate:	No			No)				
Use Schedule:	Yes			Yes	5				
Roughness Factor:	0.00300	300 0.01000							
Pressure Drop:	0.1000	in.wg./10	0 ft.	0.1000) in.wg	g./100 ft.			
Minimum Velocity:	0	ft./min		() ft./mi	n			
Maximum Velocity:	900	ft./min		750) ft./mi	n			
Minimum Height:	0	in.		() in.				
Maximum Height:	0	in.		() in.				
Outside Air Data									
		<u>Winter</u>		<u>Sı</u>	<u>immer</u>				
Infiltration Specified:		0.490	AC/hr		0.250	AC/hr			
		270	CFM		138	CFM			
Infiltration Actual:		0.490	AC/hr		0.250	AC/hr			
Building Volume:	X	33,000*	Cu.ft.	<u>X 3</u> ;	3 <u>.000*</u>	Cu.ft.			
Ū.		16,170	Cu.ft./hr		8,250	Cu.ft./hr			
	Σ	(0.0167		<u>X_(</u>	<u>).0167</u>				
Total Building Infiltration:		270	CFM		138	CFM			
Total Building Ventilation:		0	CFM		0	CFM			
*Indicated volume is based	d on custom	h building v	volume.						
		Ŭ							

---System 1---

Infiltration & Ventilation Sensible Gain Multiplier:11.71= (1.10 X 0.968 X 11.00 Summer Temp. Difference)Infiltration & Ventilation Latent Gain Multiplier:10.35= (0.68 X 0.968 X 15.73 Grains Difference)Infiltration & Ventilation Sensible Loss Multiplier:68.13= (1.10 X 0.968 X 64.00 Winter Temp. Difference)Winter Infiltration Specified:0.490 AC/hr (270 CFM), Construction: Semi-LooseSummer Infiltration Specified:0.250 AC/hr (138 CFM), Construction: Semi-Loose



Total Building Summary Loads

Component	Area	Sen	Lat	Sen	Total
Description	Quan	Loss	Gain	Gain	Gain
Meriden: Glazing-DP wood DH, U-value 0.37, SHGC 0.35	103.5	2,451	0	0	0
11G: Door-Wood - Panel, U-value 0.54	38.1	1,316	0	0	0
Overhead: Door-Overhead in front of Double, U-value 0.1	504	3,226	0	0	0
Meriden Meeting: Wall-Frame, Custom, 2x6 wall with FG and 1" Polyi rigid, U-value 0.042	725.2	1,949	0	0	0
12B-6sw: Wall-Frame, R-11 insulation in 2 x 4 stud cavity, R-6 board insulation, siding finish, wood	1487.7	6,093	0	0	0
studs, U-value 0.064					
16B-15: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition	616	2,405	0	0	0
Asphalt Shingles or Dark Metal, Tar and Gravel or Membrane, R-15 insulation, U-value 0.061					
16B-19: Roof/Ceiling-Under Attic with Insulation on Attic	2112	6.623	0	0	0
Floor (also use for Knee Walls and Partition Ceilings) Vented Attic, No Radiant Barrier, Dark	2112	0,020	Ũ	0	0
Asphalt Shingles or Dark Metal, Tar and Gravel or Membrane, R-19 insulation, U-value 0.049					
22A-pl: Floor-Slab on grade, No edge insulation, no	76	4,811	0	0	0
insulation below floor, any floor cover, passive, light dry soil, U-value 0.989		·			
Subtotals for structure:		28 874	0	0	0
Pooplo:	0	20,074	0	0	0
Feople.	0		0	0	0
Equipment.	0		0	0	0
Lighting. Ductwork:	0	0	0	0	0
Duciwork.		10 000	0	0	0
Inflitration: Winter CFM: 270, Summer CFM: 138		13,898	0	0	0
Ventilation: Winter CFM: 0, Summer CFM: 0		0	0	0	0
Hot Water Piping, 50 ft. Total:		1,075	0	0	0
Total Building Load Totals:		43,847	0	0	0
Check Figures					
Total Building Supply CFM: 0	CFM I	Per Square ft.:	:		0.000 *
Square ft. of Room Area: 2,728 Volume (ft ³): 33,000***	Squar	e ft. Per Ton:			0 **
* Based on area of rooms being heated or cooled (whichey	ver governs s	ystem) rather t	than entire fl	oor area.	
** Based on area of rooms being cooled.					
***Indicated volume is based on custom building volume.					
Building Loads		40.047			
Total Heating Required including ventilation Air: 43	3,847 Btun	43.847	MBH		
Notes					
Rhvac is an ACCA approved Manual J, D and S computer	program.				
Calculations are performed per ACCA Manual J 8th Edition	n, Version 2, a	ind ACCA Mar	nual D.		
All computed results are estimates as building use and wea	ather may var	у.			
Be sure to select a unit that meets both sensible and latent	loads accord	ing to the mar	nufacturer's p	performance	data at
your design conditions.					







100.0%

Meriden Fire Station After ESM 3 HVAC Load Calculations

for

Liberty Utilities & Town of Plainfield





Prepared By:

Margaret Dillon S.E.E.D.S.

Thursday, March 26, 2020

Rhvac is an ACCA approved Manual J, D and S computer program. Calculations are performed per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D.

Rhvac - Residential & Light C S.E.E.D.S. Jaffrey, NH 03452	ommerci		Elite So Meride	ftware Development, Inc. en Fire Station After ESM 3 Page 2			
Project Report							
General Project Informatio	n						
Project Title: Project Date: Client Name: Company Name: Company Representative: Company E-Mail Address:	Mer 3 Tu Libe S.E Mar mdil	iden Fire Sta uesday, Marc erty & Town o .E.D.S. garet Dillon lon@myfairp	tion After ES h 24, 2020 of Plainfield oint.net	M			
Design Data							
Reference City: Building Orientation: Daily Temperature Range: Latitude: Elevation: Altitude Factor:		9 0.9	Lebanon, No Front door fa 43 Degrees 906 ft. 968	ew Hampshir aces SE	e		
Ou Dry Winter: Summer:	itdoor <u>∕ Bulb</u> -3 86	Outdoor <u>Wet Bulb</u> -3.6 69	Outdoor <u>Rel.Hum</u> n/a 43%	Indoor <u>Rel.Hum</u> n/a 50%	Indoor <u>Dry Bulb</u> 61 75	Grains <u>Difference</u> n/a 16	
Check Figures							
Total Building Supply CFM Square ft. of Room Area: Volume (ft ³): * Based on area of rooms *** Based on area of rooms ***Indicated volume is base	: being he being ce ed on cu	33,0 eated or cool ooled. istom building	0 2,728 000*** ed (whicheve g volume.	CFM Po Square r governs sys	er Square ft. ft. Per Ton: stem) rather	: than entire floo	0.000 * 0 ** r area.
Building Loads							
Total Heating Required Inc	luding V	entilation Air	: 39,9	927 Btuh	39.927	MBH	
Rhvac is an ACCA approve Calculations are performed All computed results are es Be sure to select a unit that your design conditions.	ed Manu I per AC stimates t meets	ial J, D and S CA Manual J as building u both sensible	S computer pr l 8th Edition, use and weath and latent lo	ogram. Version 2, an her may vary. bads accordin	d ACCA Ma	nual D. hufacturer's per	formance data at



Miscellaneous Report

System 1 Buderus G215/5	;	Ou	tdoor	Outdoor	Outd	oor	Indoor	Indoor	Grains
Input Data		Dry	Bulb	Wet Bulb	Rel.H	um F	Rel.Hum	Dry Bulb	Difference
Winter:		-	-3	-3.6	8	0%	n/a	61	n/a
Summer:			86	69	43	3%	50%	75	15.73
Duct Sizing Inputs									
1	<u>Main Trunk</u>			<u>Runouts</u>	<u>5</u>				
Calculate:	No			No)				
Use Schedule:	Yes			Yes	5				
Roughness Factor:	0.00300	300 0.01000							
Pressure Drop:	0.1000	in.wg./10	0 ft.	0.1000) in.wg	g./100 ft.			
Minimum Velocity:	0	ft./min		() ft./mi	n			
Maximum Velocity:	900	ft./min		750) ft./mi	n			
Minimum Height:	0	in.		() in.				
Maximum Height:	0	in.		() in.				
Outside Air Data									
		<u>Winter</u>		<u>Sı</u>	<u>immer</u>				
Infiltration Specified:		0.490	AC/hr		0.250	AC/hr			
		270	CFM		138	CFM			
Infiltration Actual:		0.490	AC/hr		0.250	AC/hr			
Building Volume:	X	33,000*	Cu.ft.	<u>X 3</u> ;	3 <u>.000*</u>	Cu.ft.			
Ū.		16,170	Cu.ft./hr		8,250	Cu.ft./hr			
	Σ	(0.0167		<u>X_(</u>	<u>).0167</u>				
Total Building Infiltration:		270	CFM		138	CFM			
Total Building Ventilation:		0	CFM		0	CFM			
*Indicated volume is based	d on custom	h building v	volume.						
		Ŭ							

---System 1---

Infiltration & Ventilation Sensible Gain Multiplier:11.71= (1.10 X 0.968 X 11.00 Summer Temp. Difference)Infiltration & Ventilation Latent Gain Multiplier:10.35= (0.68 X 0.968 X 15.73 Grains Difference)Infiltration & Ventilation Sensible Loss Multiplier:68.13= (1.10 X 0.968 X 64.00 Winter Temp. Difference)Winter Infiltration Specified:0.490 AC/hr (270 CFM), Construction: Semi-LooseSummer Infiltration Specified:0.250 AC/hr (138 CFM), Construction: Semi-Loose



Total Building Summary Loads

Component	Area	Sen	Lat	Sen	Total
Description			Gain	Gain	Gain
Menden: Glazing-DP wood DH, U-value 0.37, SHGC 0.35	103.5	2,451	0	0	0
TIG: Door-Wood - Panel, U-value 0.54	38.1	1,316	0	0	0
Overnead: Door-Overnead in front of Double, U-value 0.1	504	3,226	0	0	0
and 1" Polvi rigid U-value 0.042	725.2	1,949	0	0	0
12B-6sw: Wall-Frame R-11 insulation in 2 x 4 stud	1487 7	6 093	0	0	0
cavity, R-6 board insulation, siding finish, wood	1407.1	0,000	Ŭ	0	Ŭ
studs, U-value 0.064	0.4.0	0.405			
16B-15: Roof/Ceiling-Under Attic with Insulation on Attic	616	2,405	0	0	0
Floor (also use for Knee Walls and Partition					
Ceilings), Vented Attic, No Radiant Barrier, Dark					
Asphalt Shingles or Dark Metal, Tar and Gravel or					
Membrane, R-15 insulation, U-value 0.061					
16B-50: Roof/Ceiling-Under Attic with Insulation on Attic	2112	2,703	0	0	0
Floor (also use for Knee Walls and Partition					
Ceilings), Vented Attic, No Radiant Barrier, Dark					
Asphalt Shingles or Dark Metal. Tar and Gravel or					
Membrane R-50 insulation U-value 0.02					
22A-nl: Floor-Slab on grade. No edge insulation, no	76	4 811	0	0	0
insulation below floor, any floor cover passive light	70	4,011	0	0	0
dry soil 11 yolus 0.080					
Subtotals for structure:		24,954	0	0	0
People:	0		0	0	0
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 270. Summer CFM: 138		13.898	0	0	0
Ventilation: Winter CFM: 0. Summer CFM: 0		0	0	0	0
Hot Water Piping 50 ft Total		1 075	0	0	0
		00.007	0	0	
		39,927	0	0	0
Check Figures					
Total Building Supply CFM: 0	CFM F	Per Square ft.:			0.000 *
Square ft. of Room Area: 2,728	Squar	e ft. Per Ton:			0 **
Volume (ft ³): 33,000***	•				
* Based on area of rooms being heated or cooled (whichey	ver governs sv	/stem) rather th	han entire flo	or area.	
** Based on area of rooms being cooled.	5 ,	,			
***Indicated volume is based on custom building volume.					
Building Loads					
Total Heating Required Including Ventilation Air: 39	027 Btub	30 027 N	/RH		
	,927 Diun	59.927 W			
Notes					
Rhvac is an ACCA approved Manual J, D and S computer	program.				
Calculations are performed per ACCA Manual J 8th Edition	i, Version 2, a	nd ACCA Man	ual D.		
All computed results are estimates as building use and wea	ather may vary	/.			
Be sure to select a unit that meets both sensible and latent	loads accordi	ing to the manu	ufacturer's pe	erformance of	data at
your design conditions.					







100.0%

Meriden Fire Station After ESM 4 HVAC Load Calculations

for

Liberty Utilities & Town of Plainfield





Prepared By:

Margaret Dillon S.E.E.D.S.

Thursday, March 26, 2020

Rhvac is an ACCA approved Manual J, D and S computer program. Calculations are performed per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D.

Rhvac - Residential & Light Commercial HVAC Load	ds
S.E.E.D.S.	
laffrey NH 03452	



Project Report

Project Report		
General Project Informa Project Title: Project Date: Client Name: Company Name: Company Representati Company E-Mail Addre	Ation Meriden Fire Station After ESM 4 Tuesday, March 24, 2020 Liberty Utilities & Town of Plainfield S.E.E.D.S. Margaret Dillon ss: mdillon@myfairpoint.net	
Design Data Reference City: Building Orientation: Daily Temperature Ran Latitude: Elevation: Altitude Factor: Winter: Summer:	ge: 43 Degrees 906 ft. 0.968 Outdoor Outdoor Indoor Indoor Grains Dry Bulb Wet Bulb Rel.Hum Rel.Hum Dry Bulb Difference -3 -3.6 n/a n/a 61 n/a 86 69 43% 50% 75 16	
Check Figures Total Building Supply C Square ft. of Room Are Volume (ft ³): * Based on area of roo *** Based on area of roo ***Indicated volume is I Building Loads	FM: 0 CFM Per Square ft.: 0.000 a: 2,728 Square ft. Per Ton: 0 33,000*** 33,000*** 0 ms being heated or cooled (whichever governs system) rather than entire floor area. 0 ms being cooled. 0 wased on custom building volume. 0	* **
Total Heating Required	Including Ventilation Air: 38,310 Btuh 38.310 MBH	
Notes Rhvac is an ACCA app Calculations are perforn All computed results ar Be sure to select a unit your design conditions.	roved Manual J, D and S computer program. ned per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. a estimates as building use and weather may vary. that meets both sensible and latent loads according to the manufacturer's performance data at	



Miscellaneous Report

System 1 Buderus G215/	5	Ou	tdoor	Outdoor	Outd	oor	Indoor	Indoor	Grains
Input Data		Dry	Bulb	Wet Bulb	Rel.H	um F	Rel.Hum	Dry Bulb	Difference
Winter:			-3	-3.6	8	0%	n/a	61	n/a
Summer:			86	69	4	3%	50%	75	15.73
Duct Sizing Inputs									
	<u>Main Trunk</u>			<u>Runouts</u>					
Calculate:	No			No					
Use Schedule:	Yes			Yes					
Roughness Factor:	0.00300			0.01000					
Pressure Drop:	0.1000	in.wg./10	0 ft.	0.1000	in.wg	j./100 ft.			
Minimum Velocity:	0	ft./min		0	ft./mi	n			
Maximum Velocity:	900	ft./min		750	ft./mi	n			
Minimum Height:	0	in.		0	in.				
Maximum Height:	0	in.		0	in.				
Outside Air Data									
		<u>Winter</u>		<u>Su</u>	<u>mmer</u>				
Infiltration Specified:		0.490	AC/hr		0.250	AC/hr			
		270	CFM		138	CFM			
Infiltration Actual:		0.490	AC/hr		0.250	AC/hr			
Building Volume:	X	33.000*	Cu.ft.	X 33	<u>3.000*</u>	Cu.ft.			
0		16,170	Cu.ft./hr		8,250	Cu.ft./hr			
	Σ	(0.0167		<u>X 0</u>	.0167				
Total Building Infiltration:		270	CFM		138	CFM			
Total Building Ventilation:		0	CFM		0	CFM			
*Indicated volume is base	d on custom	h building v	/olume.						
		•							

---System 1---

Infiltration & Ventilation Sensible Gain Multiplier:11.71= (1.10 X 0.968 X 11.00 Summer Temp. Difference)Infiltration & Ventilation Latent Gain Multiplier:10.35= (0.68 X 0.968 X 15.73 Grains Difference)Infiltration & Ventilation Sensible Loss Multiplier:68.13= (1.10 X 0.968 X 64.00 Winter Temp. Difference)Winter Infiltration Specified:0.490 AC/hr (270 CFM), Construction: Semi-LooseSummer Infiltration Specified:0.250 AC/hr (138 CFM), Construction: Semi-Loose



Total Building Summary Loads

Total Dunany Currinary Loads					
Component	Area	Sen	Lat	Sen	Total
Description	Quan	Loss	Gain	Gain	Gain
Meriden: Glazing-DP wood DH, U-value 0.37, SHGC 0.3	5 103.5	2,451	0	0	0
11G: Door-Wood - Panel, U-value 0.54	38.1	1,316	0	0	0
Overhead: Door-Overhead in front of Double, U-value 0.	1 504	3,226	0	0	0
Meriden Meeting: Wall-Frame, Custom, 2x6 wall with FG	725.2	1,949	0	0	0
and 1" Polyi rigid, U-value 0.042					
12B-6sw: Wall-Frame, R-11 insulation in 2 x 4 stud cavity, R-6 board insulation, siding finish, wood studs, U-value 0.064	1487.7	6,093	0	0	0
16B-50: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Vented Attic, No Radiant Barrier, Dark Asphalt Shingles or Dark Metal, Tar and Gravel or Membrane R-50 insulation, U-value 0.02	2728	3,491	0	0	0
22A-pl: Floor-Slab on grade, No edge insulation, no	76	4,811	0	0	0
insulation below floor, any floor cover, passive, light dry soil, U-value 0.989					
Subtotals for structure:		23.337	0	0	0
People:	0	,	0	0	0
Fauinment	Ŭ		Ő	Ő	Ő
Lighting:	0		Ũ	ů 0	0 0
Ductwork:	0	0	0	0	0
Infiltration: Winter CEM: 270 Summer CEM: 129		12 000	0	0	0
Ventiletion: Winter CEM: 0. Summer CEM: 0		13,090	0	0	0
Ventilation: Winter CFW. 0, Summer CFW. 0		1 075	0	0	0
Hot water Piping, 50 ft. Total:		1,075	0	0	0
Total Building Load Totals:		38,310	0	0	0
Check Figures					
Total Building Supply CFM: 0	CFM	Per Square ft			0.000 *
Square ft. of Room Area: 2,728 Volume (ft ³): 33,000***	Squa	re ft. Per Ton:			0 **
* Based on area of rooms being heated or cooled (whic	hever governs s	system) rather	than entire fl	oor area.	
** Based on area of rooms being cooled.***Indicated volume is based on custom building volume).				
Building Loads					
Total Heating Required Including Ventilation Air:	38,310 Btuh	38.310	MBH		
Notes					
Rhvac is an ACCA approved Manual J, D and S comput Calculations are performed per ACCA Manual J 8th Edit All computed results are estimates as building use and Be sure to select a unit that meets both sensible and lat your design conditions.	ter program. tion, Version 2, a weather may va ent loads accord	and ACCA Ma ry. Jing to the ma	anual D. nufacturer's p	performance o	data at

Rhvac - Residential & Light Commercial HVAC Loads S.E.E.D.S. Jaffrey, NH 03452	1	Elite Software Development, Inc. Meriden Fire Station After ESM 4 Page 5
Building Pie Chart		





100.0%

Meriden Fire Station After ESM 5 HVAC Load Calculations

for

Liberty Utilties & Town of Plainfield





Prepared By:

Margaret Dillon S.E.E.D.S.

Thursday, March 26, 2020

Rhvac is an ACCA approved Manual J, D and S computer program. Calculations are performed per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. Project Report

Project Report		
General Project Informa Project Title: Project Date: Client Name: Company Name: Company Representati Company E-Mail Addre	Ation Meriden Fire Station After ESM 5 Tuesday, March 24, 2020 Liberty Utilities & Town of Plainfield S.E.E.D.S. Margaret Dillon ive: ess: mdillon@myfairpoint.net	
Design Data Reference City: Building Orientation: Daily Temperature Ran Latitude: Elevation: Altitude Factor: Winter: Summer:	Lebanon, New Hampshire Front door faces SE Medium 43 Degrees 906 ft. 0.968 Outdoor Outdoor Indoor Indoor Grains Dry Bulb Wet Bulb Rel.Hum Rel.Hum Dry Bulb Difference -3 -3.6 n/a n/a 61 n/a 86 69 43% 50% 75 16	
Check Figures Total Building Supply C Square ft. of Room Area Volume (ft ³): * Based on area of roo *** Based on area of roo ***Indicated volume is b Building Loads Total Heating Required	CFM: 0 CFM Per Square ft.: ea: 2,728 Square ft. Per Ton: 33,000*** oms being heated or cooled (whichever governs system) rather than entire floor area. oms being cooled. based on custom building volume. d Including Ventilation Air: 36,584 Btuh 36.584 MBH	0.000 * 0 **
Notes Rhvac is an ACCA app Calculations are perforr All computed results are Be sure to select a unit your design conditions.	proved Manual J, D and S computer program. med per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D. re estimates as building use and weather may vary. t that meets both sensible and latent loads according to the manufacturer's performance dat	a at



Miscellaneous Report

System 1 Buderus G215/5	;	Ou	tdoor	Outdoor	Outd	oor	Indoor	Indoor	Grains
Input Data		Dry	Bulb	Wet Bulb	Rel.H	um F	Rel.Hum	Dry Bulb	Difference
Winter:		-	-3	-3.6	8	0%	n/a	61	n/a
Summer:			86	69	43	3%	50%	75	15.73
Duct Sizing Inputs									
1	<u>Main Trunk</u>			<u>Runouts</u>	<u>5</u>				
Calculate:	No			No)				
Use Schedule:	Yes			Yes	5				
Roughness Factor:	0.00300			0.01000)				
Pressure Drop:	0.1000	in.wg./10	0 ft.	0.1000) in.wg	g./100 ft.			
Minimum Velocity:	0	ft./min		() ft./mi	n			
Maximum Velocity:	900	ft./min		750) ft./mi	n			
Minimum Height:	0	in.		() in.				
Maximum Height:	0	in.		() in.				
Outside Air Data									
		<u>Winter</u>		<u>Sı</u>	<u>immer</u>				
Infiltration Specified:		0.490	AC/hr		0.250	AC/hr			
		270	CFM		138	CFM			
Infiltration Actual:		0.490	AC/hr		0.250	AC/hr			
Building Volume:	X	33,000*	Cu.ft.	<u>X 3</u> ;	3 <u>.000*</u>	Cu.ft.			
Ū.		16,170	Cu.ft./hr		8,250	Cu.ft./hr			
	Σ	(0.0167		<u>X_(</u>	<u>).0167</u>				
Total Building Infiltration:		270	CFM		138	CFM			
Total Building Ventilation:		0	CFM		0	CFM			
*Indicated volume is based	d on custom	h building v	volume.						
		Ŭ							

---System 1---

Infiltration & Ventilation Sensible Gain Multiplier:11.71= (1.10 X 0.968 X 11.00 Summer Temp. Difference)Infiltration & Ventilation Latent Gain Multiplier:10.35= (0.68 X 0.968 X 15.73 Grains Difference)Infiltration & Ventilation Sensible Loss Multiplier:68.13= (1.10 X 0.968 X 64.00 Winter Temp. Difference)Winter Infiltration Specified:0.490 AC/hr (270 CFM), Construction: Semi-LooseSummer Infiltration Specified:0.250 AC/hr (138 CFM), Construction: Semi-Loose



Total Building Summary Loads

rotar Dahanny Ournmary Loudo						
Component	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain	
Meriden: Glazing-DP wood DH, U-value 0.37, SHGC 0.35	103 5	2 451	0	0	0	
11G: Door-Wood - Papel I Lyalue 0.54	38.1	1 316	0	0	0	
Overhead: Deer-Overhead in front of Double LL-value 0.1	504	3 226	0	0	0	
Maridan Masting: Wall Frame, Custom, 2v6 wall with EC	705 0	3,220	0	0	0	
menden meeting. waii-Frame, Custom, 2x6 waii with FG	723.2	1,949	0	0	0	
and 1" Polyl rigid, U-value 0.042						
12B-6sw: Wall-Frame, R-11 insulation in 2 x 4 stud	1487.7	6,093	0	0	0	
cavity, R-6 board insulation, siding finish, wood						
studs, U-value 0.064						
16B-50: Roof/Ceiling-Under Attic with Insulation on Attic	2728	3,491	0	0	0	
Floor (also use for Knee Walls and Partition						
Ceilings), Vented Attic, No Radiant Barrier, Dark						
Asphalt Shingles or Dark Metal, Tar and Gravel or						
Membrane, R-50 insulation, U-value 0.02						
22A-pl; Floor-Slab on grade. No edge insulation, no	30	173	0	0	0	
insulation below floor any floor cover passive light			-	-	-	
dry soil Ll-value 0.09						
22A-nl: Floor-Slab on grade. No edge insulation no	46	2 912	0	0	0	
insulation below floor, any floor cover, passive, light	-0	2,012	0	0	U	
dry coil 11 value 0.090						
Subtotals for structure:		21,611	0	0	0	
People:	0		0	0	0	
Equipment:			0	0	0	
Lighting:	0			0	0	
Ductwork:		0	0	0	0	
Infiltration: Winter CFM: 270. Summer CFM: 138		13.898	0	0	0	
Ventilation: Winter CFM: 0. Summer CFM: 0		, 0	0	0	0	
Hot Water Piping 50 ft Total		1 075	0	0	0	
Total Duilding Load Totala		26 594	0	0		
		30,384	0	0		
Check Figures						
Total Building Supply CFM: 0	CFM P	er Square ft.:			0.000 *	
Square ft. of Room Area: 2,728	Square	ft. Per Ton:			0 **	
Volume (ft ³): 33,000***						
* Based on area of rooms being heated or cooled (whichev	er governs sys	stem) rather that	an entire floor	area.		
** Based on area of rooms being cooled.						
***Indicated volume is based on custom building volume.						
Building Loads						
Total Heating Required Including Ventilation Air: 36	584 Btub	36.584 M	BH			
		00.001 11	511			
Notes						
Rivac is an ACCA approved Manual J, D and S computer	program.					
Calculations are performed per ACCA Manual J oth Edition, version 2, and ACCA Manual D.						
All computed results are estimates as building use and wea	ather may vary.					
Be sure to select a unit that meets both sensible and latent	loads accordin	ng to the manul	acturer's perfo	ormance dat	a at	
your design conditions.						

Rhvac - Residential & Light Commercial HVAC Loads S.E.E.D.S. Jaffrey, NH 03452	1	Elite Software Development, Inc. Meriden Fire Station After ESM 5 Page 5
Building Pie Chart		





100.0%

Meriden Fire Station Energy Cost Analysis

for

Liberty Utilities & Town of Plainfield



Prepared By:

Margaret Dillon S.E.E.D.S.

Thursday, March 26, 2020

Energy Audit - Energy S.E.E.D.S. Jaffrey, NH 03452	Analysis and Cost Comparison	B	Elite Softwa	re Development, Inc. Meriden Fire Station Page 2
Project Information				
Project Title: Designed By: Project Date: Project Comment: Client Name: Client Address: Client City: Client City: Client Phone: Client Fax: Client Comment:	Meriden Fire Station Wednesday, March 25, 2020 Liberty Utilities & Town Of Plainfield	Company Name: Company Rep.: Company Address: Company City: Company Phone: Company Fax: Company Comment:	S.E.E.D.S. Margaret Dillon	
Cooling Equipment	System 1			
Model Type: Model Number: Capacity: Efficiency:	Standard Air Conditioner 0 Btuh 0			
Heating Equipment	System 1			
Model Type: Model Number: Capacity: Efficiency: System Description:	Fuel Oil Boiler 150,000 Btuh 82 AFUE Existing Conditions			
	-			
Cooling Equipment Model Type: Model Number: Capacity:	System 2 Standard Air Conditioner 0 Btuh			
Efficiency:	Outrate 2			
Model Type: Model Number: Capacity: Efficiency: System Description:	Fuel Oil Boiler 150,000 Btuh 82 AFUE After ESM 1			
Cooling Equipment	System 3			
Model Type: Model Number: Capacity: Efficiency:	Standard Air Conditioner 0 Btuh 0			
Heating Equipment	System 3			
Model Type: Model Number: Capacity: Efficiency:	Fuel Oil Boiler 150,000 Btuh 82 AFUE			
System Description:	After ESM 2			
Cooling Equipment	System 4			
Model Type: Model Number:	Standard Air Conditioner			
Capacity: Efficiency:	0 Btuh 0			
Heating Equipment	System 4			

Energy Audit - Energy Analysis S.E.E.D.S. Jaffrey, NH 03452	and Cost Comparison	Elite Software Development, Inc. Meriden Fire Station Page 3
Heating Equipment	System 4	
Model Type: Model Number:	Fuel Oil Boiler	
Capacity:	150,000 Btuh	
Efficiency:	82 AFUE	
System Description:	After ESM 3	
Cooling Equipment	System 5	
Model Type: Model Number:	Standard Air Conditioner	
Capacity:	0 Btuh	
Efficiency:	0	
Heating Equipment	System 5	
Model Type: Model Number:	Fuel Oil Boiler	
Capacity:	150,000 Btuh	
Efficiency:	82 AFUE	
System Description:	After ESM 4	
Cooling Equipment	System 6	
Model Type: Model Number:	Standard Air Conditioner	
Capacity:	0 Btuh	
Efficiency:	0	
Heating Equipment	System 6	
Model Type: Model Number:	Fuel Oil Boiler	
Capacity:	150,000 Btuh	
Efficiency:	82 AFUE	
System Description:	After ESM 5	

Energy Audit - Energy Analysis and Cost Comparison S.E.E.D.S. Jaffrey, NH 03452



Project Summary

General Project Information

Project Title: Project Date: Client Name:	Meriden Fire Station Wednesday, March 25, 2020 Liberty & Plainfield	Company Name: Company Rep: Company E-Mail Address:	S.E.E.D.S. Margaret Dillon mdillon@myfairpoint.net
Design Data			
Building Area: People: Occupancy: Actual Citv:	2,728 sq.ft. 0 0 Meriden NH	Heating Load: Loads Adj. Factor: AC On Temp.:	70,790 Btuh 0.50 0 °F
Weather Ref. City:	Lebanon, New Hampshire		
Summer Outdoor: Summer Indoor: Cooling Hours:	86 °F 75 °F 0	Winter Outdoor: Winter Indoor: Degree Days:	-3 °F 61 °F 7,200
Annual Operating Co	st Estimate		

	Fuel	Total	Total	Annual	Total	Average
System	Rates	Heating	Cooling	Service	Oper.	Monthly
Description	Set	Cost	Cost	Charges	Cost	Cost
Existing Conditions	1	\$2,198	\$0	\$176	\$2,374	\$198
After ESM 1	1	\$1,982	\$0	\$176	\$2,158	\$180
After ESM 2	1	\$1,850	\$0	\$176	\$2,026	\$169
After ESM 3	1	\$1,685	\$0	\$176	\$1,861	\$155
After ESM 4	1	\$1,617	\$0	\$176	\$1,793	\$149
After ESM 5	1	\$1,544	\$0	\$176	\$1,720	\$143



Project Summary Bar Chart





Input Data - System 1 - Existing Conditions

Estimated Cost Cooling System Type: Standard Air Conditioner Model: Efficiency: 0.00 Capacity: 0 Btuh 0 Btuh Cooling Load: Annual Cost (Spec Cooling Hours Method): \$0.00 Heating System Type: Fuel Oil Boiler Model: **82 AFUE** Efficiency: 150,000 Btuh \$1,428.41 Capacity: Oversize Penalty: \$769.14 1.35 Heating Load: 52,079 Btuh Annual Cost (Degree Days Method): \$2,197.55 **Other Costs** Service Charges: \$176.04 **Total Cost Total Annual Operating Cost:** \$2,373.59



Input Data - System 2 - After ESM 1

Estimated Cost

Cooling		
System Type:	Standard Air Conditioner	
Model:		
Efficiency:	0.00	
Capacity:	0 Btuh	
Cooling Load:	0 Btuh	
Annual Cost (Spec Cooling Hours Method):		\$0.00
Heating		
System Type:	Fuel Oil Boiler	
Model:		
Efficiency:	82 AFUE	
Capacity:	150,000 Btuh	\$1,288.28
Oversize Penalty:	1.35	\$693.69
Heating Load:	46,970 Btuh	
Annual Cost (Degree Days Method):		\$1,981.97
Other Costs		
Service Charges:		\$176.04
Total Cost		
Total Annual Operating Cost:		\$2,158.01



Input Data - System 3 - After ESM 2

Estimated Cost

Cooling		
System Type:	Standard Air Conditioner	
Model:		
Efficiency:	0.00	
Capacity:	0 Btuh	
Cooling Load:	0 Btuh	
Annual Cost (Spec Cooling Hours Method):		\$0.00
Heating		
System Type:	Fuel Oil Boiler	
Model:		
Efficiency:	82 AFUE	
Capacity:	150,000 Btuh	\$1,202.62
Oversize Penalty:	1.35	\$647.57
Heating Load:	43,847 Btuh	
Annual Cost (Degree Days Method):		\$1,850.19
Other Costs		
Service Charges:		\$176.04
Total Cost		
Total Annual Operating Cost:		\$2,026.23



Input Data - System 4 - After ESM 3

Estimated Cost

Cooling		
System Type:	Standard Air Conditioner	
Model:		
Efficiency:	0.00	
Capacity:	0 Btuh	
Cooling Load:	0 Btuh	
Annual Cost (Spec Cooling Hours Method):		\$0.00
Heating		
System Type:	Fuel Oil Boiler	
Model:		
Efficiency:	82 AFUE	
Capacity:	150,000 Btuh	\$1,095.11
Oversize Penalty:	1.35	\$589.67
Heating Load:	39,927 Btuh	
Annual Cost (Degree Days Method):		\$1,684.78
Other Costs		
Service Charges:		\$176.04
Total Cost		
Total Annual Operating Cost:		\$1,860.82

Energy Aud	it - Energy Analysis and Cost Comparison	
S.E.E.D.S.		
Jaffrey, NH	03452	



Input Data - System 5 - After ESM 4

Estimated Cost

Cooling		
System Type:	Standard Air Conditioner	
Model:		
Efficiency:	0.00	
Capacity:	0 Btuh	
Cooling Load:	0 Btuh	
Annual Cost (Spec Cooling Hours Method):		\$0.00
Heating		
System Type:	Fuel Oil Boiler	
Model:		
Efficiency:	82 AFUE	
Capacity:	150,000 Btuh	\$1,050.76
Oversize Penalty:	1.35	\$565.79
Heating Load:	38,310 Btuh	
Annual Cost (Degree Days Method):		\$1,616.55
Other Costs		
Service Charges:		\$176.04
Total Cost		
Total Annual Operating Cost:		\$1,792.59



Input Data - System 6 - After ESM 5

Estimated Cost

Cooling		
System Type:	Standard Air Conditioner	
Model:		
Efficiency:	0.00	
Capacity:	0 Btuh	
Cooling Load:	0 Btuh	
Annual Cost (Spec Cooling Hours Method):		\$0.00
Heating		
System Type:	Fuel Oil Boiler	
Model:		
Efficiency:	82 AFUE	
Capacity:	150,000 Btuh	\$1,003.42
Oversize Penalty:	1.35	\$540.30
Heating Load:	36,584 Btuh	
Annual Cost (Degree Days Method):		\$1,543.72
Other Costs		
Service Charges:		\$176.04
Total Cost		
Total Annual Operating Cost:		\$1,719.76