Energy Audit

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EVERSOURCE ENERGY

Sunapee Highway Garage

July 10, 2021

Audit Prepared by

BUILDING STRATEGIES FOR AN AFFORDABLE FUTURE
S.E.E.D.S.
SUSTAINABLE ENERGY EDUCATION DEMONSTRATION SERVICES
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Introduction

This Energy Audit has been paid for by Eversource as part of their municipal energy efficiency program. Funding may also be available to help reduce energy usage through weatherization efforts.

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

With the building modeled in existing conditions, called here Existing Conditions, energy savings can be estimated for improvements to the thermal envelope or mechanical systems. 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. There are often benefits to recommended measures beyond potential energy and dollars saved. Improved comfort, air quality, and reduced maintenance, are all potential non energy saving benefits.

This audit has been prepared with the best of intentions to assist the Eversource and the Town of Sunapee make informed decisions regarding 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 Sunapee Highway Department building was designed in 2001 and possibly constructed in 2002 by Trumbull Nelson Construction Co. It has just under 11,000 square feet conditioned floor area, including a 9,000 square foot garage with radiant floor heating.

The Viessman oil fired boiler is presumed to be original. It is in working condition, but not too soon to start planning for its replacement. Because of the low temperature radiant floor, consider converting to a high efficiency condensing propane water heater. This report includes heating and cooling load calculations which can help inform sizing future equipment.

Lighting was believed to have already been upgraded to LED recently.

The primary recommendations of this study include three envelope ESM: An air sealing package; insulating and sealing the exterior walls above the suspended ceiling where accessible; and—most of all—re-insulating the 9,000 ft2 ceiling above the garage. These ESM are described in the report and the summary cost-savings analysis can be found on the next page.

At 15 years, the 'simple payback' for the three measures is longer than it typically included in short term ESM recommendations. In this case, however, the cost of re-insulating above the garage ceiling does yield a positive ROI over 25 years and is deemed worthy for establishing an optimal thermal barrier at the ceiling. Costs for both materials and labor have been increasing , which contributes to the overall savings analysis. But an increase in energy costs could also be expected, and effectively addressing the garage ceiling is the building's single best opportunity to save dollar, energy, and carbon emissions.

Summary of Cost Savings Analysis of Recommendations

The recommended envelope improvements include targeted air sealing, insulating and air sealing the exterior wall above the suspended ceiling, and improving the thermal barrier of the ceiling over the 9000ft2 garage bays. Described in more detail in subsequent pages, the summaries below reflect the estimated cost of each measure and estimated savings in dollars, energy, and CO2 emissions.

ESM 1 and 2 have a fairly convincing annual return on investment (ROI) of about 4% for 15-25 years. ESM 3 involves the ceiling's thermal barrier. Due to rising costs of materials and labor, and today's relatively low cost of oil, at first glance it may be hard to justify a 'simple payback' of 16 years based on the current price of oil. But it is recommended none the less because it is the best opportunity to significantly reduce fuel usage and does yield a positive ROI over the life of measure. The ROI would only improve if the price of oil rises above $2.30 per gallon.

ESM #	Envelope ESM	Cost of Measure	Annual Savings	Simple Payback Years	Life of Measure	Invest-ment Gain	ROI	Annual ROI
1	Air Sealing Package	$2,270	$275	8.3	15	$1,855	81.7%	4.1%
2	Above sus-pended	$475	$47	10.1	25	$700	147.4%	3.7%
3	Ceiling	$32,850	$2,050	16.0	25	$18,400	56.0%	1.8%
ESM 1-3	Totals	$35,595	$2,372	15.0	24	$20,955	59.9%	2.0%

After implementing all three recommended ESM, at an estimated investment of $35, 595, annual savings from heating oil is predicted to be about $2,372. Over the expected service life of each measure, the return on invest-ment (ROI) would be 59.9% with an annualized ROI of 2.0%.

Kristin Bahney, your Eversource representative, will be able to determine whether these measures would qualify for a rebate, based on energy—not dollar—savings. The chart below summarizes the annual savings of oil, energy, and CO2 emissions. Annual energy savings of 142.8 million Btus results in 3,428 million Btus saved over the conservatively estimated service life of the measures.

The cost estimates for ESM one and two are based on material costs only, as both can be implemented inhouse. ESM three estimate is based on a recent contractor quote for another similar project.

ESM #	Envelope ESM	Cost of Measure	Oil Saved Gallons	Site Energy Reduction MMBTU	Source Energy Reduction MMBTU	Annual CO2 Reductions Tons
1	Air Sealing Package	$2,270	120	16.6	18.2	1.4
2	Wall above suspended	$475	20	2.8	3.1	0.2
3	Ceiling	$32,850	891	123.4	135.8	10.4
ESM 1-3	Totals	$35,595	1031	142.8	157.1	12.0

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

Elite Software Development, Inc.
Highway Dept EXISTING
Page 5

Total Building Summary Loads

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
1E-cf: Glazing-Double pane window, fixed sash, clear, insulated fiberglass frame, U-value 0.53, SHGC 0.66	12	438	0	0	0
JeldWen vinyl: Glazing-Jeld Wen DP, U-value 0.37, SHGC 0.45	41.4	1,105	0	1,746	1,746
11N: Door-Metal - Polystyrene Core, U-value 0.35	57.1	1,400	0	120	120
Insulated Overhead: Door-Overhead Door, U-value 0.1	2048	14,131	0	0	0
Gade 3 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.09	3293.9	20,632	0	429	429
Interior Rigid: Wall-Block, Custom, Unique poured wall with interior R5 rigid, U-value 0.1	375	2,588	0	0	0
Flat Blown In.Poor: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Custom, fiberglass.Poor, U-value 0.13	9000	80,730	0	0	0
Slopes.Poor: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Custom, Slopes Fiberglass, U-value 0.077	1756.1	9,615	0	4,382	4,382
22D-10rl: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4" horizontally, any floor cover, R-10 insulation, radiant, light dry soil, U-value 0.208	395	7,723	0	0	0
22D-10pl: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4" horizontally, any floor cover, R-10 insulation, passive, light dry soil, U-value 0.208	139	2,052	0	0	0
Subtotals for structure:		140,414	0	6,677	6,677
People:	8		1,600	1,840	3,440
Equipment:			126	2,411	2,537
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 733, Summer CFM: 733		55,228	1,064	1,108	2,172
Ventilation: Winter CFM: 0, Summer CFM: 0		0	0	0	0
AED Excursion:		0	0	98	98
Total Building Load Totals:		195,642	2,790	12,134	14,924

Check Figures

Total Building Supply CFM:	2,859	CFM Per Square ft.:	0.274 *
Square ft. of Room Area:	10,756	Square ft. Per Ton:	738 **
Volume (ft³):	158,049		

* 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 Including Ventilation Air:	195,642 Btuh	195.642 MBH	
Total Sensible Gain:	12,134 Btuh	81 %	
Total Latent Gain:	2,790 Btuh	19 %	
Total Cooling Required Including Ventilation Air:	14,924 Btuh	1.24 Tons (Based On Sensible + Latent)	

Notes

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.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads according to the manufacturer's performance data at your design conditions.

Condition	Sensible Heat Loss Structure MBH	Infiltration Loss MBH	Total Loss MBH	Winter CFM	Component & SA	Existing U-Value	Improved u-value
Existing	140414	55228	195642	733			
ESM 1 Air Sealing	140414	52056	192470	691			
ESM 2 Top Plate	139510	50648	190158	673	656 FT2 wall	0.09	0.07
ESM 3 Ceiling	71200	44201	115401	587	9000 FT2	0.13	0.02

Historic Energy Use Analysis

The energy analysis below is based on the energy data provided and represents a three year average (2018-2020). Fuel prices are also based on three year averages ($2.30 per gallon of oil and $1.37 per gallon of propane).

The cost of electric is based on the rates and charges from the May 2021 statement charges and an average monthly demand of 8.4KW.

Energy	Units	Site Btus	Source Btus	$Cost
Electric kWh	25,358	86,521,496	288,092,238	$4,472
Oil	3,963	548,875,500	603,763,050	$9,115
Propane	245	22,368,500	24,605,350	$364
Totals		657,765,496	916,460,638	$13,951
EUI KBtu/FT2	10756	61.2	85.2	$1.30

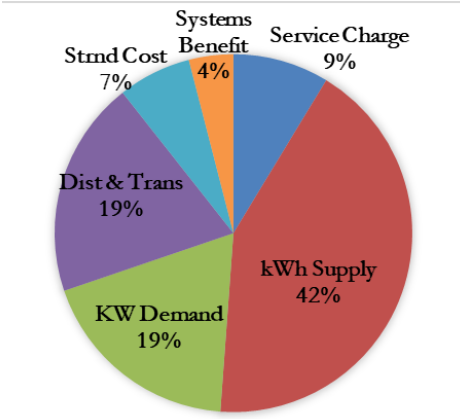
The Energy Utilization Index (EUI) offers a simple snapshot analysis of a building's energy use by looking at total amount of energy input (converted to Btu's) divided by the floor area of conditioned space. "Site Energy" refers to units of energy delivered to a site. Source energy includes transmission and some allowance for off site generation and other considerations. Source energy attempts to reflect the amount of energy is required to generate and deliver energy to the site, for a more accurate calculation of energy used and carbon emissions.

Based on the information provided the DPW's Site EUI is 61.2 KBtu/ft2. Source EUI is 85.2 KBtu/FT2 and the cost is $1.30 per ft2.

The total annual cost is broken down below by type of charge.

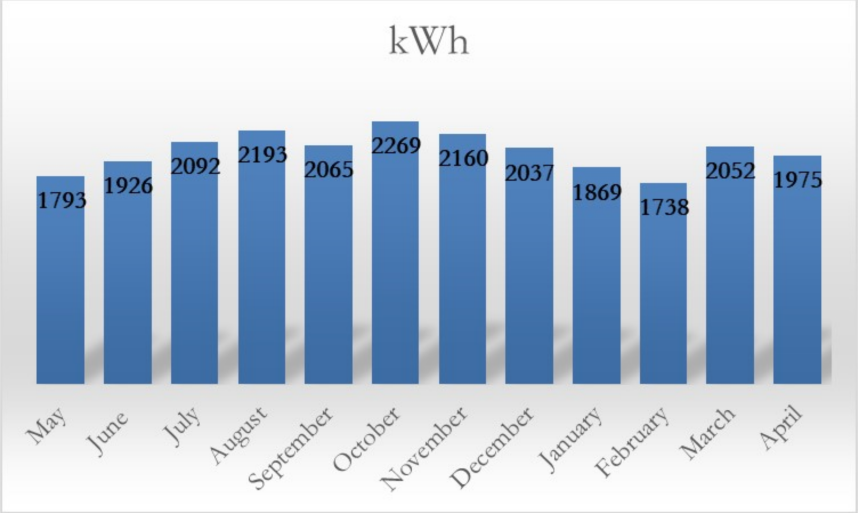
The KW Demand, which is determined each month by the peak 1-3 hours of demand on the grid, and accounts for about 19% total annual costs, may be impacted by a reduction in kWh consumption, but is mostly determined by the time of use. That is, when energy is used by the grid. For example, plugging in block warmers or chargers only at night, may reduce loads during the day enough to lower KW demand. Monthly demand was not made available for this building.

Service Charge	$389
kWh Supply	$1,900
KW Demand	$832
Distribution & Transmission	$876
Stranded Recovery Cost	$296
Systems Benefit	$180
Total	$4,472



Monthly Usage Pattern

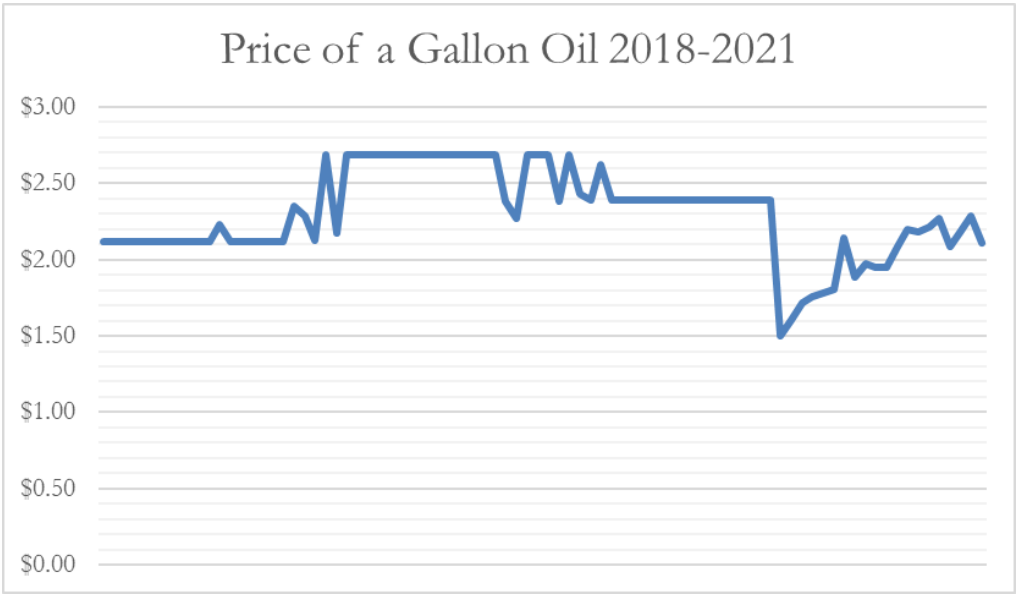
	kWh
May	1793
June	1926
July	2092
August	2193
September	2065
October	2269
November	2160
December	2037
January	1869
February	1738
March	2052
April	1975
	24169

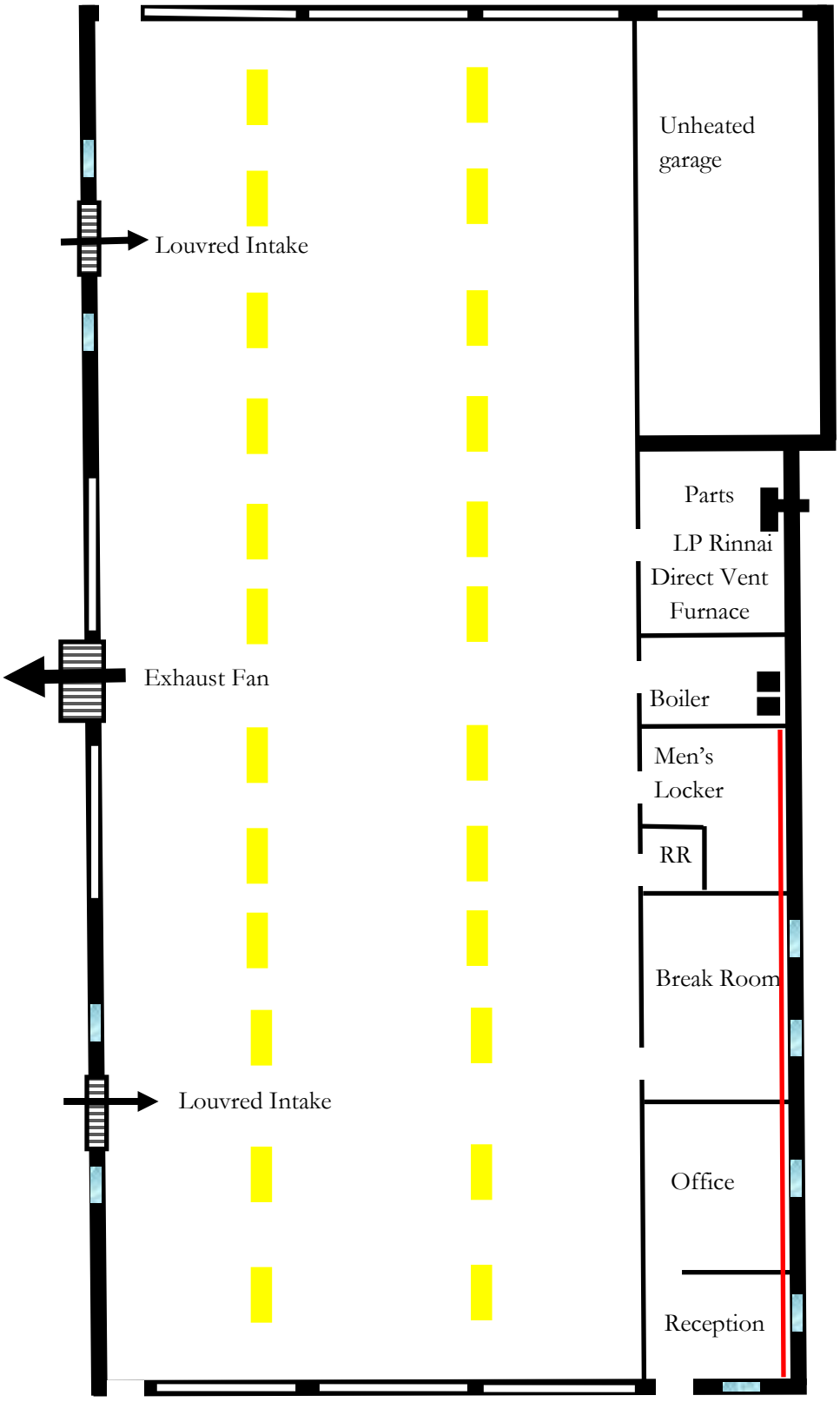


Monthly usage from May 2020 through April 2021 available from the May 2021 Statement, shows a relatively even, or, with a peak in October, a non seasonally related, pattern.

Price of Heating Oil

The price of heating oil has historically been a volatile commodity. The three year average gallon cost used for this study is $2.30 per gallon, while it was almost twice that in 2008. As of this writing, NH oil is now at $2.86 per gallon. No one has a crystal ball on future prices. If we start paying a carbon tax, the price might go up considerably—but then if demand drops, the price might go down again. Interruptions in supply lines are yet another risk to rising oil prices. The only thing that can be known is that reducing demand through improvements to the envelope to conserve energy, will always save energy, money, improve security, and reduce a building's carbon footprint. A cost benefit analysis is based on a snap shot in time.

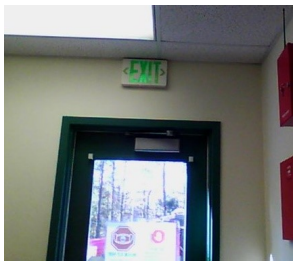


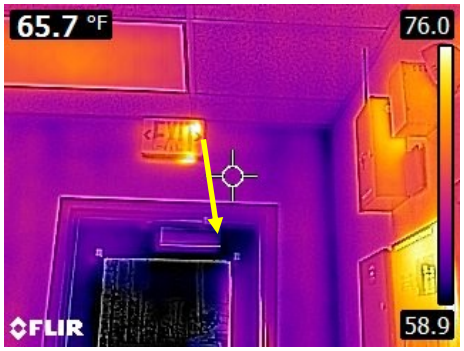

Unheated garage
Louvred Intake
Parts
LP Rinnai Direct Vent Furnace
Exhaust Fan
Boiler
Men's Locker
RR
Break Room
Louvred Intake
Office
Reception

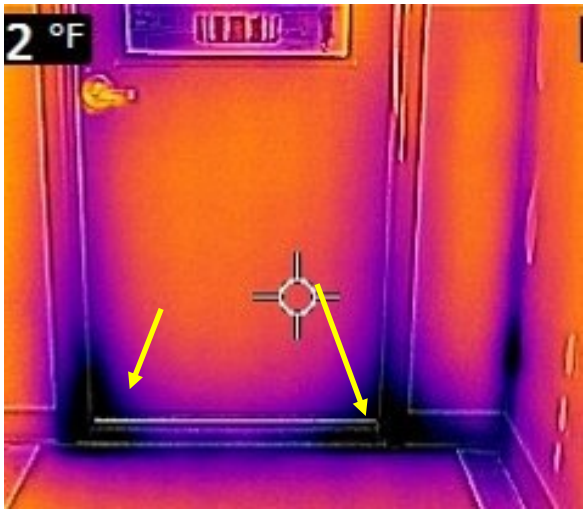
ESM 1: Air Sealing Package

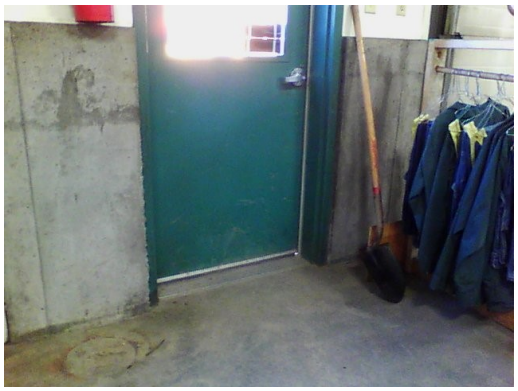
Install Exterior Door Weather-stripping

Thermographic (aka Infra red or IR) images depict differences in surface temperatures. Darker colors indicate cooler surfaces than brighter colors. During the heating season, cold outside air infiltration shows as dark 'blobs' or in streaks, also called wind-washing. All three exterior passage doors can use commercial grade weather-stripping to reduce drafts and air exchange. Doors may also need to be adjusted to assure they will close tightly, automatically.





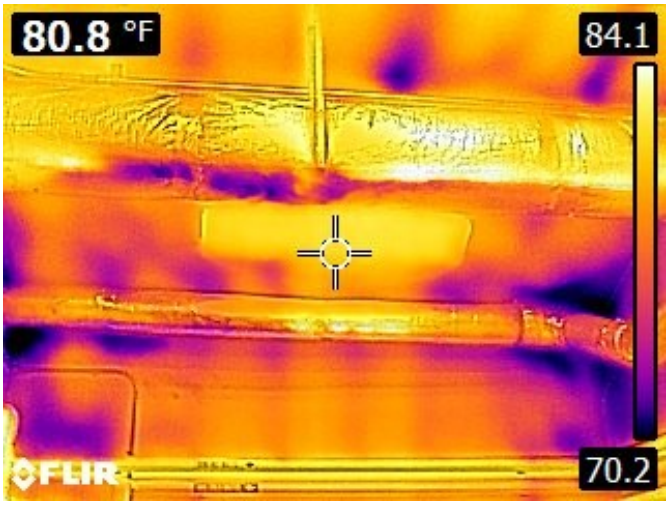




ESM 1: Air Sealing Package

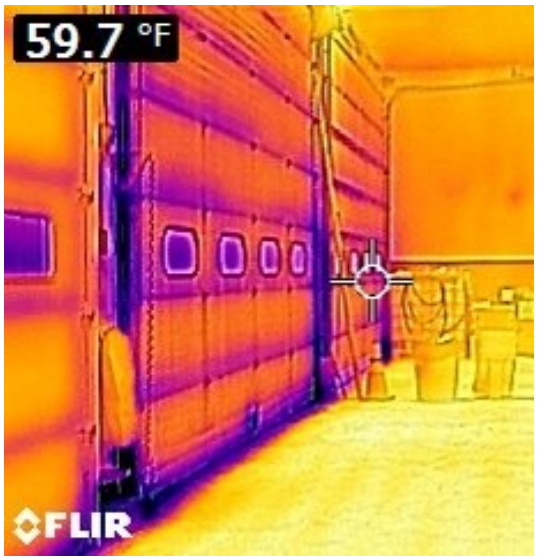
Foam Sealant, tape, and/or silicone to seal all penetrations, gaps, and cracks in the parts room.

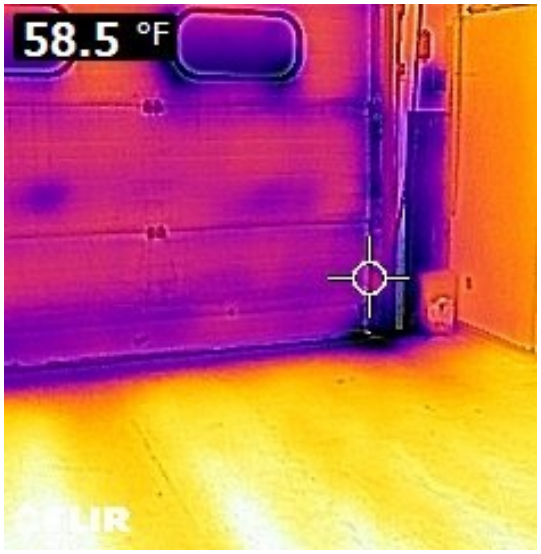
This room is heated by a direct vent propane heater, so savings will actually be in gallons of propane, but included in the dollar and energy savings calculations.



ESM 1: Air Sealing Package: Install Overhead Door Seals

Five of the eight overhead doors (in conditioned space) leak significant amount of air around the edges. (One door is new and one already has a tight seal, not even allowing light through). Its true that a lot of heat is lost when the doors open, but they are in closed position over well over 90% of the time and most all nights. So making them tighter when closed can save significant amount of air leakage.

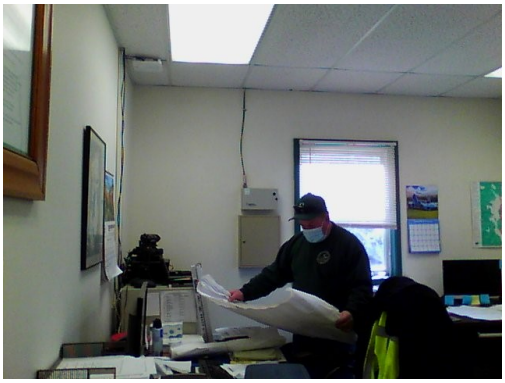


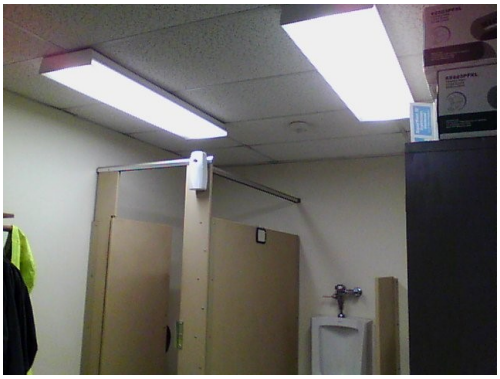


One of the quality overhead door seal lines is American Garage Door Supply which has a wide selection of side, bottom, and top seals to fit specific door types. Estimated costs include seals for five (5) 16x14 doors. [American Garage Door Supply BP4122-14 $195.92 Weatherseal Brush, L 14 ft, 2 In Brush | Zoro.com]

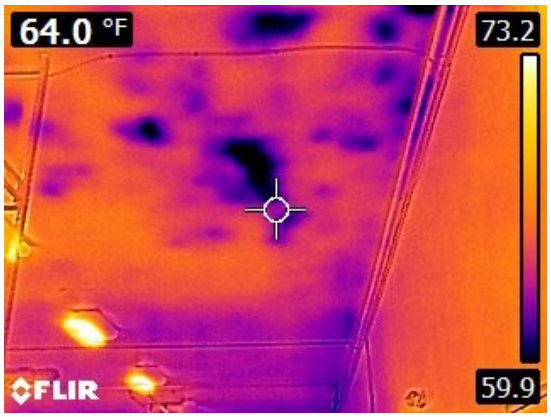
ESM 2: Air seal and insulate wall above suspended ceiling

The goal of this ESM is to seal and insulate the exterior wall above the suspended ceiling to the roof vents, which may need to be 'reconnected' to the soffit vents. This can be done by spraying two inches closed cell foam between rafters from top plate to vent. Or, to save costs and the labor consuming chore of protecting interiors from foam, by cutting rigid foam board with 1/2" clearance and using one part foam to seal to outer-most edge of top-plate and vent. This latter strategy can be done in-house.

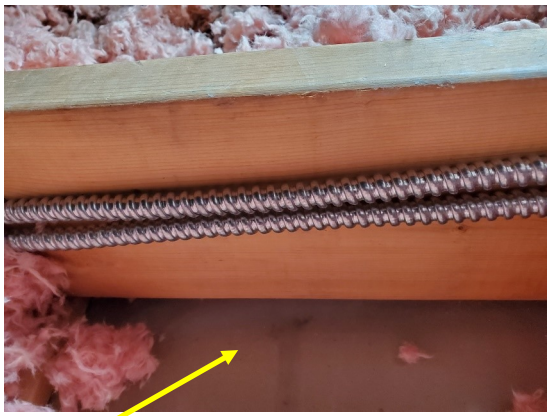




ESM 4: Re-insulate Ceiling



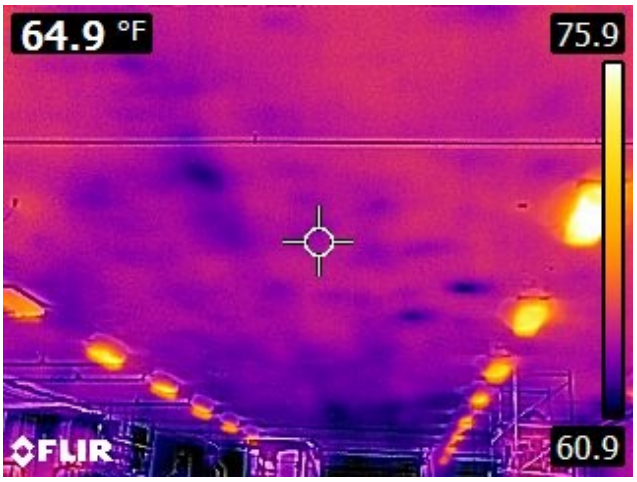
The ceiling above the garage reflects common late 20th, early 21st century practices: Strapping secured to bottom trusses or rafters, followed by a stapled polyethylene vapor barrier and sheetrock. Then anywhere from six to ten inches of blown in fiberglass. The thermal performance of this assembly is impacted by a) the air gap created by the strapping allows air movement through the low density fiberglass (Without an air barrier on all six sides, fiberglass performs better as a filter than insulator) b) foot traffic c) lack of air sealing over top plates up to roof vents.



A common, lower cost, approach to addressing those performance issues is to simply blow some additional material on top of the existing fiberglass. In many cases, this does result in some improvement—but misses the opportunity for optimal insulation values. Eventually, all material (new and old) is removed, so the recommendation is to invest once, by removing all fiberglass, foam sealing all penetrations and sealing up to the propa-vents over condition spaces, then blow in 18 inches cellulose.

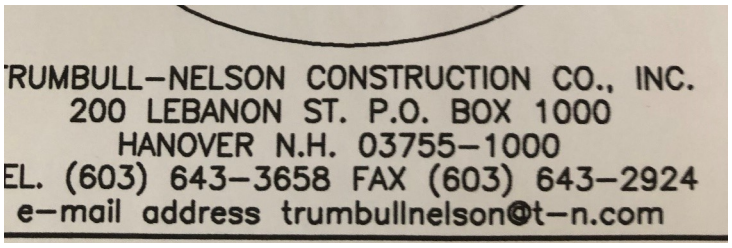
ESM 4: Re-insulate Ceiling

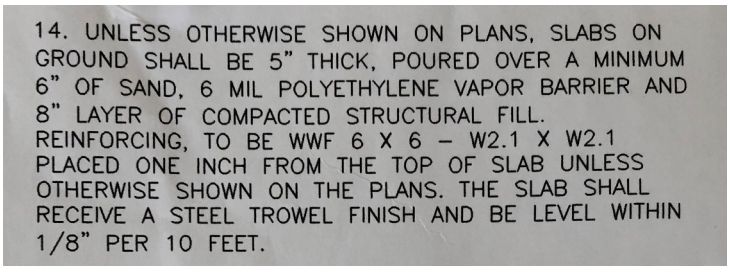
Thermal performance of the existing ceiling insulation ranges between R2 and R14. The 2015 IECC calls for R49 for new construction in both commercial and residential ceilings in Zone 6.

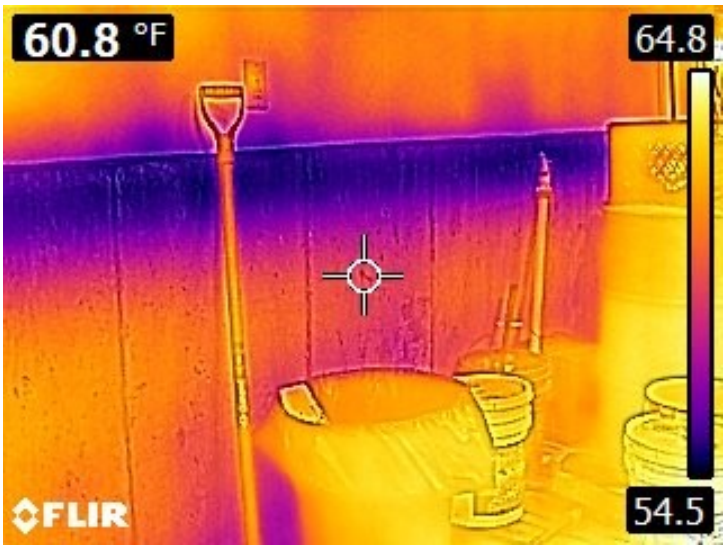


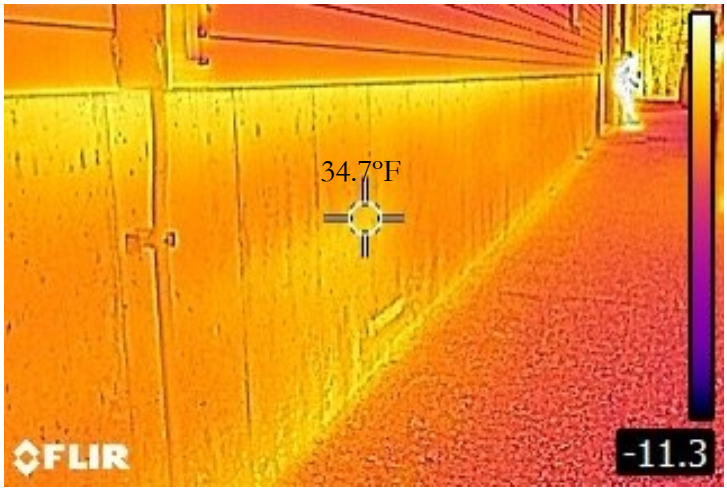
Slab and Foundation Walls

Construction plans dated 9/16/01 made no mention of insulation under or at the edges of the slab. Plans were initialed by an ELF. A phone call to Trumbell Nelson found Ed Freedman who remembered the building. He said there would have been at least 2" XPS (R10) under the radiant slab and 4' down the edge below grade. He also remembered that there was a uniquely poured wall which included 2" XPS in the inside of the pour. IR concurs with the wall having insulation, except near the top edge which may be due to either air leakage at the bottom plate, or simply colder as the slab warmth is lost.

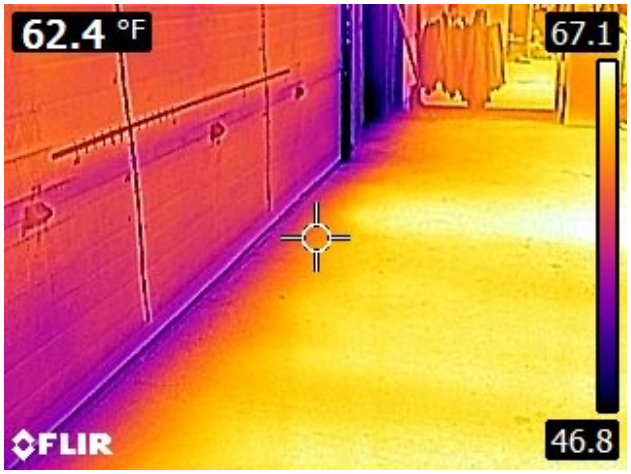








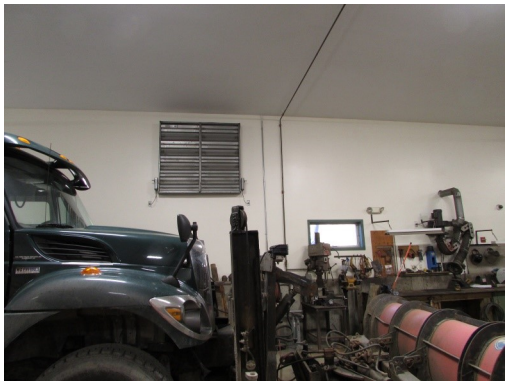
Radiant Garage Floor Images

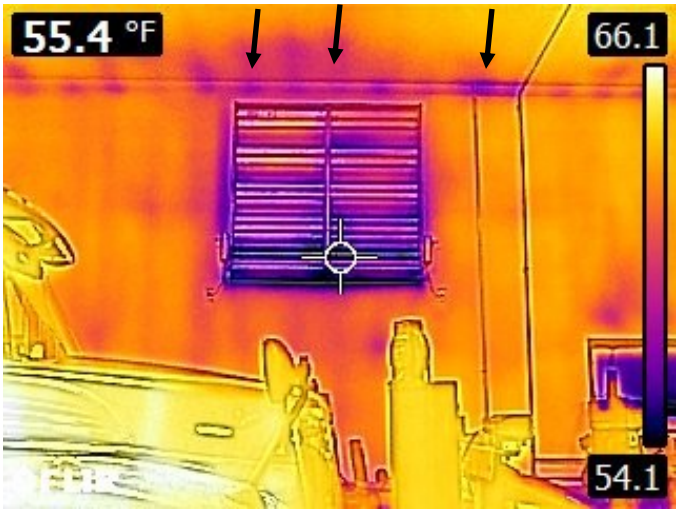


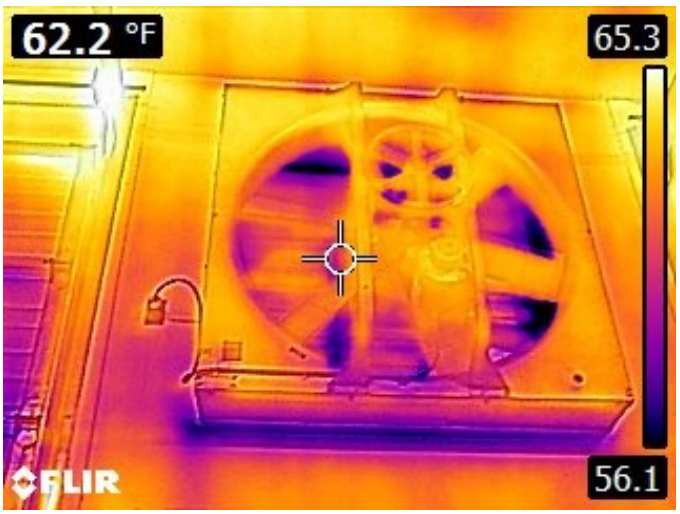
Ventilation

A large central exhaust fan is turned on manually as needed, drawing outside air through two louvred, screened openings along the same south facing wall.

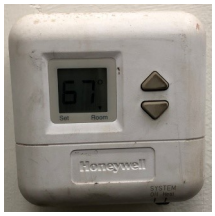
Note the cooler surfaces on the ceiling (below) as cold air is pulled through soffit vent locations. Establishing an air barrier in contact with insulation will eliminate this 'thermal by-pass'.

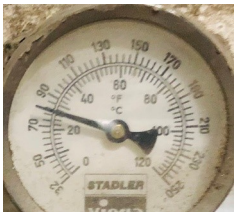






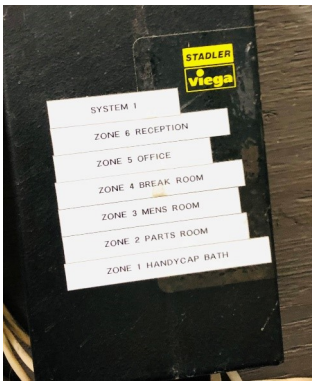
Viessmann Vitola 200	Model VB2-63
Input Rate	300,000 Btu/h
DOE Heating Capacity	258,000 Btu/h
Net IBR	224,000 Btu/h

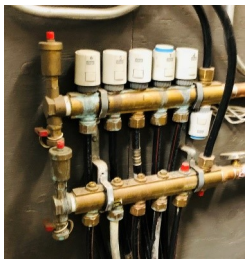




Baseboard and radiant floor temps.

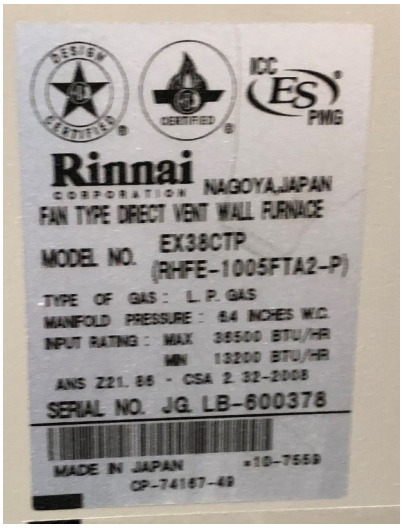
The boiler is believed to be original, therefore about 20 years old. It is advised to plan for its replacement in the next 5-10 years.



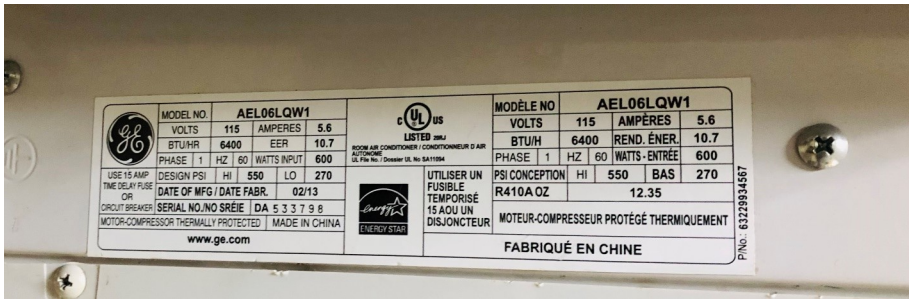


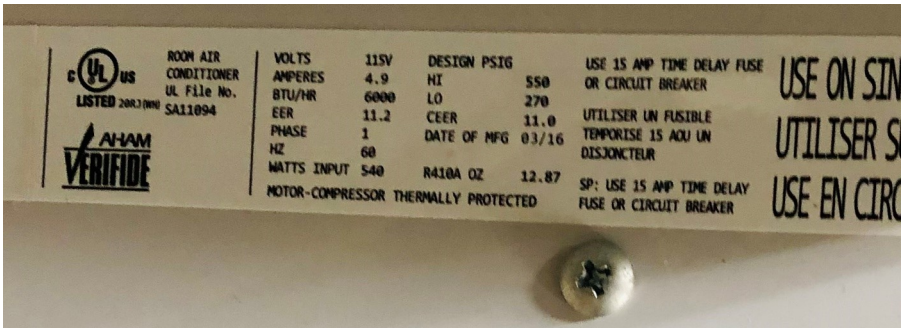
Make up combustion air supplied by a 2600RPM 'Fan in a Can' CAS-3 which comes on whenever the burner comes on.

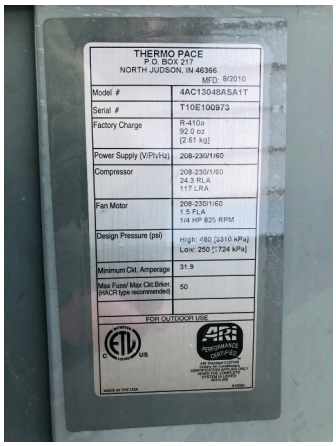
The parts room is heated by a direct vent, propane fired Rinnai wall furnace with input ratings ranging from 132MBH to 355MBH. Sensible loss is calculated to be less than 8MBH.



Summer cooling provided to the reception room and office by (2) .5 ton room AC,: one EER 10.7 dated 2013, and the other, EER 11.2 dated 2016). The outdoor unit is a Thermo Pace, model # 4AC13048ASA1T, manufactures in 2010, using R410a refrigerant.







Highway Dept EXISTING
HVAC Load Calculations

for

Town Of Sunapee

Sunapee, NH, 03782

Elite Software

RHVAC Residential HVAC Loads

Prepared By:

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

603-532-8979
Friday, July 9, 2021

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

Project Title:	Highway Dept EXISTING
Project Date:	Wednesday, June 23, 2021
Client Name:	Town Of Sunapee
Client City:	Sunapee, NH, 03782
Company Name:	S.E.E.D.S.
Company Representative:	Margaret Dillon
Company Phone:	603-532-8979
Company E-Mail Address:	mdillon@myfairpoint.net

Design Data

Reference City:		Concord AP, New Hampshire
Building Orientation:		Front door faces South
Daily Temperature Range:		High
Latitude:	43	Degrees
Elevation:	342	ft.
Altitude Factor:	0.988	

	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	n/a	n/a	67	n/a
Summer:	87	70	43%	50%	75	19

Check Figures

Total Building Supply CFM:	2,859	CFM Per Square ft.:	0.274 *
Square ft. of Room Area:	10,756	Square ft. Per Ton:	738 **
Volume (ft³):	158,049		

* 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 Including Ventilation Air:	195,642	Btuh	195.642	MBH
Total Sensible Gain:	12,134	Btuh	81	%
Total Latent Gain:	2,790	Btuh	19	%
Total Cooling Required Including Ventilation Air:	14,924	Btuh	1.24	Tons (Based On Sensible + Latent)

Notes

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.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads according to the manufacturer's performance data at your design conditions.

Miscellaneous Report

System 1 Radiant Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	67	n/a
Summer:	87	70	43%	50%	75	18.65

System 2 Baseboard Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	70	n/a
Summer:	87	70	43%	50%	75	18.65

System 3 Vented Propane Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	67	n/a
Summer:	87	70	43%	50%	75	18.65

Duct Sizing Inputs

	Main Trunk		Runouts	
Calculate:	No		No	
Use Schedule:	No		No	
Roughness Factor:	0.00300		0.01000	
Pressure Drop:	0.1000	in.wg./100 ft.	0.1000	in.wg./100 ft.
Minimum Velocity:	0	ft./min	0	ft./min
Maximum Velocity:	900	ft./min	750	ft./min
Minimum Height:	0	in.	0	in.
Maximum Height:	0	in.	0	in.

Outside Air Data

	Winter		Summer	
Infiltration Specified:	0.278	AC/hr	0.278	AC/hr
	733	CFM	733	CFM
Infiltration Actual:	0.278	AC/hr	0.278	AC/hr
Above Grade Volume:	X 158,049	Cu.ft.	X 158,049	Cu.ft.
	43,980	Cu.ft./hr	43,980	Cu.ft./hr
	X 0.0167		X 0.0167	
Total Building Infiltration:	733	CFM	733	CFM
Total Building Ventilation:	0	CFM	0	CFM

---System 1---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 74.97 = (1.10 X 0.988 X 69.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.249 AC/hr (603 CFM)
Summer Infiltration Specified: 0.249 AC/hr (603 CFM)

---System 2---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 78.23 = (1.10 X 0.988 X 72.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.517 AC/hr (85 CFM)
Summer Infiltration Specified: 0.517 AC/hr (85 CFM)

---System 3---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 74.97 = (1.10 X 0.988 X 69.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.983 AC/hr (45 CFM)
Summer Infiltration Specified: 0.983 AC/hr (45 CFM)

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	1.24	738	10,756	12,134	2,790	14,924	195,642	2,572	558	2,859	
System 1	0.00	0	9,180	0	0	0	167,175	2,198	0	2,198	0*
Zone 1			9,180	0	0	0	167,175	2,198	0	2,198	
1-Garage			9,000	0	0	0	164,731	2,166	0	2,166	20--0*
6-Mechanical			180	0	0	0	2,444	32	0	32	1--0*
System 2	1.24	738	1,233	12,134	2,790	14,924	20,678	272	558	558	0*
Zone 1			1,233	12,134	2,790	14,924	20,678	272	558	558	
2-Reception			221	4,713	892	5,605	6,149	81	217	217	2--0*
3-Office			315	2,978	719	3,697	4,529	60	137	137	2--0*
4-Men's Meeting Room			383	4,443	1,179	5,622	5,638	74	204	204	2--0*
5-Restrooms			315	0	0	0	4,362	57	0	0	0--0
System 3	0.00	0	343	0	0	0	7,789	102	0	102	0*
Zone 1			343	0	0	0	7,789	102	0	102	
7-Parts			343	0	0	0	7,789	102	0	102	1--0*

Total Building Summary Loads

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
1E-cf: Glazing-Double pane window, fixed sash, clear, insulated fiberglass frame, U-value 0.53, SHGC 0.66	12	438	0	0	0
JeldWen vinyl: Glazing-Jeld Wen DP, U-value 0.37, SHGC 0.45	41.4	1,105	0	1,746	1,746
11N: Door-Metal - Polystyrene Core, U-value 0.35	57.1	1,400	0	120	120
Insulated Overhead: Door-Overhead Door, U-value 0.1	2048	14,131	0	0	0
Gade 3 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.09	3293.9	20,632	0	429	429
Interior Rigid: Wall-Block, Custom, Unique poured wall with interior R5 rigid, U-value 0.1	375	2,588	0	0	0
Flat Blown In.Poor: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Custom, fiberglass.Poor, U-value 0.13	9000	80,730	0	0	0
Slopes.Poor: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Custom, Slopes Fiberglass, U-value 0.077	1756.1	9,615	0	4,382	4,382
22D-10rl: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, any floor cover, R-10 insulation, radiant, light dry soil, U-value 0.208	395	7,723	0	0	0
22D-10pl: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, any floor cover, R-10 insulation, passive, light dry soil, U-value 0.208	139	2,052	0	0	0
Subtotals for structure:		140,414	0	6,677	6,677
People:	8		1,600	1,840	3,440
Equipment:			126	2,411	2,537
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 733, Summer CFM: 733		55,228	1,064	1,108	2,172
Ventilation: Winter CFM: 0, Summer CFM: 0		0	0	0	0
AED Excursion:		0	0	98	98
Total Building Load Totals:		195,642	2,790	12,134	14,924

Check Figures

Total Building Supply CFM:	2,859	CFM Per Square ft.:	0.274 *
Square ft. of Room Area:	10,756	Square ft. Per Ton:	738 **
Volume (ft³):	158,049		

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Notes

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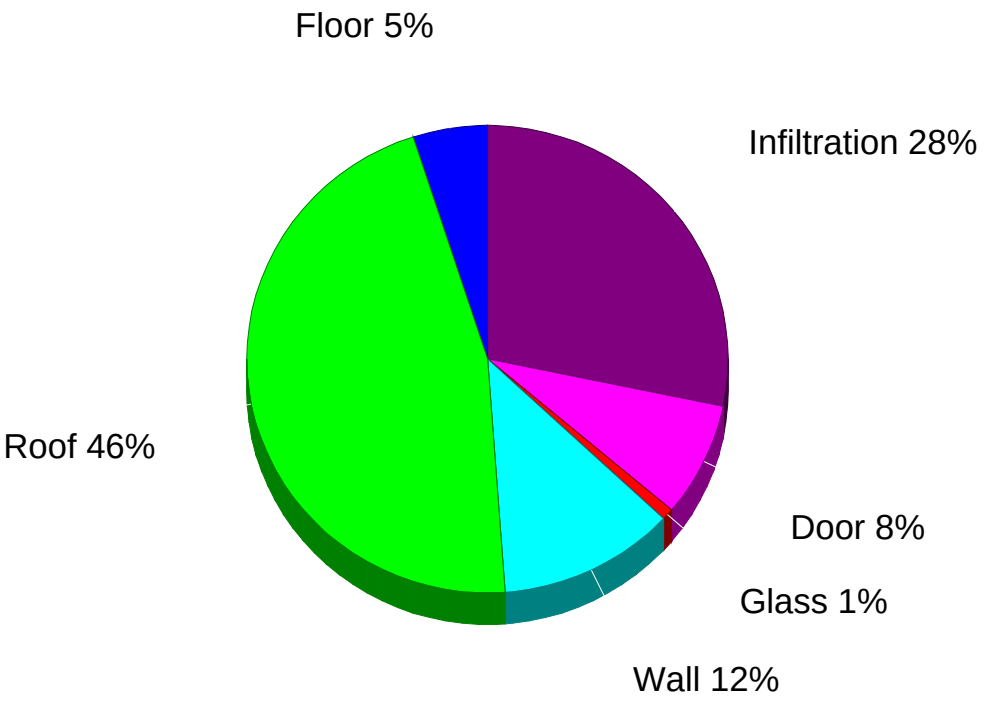
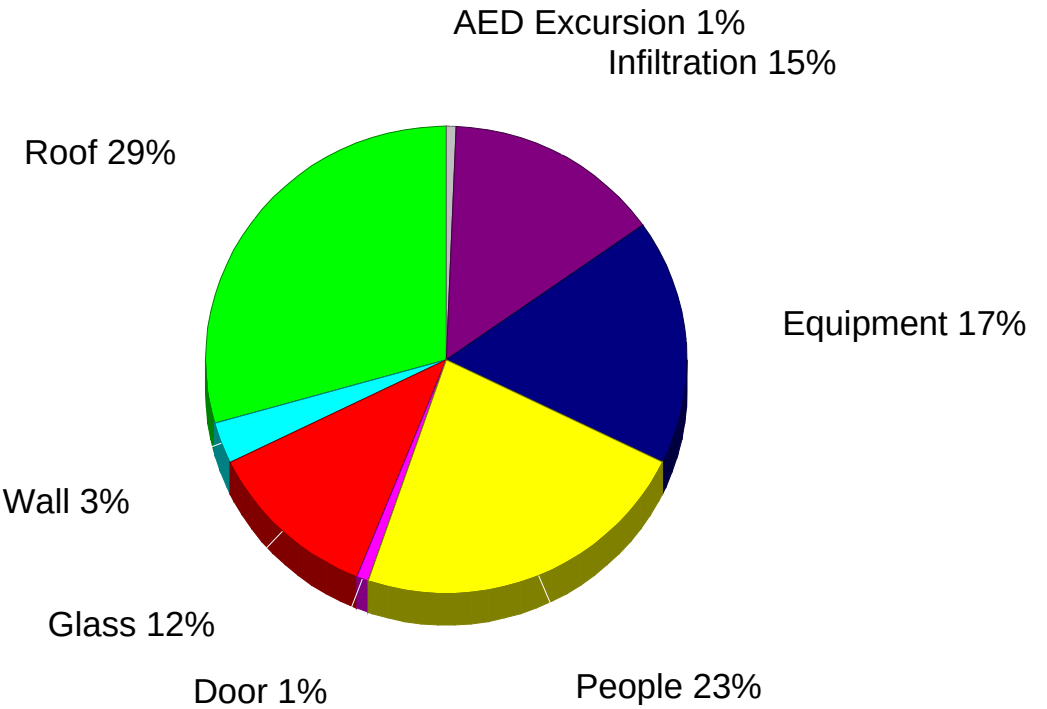
Building Pie Chart





Detailed Room Loads - Room 1 - Garage

General

Calculation Mode:	Htg. only		Occurrences:	1	
Room Length:	150.0	ft.	System Number:	1	
Room Width:	60.0	ft.	Zone Number:	1	
Area:	9,000.0	sq.ft.	Supply Air:	2,166	CFM
Ceiling Height:	16.0	ft.	Supply Air Changes:	0.9	AC/hr
Volume:	144,000	cu.ft.	Req. Vent. Clg:	0	CFM
Number of Registers:	20		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.:	592	CFM
			Actual Summer Infil.:	0	CFM

Item Description	Area Quantity	-U- Value	Htg HTM	Sen Loss	Clg HTM	Lat Gain	Sen Gain
S -Wall-Gade 3 Batts in 2x6 60 X 16	173	0.090	6.2	1,074	0.0	0	0
W -Wall-Gade 3 Batts in 2x6 150 X 16	1876	0.090	6.2	11,650	0.0	0	0
N -Wall-Gade 3 Batts in 2x6 60 X 16	173	0.090	6.2	1,074	0.0	0	0
W -Wall-Interior Rigid 125 X 3	375	0.100	6.9	2,588	0.0	0	0
S -Door-11N 2.8 X 6.8	19	0.350	24.2	460	0.0	0	0
N -Door-11N 2.8 X 6.8	19	0.350	24.2	460	0.0	0	0
S -Door-Insulated Overhead 48 X 16	768	0.100	6.9	5,299	0.0	0	0
W -Door-Insulated Overhead 32 X 16	512	0.100	6.9	3,533	0.0	0	0
N -Door-Insulated Overhead 48 X 16	768	0.100	6.9	5,299	0.0	0	0
W -Gls-1E-cf shgc-0.66 0%S (2)	12	0.530	36.6	438	0.0	0	0
UP-Ceil-Flat Blown In.Poor 150 X 60	9000	0.130	9.0	80,730	0.0	0	0
Floor-22D-10rl 395 ft..Per.	395	0.208	19.6	7,723	0.0	0	0
Subtotals for Structure:				120,328		0	0
Infil.: Win.: 592.3, Sum.: 0.0	4,695		9.458	44,403	0.000	0	0
Room Totals:				164,731		0	0

Detailed Room Loads - Room 6 - Mechanical

General

Calculation Mode:	Htg. only		Occurrences:	1	
Room Length:	17.0	ft.	System Number:	1	
Room Width:	10.6	ft.	Zone Number:	1	
Area:	180.2	sq.ft.	Supply Air:	32	CFM
Ceiling Height:	8.0	ft.	Supply Air Changes:	1.3	AC/hr
Volume:	1,442	cu.ft.	Req. Vent. Clg:	0	CFM
Number of Registers:	1		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.:	11	CFM
			Actual Summer Infil.:	0	CFM

Item Description	Area Quantity	-U- Value	Htg HTM	Sen Loss	Clg HTM	Lat Gain	Sen Gain
E -Wall-Gade 3 Batts in 2x6 10.6 X 8	84.8	0.090	6.2	527	0.0	0	0
UP-Ceil-Slopes.Poor 17 X 10.6	180.2	0.077	5.3	957	0.0	0	0
Floor-22D-10pl 11 ft..Per.	11	0.208	14.4	158	0.0	0	0
Subtotals for Structure:				1,642		0	0
Infil.: Win.: 10.7, Sum.: 0.0	85		9.458	802	0.000	0	0
Room Totals:				2,444		0	0

Equipment Cooling Loads

Item Name	Continuous Output Sensible Btuh	Continuous Output Latent Btuh	Average In-Use Output	Percent Used per Hour	Sensible Load Btuh	Latent Load Btuh
Coffee maker - warmer	155	84	100	50	78	42
Color television	683	0	100	100	683	0
Computer and monitor	1536	0	35	100	538	0
Laser printer	512	0	100	100	512	0
Miscellaneous Equipment	-1810	-42	100	100	-1810	-42
Total					0	0

Detailed Room Loads - Room 2 - Reception (Average Load Procedure)

General

Calculation Mode:	Htg. & clg.		Occurrences:	1	
Room Length:	17.0	ft.	System Number:	2	
Room Width:	13.0	ft.	Zone Number:	1	
Area:	221.0	sq.ft.	Supply Air:	217	CFM
Ceiling Height:	8.0	ft.	Supply Air Changes:	7.4	AC/hr
Volume:	1,768	cu.ft.	Req. Vent. Clg:	0	CFM
Number of Registers:	2		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.:	28	CFM
			Actual Summer Infil.:	36	CFM

Item Description	Area Quantity	-U- Value	Htg HTM	Sen Loss	Clg HTM	Lat Gain	Sen Gain
E -Wall-Gade 3 Batts in 2x6 13 X 8	95.7	0.090	6.5	620	0.8	0	81
S -Wall-Gade 3 Batts in 2x6 17 X 8	108.7	0.090	6.5	704	0.8	0	92
S -Door-11N 2.8 X 6.8	19	0.350	25.2	480	6.3	0	120
E -Gls-JeldWen vinyl shgc-0.45 0%S	8.3	0.370	26.6	221	46.6	0	386
S -Gls-JeldWen vinyl shgc-0.45 0%S	8.3	0.370	26.6	221	24.4	0	202
UP-Ceil-Slopes.Poor 17 X 13	221	0.077	5.5	1,225	4.8	0	1,055
Floor-22D-10pl 30 ft..Per.	30	0.208	15.0	449	0.0	0	0
Subtotals for Structure:				3,920		0	1,936
Infil.: Win.: 28.5, Sum.: 35.9	240		9.288	2,229	1.950	450	468
AED Excursion:							38
People: 200 lat/per, 230 sen/per:	2					400	460
Equipment:						42	1,811
Room Totals:				6,149		892	4,713

Equipment Cooling Loads

Item Name	Continuous Output Sensible Btuh	Continuous Output Latent Btuh	Average In-Use Output	Percent Used per Hour	Sensible Load Btuh	Latent Load Btuh
Coffee maker - warmer	155	84	100	50	78	42
Color television	683	0	100	100	683	0
Computer and monitor	1536	0	35	100	538	0
Laser printer	512	0	100	100	512	0
Total					1811	42

Detailed Room Loads - Room 3 - Office (Average Load Procedure)

General

Calculation Mode:	Htg. & clg.		Occurrences:	1	
Room Length:	17.0	ft.	System Number:	2	
Room Width:	18.5	ft.	Zone Number:	1	
Area:	314.5	sq.ft.	Supply Air:	137	CFM
Ceiling Height:	8.0	ft.	Supply Air Changes:	3.3	AC/hr
Volume:	2,516	cu.ft.	Req. Vent. Clg:	0	CFM
Number of Registers:	2		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.:	18	CFM
			Actual Summer Infil.:	22	CFM

Item Description	Area Quantity	-U- Value	Htg HTM	Sen Loss	Clg HTM	Lat Gain	Sen Gain
E -Wall-Gade 3 Batts in 2x6 18.5 X 8	139.7	0.090	6.5	905	0.8	0	118
E -Gls-JeldWen vinyl shgc-0.45 0%S	8.3	0.370	26.6	221	46.6	0	386
UP-Ceil-Slopes.Poor 17 X 18.5	314.5	0.077	5.5	1,744	4.8	0	1,501
Floor-22D-10pl 19 ft..Per.	19	0.208	15.0	285	0.0	0	0
Subtotals for Structure:				3,155		0	2,005
Infil.: Win.: 17.6, Sum.: 22.1	148		9.284	1,374	1.953	277	289
AED Excursion:							24
People: 200 lat/per, 230 sen/per:	2					400	460
Equipment:						42	200
Room Totals:				4,529		719	2,978

Equipment Cooling Loads

Item Name	Continuous Output Sensible Btuh	Continuous Output Latent Btuh	Average In-Use Output	Percent Used per Hour	Sensible Load Btuh	Latent Load Btuh
Coffee maker - warmer	155	84	100	50	78	42
Color television	683	0	100	100	683	0
Computer and monitor	1536	0	35	100	538	0
Laser printer	512	0	100	100	512	0
Miscellaneous Equipment	-1610	0	100	100	-1610	0
Total					200	42

Detailed Room Loads - Room 4 - Men's Meeting Room (Average Load Procedure)

General

Calculation Mode:	Htg. & clg.		Occurrences:	1	
Room Length:	17.0	ft.	System Number:	2	
Room Width:	22.5	ft.	Zone Number:	1	
Area:	382.5	sq.ft.	Supply Air:	204	CFM
Ceiling Height:	8.0	ft.	Supply Air Changes:	4.0	AC/hr
Volume:	3,060	cu.ft.	Req. Vent. Clg:	0	CFM
Number of Registers:	2		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.:	21	CFM
			Actual Summer Infil.:	27	CFM

Item Description	Area Quantity	-U- Value	Htg HTM	Sen Loss	Clg HTM	Lat Gain	Sen Gain
E -Wall-Gade 3 Batts in 2x6 22.5 X 8	163.4	0.090	6.5	1,059	0.8	0	138
E -Gls-JeldWen vinyl shgc-0.45 0%S (2)	16.6	0.370	26.6	442	46.6	0	772
UP-Ceil-Slopes.Poor 17 X 22.5	382.5	0.077	5.5	2,121	4.8	0	1,826
Floor-22D-10pl 23 ft..Per.	23	0.208	15.0	344	0.0	0	0
Subtotals for Structure:				3,966		0	2,736
Infil.: Win.: 21.4, Sum.: 26.9	180		9.289	1,672	1.950	337	351
AED Excursion:							36
People: 200 lat/per, 230 sen/per:	4					800	920
Equipment:						42	400
Room Totals:				5,638		1,179	4,443

Equipment Cooling Loads

Item Name	Continuous Output Sensible Btuh	Continuous Output Latent Btuh	Average In-Use Output	Percent Used per Hour	Sensible Load Btuh	Latent Load Btuh
Coffee maker - warmer	155	84	100	50	78	42
Color television	683	0	100	100	683	0
Computer and monitor	1536	0	35	100	538	0
Laser printer	512	0	100	100	512	0
Miscellaneous Equipment	-1410	0	100	100	-1410	0
Total					400	42

Detailed Room Loads - Room 5 - Restrooms

General

Calculation Mode:	Htg. only		Occurrences:	1	
Room Length:	17.0	ft.	System Number:	2	
Room Width:	18.5	ft.	Zone Number:	1	
Area:	314.5	sq.ft.	Supply Air:	57	CFM*
Ceiling Height:	8.0	ft.	Supply Air Changes:	1.4	AC/hr*
Volume:	2,516	cu.ft.	Req. Vent. Clg:	0	CFM
Number of Registers:	0		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.:	18	CFM
			Actual Summer Infil.:	0	CFM

* Runout Air, Supply Air and Supply Air Changes values shown are for heating only.

Item Description	Area Quantity	-U- Value	Htg HTM	Sen Loss	Clg HTM	Lat Gain	Sen Gain
E -Wall-Gade 3 Batts in 2x6 18.5 X 8	148	0.090	6.5	959	0.0	0	0
UP-Ceil-Slopes.Poor 17 X 18.5	314.5	0.077	5.5	1,744	0.0	0	0
Floor-22D-10pl 19 ft..Per.	19	0.208	15.0	285	0.0	0	0
Subtotals for Structure:				2,988		0	0
Infil.: Win.: 17.6, Sum.: 0.0	148		9.284	1,374	0.000	0	0
Room Totals:				4,362		0	0

Equipment Cooling Loads

Item Name	Continuous Output Sensible Btuh	Continuous Output Latent Btuh	Average In-Use Output	Percent Used per Hour	Sensible Load Btuh	Latent Load Btuh
Coffee maker - warmer	155	84	100	50	78	42
Color television	683	0	100	100	683	0
Computer and monitor	1536	0	35	100	538	0
Laser printer	512	0	100	100	512	0
Miscellaneous Equipment	-1810	-42	100	100	-1810	-42
Total					0	0

Detailed Room Loads - Room 7 - Parts

General

Calculation Mode:	Htg. only		Occurrences:	1	
Room Length:	17.0	ft.	System Number:	3	
Room Width:	20.2	ft.	Zone Number:	1	
Area:	343.4	sq.ft.	Supply Air:	102	CFM
Ceiling Height:	8.0	ft.	Supply Air Changes:	2.2	AC/hr
Volume:	2,747	cu.ft.	Req. Vent. Clg:	0	CFM
Number of Registers:	1		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.:	45	CFM
			Actual Summer Infil.:	0	CFM

Item Description	Area Quantity	-U- Value	Htg HTM	Sen Loss	Clg HTM	Lat Gain	Sen Gain
E -Wall-Gade 3 Batts in 2x6 20.2 X 8	161.6	0.090	6.2	1,004	0.0	0	0
N -Wall-Gade 3 Batts in 2x6 17 X 10	170	0.090	6.2	1,056	0.0	0	0
UP-Ceil-Slopes.Poor 17 X 20.2	343.4	0.077	5.3	1,824	0.0	0	0
Floor-22D-10pl 37 ft..Per.	37	0.208	14.4	531	0.0	0	0
Subtotals for Structure:				4,415		0	0
Infil.: Win.: 45.0, Sum.: 0.0	332		10.175	3,374	0.000	0	0
Room Totals:				7,789		0	0

Equipment Cooling Loads

Item Name	Continuous Output Sensible Btuh	Continuous Output Latent Btuh	Average In-Use Output	Percent Used per Hour	Sensible Load Btuh	Latent Load Btuh
Coffee maker - warmer	155	84	100	50	78	42
Color television	683	0	100	100	683	0
Computer and monitor	1536	0	35	100	538	0
Laser printer	512	0	100	100	512	0
Miscellaneous Equipment	-1810	-42	100	100	-1810	-42
Total					0	0

Miscellaneous Report

System 1 Radiant Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	67	n/a
Summer:	87	70	43%	50%	75	18.65

System 2 Baseboard Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	70	n/a
Summer:	87	70	43%	50%	75	18.65

System 3 Vented Propane Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	67	n/a
Summer:	87	70	43%	50%	75	18.65

Duct Sizing Inputs

	Main Trunk		Runouts	
Calculate:	No		No	
Use Schedule:	No		No	
Roughness Factor:	0.00300		0.01000	
Pressure Drop:	0.1000	in.wg./100 ft.	0.1000	in.wg./100 ft.
Minimum Velocity:	0	ft./min	0	ft./min
Maximum Velocity:	900	ft./min	750	ft./min
Minimum Height:	0	in.	0	in.
Maximum Height:	0	in.	0	in.

Outside Air Data

	Winter		Summer	
Infiltration Specified:	0.262	AC/hr	0.262	AC/hr
	691	CFM	691	CFM
Infiltration Actual:	0.262	AC/hr	0.262	AC/hr
Above Grade Volume:	X 158,049	Cu.ft.	X 158,049	Cu.ft.
	41,460	Cu.ft./hr	41,460	Cu.ft./hr
	X 0.0167		X 0.0167	
Total Building Infiltration:	691	CFM	691	CFM
Total Building Ventilation:	0	CFM	0	CFM

---System 1---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 74.97 = (1.10 X 0.988 X 69.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.238 AC/hr (576 CFM)
Summer Infiltration Specified: 0.238 AC/hr (576 CFM)

---System 2---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 78.23 = (1.10 X 0.988 X 72.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.475 AC/hr (78 CFM)
Summer Infiltration Specified: 0.475 AC/hr (78 CFM)

---System 3---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 74.97 = (1.10 X 0.988 X 69.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.808 AC/hr (37 CFM)
Summer Infiltration Specified: 0.808 AC/hr (37 CFM)

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	1.23	747	10,756	12,043	2,704	14,747	192,470	2,531	554	2,820	
System 1	0.00	0	9,180	0	0	0	165,151	2,172	0	2,172	0*
Zone 1			9,180	0	0	0	165,151	2,172	0	2,172	
1-Garage			9,000	0	0	0	162,743	2,140	0	2,140	20--0*
6-Mechanical			180	0	0	0	2,408	32	0	32	1--0*
System 2	1.23	747	1,233	12,043	2,704	14,747	20,130	265	554	554	0*
Zone 1			1,233	12,043	2,704	14,747	20,130	265	554	554	
2-Reception			221	4,675	855	5,530	5,965	78	215	215	2--0*
3-Office			315	2,954	697	3,651	4,416	58	136	136	2--0*
4-Men's Meeting Room			383	4,414	1,152	5,566	5,500	72	203	203	2--0*
5-Restrooms			315	0	0	0	4,249	56	0	0	0--0
System 3	0.00	0	343	0	0	0	7,189	95	0	95	0*
Zone 1			343	0	0	0	7,189	95	0	95	
7-Parts			343	0	0	0	7,189	95	0	95	1--0*

Total Building Summary Loads

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
1E-cf: Glazing-Double pane window, fixed sash, clear, insulated fiberglass frame, U-value 0.53, SHGC 0.66	12	438	0	0	0
JeldWen vinyl: Glazing-Jeld Wen DP, U-value 0.37, SHGC 0.45	41.4	1,105	0	1,746	1,746
11N: Door-Metal - Polystyrene Core, U-value 0.35	57.1	1,400	0	120	120
Insulated Overhead: Door-Overhead Door, U-value 0.1	2048	14,131	0	0	0
Gade 3 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.09	3293.9	20,632	0	429	429
Interior Rigid: Wall-Block, Custom, Unique poured wall with interior R5 rigid, U-value 0.1	375	2,588	0	0	0
Flat Blown In.Poor: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Custom, fiberglass.Poor, U-value 0.13	9000	80,730	0	0	0
Slopes.Poor: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Custom, Slopes Fiberglass, U-value 0.077	1756.1	9,615	0	4,382	4,382
22D-10rl: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, any floor cover, R-10 insulation, radiant, light dry soil, U-value 0.208	395	7,723	0	0	0
22D-10pl: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, any floor cover, R-10 insulation, passive, light dry soil, U-value 0.208	139	2,052	0	0	0
Subtotals for structure:		140,414	0	6,677	6,677
People:	8		1,600	1,840	3,440
Equipment:			126	2,411	2,537
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 691, Summer CFM: 691		52,056	978	1,017	1,995
Ventilation: Winter CFM: 0, Summer CFM: 0		0	0	0	0
AED Excursion:		0	0	98	98
Total Building Load Totals:		192,470	2,704	12,043	14,747

Check Figures

Total Building Supply CFM:	2,820	CFM Per Square ft.:	0.270 *
Square ft. of Room Area:	10,756	Square ft. Per Ton:	747 **
Volume (ft^3):	158,049		

* 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 Including Ventilation Air:	192,470	Btuh	192.470	MBH
Total Sensible Gain:	12,043	Btuh	82	%
Total Latent Gain:	2,704	Btuh	18	%
Total Cooling Required Including Ventilation Air:	14,747	Btuh	1.23	Tons (Based On Sensible + Latent)

Notes

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.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads according to the manufacturer's performance data at your design conditions.

Miscellaneous Report

System 1 Radiant Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	67	n/a
Summer:	87	70	43%	50%	75	18.65

System 2 Baseboard Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	70	n/a
Summer:	87	70	43%	50%	75	18.65

System 3 Vented Propane Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	67	n/a
Summer:	87	70	43%	50%	75	18.65

Duct Sizing Inputs

	Main Trunk		Runouts	
Calculate:	No		No	
Use Schedule:	No		No	
Roughness Factor:	0.00300		0.01000	
Pressure Drop:	0.1000	in.wg./100 ft.	0.1000	in.wg./100 ft.
Minimum Velocity:	0	ft./min	0	ft./min
Maximum Velocity:	900	ft./min	750	ft./min
Minimum Height:	0	in.	0	in.
Maximum Height:	0	in.	0	in.

Outside Air Data

	Winter		Summer	
Infiltration Specified:	0.255	AC/hr	0.255	AC/hr
	673	CFM	673	CFM
Infiltration Actual:	0.255	AC/hr	0.255	AC/hr
Above Grade Volume:	X 158,049	Cu.ft.	X 158,049	Cu.ft.
	40,380	Cu.ft./hr	40,380	Cu.ft./hr
	X 0.0167		X 0.0167	
Total Building Infiltration:	673	CFM	673	CFM
Total Building Ventilation:	0	CFM	0	CFM

---System 1---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 74.97 = (1.10 X 0.988 X 69.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.238 AC/hr (576 CFM)
Summer Infiltration Specified: 0.238 AC/hr (576 CFM)

---System 2---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 78.23 = (1.10 X 0.988 X 72.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.365 AC/hr (60 CFM)
Summer Infiltration Specified: 0.365 AC/hr (60 CFM)

---System 3---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 74.97 = (1.10 X 0.988 X 69.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.808 AC/hr (37 CFM)
Summer Infiltration Specified: 0.808 AC/hr (37 CFM)

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	1.18	776	10,756	11,720	2,478	14,198	190,158	2,500	539	2,805	
System 1	0.00	0	9,180	0	0	0	165,151	2,172	0	2,172	0*
Zone 1			9,180	0	0	0	165,151	2,172	0	2,172	
1-Garage			9,000	0	0	0	162,743	2,140	0	2,140	20--0*
6-Mechanical			180	0	0	0	2,408	32	0	32	1--0*
System 2	1.18	776	1,233	11,720	2,478	14,198	17,818	234	539	539	0*
Zone 1			1,233	11,720	2,478	14,198	17,818	234	539	539	
2-Reception			221	4,543	760	5,303	5,238	69	209	209	2--0*
3-Office			315	2,867	638	3,505	3,924	52	132	132	2--0*
4-Men's Meeting Room			383	4,310	1,080	5,390	4,911	65	198	198	2--0*
5-Restrooms			315	0	0	0	3,745	49	0	0	0--0
System 3	0.00	0	343	0	0	0	7,189	95	0	95	0*
Zone 1			343	0	0	0	7,189	95	0	95	
7-Parts			343	0	0	0	7,189	95	0	95	1--0*

Total Building Summary Loads

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
1E-cf: Glazing-Double pane window, fixed sash, clear, insulated fiberglass frame, U-value 0.53, SHGC 0.66	12	438	0	0	0
JeldWen vinyl: Glazing-Jeld Wen DP, U-value 0.37, SHGC 0.45	41.4	1,105	0	1,746	1,746
11N: Door-Metal - Polystyrene Core, U-value 0.35	57.1	1,400	0	120	120
Insulated Overhead: Door-Overhead Door, U-value 0.1	2048	14,131	0	0	0
Gade 3 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.09	2638.3	16,385	0	0	0
Interior Rigid: Wall-Block, Custom, Unique poured wall with interior R5 rigid, U-value 0.1	375	2,588	0	0	0
Gade 2 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.07	407.2	2,052	0	171	171
Gade 2 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.075	108.7	587	0	77	77
GGade 2 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.07	139.7	704	0	92	92
Flat Blown In.Poor: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Custom, fiberglass.Poor, U-value 0.13	9000	80,730	0	0	0
Slopes.Poor: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Custom, Slopes Fiberglass, U-value 0.077	1756.1	9,615	0	4,382	4,382
22D-10rl: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, any floor cover, R-10 insulation, radiant, light dry soil, U-value 0.208	395	7,723	0	0	0
22D-10pl: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, any floor cover, R-10 insulation, passive, light dry soil, U-value 0.208	139	2,052	0	0	0
Subtotals for structure:		139,510	0	6,588	6,588
People:	8		1,600	1,840	3,440
Equipment:			126	2,411	2,537
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 673, Summer CFM: 673		50,648	752	783	1,535
Ventilation: Winter CFM: 0, Summer CFM: 0		0	0	0	0
AED Excursion:		0	0	98	98
Total Building Load Totals:		190,158	2,478	11,720	14,198

Check Figures

Total Building Supply CFM:	2,805	CFM Per Square ft.:	0.269 *
Square ft. of Room Area:	10,756	Square ft. Per Ton:	776 **
Volume (ft³):	158,049		

* 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 Including Ventilation Air:	190,158	Btuh	190.158	MBH
Total Sensible Gain:	11,720	Btuh	83	%
Total Latent Gain:	2,478	Btuh	17	%
Total Cooling Required Including Ventilation Air:	14,198	Btuh	1.18	Tons (Based On Sensible + Latent)

Notes

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.
All computed results are estimates as building use and weather may vary.

Miscellaneous Report

System 1 Radiant Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	67	n/a
Summer:	87	70	43%	50%	75	18.65

System 2 Baseboard Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	70	n/a
Summer:	87	70	43%	50%	75	18.65

System 3 Vented Propane Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-2	-2.6	80%	n/a	67	n/a
Summer:	87	70	43%	50%	75	18.65

Duct Sizing Inputs

	Main Trunk		Runouts	
Calculate:	No		No	
Use Schedule:	No		No	
Roughness Factor:	0.00300		0.01000	
Pressure Drop:	0.1000	in.wg./100 ft.	0.1000	in.wg./100 ft.
Minimum Velocity:	0	ft./min	0	ft./min
Maximum Velocity:	900	ft./min	750	ft./min
Minimum Height:	0	in.	0	in.
Maximum Height:	0	in.	0	in.

Outside Air Data

	Winter		Summer	
Infiltration Specified:	0.223	AC/hr	0.223	AC/hr
	587	CFM	587	CFM
Infiltration Actual:	0.223	AC/hr	0.223	AC/hr
Above Grade Volume:	X 158,049	Cu.ft.	X 158,049	Cu.ft.
	35,220	Cu.ft./hr	35,220	Cu.ft./hr
	X 0.0167		X 0.0167	
Total Building Infiltration:	587	CFM	587	CFM
Total Building Ventilation:	0	CFM	0	CFM

---System 1---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 74.97 = (1.10 X 0.988 X 69.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.202 AC/hr (490 CFM)
Summer Infiltration Specified: 0.202 AC/hr (490 CFM)

---System 2---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 78.23 = (1.10 X 0.988 X 72.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.365 AC/hr (60 CFM)
Summer Infiltration Specified: 0.365 AC/hr (60 CFM)

---System 3---
Infiltration & Ventilation Sensible Gain Multiplier: 13.04 = (1.10 X 0.988 X 12.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 12.52 = (0.68 X 0.988 X 18.65 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 74.97 = (1.10 X 0.988 X 69.00 Winter Temp. Difference)
Winter Infiltration Specified: 0.808 AC/hr (37 CFM)
Summer Infiltration Specified: 0.808 AC/hr (37 CFM)

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	1.18	776	10,756	11,720	2,478	14,198	115,401	1,517	539	1,822	
System 1	0.00	0	9,180	0	0	0	90,394	1,189	0	1,189	0*
Zone 1			9,180	0	0	0	90,394	1,189	0	1,189	
1-Garage			9,000	0	0	0	88,100	1,158	0	1,158	11--0*
6-Mechanical			180	0	0	0	2,294	30	0	30	1--0*
System 2	1.18	776	1,233	11,720	2,478	14,198	17,818	234	539	539	0*
Zone 1			1,233	11,720	2,478	14,198	17,818	234	539	539	
2-Reception			221	4,543	760	5,303	5,238	69	209	209	2--0*
3-Office			315	2,867	638	3,505	3,924	52	132	132	2--0*
4-Men's Meeting Room			383	4,310	1,080	5,390	4,911	65	198	198	2--0*
5-Restrooms			315	0	0	0	3,745	49	0	0	0--0
System 3	0.00	0	343	0	0	0	7,189	95	0	95	0*
Zone 1			343	0	0	0	7,189	95	0	95	
7-Parts			343	0	0	0	7,189	95	0	95	1--0*

Total Building Summary Loads

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
1E-cf: Glazing-Double pane window, fixed sash, clear, insulated fiberglass frame, U-value 0.53, SHGC 0.66	12	438	0	0	0
JeldWen vinyl: Glazing-Jeld Wen DP, U-value 0.37, SHGC 0.45	41.4	1,105	0	1,746	1,746
11N: Door-Metal - Polystyrene Core, U-value 0.35	57.1	1,400	0	120	120
Insulated Overhead: Door-Overhead Door, U-value 0.1	2048	14,131	0	0	0
Gade 3 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.09	2638.3	16,385	0	0	0
Interior Rigid: Wall-Block, Custom, Unique poured wall with interior R5 rigid, U-value 0.1	375	2,588	0	0	0
Gade 2 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.07	407.2	2,052	0	171	171
Gade 2 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.075	108.7	587	0	77	77
GGade 2 Batts in 2x6: Wall-Frame, Custom, Grade 3 fg batts , U-value 0.07	139.7	704	0	92	92
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	9000	12,420	0	0	0
Slopes.Poor: Roof/Ceiling-Under Attic with Insulation on Attic Floor (also use for Knee Walls and Partition Ceilings), Custom, Slopes Fiberglass, U-value 0.077	1756.1	9,615	0	4,382	4,382
22D-10rl: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, any floor cover, R-10 insulation, radiant, light dry soil, U-value 0.208	395	7,723	0	0	0
22D-10pl: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, any floor cover, R-10 insulation, passive, light dry soil, U-value 0.208	139	2,052	0	0	0
Subtotals for structure:		71,200	0	6,588	6,588
People:	8		1,600	1,840	3,440
Equipment:			126	2,411	2,537
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 587, Summer CFM: 587		44,201	752	783	1,535
Ventilation: Winter CFM: 0, Summer CFM: 0		0	0	0	0
AED Excursion:		0	0	98	98
Total Building Load Totals:		115,401	2,478	11,720	14,198

Check Figures

Total Building Supply CFM:	1,822	CFM Per Square ft.:	0.175 *
Square ft. of Room Area:	10,756	Square ft. Per Ton:	776 **
Volume (ft³):	158,049		

* 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 Including Ventilation Air:	115,401	Btuh	115.401	MBH
Total Sensible Gain:	11,720	Btuh	83	%
Total Latent Gain:	2,478	Btuh	17	%
Total Cooling Required Including Ventilation Air:	14,198	Btuh	1.18	Tons (Based On Sensible + Latent)

Notes

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.

Sunapee Highway Garage
Energy Cost Analysis

for

Town Of Sunapee

Sunapee, NH, 03782

Elite Software
ENERGY AUDIT
Residential and Light Commercial Energy Analysis

Prepared By:

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

603-532-8979
Sunday, July 11, 2021

Project Information

Project Title:	Sunapee Highway Garage	Company Name:	S.E.E.D.S.
Designed By:		Company Rep.:	Margaret Dillon
Project Date:	Thursday, June 24, 2021	Company Address:	
Project Comment:		Company City:	
Client Name:	Town Of Sunapee	Company Phone:	603-532-8979
Client Address:		Company Fax:	
Client City:	Sunapee, NH, 03782	Company Comment:	
Client Phone:			
Client Fax:			
Client Comment:			

Cooling Equipment System 1

Model Type:	Standard Air Conditioner
Model Number:	
Capacity:	12,000 Btuh
Efficiency:	9.5 SEER

Heating Equipment System 1

Model Type:	Fuel Oil Boiler
Model Number:	
Capacity:	258,000 Btuh
Efficiency:	85 AFUE
System Description:	Existing

Cooling Equipment System 2

Model Type:	Standard Air Conditioner
Model Number:	
Capacity:	12,000 Btuh
Efficiency:	9.5 SEER

Heating Equipment System 2

Model Type:	Fuel Oil Boiler
Model Number:	
Capacity:	258,000 Btuh
Efficiency:	87 AFUE
System Description:	ESM 1

Cooling Equipment System 3

Model Type:	Standard Air Conditioner
Model Number:	
Capacity:	12,000 Btuh
Efficiency:	9.5 SEER

Heating Equipment System 3

Model Type:	Fuel Oil Boiler
Model Number:	
Capacity:	258,000 Btuh
Efficiency:	87 AFUE
System Description:	ESM 2

Cooling Equipment System 4

Model Type:	Standard Air Conditioner
Model Number:	
Capacity:	12,000 Btuh
Efficiency:	9.5 SEER

Heating Equipment System 4

Heating Equipment	System 4
Model Type:	Fuel Oil Boiler
Model Number:	
Capacity:	258,000 Btuh
Efficiency:	87 AFUE
System Description:	ESM 3

Project Summary

General Project Information

Project Title:	Sunapee Highway Garage	Company Name:	S.E.E.D.S.
Project Date:	Thursday, June 24, 2021	Company Rep:	Margaret Dillon
Client Name:	Town Of Sunapee	Company Phone:	603-532-8979
Client City:	Sunapee, NH, 03782	Company E-Mail Address:	mdillon@myfairpoint.net

Design Data

Building Area:	10,756 sq.ft.	Cooling Load:	11,246 Btuh
People:	6	Heating Load:	210,546 Btuh
Occupancy:	8	Loads Adj. Factor:	0.86
		AC On Temp.:	75 °F
Actual City:	Concord AP, New Hampshire		
Weather Ref. City:	Concord AP, New Hampshire		
Summer Outdoor:	87 °F	Winter Outdoor:	-2 °F
Summer Indoor:	75 °F	Winter Indoor:	62 °F
Cooling Hours:	150	Degree Days:	7,000

Annual Operating Cost Estimate

System Description	Fuel Rates Set	Total Heating Cost	Total Cooling Cost	Annual Service Charges	Total Oper. Cost	Average Monthly Cost
Existing	1	$9,110	$42	$0	$9,152	$763
ESM 1	1	$8,835	$42	$0	$8,877	$740
ESM 2	1	$8,788	$40	$0	$8,828	$736
ESM 3	1	$6,738	$40	$0	$6,778	$565