AEA

Arbogast Energy Auditing

Energy Auditing for Commercial, Government, & Industrial

"Lower Your Building's Costs & Save Thousands of $"

ASHRAE Level II Audit

Town Buildings

Town of Atkinson, New Hampshire

Academy Ave.

Atkinson, NH

Member of U.S. Green Building Council

LEED Accredited Professional

Utility History Period Evaluated

8/1/2008 7/31/2010

Building Type

Municipal Buildings

Energy Audit Date:

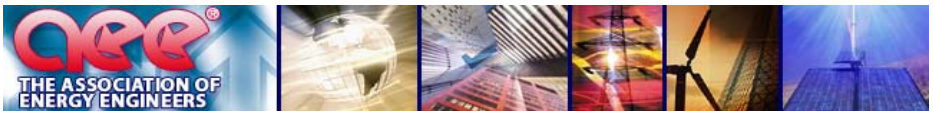
12/2/2010

Infrared Thermography Certification

Energy Audit Preformed by:

Elmer Arbogast

Member of



Certifications from AEE

Certified Energy Manager

Certified Energy Auditor

Certified Sustainable Development Professional

Member of ASHRAE

ASHRAE

Advancing HVAC&R to serve humanity and promote a sustainable world

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Definition of an ASHRAE Level II Audit

- A breakdown of energy use within each building is to be provided. A Level II energy analysis identifies and provides the savings and cost analysis of all practical measures that meet the owner's constraints and economic criteria, along with a discussion of any effect on operation and maintenance procedures. It also provides a listing of potential capital-intensive improvements that require more thorough data collection and analysis, along with an initial judgment of potential costs and savings.
- The ASHRAE Level II Audit should be used as a planning tool. The laundry list of energy conservation measures should provide direction on how the town can spend its money in the most cost-effective way.

Existing Energy Performance of Buildings

- The performance of the town buildings is better than many towns of similar size and location. This can be attributed to good energy awareness by the energy committee and the town government. All town buildings have the potential for additional improvement in energy usage, and two have major comfort issues that should be addressed.
- Ranking the building's lowest energy usage to highest energy usage per square foot, using the source energy usage index (EUI) without any normalization for type of usage, hours of operation, computer equipment, and occupancy, is as follows: Kimball House, Highway Garage, Community Center, Fire Station, Kimball Library, Family Mediation Center, Police Department, and Town Hall.

Potential Energy Performance of Buildings

- The recommendations laid out in this report have the potential of reducing the town's electrical usage by 39%, fuel usage by 63%, and CO2 emissions by 52%. The recommendations will also address comfort issues at all buildings.
- These recommendations can be used to achieve the desired 2025 reductions of energy usage and emissions laid out in the New Hampshire Climate Action Plan.

Process and Parameters Used to Evaluate Recommendations

- For each recommendation, energy savings were estimated using an energy savings calculation and current operational data collected onsite. An estimated installation cost was completed for each recommendation, and for all major components and equipment, an actual cost was obtained. The labor and remaining material were estimated using RSMeans cost data. Each recommendation was then given a priority based on payback. Recommendations with life safety or comfort components were given the higher priority. In addition, recommendations were made to convert all the buildings to propane, which will allow a low cost conversion to natural gas when it is available to the town buildings.
- The extension of natural gas into the town of Atkinson and the conversion of the town buildings, along with many of the residences and businesses, are the major steps to allow the town as a whole reach the 2025 energy usage and emission goals of the New Hampshire Climate Action Plan. It will also create a positive economic effect on the community by greatly reducing its energy cost and providing a more stable energy source. The extension is a midterm goal of 3 to 7 years, and therefore conversion to propane is recommended at this time. Please note that direct conversion to natural gas would result in an additional 25% reduction in fuel costs at current market rates.
- Finally, the savings for each building are totaled and evaluated against the building's energy usage index (EUI) and the building's benchmarking to ensure the projected energy savings are achievable.

Next Step

- The town has several approaches to consider in implementing these recommendations.
  - The first is to implement each recommendation separately. This gives the town the most flexibility and control over the implementation of the recommendations. However, this also requires the most work be done by town employees and selectmen. This approach will give the selectmen a way to closely evaluate the cost of the recommendation; it would, however, require the town to take on project management responsibility.

  - The second is to implement all recommendations at once through a contractor providing this comprehensive approach. This approach reduces the town's workload by having one project manager for the project and having to issue only one contract for the project. This approach would allow the town to apply for larger grants and low interest loans, which are available. These contractors would also bring other financing options to the table, which might reduce the overall cost of the project and financing. With this approach, the town does lose some of the flexibility as to who would do the work and could lead to limitation of town input on design, but this option would allow the town to receive a guaranteed savings contract from an energy retrofit service company (ERSCO). This option would ensure that if the savings are not met then the town would receive a check for the difference. There is a fee for this service which in general ranges from 5 to 10% of the contractor price. The estimated prices does not include this fee and therefore would need to be added to reevaluate return on investment (ROI).

  - The third approach is the one recommended by Arbogast Energy Auditing, which is to have a construction management company manage the project. The estimates in this report are based on Arbogast Energy Auditing providing this service; however, the town should be able to find other companies that provide this service at similar cost. This approach reduces the workload required by the town while retaining flexibility and design input. It also gives the Town one project manager who is responsible for the project, but would require the town to issue multiple contracts. This approach would allow the town to apply for larger grants and low interest loans, which are available. Arbogast Energy Auditing and some other providers of this service can bring other financing options to the table which might reduce the overall cost of the project and financing.

Energy Conservation in Historical Buildings

- Best practices for energy-conserving techniques in historic buildings may differ from the tools and techniques used in modern buildings. Recommendations in this study may need to be tapered if property owners are seeking to meet both energy conservation and historic preservation goals, or if a project is using federal funding. Recommendations made in this Energy Audit Report or Energy Study, if and when implemented, may require review by the New Hampshire State Historic Preservation Office (SHPO).

Energy Efficency Funding, Incentives and Rebate Database Website

- Database of State Incentives for Renewables and Efficiency (DSIRE) for New Hampshire. http://www.dsireusa.org/incentives/index.cfm?re=1&ee=1&spv=0&st=0&srp=1&state=NH

Findings and Implementation Plan Summary Table

Finding ID Number	Building	Finding	Recommendation	Package	Priority	Notes
1	Town Hall	Door weather stripping - leaking from thermal scan	Door weather stripping	1	1	
2	Town Hall	Insulation and air/vapor barrier in ceiling damaged	Weatherization - Repair air barrier	1	1	
3	Town Hall	Skylight insulation improvements	Weatherization - Install air/vapor barrier	1	1	
4	Town Hall	Controls upgrade	Building Controls - Install a BAS	2	3	
5	Town Hall	HVAC upgrade	HVAC System - Install new cabinet heaters	2	3	
6	Town Hall	VFD - System loop pump	HVAC System - VFD on system pump	2	3	
7	Town Hall	Space is air-conditioned with no economizer	HVAC - HRU w/economizer & dehumidification	2	2	
8	Town Hall	Outside air Level below ASHRAE 62.1	HVAC See Finding # 7	2	2	F-1
9	Town Hall	Micro-CHP	Renewable Install Micro-CHP	2	3	
10	Town Hall	Lighting	Lighting upgrade	1	2	
11	Police	Door weather stripping - leaking from thermal scan	Door weather stripping	1	1	
12	Police	Space around window surround leaking	Weatherization - Caulk above windows	1	1	
13	Police	Ductwork needs to be replaced	HVAC - Ductwork Replacement	2	1	
14	Police	Control upgrade - zoning	Building Controls - Add Zoning Control	1	3	
15	Police	Space is air-conditioned with no economizer	HVAC - Add economizer to existing unit	1	1	
16	Police	Lighting	Lighting Upgrade	1	4	
17	Police	Vending machine with no Vending Mizers	Vending Mizers - Install Vending Mizer & delamp	1	1	
18	Police	Thermal Solar	Renewable Install Thermal Solar	2	3	
19	Police	Timer on water heater	Install Timer on water heater	1	1	
20	Fire Station	Door weather stripping - leaking from thermal scan	Door weather stripping	1	2	
21	Fire Station	Space is air conditioned with no economizer	HVAC - Install economizer on furnaces	2	1	
22	Fire Station	Outside air Level below ASHRAE 62.1	HVAC - See Finding #21	2	1	F-1
23	Fire Station	Lighting	Lighting upgrade	1	2	
24	Fire Station	Insulation and air barrier damaged	Weatherization - Repair insulation and air barrier	1	1	
25	Community Center	Door weather-stripping - leaking from thermal scan	Door weather stripping	1	1	
26	Community Center	Window air conditioners need to be replaced	HVAC - Install central HVAC unit	2	2	
27	Community Center	Space is air-conditioned with no economizer	HVAC - See Finding #26	2	2	
28	Community Center	Outside air Level below ASHRAE 62.1	HVAC - See Finding #26	2	2	F-1
29	Community Center	Higher efficiency boiler available	HVAC - Install a high-efficiency propane boiler	2	2	
30	Community Center	Lighting	Lighting Upgrade	1	2	
31	Community Center	Timer on water heater	Install Timer on water heater	1	1	
64	Community Center	Windows in need of repair	Weatherization - Convert windows to inoperable and caulk	1	1	
32	Library	Door weather stripping - leaking from thermal scan	Door weather stripping	1	1	
33	Library	Controls need optimization	Building controls - Control optimization	1	1	
34	Library	No heat recovery on exhaust air	HVAC - Install HRU	2	3	
35	Library	Reset boiler off of building load and OAT	Building control - Boiler building load control	1	1	
36	Library	Higher efficiency boiler available	HVAC - Install 2 high-efficiency propane boilers	2	2	
37	Library	Lighting	Lighting Upgrade	1	4	
38	Kimball House	Door weather stripping - leaking from thermal scan	Door weather stripping	1	1	
39	Kimball House	Insulate above kitchen	Weatherization - Add insulation above kitchen	1	1	
40	Kimball House	Insulation needs to be repaired and protected in attic	Weatherization - Install plywood for storage	1	1	
41	Kimball House	Walls need insulation	Weatherization - Blow insulation into walls	2	3	
42	Kimball House	Duct needs to be insulated and sealed	HVAC - Seal and insulate ductwork	1	1	
43	Kimball House	Insulate between basement and first floor	Weatherization - Install insulation in basement	1	1	
44	Kimball House	Lighting	Lighting Upgrade	1	1	
45	Kimball House	Need to turn off phantom loads at unoccupied times	Provide smart power strips for plug-in loads	1	2	
46	Hwy Garage	Door weather stripping - leaking from thermal scan	Door weather stripping	1	2	
47	Hwy Garage	Front overhead door needs to be repaired	Weatherization - Repair bottom of door	1	1	
48	Hwy Garage	Vehicle garage w/o CO & CO2 monitoring	Install CO and CO2 monitoring	2	1	
49	Hwy Garage	Waste oil available as fuel source	HVAC - Install waste oil furnace	2	2	
50	Hwy Garage	Lighting	Lighting upgrade	1	1	
51	Mediation Center	Door Weather stripping - leaking from thermal scan	Door weather stripping	1	1	
52	Mediation Center	Interior storm windows	Weatherization - Install Solarize Inflectors	1	2	
53	Mediation Center	Window repair	Weatherization - Repair and seal windows	1	2	
54	Mediation Center	Window replacement	Weatherization, Replace windows	2	3	
55	Mediation Center	Lighting	Lighting upgrade	1	1	
56	Mediation Center	Furnace is oversized	HVAC - Install high-efficiency Propane Furnace	2	3	
57	All Buildings - Except Police		Thermal Solar	4	4	
58	All Buildings		Wind energy	4	4	
59	All Buildings - Except Town Hall		Combine Heat and Power	4	4	
60	All Buildings		District Heating	4	4	
61	All Buildings		Bio Energy	4	4	
62	All Buildings		Yearly Energy Review	3	1	
63	All Buildings		Real-time Monitoring	3	1	

General Notes

G-1	Package identification: 1 - Lower cost operational and maintenance, 2 - Capital improvement measure, 3 - Energy management improvement opportunity, 4 - Non energy saving measure
G-2	Priority ratings: 1 - High priority, 2 - Medium priority, 3 - Low priority, 4-Information only

Finding Notes

F-1 Space is occupied below the density level used by ASHRAE, and therefore indoor air quality is acceptable.

Recommendation, Cost and Savings Summary Tables - Page 1

Existing Energy Usage

Building Baseline	Building(s)	Existing Electrical Energy Usage (KWH/yr)	Average Electrical Demand (KW)	Propane Usage (Gal)	Fuel Oil Usage (Gal)	Existing Utility Cost ($)	Existing Source EUI (kBtu/SF)	Existing CUI ($/SF)	Existing Building CO2 Emissions (Metric Tons)
8/01/2009 to 7/31/2010	Atkinson Town Hall	91,397	24.65	0	83	$12,840.82	171	$1.96	31.56
8/01/2009 to 7/31/2010	Police Department	41,160	12.12	625	0	$5,334.02	156	$1.49	17.42
8/01/2009 to 7/31/2010	Kimball Library	91,840	34.73	3,716	0	$19,707.87	132	$1.79	52.23
8/01/2009 to 7/31/2010	Kimball House	979	1.89	0	763	$2,219.40	47	$0.89	8.07
8/01/2009 to 7/31/2010	Mediation Center	5,570	0.00	0	604	$2,450.80	135	$2.17	8.00
8/01/2009 to 7/31/2010	Fire Station	67,582	23.26	2,835	0	$13,932.20	94	$1.22	39.01
8/01/2009 to 7/31/2010	Highway Garage	6,077	4.04	1,006	0	$2,787.98	56	$0.94	7.82
8/01/2009 to 7/31/2010	Community Center	15,517	9.55	103	1,581	$6,535.26	61	$0.96	21.85
8/01/2009 to 7/31/2010	Total All Buildings	320,122	110.24	8,285	3,030	$65,808.36	110	$1.43	185.97

Goal - Energy Usage

Energy Goals will be set during Energy Planning Stage which is not included in this report

Building Baseline	Building(s)	Electrical Energy Usage (KWH/yr)	Average Electrical Demand (KW)	Propane Usage (Gal)	Fuel Oil Usage (Oil)	Utility Cost ($)	EUI (kBtu/SF)	CUI ($/SF)	Building CO2 Emissions (Metric Tons)
Short Term (1 to 3 Years)									
Mid Term (3 to 5 Years)									
Long Term (5 to 10 Years)									

Operation and Maintenance Measures

Energy Conversion Project Title	Building(s) Where Implemented	Finding Number	Electrical Energy Avoided (KWH)	Electrical Demand Reduced (KW)	Fuel Oil Usage Avoided (Gallons)	Propane Usage Avoided (Gallons)	Metric Tons of CO2 Reduced	Estimated Installation Cost	Yearly Utility Cost Savings	Simple Payback (Years)	Lifetime Return on Investment
Door weather stripping	Town Hall	1	1,412.05	0.00	0.00	0.00	0.47	$687.58	145.75	4.72	169.57%
Door weather stripping	Police	11	24.19	0.00	0.00	109.67	0.64	$968.37	196.62	4.93	162.43%
Door weather stripping	Fire Station	20	62.90	0.00	0.00	251.42	1.47	$3,755.95	451.51	8.32	96.17%
Door weather stripping	Community Center	25	40.64	0.00	116.91	0.00	1.20	$825.10	322.19	2.56	312.39%
Door weather stripping	Library	32	52.26	0.00	0.00	236.89	1.38	$1,237.65	424.69	2.91	274.52%
Door weather stripping	Kimball House	38	0.00	0.00	59.88	0.00	0.61	$412.55	166.56	2.48	322.99%
Door weather stripping	Hwy Garage	46	0.00	0.00	0.00	115.16	0.66	$1,699.61	203.83	8.34	107.93%
Door weather stripping	Mediation Center	51	0.00	0.00	59.88	0.00	0.61	$412.55	162.88	2.53	315.84%
Weatherization - Repair air barrier	Town Hall	2	3,145.51	0.00	0.00	0.00	1.06	$683.87	324.66	2.11	949.49%
Weatherization - Install air/vapor barrier	Town Hall	3	3,831.90	0.00	0.00	0.00	1.29	$1,045.39	395.51	2.64	756.68%
Weatherization - Caulk above windows	Police	12	107.09	0.00	0.00	87.74	0.54	$869.23	166.35	5.23	287.06%
Weatherization - Repair insulation and air barrier	Fire Station	24	21.56	0.00	0.00	86.16	0.50	$683.87	154.74	4.42	452.53%
Weatherization - Repair bottom of door	Hwy Garage	47	0.00	0.00	0.00	127.95	0.74	$1,176.47	226.47	5.19	481.26%
Weatherization - Add insulation above kitchen	Kimball House	39	0.00	0.00	61.24	0.00	0.62	$738.14	166.56	4.43	451.30%
Weatherization - Install plywood for storage	Kimball House	40	0.00	0.00	56.70	0.00	0.58	$797.54	154.22	5.17	386.75%
Weatherization - Install insulation in basement	Kimball House	43	0.00	0.00	106.57	0.00	1.08	$1,123.97	289.86	3.88	773.68%
Weatherization - Install Solarize Inflectors	Mediation Center	52	259.24	0.00	97.12	0.00	1.07	$1,650.00	290.92	7.41	134.88%
Weatherization - Repair and seal windows	Mediation Center	53	14.52	0.00	43.84	0.00	0.45	$814.07	120.75	6.74	148.33%
Weatherization - Convert windows to inoperable and caulk	Community Center	64	43.55	0.00	131.52	0.00	1.35	$2,933.59	362.24	8.10	123.48%
Building Controls - Add Zoning Control	Police	14	0.00	0.00	0.00	62.50	0.36	$1,614.90	110.63	13.92	107.76%
Building controls - Control optimization	Library	33	803.56	0.00	0.00	248.02	1.70	$784.31	521.93	1.50	1330.91%
Building control - Boiler building load control	Library	35	0.00	0.00	0.00	138.42	0.80	$784.31	245.00	3.20	624.75%
HVAC - Seal and insulate ductwork	Kimball House	42	0.00	0.00	76.00	0.00	0.77	$667.52	206.72	3.23	929.06%
HVAC - Add economizer to existing unit	Police	15	4,331.60	0.00	0.00	0.00	1.46	$1,620.92	447.09	3.63	413.73%
Lighting upgrade	Town Hall	10	3,264.79	0.91	0.00	0.00	1.10	$2,497.52	344.20	6.44	155.22%
Lighting Upgrade	Police	16	97.76	0.56	0.00	0.00	0.03	$9.88	14.55	0.68	1030.94%
Lighting upgrade	Fire Station	23	1,056.38	4.84	0.00	0.00	0.36	$732.03	147.26	4.63	172.73%
Lighting Upgrade	Community Center	30	3,457.86	33.24	0.00	0.00	1.16	$3,773.06	619.48	5.55	144.15%

Recommendation, Cost and Savings Summary Tables - Page 2

Lighting Upgrade	Library	37	0.00	0.00	0.00	0.00	0.00	$0.00	0.00	0.00	0.0%
Lighting Upgrade	Kimball House	44	1,105.44	17.03	0.00	0.00	0.37	$195.69	248.64	0.63	1277.64%
Lighting upgrade	Hwy Garage	50	3,844.62	16.30	0.00	0.00	1.29	$2,629.57	525.63	4.62	173.08%
Lighting upgrade	Mediation Center	55	203.84	1.18	0.00	0.00	0.07	$25.49	30.33	0.84	951.89%
Provide smart power strips for plug-in loads	Kimball House	45	67.39	0.00	0.00	0.00	0.02	$49.26	6.96	7.08	169.45%
Vending Mizers - Install Vending Mizer & delamp	Police	17	2,312.64	0.08	0.00	0.00	0.78	$395.06	239.36	1.65	605.89%
Install Timer on water heater	Community Center	31	0.00	0.00	0.00	80.22	0.46	$175.42	141.99	1.24	1214.10%
Install Timer on water heater	Police	19	730.00	4.00	0.00	0.01	0.25	$175.42	106.96	1.64	914.59%

Capital Improvement Measures

Energy Conversion Project Title	Building(s) Where Implemented	Finding Number	Electrical Energy Avoided (KWH)	Electrical Demand Reduced (KW)	Fuel Oil Usage Avoided (Gallons)	Propane Usage Avoided (Gallons)	Metric Tons of CO2 Reduced	Estimated Installation Cost	Yearly Utility Cost Savings	Simple Payback (Years)	Lifetime Return on Investment
Weatherization - Blow insulation into walls	Kimball House	41	0.00	0.00	158.76	0.00	1.61	$4,876.24	11.29	11.29	265.67%
Weatherization, Replace windows	Mediation Center	54	31.51	0.00	63.50	0.00	0.66	$6,405.23	175.98	36.40	137.37%
Building Controls - Install a BAS	Town Hall	4	3,847.41	0.00	0.00	0.00	1.29	$8,049.67	397.11	20.27	59.20%
HVAC System - Install new cabinet heaters	Town Hall	5	4,197.17	0.00	0.00	0.00	1.41	$32,908.93	433.21	75.97	26.33%
HVAC System - VFD on system pump	Town Hall	6	1,721.47	0.00	0.00	0.00	0.58	$3,895.39	177.68	16.01	124.89%
HVAC - HRU w/economizer & dehumidification	Town Hall	7	12,797.21	0.00	0.00	0.00	4.30	$14,686.27	1320.86	11.12	179.88%
HVAC See Finding # 7	Town Hall	8	0.00	0.00	0.00	0.00	0.00	$0.00	0.00	0.00	0.0%
HVAC - Ductwork Replacement	Police	13	0.00	0.00	0.00	0.00	0.00	$23,169.93	0.00	0.00	0.0%
HVAC - Install economizer on furnaces	Fire Station	21	16,576.56	0.00	0.00	0.00	5.57	$12,066.67	1710.95	7.05	212.69%
HVAC - See Finding #21	Fire Station	22	0.00	0.00	0.00	0.00	0.00	$0.00	0.00	0.00	0.0%
HVAC - Install central HVAC unit	Community Center	26	1,689.60	0.00	278.36	0.00	3.39	$16,124.71	931.53	17.31	115.54%
HVAC - See Finding #26	Community Center	27	0.00	0.00	0.00	0.00	0.00	$0.00	0.00	0.00	0.0%
HVAC - See Finding #26	Community Center	28	0.00	0.00	0.00	0.00	0.00	$0.00	0.00	0.00	0.0%
HVAC - Install a high-efficiency propane boiler	Community Center	29	0.00	0.00	1581.00	-1894.52	5.16	$5,450.98	947.02	5.76	347.47%
HVAC - Install HRU	Library	34	0.00	0.00	0.00	317.31	1.82	$23,024.69	561.64	41.00	48.79%
HVAC - Install 2 high-efficiency propane boilers	Library	36	0.00	0.00	0.00	1009.83	5.80	$16,036.60	1787.39	8.97	222.91%
HVAC - Install waste oil furnace	Hwy Garage	49	0.00	0.00	0.00	760.00	4.37	$14,679.74	1345.20	10.91	137.45%
HVAC - Install high-efficiency Propane Furnace	Mediation Center	56	0.00	0.00	761.00	-923.97	2.42	$5,856.21	434.50	13.48	148.39%
Install CO and CO2 monitoring	Hwy Garage	48	0.00	0.00	0.00	0.00	0.00	$9,359.48	0.00	0.00	0.0%

Renewable Energy Opportunities

Energy Conversion Project Title	Building(s) Where Implemented	Finding Number	Electrical Energy Avoided (KWH)	Electrical Demand Reduced (KW)	Fuel Oil Usage Avoided (Gallons)	Propane Usage Avoided (Gallons)	Metric Tons of CO2 Reduced	Estimated Installation Cost	Yearly Utility Cost Savings	Simple Payback (Years)	Lifetime Return on Investment
Renewable Install Micro-CHP	Town Hall	9	15,586.55	14.40	83.00	-702.59	2.04	$19,753.09	704.69	28.03	71.35%
Renewable Install Thermal Solar	Police	18	0.00	0.00	0.00	96.92	0.56	$7,633.99	171.55	38.96	38.50%
Thermal Solar	All Buildings - Except Police	57	0.00	0.00	0.00	0.00	0.00	$0.00	0.00	0.00	0.0%
Wind energy	All Buildings	58	0.00	0.00	0.00	0.00	0.00	$0.00	0.00	0.00	0.0%
Combine Heat and Power	All Buildings - Except Town Hall	59	0.00	0.00	0.00	0.00	0.00	$0.00	0.00	0.00	0.0%
District Heating	All Buildings	60	0.00	0.00	0.00	0.00	0.00	$0.00	0.00	0.00	0.0%
Bio Energy	All Buildings	61	0.00	0.00	0.00	0.00	0.00	$0.00	0.00	0.00	0.0%

Energy Management Improvement Opportunities

Energy Conversion Project Title	Building(s) Where Implemented	Finding Number	Electrical Energy Avoided (KWH)	Electrical Demand Reduced (KW)	Fuel Oil Usage Avoided (Gallons)	Propane Usage Avoided (Gallons)	Metric Tons of CO2 Reduced	Estimated Installation Cost	Yearly Utility Cost Savings	Simple Payback (Years)	Lifetime Return on Investment
Yearly Energy Review	All Buildings	62	4,801.83	0.00	45.45	124.27	2.79	$720	1,352.44	0.53	87.8%
Real-time Monitoring	All Buildings	63	16,006.10	5.51	151.51	414.24	9.30	$4,800	1,684.46	2.85	-64.9%

Recommendation, Cost and Savings Summary Tables - Page 3

Total Project Summary per Building

	Building(s) Where Implemented		Total Electrical Energy Avoided (KWH)	Total Electrical Demand Reduced (KW)	Fuel Oil Usage Avoided (Gallons)	Propane Usage Avoided (Gallons)	Metric Tons of CO2 Reduced		
	Atkinson Town Hall		49,804	15	83	-703	14		
	Police Department		7,603	5	0	357	5		
	Kimball Library		856	0	0	1950	11		
	Kimball House		1,173	17	519	0	6		
	Mediation Center		509	1	1025	-924	5		
	Fire Station		17,717	5	0	338	8		
	Highway Garage		3,845	16	0	1003	7		
	Community Center		5,188	33	1976	-1814	11		
		Total Reduction:	129,140	176	4505	1275	96		
		Percentage Reduction	40.34%	13.32%	148.68%	15.39%	51.87%		

Funding Opportunities - Page 1

Finding ID Number	Building	Recommendation	Rebates			Loans		Grants	Notes
			Unitil-Commercial and Industrial Energy Efficiency Programs, Web site: http://services.unitil.com/nh/bus_energy_efficiency_programs.asp	New Hampshire - Pay for Performance Program, Web site: http://www.nhp4p.com/	NH PUC - Renewable Energy Rebate Program, Web Site: http://www.puc.nh.gov/Sustainable%20Energy/RenewableEnergyRebates-CI.html	Unitil - Municipal Smart Start, Web Site: www.unitil.com	Community Development Finance Authority - Municipal Energy Reduction Fund, Web site: http://www.nhcdfa.org/web/erp/merf/merf_overview.html	The New England Grassroots Environment Fund (NEGEF), Web site grassrootsfund.org/	
1	Town Hall	Door weather stripping	No	Yes	No	No	Yes		
2	Town Hall	Weatherization - Repair air barrier	No	Yes	No	No	Yes		
3	Town Hall	Weatherization - Install air/vapor barrier	No	Yes	No	No	Yes		
4	Town Hall	Building Controls - Install a BAS	Yes	Yes	No	Yes	Yes		
5	Town Hall	HVAC System - Install new cabinet heaters	No	Yes	No	No	Yes		
6	Town Hall	HVAC System - VFD on system pump	Yes	Yes	No	Yes	Yes		
7	Town Hall	HVAC - HRU w/economizer & dehumidification	Yes	Yes	No	Yes	Yes		
9	Town Hall	Renewable Install Micro-CHP	Yes	Yes	Yes	Yes	Yes		
10	Town Hall	Lighting upgrade	Yes	Yes	No	Yes	Yes		
11	Police	Door weather stripping	No	Yes	No	No	Yes		
12	Police	Weatherization - Caulk above windows	No	Yes	No	No	Yes		
13	Police	HVAC - Ductwork Replacement	No	Yes	No	No	Yes		
14	Police	Building Controls - Add Zoning Control	Yes	Yes	No	Yes	Yes		
15	Police	HVAC - Add economizer to existing unit	Yes	Yes	No	Yes	Yes		
16	Police	Lighting Upgrade	Yes	Yes	No	Yes	Yes		
17	Police	Vending Mizers - Install Vending Mizer & delamp	Yes	Yes	No	Yes	Yes		
18	Police	Renewable Install Thermal Solar	No	Yes	Yes	No	Yes		
19	Police	Install Timer on water heater	Yes	Yes	No	Yes	Yes		
20	Fire Station	Door weather stripping	No	Yes	No	No	Yes		
21	Fire Station	HVAC - Install economizer on furnaces	Yes	Yes	No	Yes	Yes		
23	Fire Station	Lighting upgrade	Yes	Yes	No	Yes	Yes		
24	Fire Station	Weatherization - Repair insulation and air barrier	No	Yes	No	No	Yes		
25	Community Center	Door weather stripping	No	Yes	No	No	Yes		
26	Community Center	HVAC - Install central HVAC unit	Yes	Yes	No	Yes	Yes		
29	Community Center	HVAC - Install a high-efficiency propane boiler	No	Yes	No	No	Yes		
30	Community Center	Lighting Upgrade	Yes	Yes	No	Yes	Yes		
31	Community Center	Install Timer on water heater	Yes	Yes	No	Yes	Yes		
64	Community Center	Weatherization - Convert windows to inoperable and caulk	No	Yes	No	No	Yes		
32	Library	Door weather stripping	No	Yes	No	No	Yes		
33	Library	Building controls - Control optimization	Yes	Yes	No	Yes	Yes		
34	Library	HVAC - Install HRU	Yes	Yes	No	Yes	Yes		
35	Library	Building control - Boiler building load control	No	Yes	No	No	Yes		
36	Library	HVAC - Install 2 high-efficiency propane boilers	No	Yes	No	No	Yes		
37	Library	Lighting Upgrade	Yes	Yes	No	Yes	Yes		
38	Kimball House	Door weather stripping	No	Yes	No	No	Yes		
39	Kimball House	Weatherization - Add insulation above kitchen	No	Yes	No	No	Yes		
40	Kimball House	Weatherization - Install plywood for storage	No	Yes	No	No	Yes		
41	Kimball House	Weatherization - Blow insulation into walls	No	Yes	No	No	Yes		

Funding Opportunities - Page 2

42	Kimball House	HVAC - Seal and insulate ductwork	No	Yes	No	No	Yes		
43	Kimball House	Weatherization - Install insulation in basement	No	Yes	No	No	Yes		
44	Kimball House	Lighting Upgrade	Yes	Yes	No	Yes	Yes		
45	Kimball House	Provide smart power strips for plug-in loads	Yes	Yes	No	Yes	Yes		
46	Hwy Garage	Door weather stripping	No	Yes	No	No	Yes		
47	Hwy Garage	Weatherization - Repair bottom of door	No	Yes	No	No	Yes		
48	Hwy Garage	Install CO and CO2 monitoring	No	No	No	No	No		F-1
49	Hwy Garage	HVAC - Install waste oil furnace	No	Yes	No	No	Yes		
50	Hwy Garage	Lighting upgrade	Yes	Yes	No	Yes	Yes		
51	Mediation Center	Door weather stripping	No	Yes	No	No	Yes		
52	Mediation Center	Weatherization - Install Solarize Inflectors	No	Yes	No	No	Yes		
53	Mediation Center	Weatherization - Repair and seal windows	No	Yes	No	No	Yes		
54	Mediation Center	Weatherization, Replace windows	No	Yes	No	No	Yes		
55	Mediation Center	Lighting upgrade	Yes	Yes	No	Yes	Yes		
56	Mediation Center	HVAC - Install high-efficiency Propane Furnace		Yes	No		Yes		
57	All Buildings - Except Police	Thermal Solar	No	Yes	Yes	No	Yes		
58	All Buildings	Wind energy	No	Yes	Yes	No	Yes		
59	All Buildings - Except Town Hall	Combine Heat and Power	No	Yes	Yes	No	Yes		
60	All Buildings	District Heating	No	Yes	Yes	No	Yes		
61	All Buildings	Bio Energy	No	Yes	Yes	No	Yes		
62	All Buildings	Yearly Energy Review	No	Yes	No	Yes	Yes		
63	All Buildings	Real-time Monitoring	No	Yes	No	Yes	Yes		

General Notes

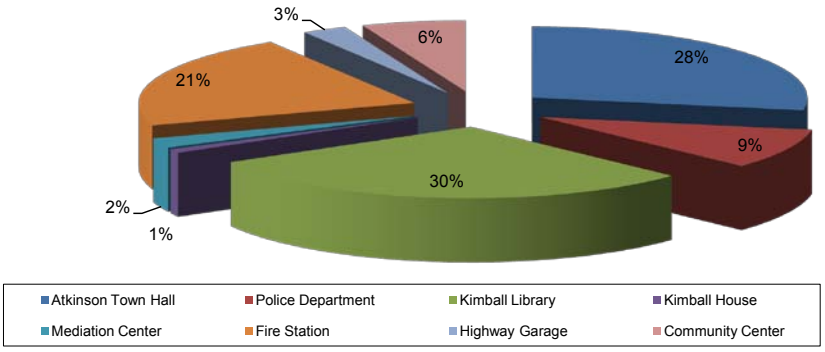
G-1	Funding as of 04-20-2011
G-2	Please see website for information on each funding option
G-3	New Hampshire Pay for performance and all loan and grant programs require comprehensive implementation approach. The town of Atkinson should work with a qualified consultant or contractor to identify which recommendation will be included.

Finding Notes

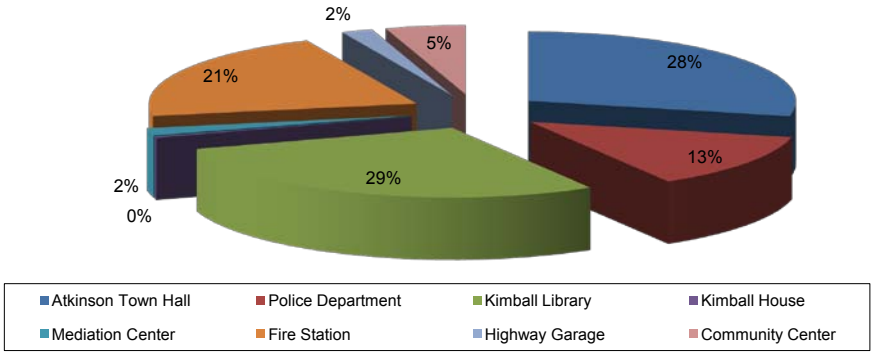
F-1	This is a non-energy saving recommendation and therefore are not included in these rebate, grant and loan program

Electric Usage, Electric Cost, and Total Utility Cost by Building

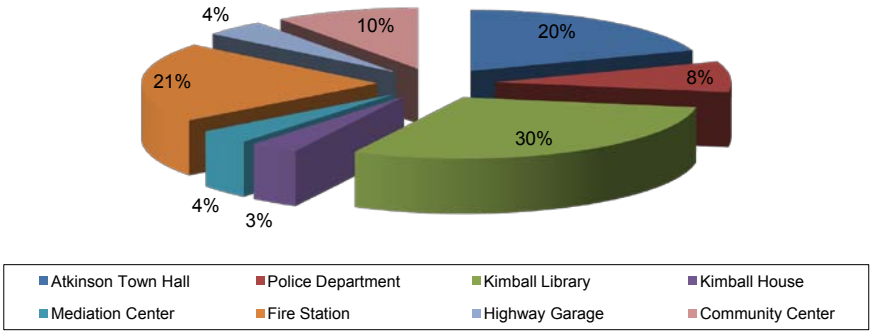
Electric Cost by Building



Electric Usage by Building

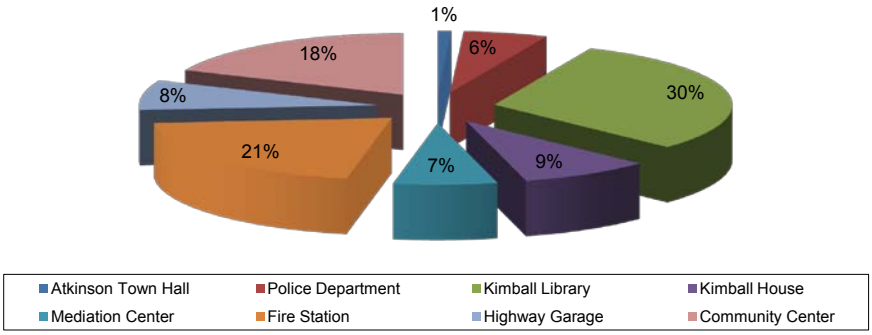


Total Utility Cost by Building

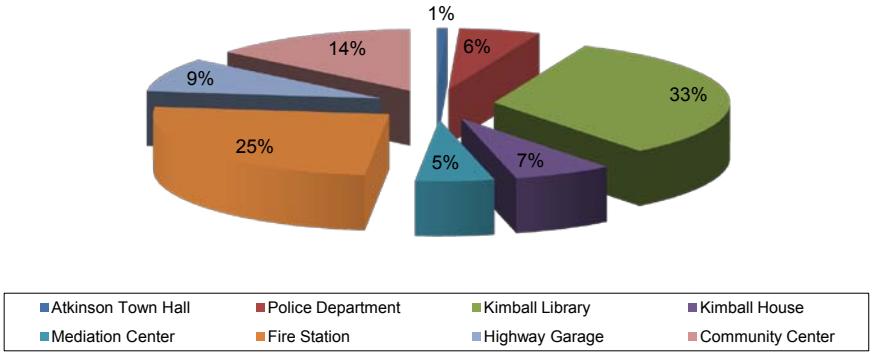


Fuel Usage, Fuel Cost, and Total Utility Cost by Building

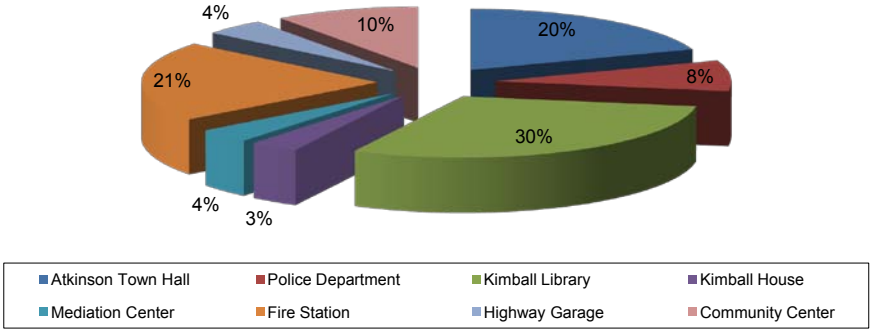
Fuel Cost by Building



Fuel Usage by Building



Total Utility Cost by Building



Electric

- The town of Atkinson is serviced by Unitil Energy System Inc., for their electric distribution and is currently purchasing electricity from Glacial Energy of New England, Inc. Glacial Energy's electric rates are based on an index and therefore change monthly based on the energy market.

Electric - Distribution Rate Schedule

- The entire town's buildings distribution rate schedule is General 2 (G2). This is a regulated portion of the electric bill and this rate schedule is the best fit for the town buildings. Currently, the town is paying a monthly meter charge of $11.00 plus $0.02557 per kilowatt hour (KWH) and 7.27 per kilowatt (KW) for electric distribution portion of the electric bill.

Electric - Supplier Rate Schedule

- The town of Atkinson has chosen Glacial Energy to supply the electricity for the town buildings. The average electric rate paid for the period evaluated in this report for electrical supply was $0.07765 per KWH. This was a slight savings over the fixed rate offering from Unitil's average of $0.08194. The Unitil rates can be found at http://www.unitil.com/energy-for-businesses/electric-information/rates.

Electric - Recommendations

- It is recommended that the town of Atkinson review its electrical supplier annually and negotiate the best rate for the town. It is also recommended that at the end of each year, the chosen supplier provide a summary of rates charged per KWH and compare monthly charges to the standard offering from Unitil Energy Systems. A list of electric suppliers and aggregators is available at http://www.puc.nh.gov/Consumer/energysuppliers.htm.

Electric - Profile

- The town of Atkinson's buildings included in this report used a little over 320,000 KWH from November 2009 to October 2010 with an average demand of 110 KW at an average total rate of $0.1032 per KWH and $7.27 per KW.

Observations: Atkinson Town Hall

Original Design and Current Use

- The Town Hall was built to be a town hall in 1987, was designed for its current use and still meets the needs of the town. The building is 2,970 square feet housing 11 total employees, 4 full-time and 7 part-time. The building has an average of 41 visitors per day. The Town Hall has a population density of 3.7 employees per 1,000 square feet which is well below the average of 7 employees per 1000 square feet. This is due to the ratio of office to meeting space in the building.

Retrofits

- The building has only had some minor retrofits since it was built in 1987. The cabinet unit supplying the heat and cooling to the space should be replaced due to age and condition. The air handler has already been removed and should be replaced with a heat recovery unit with dehumidification

On-Site Renewable Energy

- The on-site renewable energy that has the best fit for this building is Micro-Combine Heat and Power. This fits this building because it will eliminate need for the boiler and provide reheat source for dehumidification during the summer months.

Age and Condition of the Mechanical Equipment

- The central heat pump unit was replaced in 2003 and has another 13 years of life expectancy. The cabinet heating and cooling units in the space are original 1987 units and are reaching the end of their 20 to 25 year life expectancy. The boiler is also original to the building and approaching the end of its life; however, since it is backup heat, replacement is not the highest priority.

Indoor Air Quality

- The air quality in this building is very good with CO2 reading ranging from 635 ppm to 745 ppm and air particle counts as follows:

Size		Count	Size		Count
.3 Microns	-	12,115	.5 Microns	-	2,604
1 Microns	-	936	2 Microns	-	538
5 Microns	-	66	10 Microns	-	19

- The amount of outside air is slightly high for normal building usage and should be controlled with demand control ventilation to save energy and ensure proper ventilation during heavy usage.
- Currently, the building is getting outside air because the exhaust fans are creating a negative pressure in the building and air is infiltrating the building through leaks. The building should be sealed and a heat recovery unit should be installed to recover the heat being exhausted and keep the building at a neutral to positive pressure relative to the outside.

Space temperature and Humidity

- During the energy audit, the space temperature was maintained within an acceptable range during business hours and was set back during unoccupied time.
- It was noted, however, that during high humidity times of the year there is a humidity problem. This currently is being controlled by manually controlled dehumidifiers in the space. A central dehumidifying system should be installed and the current dehumidifiers be removed.

R- Value

- The building is a wood frame structure with a brick facade. The windows are double pane and are not low e but are in good condition for the age. The R-Value of the building wall is what is expected from a building of this age. There are numerous places that are showing air leakage and these leaks should be repaired.

Maintenance

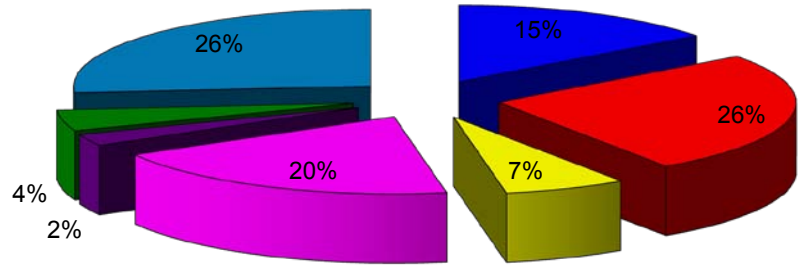
- The maintenance in this building is completed on an as needed basis to address issues. Implementing a preventive or condition-based maintenance program would save the town money on both energy and equipment maintenance cost.

People's Energy Awareness

- Overall, the energy awareness by the people using this building was good. Computers and lights were turned off at night and a time clock is turning off the HVAC unit at night. The outdoor lights are controlled by an astronomic time clock.

Atkinson Town Hall

ENERGY USAGE PROFILE



Total Facility Site Consumption	323 (Millions of BTU/hr)
Cooling	14.8%
Heating	25.7%
Pumps	6.6%
Lighting	19.6%
Fans	2.5%
Domestic Hot Water	4.4%
Plug Load (Include Computers)	26.3%
Total	100%

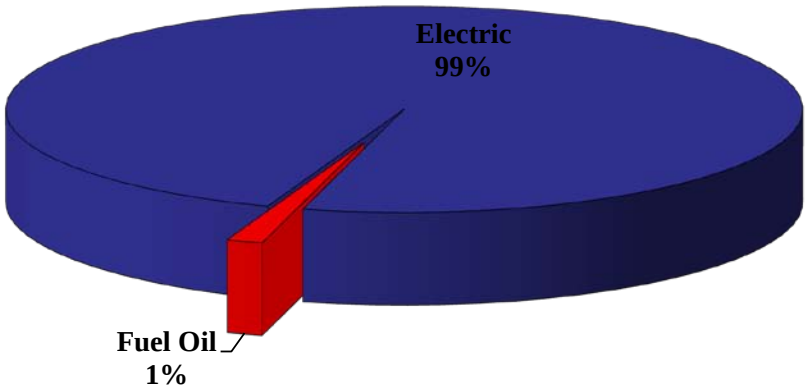
Town of Atkinson, New Hampshire
Atkinson Town Hall
Utility Analysis Period:

8/01/2009 to 7/31/2010

	Current Year			Previous Year		
	8/1/2009 to 7/31/2010			8/1/2008 to 7/31/2009		
	Electric		Fuel Oil	Electric		Fuel Oil
Utility Costs	$12,652		$189	$13,687		$126
Utility Usage	91,397		83	86,442		55
$ Cost/Unit (kWh, Therm, Gal)	$0.14		$2.29	$0.16		$2.29
	CDD		HDD	CDD		HDD
	419		6,689	324		7,366
Current Year Vs Previous Year	**Electric**		**Fuel Oil**			
Change in Cost	-8%		50%			
Change in Usage	6%		50%			
Change in $ Cost/Unit	-13%		0%			
Change in Degree Day	29%		-9%			

Fuel Usage Estimated from tank level. Electrical usage down while Cooling Degree Days increasing due to current energy efficiency activities.
CDD - Cooling Degree Day
HDD - Heating Degree Day

Utility Cost Comparison Current Year



Energy Benchmarking: Atkinson Town Hall

The calculation of EUI (Energy Use Intensity) is shown below. EUI, expressed in kBtu/sf, is normalized for floor area, the most dominant influence on energy use in most buildings. Its use usually provides a good approximation of how your building's energy performance compares to others. Site EUI indicates the rate at which energy is used at your building (the point of use). Source EUI indicates the rate at which energy is used at the generation sources serving your building (the point of source) and indicates the societal energy penalty due to your building The lower the EUI, the higher the rating, indicating that the building is more efficient than other buildings. The greater the EUI, the lower the rating, indicating that there is an opportunity for higher potential benefits from operational improvements.

To compare the buildings shown below to each other, and to determine the ranking of the buildings from having the most to the least opportunity for demand-side improvements from a financial perspective, please see the Site EUI ranking below.

The Site EUI below has been applied to a Department of Energy statistical model from the Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark. The Department of Energy has estimated energy use and cost reductions for building source EUI ratings (percentiles) in the table below. Please see the DOE Regional Source EUI Comparison graph below to rate your building in relation to the regional distribution of similar type buildings. (Note: The Source EUI includes the inefficiencies of electrical generation and transmission. A reduction in 'electrical' source EUI includes a benefit in terms of reduction of air pollution emissions and green house gasses, and is thus an indicator of societal benefit.)

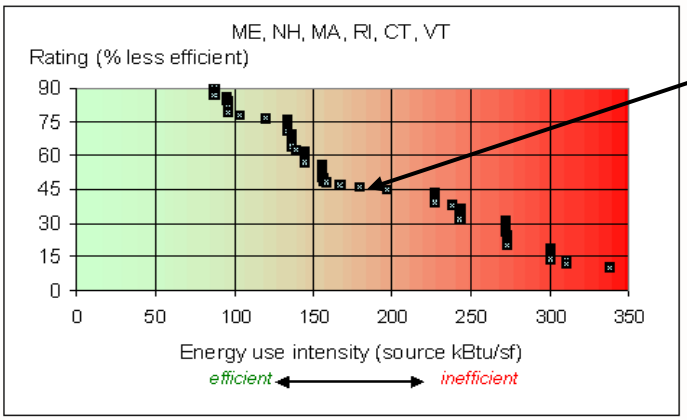
Source EUI Rating for your Building	Energy use and cost reduction potential (%)	Walk-thru energy assessment recommended?
above 60%	below 25%	No
40 to 60%	20 to 35%	Maybe
20 to 40%	35 to 50%	Yes
Below 20%	above 50%	Definitely

Rating from the most efficient to the least efficient - 2010 consumption

Site EUI Rank	Building	Annual Total Electrical Use (kWh)	Annual Total Non-Electrical Fuel Use (Gals)	Occupied Building Gross Floor Area (sq-ft)	Site EUI Rating	Source EUI: Annual Total Source Energy Use per Sq-Ft (kBtu/sf)	Rating (Regional Source EUI Comparison)
1	Atkinson Town Hall	91,397	83	6,567	**49**	**171**	**0.45**

Building Type

Office Building



Source EUI	Est Regional Rating	Building
171	45%	Atkinson Town Hall

Source: Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **1**

Finding Description: **Door weather stripping**

Building: **Town Hall**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	No

Recommendation:

Overall, the door weather stripping is in poor condition at the town hall. Weather stripping breaks down over time and with use. Therefore it is recommended that the door weather stripping at this building be given a high priority at this time. For this type of building and use, it is anticipated that the weather stripping for these doors should be replaced every 8 to 10 years.

Estimated Economic Impact Summary:

Energy Savings heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Interior Temp	Avg. OA Temp	Hours per year	BTU/KWH
0.31	589.6	0.4	1.08	68	34	6,048	11,942

Cooling Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Avg OA Enthalpy	Interior Enthalpy	Hours per year	BTU/KWH
0.31	589.6	0.4	1	28	25.5	2,688	11,942

Estimated Annual Electrical Energy Savings	1,412.05	KWH	$145.75
Estimated Annual Electrical Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$145.75
		Life Expectancy of Equipment (Years)	8
		Lifetime Energy Savings	$1,165.96
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	4.72
		Lifetime Return On Investment	169.57%

Implementation Plan:

The Entire perimeter of the entrance doors should be sealed to eliminate heat loss. Sealing kits from American Garage Door Supply are listed in the appendix of this report.

Estimated cost for this installation: $687.58

Description	# Units	Labor and Material Cost/Unit	Total	Source
Entrance Doorjamb Kit	5	$72.70	$363.50	American Garage Door Supply and RSMeans
Entrance Door Bottom Kit	5	$32.50	$162.50	American Garage Door Supply and RSMeans
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$687.58	

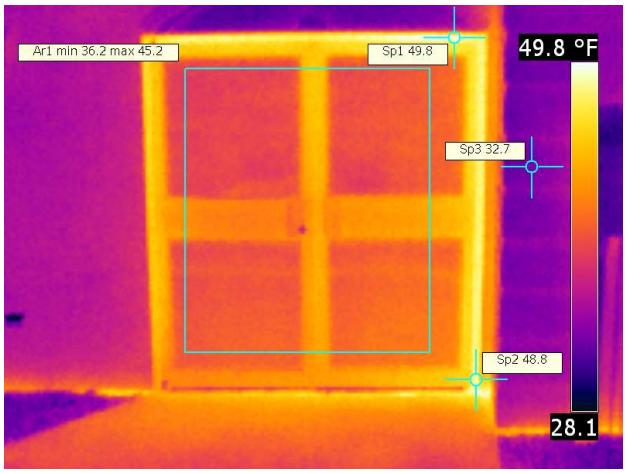
Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Inspection Report

Report Date 2/27/2011

Company	Arbogast Energy Auditing	**Customer**	Town of Atkinson, NH
Address	317 Austin St #4	**Site Address**	New Hampshire
Thermographer	Elmer Arbogast	**Contact Person**	Michelle Veasey



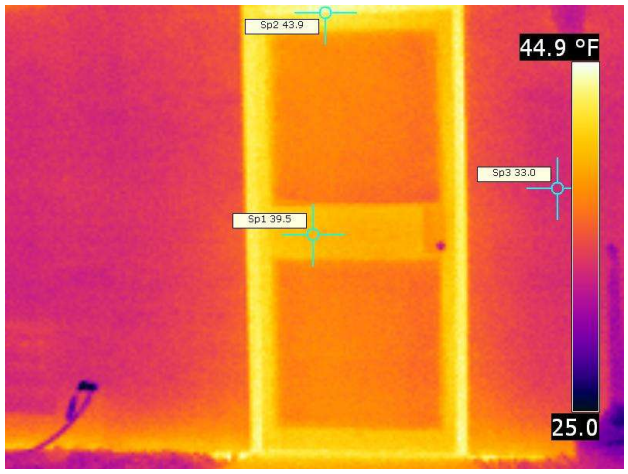


Image and Object Parameters

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Image Date	11/1/2010 11:01:33 AM
Image Name	IR_2206.jpg
Emissivity	0.95
Reflected apparent temperature	0.0 °F
Object Distance	3.2 ft

Text Comments

Description

Door showing air leakage and in need of weather stripping.	Themal imaging showing need for improved weather stripping.

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** 2

Finding Description: Weatherization - Repair air barrier

Building: Town Hall

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	No

Recommendation:

There is damage to the vapor/air barrier between the occupied space and the attic. This should be repaired to stop air from rising from the occupied space into the attic. This creates a twofold issue in that the air rising from the occupied space to the attic has to be replaced with outside air which is then heated. In addition, keeping the attic too warm during the winter when there is a snow load can create ice and ice jams.

Estimated Economic Impact Summary:

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open Area Square Foot	Air Rate - FPM	Diversity Factor	Constant	Interior Temp	Avg OA Temp	Hours per year	BTU/KWH
16.42	20	0.5	1.08	68	34	6,048	11,942

Cooling Savings

Open Area Square Foot	Air Rate - FPM	Diversity Factor	Constant	Avg OA Enthalpy	Interior Enthalpy	Hours per year	BTU/KWH
16.42	20	0.5	1	28	25.5	2,688	11,942

Estimated Annual Electrical Energy Savings	3,145.51	KWH	$324.66
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$324.66
Life Expectancy of Equipment (Years)			20
Lifetime Energy Savings			$6,493.27
Estimated Annual Operational Savings			$0.00
Simple Payback Years			2.11
Lifetime Return On Investment			949.49%

Implementation Plan:

The plastic vapor barrier which is hanging should be reattached with tape, and any missing barrier should be replaced. In addition, the insulation pushed down in the attic should be fixed for maximum cover. It is estimated that it should take about 8 man-hours to complete these tasks.

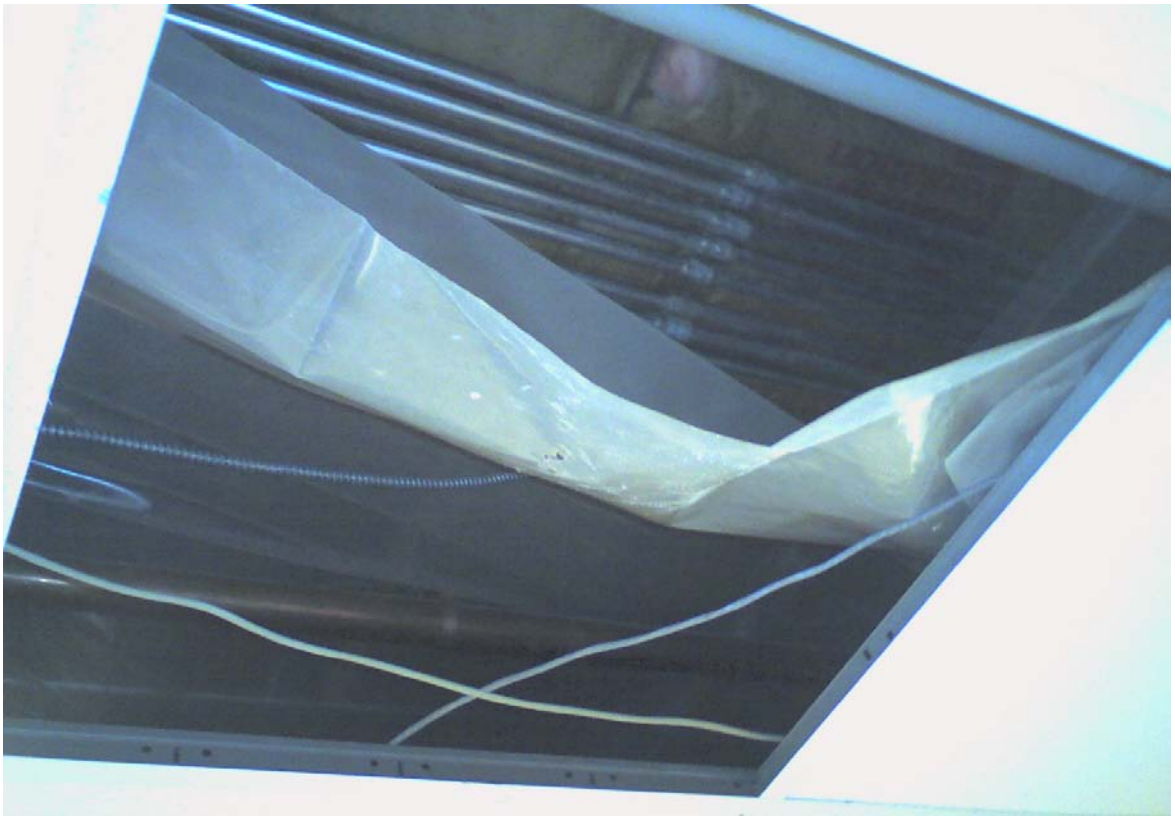
Estimated cost for this installation: $683.87

Description	# Units	Labor and Material Cost/Unit	Total	Source
Vapor/Air barrier - 6 mil plastic	2	$93.98	$187.96	
Taping	1	$335.20	$335.20	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$683.87	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Damaged Vapor/Air Barrier



Damaged Insulation

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 3**

Finding Description: **Weatherization - Install air/vapor barrier**

Building: **Town Hall**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	No

Recommendation:

There is insulation and air/vapor barrier missing on the surround of the skylight. Since the skylight has the potential of creating a large chimney effect, it should be wrapped with a vapor barrier and then have R-13 insulation installed completely around. An access to the stained glass lights should be built and insulated then sealed for a complete vapor barrier around the skylight. This creates a twofold issue in that the air rising from the occupied space to the attic has to be replaced with outside air which is then heated. In addition, keeping the attic too warm during the winter when there is a snow load can create ice and ice jams.

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open	Air Rate -	Diversity	Constant	Interior	Avg OA Temp	Hours per Year	BTU/KWH
10.00	20	1	1.08	68	34	6,048	11,942

Cooling Savings

Open	Air Rate -	Diversity	Constant	Avg OA	Interior	Hours per Year	BTU/KWH
10.00	20	1	1	28	25.5	2,688	11,942

Estimated Annual Electrical Savings	3,831.90	KWH	$395.51
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00

Total Annual Cost Savings	$395.51
Life Expectancy of Equipment (Years)	20
Lifetime Energy Savings	$7,910.18
Estimated Annual Operational Savings	$0.00
Simple Payback Years	2.64
Lifetime Return On Investment	756.68%

Implementation Plan:

Wood framing should be built around the access to the lights for the stained glass display. Then an access door should be installed; this door should either be insulated or weather stripped. The remaining skylight surround should be wrapped with a plastic vapor barrier and have R-13 insulation attached on the outside of this barrier.

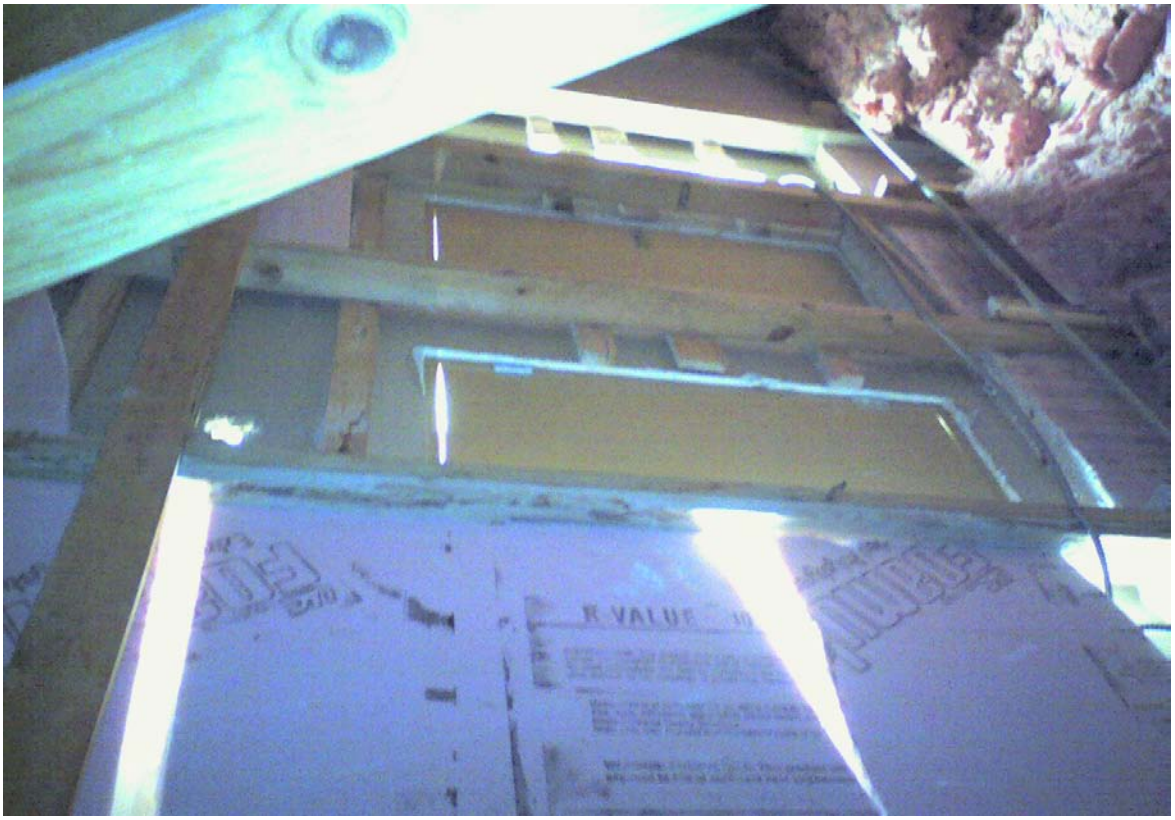
Estimated cost for this installation: $1,045.39

Description	# Units	Labor and Material Cost/Unit	Total	Source
Fiberglass Insulation - roll 13	10	$20.98	$209.80	
Vapor/Air barrier - 6 mil plastic	2	$93.98	$187.96	
Light access	1	$360.00	$360.00	
Board insulation	2	$20.98	$41.96	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$1,045.39	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Removed Insulation from Skylight Surround



FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **4**

Finding Description: **Building Controls - Install a BAS**

Building: **Town Hall**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Install a central building automation system (BAS) equal to Honeywell Comfort Point system. The BAS should be a LON based control system and have the capabilities of a Web interface. The interface should include graphics for easy navigation and interaction with the control system. This system will insure the building HVAC system runs at it optimum efficiency and will reduce run-time.

System Efficiency Improvement

Estimated Annual Electrical Savings	3847.41	KWH	$397.11
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$397.11
Life Expectancy of Equipment (Years)			12
Lifetime Energy Savings			$4,765.32
Estimated Annual Operational Savings			$0.00
Simple Payback Years			20.27
Lifetime Return On Investment			59.20%

Implementation Plan:

Install a central BAS system capable of controlling the central heat pump, system pump, well pump, 11 cabinet units, and a heat recovery unit. System should have Web interface that includes graphics for easy interaction.

Estimated cost for this installation: $8,049.67

Description	# Units	Labor and Material Cost/Unit	Total	Source
Central system controller	1	$825.00	$825.00	
Cabinet Controller	1	$825.00	$825.00	
Sensors	11	$92.00	$1,012.00	
Programming	1	$2,200.00	$2,200.00	
Wiring	1	$1,296.00	$1,296.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$8,049.67	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **5**

Finding Description: **HVAC System - Install new cabinet heaters**

Building: **Town Hall**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

Install new cabinet heater in place of existing units. Once unit is removed and prior to installation of new units, an insulated heat-reflective insulation should be installed.

Estimated Economic Impact Summary

System Efficiency Improvement

Estimated Annual Electrical Savings	4,197.17	KWH	$433.21
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$433.21
Life Expectancy of Equipment (Years)			20
Lifetime Energy Savings			$8,664.23
Estimated Annual Operational Savings			$0.00
Simple Payback Years			75.97
Lifetime Return On Investment			26.33%

Implementation Plan:

Remove existing cabinet heater, install Refectix Reflective R-3 insulation on wall behind new units. Install new cabinet heaters connecting to existing electrical supply, piping, and controls.

Estimated cost for this installation: $32,908.93

Description	# Units	Labor and Material Cost/Unit	Total	Source
Cabinet Units	11	$1,750.00	$19,250.00	
Removal of Existing Units	11	$130.00	$1,430.00	
Installation of New Units	11	$390.00	$4,290.00	
Refectix - Reflective Insulation	11	$18.67	$205.33	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$32,908.93	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **6**

Finding Description: **HVAC System - VFD on system pump**

Building: **Town Hall**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Re-pipe all cabinet heaters' 3-way control valves such that they operate as a 2-way valve and install a bypass between the supply and return with a differential pressure regulator as the pipes leaves the mechanical room. Install a VFD on the system pump motor. The pump should be controlled to maintain a constant differential pressure in the system as measured in the piping 15 feet after it leaves the mechanical room. The VFD should be set to maintain a minimum speed to match the minimum flow requirements of the central heat pump.

Estimated Economic Impact Summary

Energy Savings = Motor Watts X Runtime X Control Sequence Profile factor

Motor Watts	Reduced Run Hours	Control Sequence Profile Factor for differential pressure control
1.655264	2,600	0.4

Estimated Annual Electrical Savings	1,721.47 KWH	$177.68
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	0.00 Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00 Gallons	$0.00
	Total Annual Cost Savings	$177.68
	Life Expectancy of Equipment (Years)	20
	Lifetime Energy Savings	$3,553.64
	Estimated Annual Operational Savings	$0.00
	Simple Payback Years	16.01
	Lifetime Return On Investment	124.89%

Implementation Plan:

Convert valves and install VFD per recommendation.

Estimated cost for this installation with rebate: $2,845.39

Description	# Units	Labor and Material Cost/Unit	Total	Source
Honeywell D146M1040	1	$245.00	$245.00	Honeywell direct pricing
3-way to 2-way valve conversion	11	$75.00	$825.00	RSMeans Estimate
2-HP VFD	1	$685.00	$685.00	Grainger pricing
Differential Pressure controller	1	$884.97	$884.97	Kele pricing
Bypass Piping	1	$340.00	$340.00	RSMeans Estimate
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$1,050.00	
Total			$3,895.39	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 7**

Finding Description: **HVAC - HRU w/economizer & dehumidification**

Building: **Town Hall**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Install a 1,200 CFM heat recovery unit (HRU) in the mechanical room and attach to ductwork from removed Air Handler #1. HRU should be capable of recirculation of the air when CO2 levels are less than 900 ppm in the space and will supply 100% outside air when levels are above 900 ppm. The unit will have a defrost cycle to prevent unit freeze up. Unit should also have the capability to dehumidify the space if the space rises above 40% RH.

Estimated Economic Impact Summary

Energy Savings Heating = CFM of Ventilation X 1.08 X (Avg. Unit Discharge Temperature – Avg. OA Temperature Heating Season) X Hours per Day X Days/Year

Energy Savings Cooling = CFM of Ventilation / 13.8 X (Avg. OA Enthalpy Cooling Season - Avg. Unit Discharge Enthalpy) X Hours per Day X Days/Year

Energy Savings Heating

CFM	Constant	Avg. Discharge	Avg. OA Temp	Hours per Year	Btu/KWH
1,200	1.08	80	34	2,520	11,942

Energy Savings Cooling

CFM	Constant	Avg. Discharge	Avg. OA Temp	Hours per Year	Btu/KWH
1,200	1.08	25.5	28	800	11,942

Estimated Annual Electrical Savings	12,797.21	KWH	$1,320.86
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$1,320.86
Life Expectancy of Equipment (Years)			20
Lifetime Energy Savings			$26,417.29
Estimated Annual Operational Savings			$0.00
Simple Payback Years			11.12
Lifetime Return On Investment			179.88%

Implementation Plan:

Implement per recommendation

Estimated cost for this installation: $14,686.27

Description	# Units	Labor and Material Cost/Unit	Total	Source
Venmar - HRV-200	1	$8,400.00	$8,400.00	Venmar Quote
Unit Installation/ductwork	1	$1,400.00	$1,400.00	RSMeans Estimate
Honeywell C7232 -CO2 sensor	1	$565.00	$565.00	Honeywell direct pricing
Electrical Powering wiring	1	$375.00	$375.00	RSMeans Estimate
Control Wiring	1	$225.00	$225.00	RSMeans Estimate
Unit Drain Piping	1	$130.00	$130.00	RSMeans Estimate
Description	1	$140.00	$140.00	RSMeans Estimate
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$14,686.27	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 8**

Finding Description: **HVAC See Finding # 7**

Building: **Town Hall**

General Finding Impacts

Energy Savings	No
Fuel Savings	No
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	Yes
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

Recommendation #7 includes economizer

Estimated Economic Impact Summary

Estimated Annual Electrical Savings	0.00	KWH
Estimated Annual Electric Demand Savings	0.00	KW
Estimated Annual Propane Savings	0.00	Gallons
Estimated Annual Fuel Oil Savings	0.00	Gallons

Implementation Plan:

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
Contractor Markup			0%	Equivalent of 10% Overhead and 10% Profit
Total Prior to Unitil Rebate			$0.00	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** 9

Finding Description: Renewable Install Micro-CHP

Building: Town Hall

General Finding Impacts

Energy Savings	No
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

Install a propane fired Micro-CHP to replace the boiler and provide electric power to the building. This installation will not only reduce the electrical usage of the building but will provide a cost effective source of hot water during the summer to allow dehumidification. Please note that natural gas would improve this recommendation's payback.

Estimated Economic Impact Summary

Energy Savings Electric Production = Unit KW * Hour of Operation per Year Heating Savings = (Btu per hour * Hours of Operation per Year)/Btu/KWH Propane Usage (negative) = Propane usage per hour * Hours of Operation Fuel Oil usage is fuel oil used previous year

Hours of Operation	KW Output	Btu/hr Heating	Propane per hour		Btu/KWH
3,456	1.2	79.1	0.2		11.942
			18,500.03		

Estimated Annual Electrical Savings	15,586.55	KWH	$1,608.77
Estimated Annual Electric Demand Savings	14.40	KW	$113.76
Estimated Annual Propane Savings	-702.59	Gallons	-$1,243.59
Estimated Annual Fuel Oil Savings	83.00	Gallons	$225.76
Total Annual Cost Savings			$704.69
Life Expectancy of Equipment (Years)			20
Lifetime Energy Savings			$14,093.88
Estimated Annual Operational Savings			$0.00
Simple Payback Years			28.03
Lifetime Return On Investment			71.35%

Implementation Plan:

Recommendation is based on Free Watt hydronic unit. Baxi makes a unit which is more suited and cost effective; however, at the time of the audit, it did not appear to be imported into the USA from the UK.

Estimated cost for this installation: $19,753.09 This recommendation cost was not estimated.

Description	# Units	Labor and Material Cost/Unit	Total	Source
FreeWatt Hydronic Micro-CHP	1	$16,000	$16,000	Typical Installed cost
	0	0	0	
Contractor Markup			23%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$19,753.09	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 10**

Finding Description: **Lighting upgrade**

Building: **Town Hall**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

Estimated Economic Impact Summary

Energy Savings = [Watts of Existing Fixture-Watts of New Fixture] X Number of Fixture X Lighting hours per year
See Attached Calculation Sheet.

Estimated Annual Electrical Savings	3264.79	KWH	$336.98
Estimated Annual Electric Demand Savings	0.91	KW	$7.22
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$344.20
		Life Expectancy of Equipment (Years)	10
		Lifetime Energy Savings	$3,441.99
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	6.44
		Lifetime Return On Investment	155.22%

Implementation Plan:
See following detail sheet

Estimated cost for this installation after rebate: $2,217.52

Description	# Units	Labor and Material Cost/Unit	Total	Source
Light level sensor/switch	0	$779.50	$0.00	Lutron MRF2-2S8A-1O1D
Occupancy Sensor	7	$121.80	$852.60	Leviton PR150-1LW
Exit Lights	0	$270.00	$0.00	LITHONIA Model LHQM S W 3 R HO R0
Flagpole down-lighting	2	$529.00	$1,058.00	
36 Watt Wall Pack	0	$450.00	$0.00	
	0	$0.00	$0.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$280.00	
Total			$2,497.52	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Lighting Audit Report

Atkinson New Hampshire

Town Hall **Page 1**

1	Location:	Recommendation:							
	Vestibule - front	none	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	2	67.2	2600	349.44	0.1344		
	Proposed:	2-F32T8 - u	2	67.2	1300	174.72	0.1344	174.72	0
		Proposed lighting controls:							
2	Location:	Recommendation:							
	Lobby / Hallway	none	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	17	67.2	2600	2970.24	1.1424		
	Proposed:	2-F32T8 - U	17	67.2	1300	1485.12	1.1424	1485.12	0
		Proposed lighting controls:							
3	Location:	Recommendation:							
	Lobby / Hallway	None	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	75 Watt Spotlights - Incandescent	8	75	800	480	0.6		
	Proposed:	75 Watt Spotlights - Incandescent	8	75	800	480	0.6	0	0
		Proposed lighting controls:	None						
4	Location:	Recommendation:							
	North vestibule	Motion Sensor	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	1	67.2	2600	174.72	0.0672		
	Proposed:	2-F32T8 - U	1	67.2	1300	87.36	0.0672	87.36	0
		Proposed lighting controls:	Occupancy Sensor - LEVITON PR150-1LW						
5	Location:	Recommendation:							
	server room	Motion Sensor	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	1	67.2	2600	174.72	0.0672		
	Proposed:	2-F32T8	1	67.2	1300	87.36	0.0672	87.36	0
		Proposed lighting controls:	Occupancy Sensor - LEVITON PR150-1LW						
6	Location:	Recommendation:							
	Meeting Room	None	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	12	134.4	2600	4193.28	1.6128		
	Proposed:	4-F32T8	12	134.4	2600	4193.28	1.6128	0	0
		Proposed lighting controls:							
7	Location:	Recommendation:							
	Treasurer	None	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	2	134.4	2600	698.88	0.2688		
	Proposed:	4-F32T8	2	134.4	2600	698.88	0.2688	0	0
		Proposed lighting controls:							

8	Location:	Recommendation:							
	Mechanical Room	Motion	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	1600	215.04	0.1344		
	Proposed:	2-F32T8	2	67.2	800	107.52	0.1344	107.52	0
		Proposed lighting controls:	Occupancy Sensor - LEVITON PR150-1LW						
9	Location:	Recommendation:							
	Break room	Motion	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	1	134.4	2600	349.44	0.1344		
	Proposed:	4-F32T8	1	134.4	1300	174.72	0.1344	174.72	0
		Proposed lighting controls:	Occupancy Sensor - LEVITON PR150-1LW						
10	Location:	Recommendation:							
	files	Motion	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	2	100.8	2600	524.16	0.2016		
	Proposed:	4-F32T8	2	100.8	1300	262.08	0.2016	262.08	0
		Proposed lighting controls:	Occupancy Sensor - LEVITON PR150-1LW						
11	Location:	Recommendation:							
	storage	Motion	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	1	100.8	2600	262.08	0.1008		
	Proposed:	4-F32T8	1	100.8	1300	131.04	0.1008	131.04	0
		Proposed lighting controls:	Occupancy Sensor - LEVITON PR150-1LW						
12	Location:	Recommendation:							
	tax collector	None	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	2	100.8	2600	524.16	0.2016		
	Proposed:	4-F32T8	2	100.8	2600	524.16	0.2016	0	0
		Proposed lighting controls:	none						
13	Location	Recommendation:							
	Town Clerk	None	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	6	100.8	2600	1572.48	0.6048		
	Proposed:	4-F32T8	6	100.8	2600	1572.48	0.6048	0	0
		Proposed lighting controls:							

14	Location	Recommendation:							
	Town Clerk	None	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	6	100.8	2600	1572.48	0.6048		
	Proposed:	4-F32T8	6	100.8	2600	1572.48	0.6048	0	0
		Proposed lighting controls:							

14	Location:	Recommendation:							
	code enforcement	None	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	6	100.8	2600	1572.48	0.6048		
	Proposed:	4-F32T8	6	100.8	2600	1572.48	0.6048	0	0
		Proposed lighting controls:	None						
15	Location:	Recommendation:							
	rear vestibule	Motion	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	1	67.2	2600	174.72	0.0672		
	Proposed:	2-F32T8 - U	1	67.2	1300	87.36	0.0672	87.36	0
		Proposed lighting controls:	Occupancy Sensor - LEVITON PR150-1LW						
16	Location:	Recommendation:							
	exit lights	No work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	stiltron ux-esc-sr	6	16	8760	840.96	0.096		
	Proposed:	LED	6	3.3	8760	173.448	0.0198	667.512	0.0762
		Proposed lighting controls:							
17	Location:	Recommendation:							
	Outdoor building mounted flood Lights	Replace Quartz with solid state lighting	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	Quartz	2	400	800	640	0.8		
	Proposed:	Quartz	2	400	800	640	0.8	0	0
		Proposed lighting controls:							
18	Location:	Recommendation:							
	Outdoor Flagpole lights floodlights	Replace Quartz with solid state lighting	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	Quartz	2	400	3640	2912	0.8		
	Proposed:	LED	1	50	3640	182	0.05	2730	0.75
		Proposed lighting controls:							
19	Location:	Recommendation:							
	Outdoor Building Mounted Wall packs	Replace Existing Wall Packs with solid state lighting	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	wall packs	3	126	800	302.4	0.378		
	Proposed:	wall packs	3	126	800	302.4	0.378	0	0
		Proposed lighting controls:							

Lighting Cost/Payback Analysis
Town Hall

			KW Rate: 7.9		KWH Rate: 0.10322
Existing System	**Annual**	**Monthly**		**Annual $**	**Monthly $**
KWH:	14,597			$1,507	
KW:	65.2608	5.4384		$515.56	$42.96
Proposed System	**Annual**	**Monthly**		**Annual $**	**Monthly $**
KWH:	11332.008			$1,170	
KW:	64.3464	5.3622		$508.34	$42.36
Saved	**Annual**	**Monthly**		**Annual $**	**Monthly $**
KWH:	3264.792			$337	
KW:	0.9144	0.0762		$7.22	$0.60

Observations: Police Department

Original Design and Current Use

- The original building was a one room schoolhouse built in the 1800s. There was an addition added sometime in the 1900s. The building is currently being used as a police station. The energy performance of this building is good; however, the comfort level of the occupants is very poor, and improvements need to be made to improve both comfort and reduce energy usage. The building is 3,575 square feet with 5 full-time employees and 20 part-time. The building has an average of 15 visitors per day. Since this is a police station, most of the employees spend a good portion of their time outside of the office. Therefore, the building is generally occupied by 4 or fewer people at a time.

Retrofits

- The building has been retrofitted many times throughout its history. The current retrofit to a police station was adequate at the time of the retrofit; however, due to lack of a sally port, multiple cells and failing ductwork, the building should be remodeled or replaced. There were also signs that the roof had been leaking. This needs to be addressed to improve indoor air quality issues, avoid mold growth, and improve the energy efficiency of the building.

On-Site Renewable Energy

- This recommended renewable energy opportunity for this building is Thermal Solar. The heat from the Thermal Solar could be used to supply heat to booster heat coils to add zoning to this building and improve comfort. On-site renewable energy sources for all buildings are addressed later in this report.

Age and Condition of the Mechanical Equipment

- The rooftop HVAC unit was manufactured in 1995 and is in good condition for its age. The typical life expectance for this type of unit is about 20 to 25 years. Therefore' the town should plan to replace this unit in the next 5 to 10 years. The ductwork installation was not adequate for this building and is leaking above the ceiling and should be replaced.

Indoor Air Quality

- The CO2 reading during the energy audit ranged from 496 to 602 ppm. The CO2 level should be maintained between 700 and 1,000 ppm to both ensure good indoor air quality and avoid excess ventilation. Excess ventilation uses a lot of energy to heat or cool the outside air to the indoor air temperature. The particle count is on the high side of what is seen in normal buildings. Since the larger particles increase when the unit was running, the unit is stirring particles and not filtering them out of the air. This is due to the large duct leakage and the lack of return air ducts. Since the smaller particles decreased when the unit was running, the unit is supplying outside air and ventilating the space. Replacing the supply ductwork, installing a return air ductwork' and using a high-quality filter in the HVAC unit will reduce all particle sizes and improve indoor air quality.

Space Temperature and Humidity

- The temperature inside this building is controlled by one programmable thermostat located in the chief's office, and the ductwork leaks above the ceiling. This creates two issues within this space. One is that there is an extreme temperature gradient from the ceiling to the floor in most of the building and a large swing in temperature within the building. The temperatures measured down the wall range from a high of over 94 degrees at the ceiling level, while temperature at sitting level was 70.1 degrees. The data logger left in the police station demonstrated that during normal business hours, the temperature ranged from almost 80 degrees to less than 70 degrees.

R- Value

- The building is a wood-framed structure with a brick facade. The windows are a mix of single-pane and double-pane windows. The R-Value of this building's walls is what is expected from a building of this age. There are numerous places which are showing leakage, and these leaks should be repaired. The roof of the addition has an R-Value which is lower than expected. Since the roof shows signs of water leakage, the roof should be replaced, and proper insulation should be installed.

Maintenance

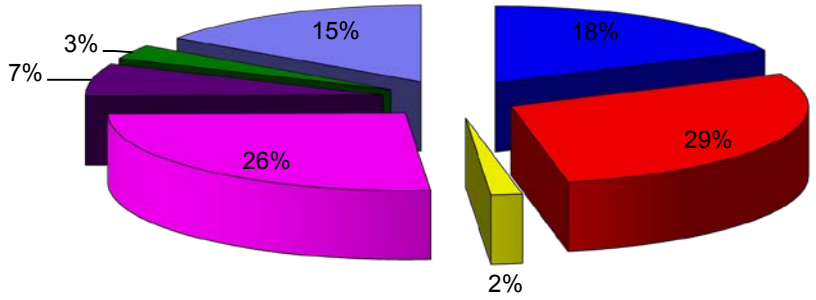
- The maintenance in this building is completed on an as needed basis to address issues. Implementing a preventive or condition-based maintenance program would save the town money on both energy and equipment maintenance costs.

People's Energy Awareness

- Overall, the energy awareness by the people using this building was good. Computers and lights were turned off at night and a programmable thermostat set back the building at night. It should be noted that this building has major comfort issues and failing ductwork.

Police Department

ENERGY USAGE PROFILE



Total Facility Site Consumption	197 (Millions of BTU/hr)
Cooling	18.0%
Heating	28.8%
Pumps	1.7%
Lighting	26.1%
Fans	6.8%
Domestic Hot Water	3.0%
Plug Load (Include Computers and Electric Heaters)	15.3%
Total	100%

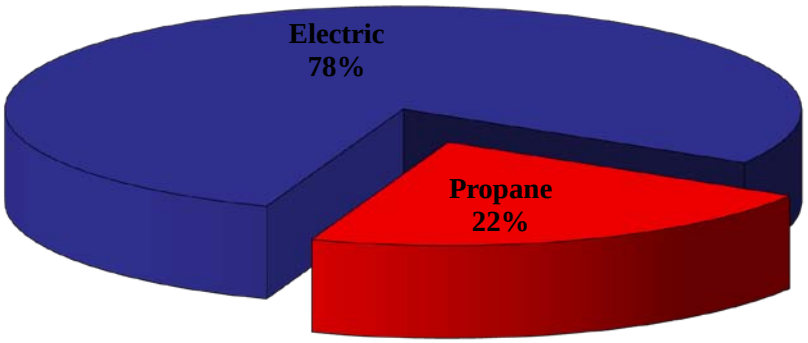
Town of Atkinson, New Hampshire
Police Department
Utility Analysis Period:

8/01/2009 to 7/31/2010

	Current Year			Previous Year		
	8/1/2009	to	7/31/2010	8/1/2008	to	7/31/2009
	Electric		Propane	Electric		Propane
Utility Costs	$4,167		$1,167	$6,226		$1,850
Utility Usage	41,160		625	36,474		1,225
$ Cost/Unit (kWh, Therm, Gal)	$0.10		$1.87	$0.17		$1.51
	CDD		HDD	CDD		HDD
	419		6,689	324		7,366
Current Year Vs Previous Year	**Electric**		**Propane**			
Change in Cost	-33%		-37%			
Change in Usage	13%		-49%			
Change in $ Cost/Unit	-41%		24%			
Change in Degree Day	29%		-9%			

Electrical usage increase as CDD increased. Propane usage decreased at a greater rate than HDD decrease most likely due to tank filling cycle.
CDD - Cooling Degree Day
HDD - Heating Degree Day

Utility Cost Comparison Current Year



Energy Benchmarking: Police Department

The calculation of EUI (Energy Use Intensity) is shown below. EUI, expressed in kBtu/sf, is normalized for floor area, the most dominant influence on energy use in most buildings. Its use usually provides a good approximation of how your building's energy performance compares to others. Site EUI indicates the rate at which energy is used at your building (the point of use). Source EUI indicates the rate at which energy is used at the generation sources serving your building (the point of source) and indicates the societal energy penalty due to your building The lower the EUI, the higher the rating, indicating that the building is more efficient than other buildings. The greater the EUI, the lower the rating, indicating that there is an opportunity for higher potential benefits from operational improvements.

To compare the buildings shown below to each other, and to determine the ranking of the buildings from having the most to the least opportunity for demand-side improvements from a financial perspective, please see the Site EUI ranking below.

The Site EUI below has been applied to a Department of Energy statistical model from the Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark. The Department of Energy has estimated energy use and cost reductions for building source EUI ratings (percentiles) in the table below. Please see the DOE Regional Source EUI Comparison graph below to rate your building in relation to the regional distribution of similar type buildings. (Note: The Source EUI includes the inefficiencies of electrical generation and transmission. A reduction in 'electrical' source EUI includes a benefit in terms of reduction of air pollution emissions and green house gasses, and is thus an indicator of societal benefit.)

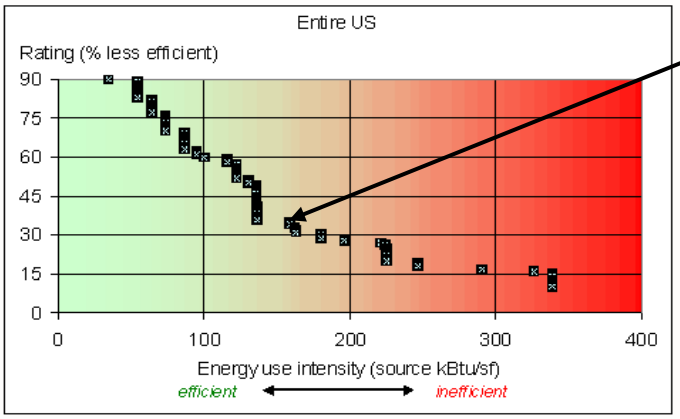
Source EUI Rating for your Building	Energy use and cost reduction potential (%)	Walk-thru energy assessment recommended?
above 60%	below 25%	No
40 to 60%	20 to 35%	Maybe
20 to 40%	35 to 50%	Yes
Below 20%	above 50%	Definitely

Rating from the most efficient to the least efficient - 2010 consumption

Site EUI Rank	Building	Annual Total Electrical Use (kWh)	Annual Total Non-Electrical Fuel Use (Gals)	Occupied Building Gross Floor Area (sq-ft)	Site EUI Rating	Source EUI: Annual Total Source Energy Use per Sq-Ft (kBtu/sf)	Rating (Regional Source EUI Comparison)
1	Police Department	41,160	625	3,575	**55**	**156**	**0.32**

Building Type

Fire/Police Station



Source EUI	Est Regional Rating	Building
156	32%	Police Department

Source: Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 11**

Finding Description: **Door weather stripping**

Building: **Police**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	No

Recommendation:

Overall, the door weather stripping is in poor condition at the Police Department. Weather stripping breaks down over time and with use. Therefore it is recommended that the door weather stripping at this building be given a high priority at this time. For this type of building and use, it is anticipated that the weather stripping for these doors should be replaced every 8 to 10 years.

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year
Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Interior Temp	Avg OA Temp	Hours per Year	BTU/Gallon
0.25	589.6	0.25	1.08	68	34	6,048	74,620

Cooling Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Avg OA Enthalpy	Interior Enthalpy	Hours per Year	BTU/Gallon
0.25	589.6	0.25	1	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	24.19	KWH	$2.50
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	109.67	Gallons	$194.12
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$196.62
Life Expectancy of Equipment (Years)			8
Lifetime Energy Savings			$1,572.93
Estimated Annual Operational Savings			$0.00
Simple Payback Years			4.93
Lifetime Return On Investment			162.43%

Implementation Plan:

The Entire perimeter of the entrance doors should be sealed to eliminate heat loss. sealing kits from American Garage Door Supply are listed in the appendix of this report. The door to the mechanical room should be replaced with a steel insulated door.

Estimated cost for this installation: $968.37

Description	# Units	Labor and Material Cost/Unit	Total	Source
Replacement of Door	1	$320.00	$320.00	
Entrance Doorjamb Kit	4	$72.70	$290.80	
Entrance Door Bottom Kit	4	$32.50	$130.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$968.37	

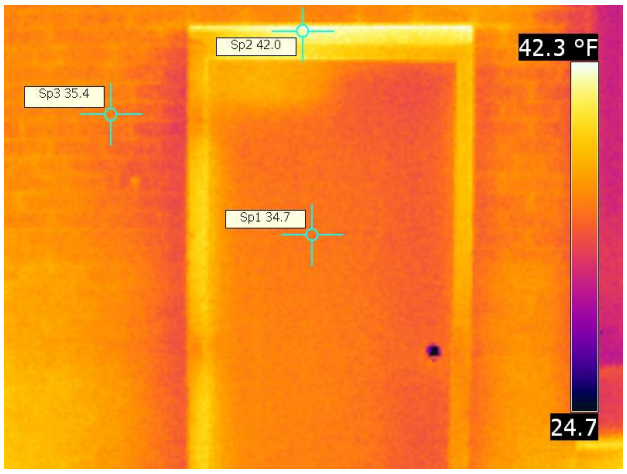
Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Inspection Report

Report Date 2/27/2011

Company	Arbogast Energy Auditing	**Customer**	Town of Atkinson, NH
Address	317 Austin St #4	**Site Address**	New Hampshire
Thermographer	Elmer Arbogast	**Contact Person**	Michelle Veasey



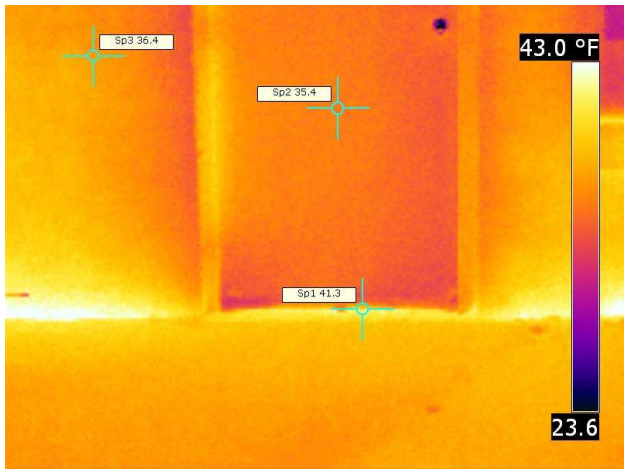


Image and Object Parameters

Camera Model	FLIR T200_ Western
Image Date	11/1/2010 11:13:24 AM
Image Name	IR_2246.jpg
Emissivity	0.95
Reflected apparent temperature	27.0 °F
Object Distance	3.2 ft

Text Comments

Description

Imaging showing door air leakage, typical of all doors at the Police Station.

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 12**

Finding Description: **Weatherization - Caulk above windows**

Building: **Police**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	No

Estimated Economic Impact Summary

The original windows in the Police Department addition were replaced with smaller windows or sealed completely off. The caulking around the surround of these windows is leaking from the caulk deteriorating with age. This caulking should be removed, and new caulking along with a backer rod should be installed.

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Interior Temp	Avg OA Temp	Hours per year	Btu/Gallon
0.25	589.6	0.2	1.08	68	34	6,048	74,620

Cooling Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Avg OA Enthalpy	Interior Enthalpy	Hours per year	Btu/KWH
0.25	589.6	0.2	1	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	107.09	KWH	$11.05
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	87.74	Gallons	$155.30
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$166.35
Life Expectancy of Equipment (years)			15
Life Time Energy Savings			$2,495.24
Estimated Annual Operational Savings			$0.00
Simple Payback Years			5.23
Lifetime Return On Investment			287.06%

Implementation Plan:

Window surrounds should have existing caulking removed and window and surround should be completely re-caulked.

Estimated cost for this installation: $869.23

Description	# Units	Labor and Material Cost/Unit	Total	Source
Backer Rod	8	$40.52	$324.16	
Caulking	8	$42.60	$340.80	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$869.23	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Inspection Report

Report Date 2/27/2011

Company	Arbogast Energy Auditing	**Customer**	Town of Atkinson, NH
Address	317 Austin St #4	**Site Address**	New Hampshire
Thermographer	Elmer Arbogast	**Contact Person**	Michelle Veasey

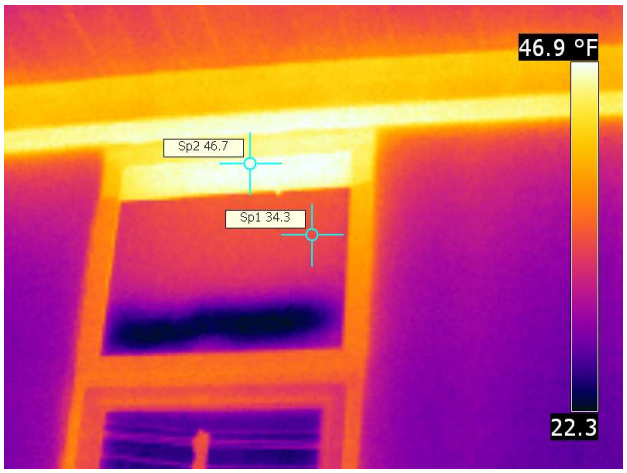


Image and Object Parameters

Camera Model	FLIR T200_ Western
Image Date	11/1/2010 11:16:19 AM
Image Name	IR_2266.jpg
Emissivity	0.95
Reflected apparent temperature	0.0 °F
Object Distance	3.2 ft

Text Comments

Description

Imaging showing air leakage at top of window surround.

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 13**

Finding Description: **HVAC - Ductwork Replacement**

Building: **Police**

General Finding Impacts

Energy Savings	No
Fuel Savings	No
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

The existing ductwork in the Police Department is leaking and causing comfort issues and should be replaced. It should be noted that this recommendation will not result in any net energy savings and most likely will result in an increase in energy usage as heat is supplied to all areas of the building. It should be noted that there were signs of leaks from the roof which should be fixed prior to this retrofit.

Estimated Economic Impact Summary

No energy savings. Energy saving will result from implementing this recommendation plus recommendation #14.

Estimated Annual Electrical Savings	0.00	KWH
Estimated Annual Electric Demand Savings	0.00	KW
Estimated Annual Propane Savings	0.00	Gallons
Estimated Annual Fuel Oil Savings	0.00	Gallons

Implementation Plan:

Remove the dropped ceiling and existing ductwork back to the HVAC unit. Install supply and return ductwork to distribute the air throughout the space. It is recommended the ductwork is designed to incorporate the zone included in recommendation #14. Reinstall the ceiling with new ceiling panels.

Estimated cost for this installation: $23,169.93

Description	# Units	Labor and Material Cost/Unit	Total	Source
Ceiling Removal	1	$1,600.00	$1,600.00	
Ductwork	1	$11,750.00	$11,750.00	
Ceiling Replacement	1	$4,375.00	$4,375.00	
	0	$0.00	$0.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Total Prior to Unitil Rebate			$23,169.93	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Atkinson Police Station Particle Counts

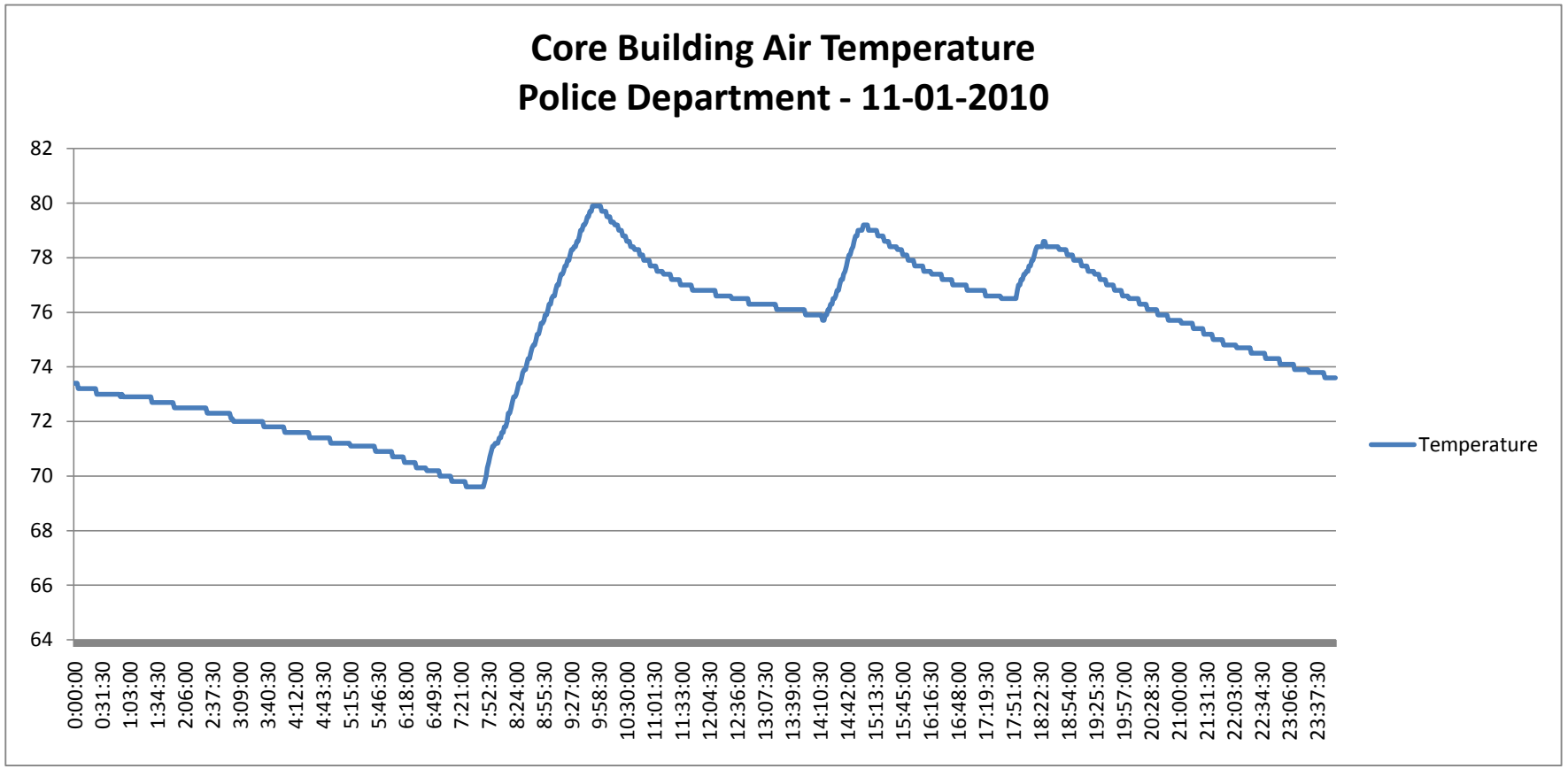
	Test 1	test 2	test 3
Particle size	Top of Refrigerator	Top of Refrigerator	Dispatch
0.3 micron	42,476	45,934	46,317
0.5 micron	3,647	3,711	3,841
1 micron	607	501	511
2 micron	315	237	206
5 micron	74	40	29
10 micron	27	12	8

Test 1 was taken while HVAC unit was running and had be running for at least 1 1/2 hours. Note the higher count of larger particles.

Test 2 was taken 1/2 hour after HVAC unit had shut down and at least 2 people were occupying the space. Note the increase in smaller particles, which is common with reduced outside air in an occupied space. Also note the decrease in larger particle count as the unit stops stirring the dust in the duct and above the ceiling.

Test 3 was taken 1 hour after HVAC unit had shut down and at least 2 people were occupying the space. Note the increase in smaller particles, which is common with reduced outside air in an occupied space. Also note the decrease in larger particle count as the unit stops stirring the dust in the duct and above the ceiling.

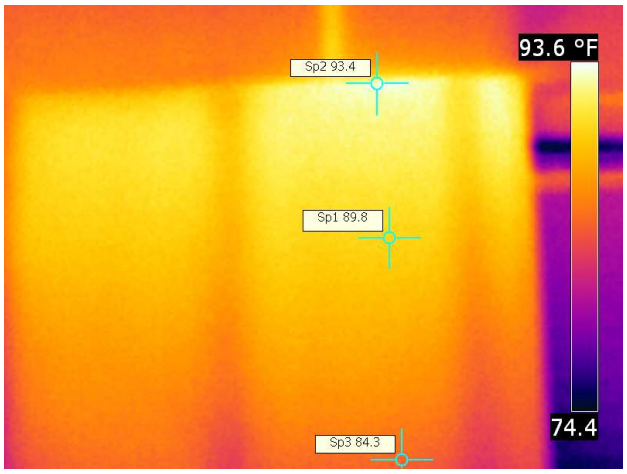
These tests support the need to replace the ductwork in the building. The total particle counts are on the higher side of normal building particle count; however, since this unit does not identify the particle, I can not make any additional comments.


Core Building Air Temperature
Police Department - 11-01-2010
82
80
78
76
74
72
70
68
66
64
0:00:00
0:31:30
1:03:00
1:34:30
2:06:00
2:37:30
3:09:00
3:40:30
4:12:00
4:43:30
5:15:00
5:46:30
6:18:00
6:49:30
7:21:00
7:52:30
8:24:00
8:55:30
9:27:00
9:58:30
10:30:00
11:01:30
11:33:00
12:04:30
12:36:00
13:07:30
13:39:00
14:10:30
14:42:00
15:13:30
15:45:00
16:16:30
16:48:00
17:19:30
17:51:00
18:22:30
18:54:00
19:25:30
19:57:00
20:28:30
21:00:00
21:31:30
22:03:00
22:34:30
23:06:00
23:37:30
Temperature

Inspection Report

Report Date 2/27/2011

Company	Arbogast Energy Auditing	**Customer**	Town of Atkinson, NH
Address	317 Austin St #4	**Site Address**	New Hampshire
Thermographer	Elmer Arbogast	**Contact Person**	Michelle Veasey



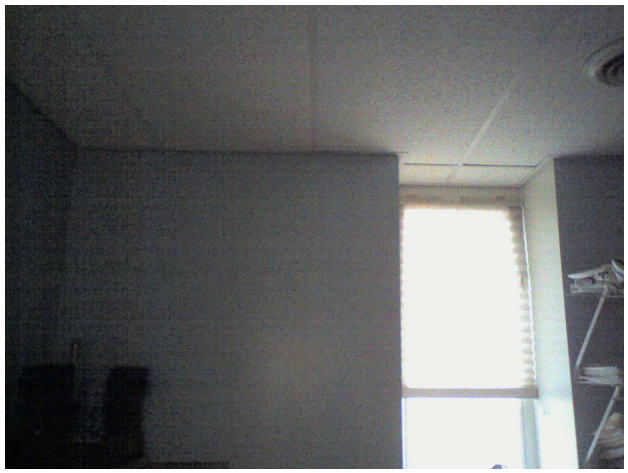


Image and Object Parameters

Camera Model	FLIR T200_ Western
Image Date	11/4/2010 3:03:35 PM
Image Name	IR_2566.jpg
Emissivity	0.95
Reflected apparent temperature	72.0 °F
Object Distance	3.2 ft

Text Comments

Description

This is a picture taken of a wall within the Police Department. The unit was running 15 minutes prior to this picture but was not running at the time of the picture. At the ceiling level the temperature is 93.4 degrees.

Inspection Report

Report Date 2/27/2011

Company	Arbogast Energy Auditing	**Customer**	Town of Atkinson, NH
Address	317 Austin St #4	**Site Address**	New Hampshire
Thermographer	Elmer Arbogast	**Contact Person**	Michelle Veasey

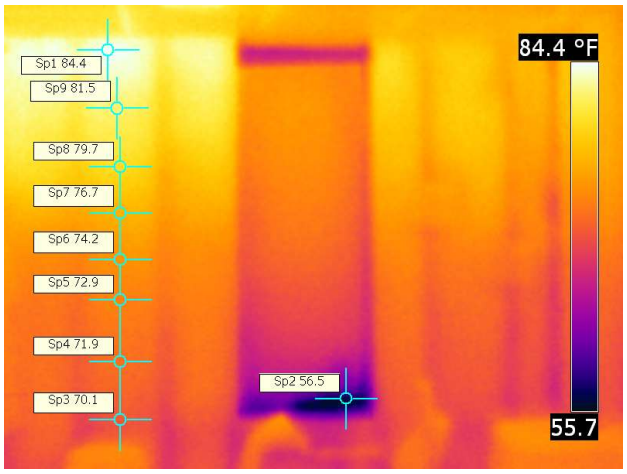


Image and Object Parameters

Camera Model	FLIR T200_ Western
Image Date	11/4/2010 3:07:36 PM
Image Name	IR_2581.jpg
Emissivity	0.95
Reflected apparent temperature	72.0 °F
Object Distance	3.2 ft

Text Comments

Description

Temperature gradiant on an outside wall at the Police Department.

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 14**

Finding Description: **Building Controls - Add Zoning Control**

Building: **Police**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

The Police Department is currently served by one thermostat which is located in the chief's office. This creates large swings in the temperature of the remaining space, resulting in both wasted energy and occupant discomfort. Therefore, zone dampers and a zone controller should be installed.

Estimated Economic Impact Summary

Improved System Efficiency

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	62.50	Gallons	$110.63
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$110.63
Life Expectancy of Equipment (Years)			15
Lifetime Energy Savings			$1,659.38
Estimated Annual Operational Savings			$0.00
Simple Payback Years			13.92
Lifetime Return On Investment			107.76%

Implementation Plan:

A Honeywell HZ311 zone controller should be installed to control the HVAC system. A new programmable Honeywell TH4110D should be installed in the chief's office, squad room, and the officer's room. This could be installed under current ductwork; however, it is recommended that the ductwork be replaced and zoned such that the vestibule, Chief's Office, Lieutenant's Office, and interview room are zone 1; the equipment room, armory, office room, office, and hallway area are zone 2; the dispatch area, squad room, records, evidence, interview room, and cell are zone 3. The cost estimate is completed assuming that the ductwork is replaced.

Estimated cost for this installation after rebate: $1,539.90

Description	# Units	Labor and Material Cost/Unit	Total	Source
Honeywell HZ311 controller	1	$280.00	$280.00	
Honeywell TH4110D1007	3	$71.80	$215.40	
Honeywell ZD damper	4	$185.00	$740.00	
Ductwork	0	$900.00	$0.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$75.00	
Total			$1,614.90	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **15**

Finding Description: **HVAC - Add economizer to existing unit**

Building: **Police**

General Finding Impacts

Energy Savings	No
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

The existing York rooftop unit has the capabilities to provide an enthalpy-based economizer which will reduce the run-time of the air conditioning compressors.

Estimated Economic Impact Summary

Energy Savings = Compressor Wattage * Reduced Run-time

Energy Savings	
Compressor KW	Reduced Run-time
8.33	520

Estimated Annual Electrical Savings	4331.60	KWH	$447.09
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$447.09
		Life Expectancy of Equipment (Years)	15
		Lifetime Energy Savings	$6,706.29
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	3.63
		Lifetime Return On Investment	413.73%

Implementation Plan:

The enthalpy economizer package should be ordered from York for this unit and installed by a qualified person.

Estimated cost for this installation: $1,620.92

Description	# Units	Labor and Material Cost/Unit	Total	Source
Economizer pack from York	1	$1,240.00	$1,240.00	York List Pricing
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$1,620.92	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 16**

Finding Description: **Lighting Upgrade**

Building: **Police**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	No

Recommendation:

Replace lighting per attached detail sheet.

Estimated Economic Impact Summary

Energy Savings = [Watts of Existing Fixture-Watts of New Fixture] X Number of Fixture X Lighting Hours per Year

See attached calculation sheet.

Estimated Annual Electrical Savings	97.76 KWH	$10.09
Estimated Annual Electric Demand Savings	0.56 KW	$4.46
Estimated Annual Propane Savings	0.00 Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00 Gallons	$0.00
Total Annual Cost Savings		$14.55
Life Expectancy of Equipment (Years)		7
Lifetime Energy Savings		$101.82
Estimated Annual Operational Savings		$0.00
Simple Payback Years		0.68
Lifetime Return On Investment		1030.94%

Implementation Plan:

See following recommendations.

Estimated cost for this installation: $9.88

Description	# Units	Labor and Material Cost/Unit	Total	Source
11 Watt compact fluorescent	1	$8.00	$8.00	
Contractor Markup			23%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$9.88	

Recommend Work to be performed by: Town Maintenance

Owner Action: Purchase lightbulb

Lighting Audit Report

Atkinson, New Hampshire - Police

Police Department **Page** **1**

1	Location:	Recommendation:							
	Chief Office		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	4	134.4	2080	1118.21	0.5376		
	Proposed:	4-F32T8	4	134.4	2080	1118.21	0.5376	0	0
		Proposed lighting controls:							
2	Location:	Recommendation:							
	Front Vestibule Area		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	1	134.4	2080	279.552	0.1344		
	Proposed:	4-F32T8	1	134.4	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
3	Location:	Recommendation:							
	Front Vestibule area		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8 - U	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
4	Location:	Recommendation:							
	Hallway		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8 - U	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
5	Location:	Recommendation:							
	North Vestibule		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8 - U	1	67.2	2080	139.776	0.0672	0	0
		Proposed lighting controls:							
6	Location:	Recommendation:							
	File		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	4	67.2	2080	559.104	0.2688		
	Proposed:	2-F32T8	4	67.2	2080	559.104	0.2688	0	0
		Proposed lighting controls:							
7	Location:	Recommendation:							
	officer room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	2	134.4	2080	559.104	0.2688		
	Proposed:	4-F32T8	2	134.4	2080	559.104	0.2688	0	0

8	Location:	Recommendation:							
	equipment room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
9	Location:	Recommendation:							
	interview room	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	2	134.4	2080	559.104	0.2688		
	Proposed:	4-F32T8	2	134.4	2080	559.104	0.2688	0	0
		Proposed lighting controls:	None						
10	Location:	Recommendation:							
	executive officer	No Work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	2	134.4	2080	559.104	0.2688		
	Proposed:	4-F32T8	2	134.4	2080	559.104	0.2688	0	0
		Proposed lighting controls:							
11	Location:	Recommendation:							
	Dispatch area		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	4	134.4	2080	1118.21	0.5376		
	Proposed:	4-F32T8	4	134.4	2080	1118.21	0.5376	0	0
		Proposed lighting controls:	none						
12	Location:	Recommendation:							
	South Vestibule		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	4	134.4	2080	1118.21	0.5376		
	Proposed:	4-F32T8	4	134.4	2080	1118.21	0.5376	0	0
		Proposed lighting controls:	2 - bulbs out						
13	Location:	Recommendation:							
	observation	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8 - U	1	67.2	2080	139.776	0.0672	0	0
		Proposed lighting controls:	2 On all the time 4 controlled by switch						
14	Location:	Recommendation:							
	interview	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	2	134.4	2080	559.104	0.2688		
	Proposed:	4-F32T8	2	134.4	2080	559.104	0.2688	0	0
		Proposed lighting controls:	None						

15	Location:	Recommendation:							
	cell	No work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8 - U	1	67.2	2080	139.776	0.0672	0	0
		Proposed lighting controls:	None						
16	Location:	Recommendation:							
	squad room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F32T8	6	134.4	2080	1677.31	0.8064		
	Proposed:	4-F32T8	6	134.4	2080	1677.31	0.8064	0	0
		Proposed lighting controls:							
17	Location:	Recommendation:							
	closet		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
18	Location:	Recommendation:							
	restroom		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8 - U	1	67.2	2080	139.776	0.0672	0	0
		Proposed lighting controls:	One Bulb out						
19	Location:	Recommendation:							
	Utility		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	1- 60watt incandescent	1	60	2080	124.8	0.06		
	Proposed:	11 watt compact Florescent	1	13	2080	27.04	0.013	97.76	0.047
		Proposed lighting controls:							
20	Location:	Recommendation:							
	evidence		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8	1	67.2	2080	139.776	0.0672	0	0
		Proposed lighting controls:	Motion Sensor						
21	Location:	Recommendation:							
	evidence front	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - u	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8 - u	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							

22	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	armory								
	Existing:	2-F32T8 -u	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8 u	1	67.2	2080	139.776	0.0672	0	0
		Proposed lighting controls:							

1	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	armory	Outdoor lights							
	Existing:		4	75	2080	624	0.3		
	Proposed:		4	75	2080	624	0.3	0	0
	Police Department								

KW Rate: 7.9 KWH Rate: 0.11

Existing System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	9,834		$1,082	
KW:	56.736	4.728	$448.21	$37.35

Proposed System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	9736.48		$1,071	
KW:	56.172	4.681	$443.76	$36.98

Saved	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	97.76		$11	
KW:	0.564	0.047	$4.46	$0.37

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 17**

Finding Description: **Vending Mizers - Install Vending Mizer & delamp**

Building: **Police**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	No

Recommendation:

Vending machine in kitchen area should have a Vending Mizer installed and display lights removed.

Estimated Economic Impact Summary

Energy Savings = [Watts of Existing Fixture-Watts of New Fixture] X Number of Fixtures X Lighting Hours per Year

Watts of Lamps to be removed	Hours Per Year	KW of Vending Machine	Reduced Hours of Operation
84	8,760	1.2	1,314

Estimated Annual Electrical Savings	2,312.64	KWH	$238.70
Estimated Annual Electric Demand Savings	0.08	KW	$0.66
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$239.36
		Life Expectancy of Equipment (Years)	10
		Lifetime Energy Savings	$2,393.63
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	1.65
		Lifetime Return On Investment	605.89%

Implementation Plan:

The lamps in vending machines are designed only to draw people to the machine to buy products; where this machine is located, it has little effect. Therefore these bulbs should be removed. A Vending Mizer allows the machine to run at a slightly higher temperature and shuts down certain features when no one is present. When someone activates the occupancy sensor, the machine returns to full operation and normal set temperature. The Vending Mizer has no effect on product or operation of machine.

Estimated cost for this installation: $395.06

Description	# Units	Labor and Material Cost/Unit	Total	Source
Vending Mizer	1	$285.00	$285.00	
Lamp removal	1	$35.00	$35.00	
Contractor Markup			23%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$395.06	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **18**

Finding Description: **Renewable Install Thermal Solar**

Building: **Police**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

The Police Department has a south facing roof that has the opportunity to install a solar hot water heater to provide zoning heat. Note this recommendation should be completed as part of a renovation and not a stand-alone installation. This will help create both energy savings and improved comfort. The addition of this equipment will result in an increase in maintenance cost, which is estimated to be $110.00.

Estimated Economic Impact Summary

Energy Savings Heating =Btu of Heating per days* Diversity Factor * Units * Weeks per Year * Days per Week

Btu/day	Diversity Factor	# of Units	Weeks per Year	Days per Week
28,000.00	1	1	36	7

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	96.92	Gallons	$171.55
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$171.55
Life Expectancy of Equipment (Years)			15
Lifetime Energy Savings			$2,573.31
Estimated Annual Operational Savings			-$110.00
Simple Payback Years			38.96
Lifetime Return On Investment			38.50%

Implementation Plan:

Install a Thermal Solar collector model Sun-Maxx-30 Evacuated Tube or equal on the south facing roof of the Police Department. The installation shall include all pumps and piping necessary to complete a working system including a storage tank, controls, and connection to existing system. The water then should pump to a coil located at each zone damper location.

Estimated cost for this installation after rebate: $6,684.14

Description	# Units	Labor and Material Cost/Unit	Total	Source
Sun-Maxx 30	1	$2,250.00	$2,250.00	
Coils	3	$240.00	$720.00	
Pex Piping	3	$340.00	$1,020.00	
Tank and controls	1	$1,850.00	$1,850.00	
Contractor Markup			31%	Equivalent of 10% Overhead and 10% Profit
Rebates			$949.85	
Total			$7,633.99	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 19**

Finding Description: **Install Timer on water heater**

Building: **Police**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

It was observed during the energy audit that the electric hot water heater was on when the space was not occupied. Installing a time clock will shut off the water heater when space is unoccupied but ensure hot water when needed.

Estimated Economic Impact Summary

Energy Savings = KW of Water Heater * Reduced Run-time from Time Clock

Btu/hr	Reduced Run Hours	
4	182.5	Based on reducing the run-time of the water heater by 1/2 hour per

Estimated Annual Electrical Savings	730.00	KWH	$75.35
Estimated Annual Electric Demand Savings	4.00	KW	$31.60
Estimated Annual Propane Savings	0.01	Gallons	$0.01
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$106.96
		Life Expectancy of Equipment (Years)	15
		Lifetime Energy Savings	$1,604.42
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	1.64
		Lifetime Return On Investment	914.59%

Implementation Plan:

Time clock should be installed in the power wiring of the water heater set 1 hour prior to space being occupied and shut off 1/2 hour prior to space being unoccupied.

Estimated cost for this installation: $175.42

Description	# Units	Labor and Material Cost/Unit	Total	Source
INTERMATIC Model # EI600WC	1	$134.20	$134.20	
	0	$0.00	$0.00	
Contractor Markup			31%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$175.42	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Observations: Kimball Library

Original Design and Current Use

- Kimball Library was built in 2008 to function as a library, and its design focuses on energy efficiency. The design uses insulated structural panels and thus puts the insulation and vapor/air barrier at the outer shell of the building. This matches the traditional construction methods for the exterior walls, but not for the roof structure. This construction technique creates a larger volume of space to be heated, but at the same time eliminates the mechanical penetrations through the insulation and vapor/air barrier. The overall effect is a slightly more energy-efficient building. The building is 11,400 square feet housing 11 total employees, 2 full-time and 9 part-time. The building has an average of 150 visitors per day.

Retrofits

- The structure was built in 2008 and has not had any retrofits. The recommended retrofits for this building are control sequence improvements and boiler upgrades.

On-Site Renewable Energy

- The recommended on-site renewable energy for this building is Thermal Solar. The heat from the Thermal solar could be used to supply heat to preheat coils to heat outside air and reduce boiler load. On-site renewable energy sources for all buildings are addressed later in this report.

Age and Condition of the Mechanical Equipment

- All equipment in the building is new from construction of 2008. The town should plan to have the equipment evaluated for replacement in 18 years when the equipment reaches 20 and each year after that.

Indoor Air Quality

- The Air Quality in this building is very good with CO2 reading ranging from 384 ppm to 481 ppm and air particle counts as follows:

Size		Count	Size		Count
.3 Microns	-	8,745	.5 Microns	-	1,402
1 Microns	-	735	2 Microns	-	340
5 Microns	-	51	10 Microns	-	18

- The amount of outside air is higher than for normal building usage. The minimum outside air should be reduced to 5%, and more aggressive demand control ventilation set points should be implemented.

Space temperature and Humidity

- During the energy audit, the space temperature was maintained within an acceptable range during business hours and was set back during unoccupied time.

R- Value

- The R-Value of this building's walls is what is expected from a building of this age. All exterior doors are showing air leakage, and these leaks should be repaired. The building is a wood-framed, vinyl-sided building using insulated structural panes for the roof. The windows are double-pane windows with low-e glass.

Maintenance

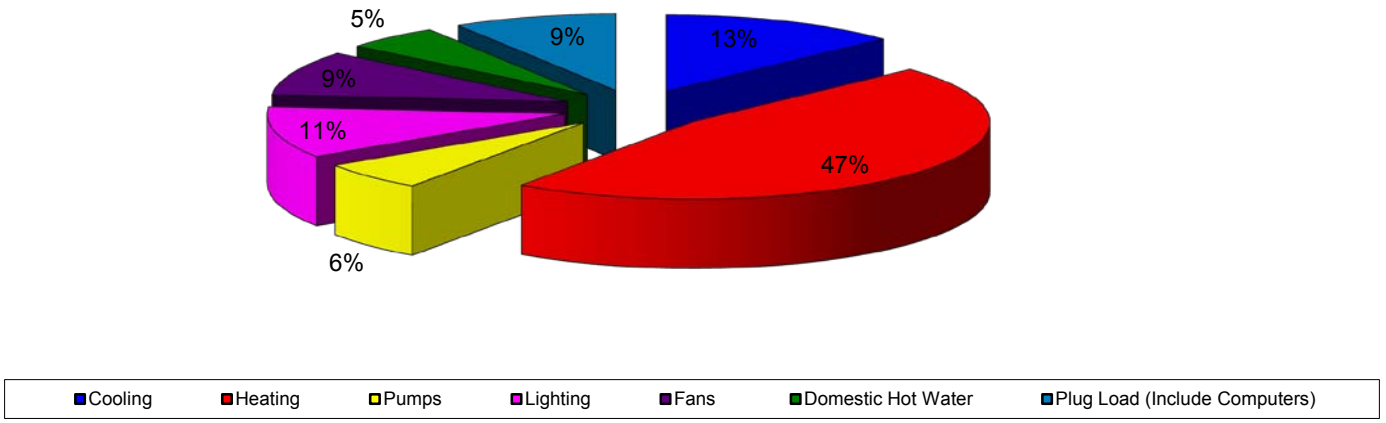
- The maintenance on this building is completed on a preventive maintenance approach. Implementing a condition-based maintenance program would save the town money on both energy and equipment maintenance cost.

People's Energy Awareness

- Overall, the energy awareness of the people using this building was good. Computers and lights were turned off at night, and a building automation system set back the HVAC unit at night. The interior and outdoor lights are controlled by a lighting control panel with an Astronomic time clock.

Kimball Library

ENERGY USAGE PROFILE



Total Facility Site Consumption	652 (Millions of BTU/hr)
Cooling	13.1%
Heating	46.7%
Pumps	5.9%
Lighting	10.8%
Fans	9.4%
Domestic Hot Water	5.2%
Plug Load (Include Computers)	8.9%
Total	100%

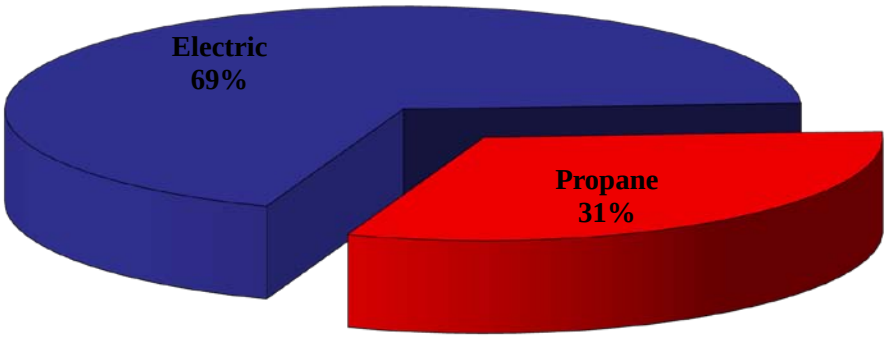
Town of Atkinson, New Hampshire
Kimball Library
Utility Analysis Period:

8/01/2009 to 7/31/2010

	Current Year			Previous Year		
	8/1/2009	to	7/31/2010	8/1/2008	to	7/31/2009
	Electric		Propane	Electric		Propane
Utility Costs	$13,506		$6,202	$10,945		$15,808
Utility Usage	91,840		3,716	84,840		8,292
$ Cost/Unit (kWh, Therm, Gal)	$0.15		$1.67	$0.13		$1.91
	CDD		HDD	CDD		HDD
	419		6,689	324		7,366
Current Year Vs Previous Year	**Electric**		**Propane**			
Change in Cost	23%		-61%			
Change in Usage	8%		-55%			
Change in $ Cost/Unit	14%		-12%			
Change in Degree Day	29%		-9%			

Electric usage increase proportional to CDD and Propane Usage decrease proportional to HDD
CDD - Cooling Degree Day
HDD - Heating Degree Day

Utility Cost Comparison Current Year



Energy Benchmarking: Kimball Library

The calculation of EUI (Energy Use Intensity) is shown below. EUI, expressed in kBtu/sf, is normalized for floor area, the most dominant influence on energy use in most buildings. Its use usually provides a good approximation of how your building's energy performance compares to others. Site EUI indicates the rate at which energy is used at your building (the point of use). Source EUI indicates the rate at which energy is used at the generation sources serving your building (the point of source) and indicates the societal energy penalty due to your building The lower the EUI, the higher the rating, indicating that the building is more efficient than other buildings. The greater the EUI, the lower the rating, indicating that there is an opportunity for higher potential benefits from operational improvements.

To compare the buildings shown below to each other, and to determine the ranking of the buildings from having the most to the least opportunity for demand-side improvements from a financial perspective, please see the Site EUI ranking below.

The Site EUI below has been applied to a Department of Energy statistical model from the Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark. The Department of Energy has estimated energy use and cost reductions for building source EUI ratings (percentiles) in the table below. Please see the DOE Regional Source EUI Comparison graph below to rate your building in relation to the regional distribution of similar type buildings. (Note: The Source EUI includes the inefficiencies of electrical generation and transmission. A reduction in 'electrical' source EUI includes a benefit in terms of reduction of air pollution emissions and green house gasses, and is thus an indicator of societal benefit.)

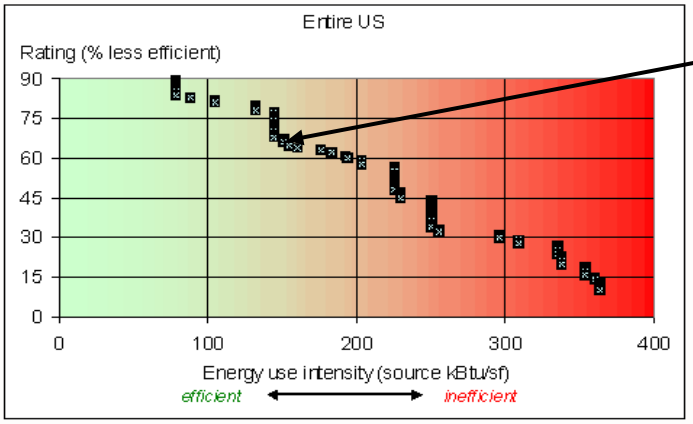
Source EUI Rating for your Building	Energy use and cost reduction potential (%)	Walk-thru energy assessment recommended?
above 60%	below 25%	No
40 to 60%	20 to 35%	Maybe
20 to 40%	35 to 50%	Yes
Below 20%	above 50%	Definitely

Rating from the most efficient to the least efficient - 2010 consumption

Site EUI Rank	Building	Annual Total Electrical Use (kWh)	Annual Total Non-Electrical Fuel Use (Gals)	Occupied Building Gross Floor Area (sq-ft)	Site EUI Rating	Source EUI: Annual Total Source Energy Use per Sq-Ft (kBtu/sf)	Rating (Regional Source EUI Comparison)
1	Kimball Library	91,840	3,716	11,000	**59**	**132**	**0.70**

Building Type

Library



Source EUI	Est Regional Rating	Building
132	70%	Kimball Library

Source: Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **32**

Finding Description: **Door weather stripping**

Building: **Library**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Overall, the door weather stripping is in fair condition at the Kimball Library. Weather stripping breaks down over time and with use. Therefore it is recommended that the door weather stripping at this building be given a priority at this time. For this type of building and use, it is anticipated that the weather stripping for these doors should be replaced every 8 to 10 years.

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Area	Speed -	Factor	Constant	Temp	Avg OA Temp	Hours per Year	n
0.56	589.6	0.24	1.08	68	34	6,048	74,620

Area	Speed -	Factor	Constant	Enthalpy	Enthalpy	Hours per Year	Btu/KWH
0.56	589.6	0.24	1	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	52.26	KWH	$5.39
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	236.89	Gallons	$419.30
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$424.69
Life Expectancy of Equipment (Years)			8
Lifetime Energy Savings			$3,397.54
Estimated Annual Operational Savings			$0.00
Simple Payback Years			2.91
Lifetime Return On Investment			274.52%

Implementation Plan:

The Entire perimeter of the entrance doors should be sealed to eliminate heat loss. Sealing kits from American Garage Door Supply are listed in the appendix of this report.

Estimated cost for this installation: $1,237.65

Description	# Units	Labor and Material Cost/Unit	Total	Source
Entrance Doorjamb Kit	9	$72.70	$654.30	
Entrance Door Bottom Kit	9	$32.50	$292.50	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$1,237.65	

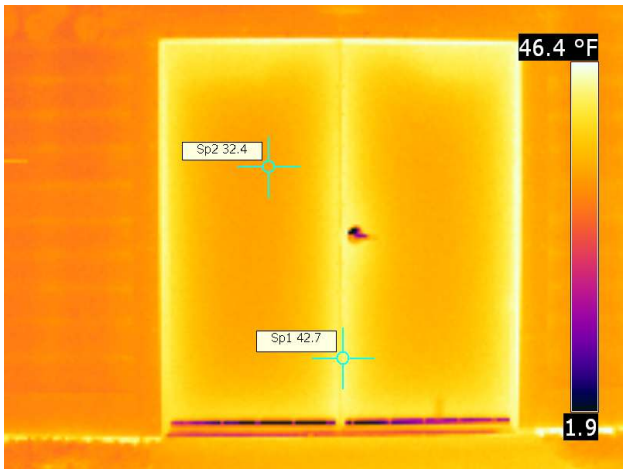
Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Inspection Report

Report Date 11/23/2010

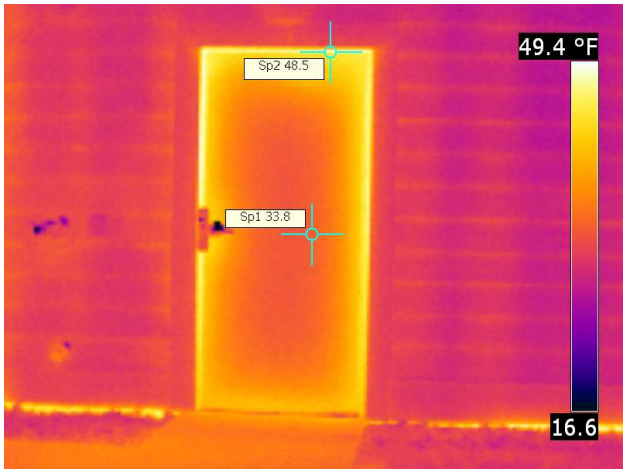
Company	Arbogast Energy Auditing	**Customer**	Town of Atkinson NH
Address	317 Austin St #4	**Site Address**	Library
Thermographer	Elmer Arbogast	**Contact Person**	Michelle Veasey



Camera Model	FLIR FLIR T200_ Western
Image Date	11/1/2010 10:57:43 AM
Image Name	IR_2194.jpg
Emissivity	0.95
Reflected apparent temperature	0.0 °F
Object Distance	3.2 ft

Description

Door showing air leakage at library.



Camera Model	FLIR FLIR T200_ Western
Image Date	11/1/2010 10:57:55 AM
Image Name	IR_2196.jpg
Emissivity	0.95
Reflected apparent temperature	0.0 °F
Object Distance	3.2 ft

Description

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **33**

Finding Description: **Building controls - Control optimization**

Building: **Library**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

It was noted that during the energy audit that the CO2 levels in the library remained very low despite the fact that the control system had demand control ventilation sequence. The minimum outdoor air should be reduced to 5%,and the controls should not start to increase the ventilation rate until the space CO2 reaches 800ppm. Then proportionally increase the ventilation rate to 100% when the CO2 rate hits 1,100 ppm. It was also noted that the boiler was reset off of outdoor air temperature only. A load-based boiler reset temperature sequence should be implemented. This sequence will reset the boiler temperature based on outside air temperature and building load, and turn the boiler off if there is no call for heat or reheat.

Estimated Economic Impact Summary

Energy Savings Heating = Reduced CFM of Ventilation X 1.08 X (Avg. Interior Temperature – Avg. OA Temperature Heating Season) X Hours per Day X Days/Year

Energy Savings Cooling = CFM of Ventilation / 13.8 X (Avg. OA Enthalpy Cooling Season – Interior Enthalpy) X Hours per Day X Days/Year

Energy Savings Heating

Reduced CFM	Constant	Avg. Interior Temp	Avg. OA Temp	Hours per Year	BTU/Gal
200	1.08	68	34	2,520	74,620

Energy Savings Cooling

Reduced CFM	Constant	Avg. OA Enthalpy	Avg. Interior Enthalpy	Hour Per Year	BTU/Gal
200	1.08	68	34	1,120	10,236

Estimated Annual Electrical Savings	803.56	KWH	$82.94
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	248.02	Gallons	$438.99
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$521.93
		Life Expectancy of Equipment (Years)	20
		Lifetime Energy Savings	$10,438.53
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	1.50
		Lifetime Return On Investment	1330.91%

Implementation Plan:

The sequences in this recommendation should be programmed into the existing controllers. It is estimated that a total of 6 hours will be required to make these changes and commission them into the building.

Estimated cost for this installation: $784.31

Description	# Units	Labor and Material Cost/Unit	Total	Source
Programming time	4	$100.00	$400.00	
Controller download time	1	$100.00	$100.00	
Commissioning Time	1	$100.00	$100.00	
	0	$0.00	$0.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$784.31	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **34**

Finding Description: **HVAC - Install HRU**

Building: **Library**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Install the heat recovery wheel section on the existing 2 Trane air handlers.

Estimated Economic Impact Summary

Energy Savings heating = CFM of Ventilation X 1.08 X (Avg. Unit Discharge Temperature – Avg. OA Temperature Heating Season) X Hours per Day X Days/Year

Energy Savings cooling = CFM of Ventilation / 13.8 X (Avg. OA Enthalpy Cooling Season - Avg. Unit Discharge Enthalpy) X Hours per Day X Days/Year

Energy Savings Heating

CFM	Constant	Unit Discharge Temp	Avg OA Temp	Hours per Year	Btu/gallon
1450	1.08	40	34	2,520	74,620

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	317.31	Gallons	$561.64
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$561.64
		Life Expectancy of Equipment (Years)	20
		Lifetime Energy Savings	$11,232.89
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	41.00
		Lifetime Return On Investment	48.79%

Implementation Plan:

Install two Trane heat recovery wheel in mechanical room of the library and attached to existing units and ductwork.

Estimated cost for this installation: $23,024.69

Description	# Units	Labor and Material Cost/Unit	Total	Source
Size 21 energy recovery wheel	1	$7,800.00	$7,800.00	
Size 8 energy recovery wheel	1	$2,600.00	$2,600.00	
Rigging	1	$2,000.00	$2,000.00	
Ductwork modifications	1	$3,500.00	$3,500.00	
Control upgrade	1	$2,000.00	$2,000.00	
Electrical Power wiring	1	$750.00	$750.00	
Contractor Markup			23%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$23,024.69	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 35**

Finding Description: **Building control - Boiler building load control**

Building: **Library**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

It was noted that the boiler was reset off of outdoor air temperature only. A load-based boiler reset temperature sequence should be implemented. This sequence will reset the boiler temperature based on outside air temperature and building load, and turn the boiler off if there is no call for heat or reheat.

Estimated Economic Impact Summary

See following calculation sheet.

Estimated Annual Electrical Savings	0.00 KWH	$0.00
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	138.42 Gallons	$245.00
Estimated Annual Fuel Oil Savings	0.00 Gallons	$0.00
Total Annual Cost Savings		$245.00
Life Expectancy of Equipment (Years)		20
Lifetime Energy Savings		$4,900.01
Estimated Annual Operational Savings		$0.00
Simple Payback Years		3.20
Lifetime Return On Investment		624.75%

Implementation Plan:

The sequences in this recommendation should be programmed into the existing controllers. It is estimated that a total of 6 hours will be required to make these changes and commission them into the building.

Estimated cost for this installation: $784.31

Description	# Units	Labor and Material Cost/Unit	Total	Source
Programming time	4	$100.00	$400.00	
Controller download time	1	$100.00	$100.00	
Commissioning Time	1	$100.00	$100.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$784.31	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Energy Savings Estimate for:
Boiler Temperature Reset
Library
Atkinson, NH

Prepared by Elmer Arbogast

11/19/2010

1.2 Boiler Temperature Reset

Baseline average boiler combustion efficiency is 80%
Baseline average boiler jacket, Heat Exchanger and Piping loss is 10%
The average boiler temperature is the temperature of the hot water produced

A. General Data for Baseline and Proposed Operation

B. Baseline Operation

1	Baseline annual boiler BC	3,716	Gallons	Based on usage provided by Customer
2	Baseline average boiler temperature (BT)	160	deg F	Based on Temp of Observed Operation
3	Baseline ave boiler comb efficiency (BBCE)	80.0%		Verified
4	Baseline average boiler jacket loss (BBJL)	10.0%		Baxi Jacket Loss
5	Baseline ave boiler overall efficiency (BBOE)	70.0%		= BBCE - BBJL
6	Annual facility heating requirement (AFHR)	2,601	Gallons	= BC x BBOE

C. Proposed Operation

1	Annual facility heating requirement (AFHR)	2,601	Gallons	= BC x BBOE (same as baseline)
2	Proposed Ave Boiler comb Eff(PBCE)	80%		Lochinvar Published Efficiency
3	Proposed average boiler temperature (PT)	130	deg F	Based Baxi Programming
4	Average reduction in boiler temperature (BTR)	30	deg F	= BT - PT
5	Combustion efficiency improvement (CEI)	0.8%		= (PBCE-BBCE/BBCE) + BTR/36/100
	see http://oee.nrcan.gc.ca/industrial/technical-info/'benchmarking/apma/chapter2.cfm?attr=24			
6	Jacket loss reduction (JLR)	1.9%		= BBJL x (1 - PT/BT)
7	Condensing Boiler Jacket Size Reduction(CBJSR)	0.0%		Jacket Comparison of New to Existing Boilers
8	Proposed ave boiler overall efficiency (PBOE)	72.7%		= BBCE + CEI - (BBJL - JLR)+(CBJSR*(BBJL-JLR)
9	Proposed boiler Condition (PC)	3,578	Gallons	= AFHR/PBOE

D. Savings Determination

1 The data in this table is taken directly from Sections B and C above.

	Gas Savings Gallons
Baseline Operation	3,716
Proposed Operation	3,578
Year Savings -	138
Precentage Savings	4%

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 36**

Finding Description: **HVAC - Install 2 high-efficiency propane boilers**

Building: **Library**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

Replace existing 82% efficient boilers with 94% efficient Lochinvar boilers.

See following calculation sheet.

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	1009.83	Gallons	$1,787.39
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$1,787.39
Life Expectancy of Equipment (Years)			20
Lifetime Energy Savings			$35,747.89
Estimated Annual Operational Savings			$0.00
Simple Payback Years			8.97
Lifetime Return On Investment			222.91%

Implementation Plan:

Remove 2 existing Burnham boilers and install 2 Lochinvar KBN286 in their place. Boilers should come with Lochinar smart system controls.

Estimated cost for this installation: $16,036.60

Description	# Units	Labor and Material Cost/Unit	Total	Source
Lochinvar KBN286	2	$5,634.00	$11,268.00	
Boiler Removal	2	$500.00	$1,000.00	
Boiler Installation	2	$1,650.00	$3,300.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$16,036.60	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Energy Savings Estimate for:
Boiler Replacment
Library
Atkinson NH

Prepared by Elmer Arbogast

11/19/2010

1.2 Boiler Temperature Reset

Baseline average boiler combustion efficiency is 80%
Baseline average boiler jacket, Heat Exchanger and Piping loss is 10%
The average boiler temperature is the temperature of the hot water produced

A. General Data for Baseline and Proposed Operation

B. Baseline Operation

1	Baseline annual boiler BC	3,716	Gallons	Based on usage provided by Customer
2	Baseline average boiler temperature (BT)	160	deg F	Based on Temp of Observed Operation
3	Baseline ave boiler comb efficiency (BBCE)	80.0%		Verified
4	Baseline average boiler jacket loss (BBJL)	15.0%		Baxi Jacket Loss
5	Baseline ave boiler overall efficiency (BBOE)	65.0%		= BBCE - BBJL
6	Annual facility heating requirement (AFHR)	2,415	Gallons	= BC x BBOE

C. Proposed Operation

1	Annual facility heating requirement (AFHR)	2,415	Gallons	= BC x BBOE (same as baseline)
2	Proposed Ave Boiler comb Eff(PBCE)	96%		Lochinvar Published Efficiency
3	Proposed average boiler temperature (PT)	130	deg F	Based Baxi Programming
4	Average reduction in boiler temperature (BTR)	30	deg F	= BT - PT
5	Combustion efficiency improvement (CEI)	20.8%		= (PBCE-BBCE/BBCE) + BTR/36/100
	see http://oee.nrcan.gc.ca/industrial/technical-info/'benchmarking/apma/chapter2.cfm?attr=24			
6	Jacket loss reduction (JLR)	2.8%		= BBJL x (1 - PT/BT)
7	Condensing Boiler Jacket Size Reduction(CBJSR)	5.0%		Jacket Comparison of New to Existing Boilers
8	Proposed ave boiler overall efficiency (PBOE)	89.3%		= BBCE + CEI - (BBJL - JLR)+(CBJSR*(BBJL-JLR)
9	Proposed boiler Condition (PC)	2,706	Gallons	= AFHR/PBOE

D. Savings Determination

1 The data in this table is taken directly from Sections B and C above.

	Gas Savings Gallons
Baseline Operation	3,716
Proposed Operation	2,706
Year Savings -	1,010
Precentage Savings	27%

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **37**

Finding Description: **Lighting Upgrade**

Building: **Library**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

Replace lighting per attached detail sheet.

Estimated Economic Impact Summary

Energy Savings = [Watts of Existing Fixture-Watts of New Fixture] x Number of Fixtures x Lighting Hours per Year

See attached calculation sheet.

Estimated Annual Electrical Savings	0.00	KWH
Estimated Annual Electric Demand Savings	0.00	KW
Estimated Annual Propane Savings	0.00	Gallons
Estimated Annual Fuel Oil Savings	0.00	Gallons

Implementation Plan:

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
	0	$0.00	$0.00	
Contractor Markup			#DIV/0!	Equivalent of 10% Overhead and 10% Profit
Total			$0.00	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Lighting Audit Report

Atkinson New Hampshire - Library

Library **Page** **1**

1	Location:	Recommendation:							
	Mez		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	10	67.2	2912	1956.86	0.672		
	Proposed:	2-F32T8	10	67.2	2912	1956.86	0.672	0	0
		Proposed lighting controls:							
2	Location:	Recommendation:							
	mechanical room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	8	67.2	2912	1565.49	0.5376		
	Proposed:	2-F32T8	8	67.2	2912	1565.49	0.5376	0	0
		Proposed lighting controls:							
3	Location:	Recommendation:							
	Storage rm office		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	2	67.2	2912	391.373	0.1344		
	Proposed:	2-F32T8 - U	2	67.2	2912	391.373	0.1344	0	0
		Proposed lighting controls:							
4	Location:	Recommendation:							
	Office		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F16T8	12	33.6	2912	1174.12	0.4032		
	Proposed:	2-F16T8	12	33.6	2912	1174.12	0.4032	0	0
		Proposed lighting controls:							
5	Location:	Recommendation:							
	Office		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	23 watt cp	5	67.2	2912	978.432	0.336		
	Proposed:	23 watt cp	5	67.2	2912	978.432	0.336	0	0
		Proposed lighting controls:							
6	Location:	Recommendation:							
	Restrooms		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F16T8	5	33.6	2912	489.216	0.168		
	Proposed:	2-F16T8	5	33.6	2912	489.216	0.168	0	0
		Proposed lighting controls:	Has a-b lighting						
7	Location:	Recommendation:							
	Electrical room and Telecom		**# of Fixtures**	**Watts**	**(hrs**	**(Used)**	**(Used)**	**(Saved)**	**(Saved)**
	Existing:	3-F32T8	2	100.8	2912	587.059	0.2016		
	Proposed:	3-F32T8	2	100.8	2912	587.059	0.2016	0	0
		Proposed lighting controls:							

8	Location:	Recommendation:							
	Children area rr		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F16T8	3	33.6	2912	293.53	0.1008		
	Proposed:	2-F16T8	3	33.6	2912	293.53	0.1008	0	0
		Proposed lighting controls:							
9	Location:	Recommendation:							
	Children area	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	1-F32T8	38	33.6	2912	3718.04	1.2768		
	Proposed:	1-F32T8	38	33.6	2912	3718.04	1.2768	0	0
		Proposed lighting controls:	None						
10	Location:	Recommendation:							
	Children area cp	No Work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	11 watt compact fluorescent	32	11	2912	1025.02	0.352		
	Proposed:	None	32	11	2912	1025.02	0.352	0	0
		Proposed lighting controls:							
11	Location:	Recommendation:							
	West and Center Stair well	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	Compact Flour 2 bulb	8	33.6	2912	782.746	0.2688		
	Proposed:	No work in this area	8	33.6	2912	782.746	0.2688	0	0
		Proposed lighting controls:	none						
12	Location:	Recommendation:							
	pre school area		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	1-F32T8	16	33.6	2912	1565.49	0.5376		
	Proposed:	1-F32T8	16	33.6	2912	1565.49	0.5376	0	0
		Proposed lighting controls:	plus 2 23 watt cp						
13	Location:	Recommendation:							
	front main light	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 -	22	67.2	2912	4305.1	1.4784		
	Proposed:	2-F32T8 -	22	67.2	2912	4305.1	1.4784	0	0
		Proposed lighting controls:	2 On all the time 4 controlled by switch						
14	Location:	Recommendation:							
	desk area cp	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	23	13	23	2912	870.688	0.299		
	Proposed:	23 watt	13	23	2912	870.688	0.299	0	0
		Proposed lighting controls:	None						

	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
15	desk area 24 inch	No work							
	Existing:	2-F16T8	5	33.6	2912	489.216	0.168		
	Proposed:	2-F16T8	5	33.6	2912	489.216	0.168	0	0
		Proposed lighting controls:	None						
16	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	director office								
	Existing:	1-F32T8	5	33.6	2912	489.216	0.168		
	Proposed:	1-F32T8	5	33.6	2912	489.216	0.168	0	0
		Proposed lighting controls:							
17	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	director office cp								
	Existing:	23	4	23	2912	267.904	0.092		
	Proposed:	23	4	23	2912	267.904	0.092	0	0
		Proposed lighting controls:							
18	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Main Library	has ab light							
	Existing:	2-F16T8	34	33.6	2912	3326.67	1.1424		
	Proposed:	2-F16T8	34	33.6	2912	3326.67	1.1424	0	0
		Proposed lighting controls:	Motion - One Bulb out						
19	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Main library CP								
	Existing:	23	4	23	2912	267.904	0.092		
	Proposed:	23	4	23	2912	267.904	0.092	0	0
		Proposed lighting controls:							
20	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Confer rm	has ab lighting							
	Existing:	2-F16T8	4	33.6	2912	391.373	0.1344		
	Proposed:	2-F16T8	4	33.6	2912	391.373	0.1344	0	0
		Proposed lighting controls:							
21	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Conference room flood	no work							
	Existing:	Flood	4	23	2912	267.904	0.092		
	Proposed:	flood	4	23	2912	267.904	0.092	0	0
		Proposed lighting controls:							

22	Location:	Recommendation:							
	Conference room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	1F32T8	4	33.6	2912	391.373	0.1344		
	Proposed:	1-F32T8	4	33.6	2912	391.373	0.1344	0	0
		Proposed lighting controls:							
23	Location:	Recommendation:							
	Game room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	2912	391.373	0.1344		
	Proposed:	2-F32T8	2	67.2	2912	391.373	0.1344	0	0
		Proposed lighting controls:							
24	Location:	Recommendation:							
	Study room	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F16T8	4	33.6	2912	391.373	0.1344		
	Proposed:	2-F16T8	4	33.6	2912	391.373	0.1344	0	0
		Proposed lighting controls:							
25	Location:	Recommendation:							
	Atkinson Room	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F16T8	6	33.6	2912	587.059	0.2016		
	Proposed:	2-F16T8	6	33.6	2912	587.059	0.2016	0	0
		Proposed lighting controls:							
26	Location:	Recommendation:							
	Lobby	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F16T8	8	33.6	2912	782.746	0.2688		
	Proposed:	2-F16T8	8	33.6	2912	782.746	0.2688	0	0
		Proposed lighting controls:							
27	Location:	Recommendation:							
	Lobby cp	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	23	3	23	2912	200.928	0.069		
	Proposed:	23	3	23	2912	200.928	0.069	0	0
		Proposed lighting controls:	2 - lamps out						
28	Location:	Recommendation:							
	Meeting room	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F16T8	12	33.6	2912	1174.12	0.4032		
	Proposed:	2-F16T8	12	33.6	2912	1174.12	0.4032	0	0
		Proposed lighting controls:	Plus 1 lamp with cp						

29	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Meeting room	no work							
	Existing:	1-F32T8	16	33.6	2912	1565.49	0.5376		
	Proposed:	1-F32T8	16	33.6	2912	1565.49	0.5376	0	0
		Proposed lighting controls:	Plus 1 lamp with cp						

30	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Chair Storage	no work							
	Existing:	2-F32T8	2	67.2	2912	391.373	0.1344		
	Proposed:	2-F32T8	2	67.2	2912	391.373	0.1344	0	0
		Proposed lighting controls:	plus 1 cp in closet						

31	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Lobby restroom								
	Existing:	2-F32T8	2	67.2	2912	391.373	0.1344		
	Proposed:	2-F32T8	2	67.2	2912	391.373	0.1344	0	0
		Proposed lighting controls:	Motion sensor						

32	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Kitchen								
	Existing:	2-F16T8	2	33.6	2912	195.686	0.0672		
	Proposed:	2-F16T8	2	33.6	2912	195.686	0.0672	0	0
		Proposed lighting controls:	Motion sensor						

Lighting Cost/Payback Analysis
Library

KW Rate: 12.82 KWH Rate: 0.08008

Existing System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	31,079		$0	
KW:	10.6728	10.6728	$0.00	$0.00
Proposed System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	31079.1936		$0	
KW:	128.0736	10.6728	$0.00	$0.00
Saved	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	0		$0	
KW:	0	0	$0.00	$0.00

Observations: Kimball House

Original Design and Current Use

- The Kimball House building is a house that was built in the 1800s which is now used as a museum. There is importance to maintaining the historical look of the building. The building is 2,506 square feet which is staffed by volunteers and has visitors on one or two days of each week. It is open for 4 hours each of those days.

Retrofits

- The building has had many retrofits throughout the history of its life. The recommended retrofits for this building are focused around the improvement of building insulation and sealing.

On-Site Renewable Energy

- We are not recommending any on-site renewable energy due to the desire to maintain the historical look of the building.

Age and Condition of the Mechanical Equipment

- The HVAC equipment in the building is 20-plus years old; however, it is still in good condition and operating efficiently. Since this equipment has such little usage, the equipment should be evaulated every 5 years to determine the need for replacement.

Indoor Air Quality

- The air quality in this building is very good due to the large amount of outside air infiltrating into the building and the low usage of the building.
- Due to the age of the building, the cost to completely seal the building would be extremely high. Natural ventilation meets requirements of the building occupants.

Space Temperature and Humidity

- During the energy audit the space temperature was maintained within an acceptable range during business hours and was set back during unoccupied time.

R- Value

- The R-Value of the building walls is what is expected from a building of this age. The walls have a calculated R-Value of 2.67 using thermal imaging to determine the value. The Attic has been insulated; however, there has been damage to the insulation as seen in finding #40. The insulation should be protected to prevent future damage. The walls should have insulation blown into them and there should be insulation installed between the basement and the first floor, and also between the kitchen and the barn area. The building is a wood frame structure with wood siding. The windows are single pane windows with attached storm windows.

Maintenance

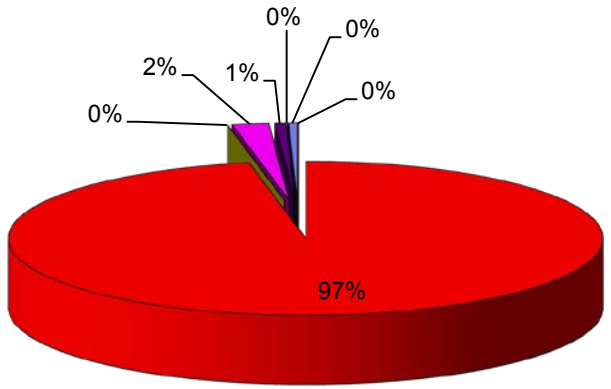
- The maintenance in this building is completed on an as needed basis to address issues. Implementing a preventive or condition-based maintenance program would save the town money on both energy and equipment maintenance cost.

People's Energy Awareness

- The overall energy awareness of the people using this building was good. Lights were turned off at night, and a building programmable thermostat set back the HVAC unit during unoccupied times. Power strips with timers should be installed on all small appliances and printers to reduce phantom loads.

Kimball House

ENERGY USAGE PROFILE



Total Facility Consumption	110 (Millions of BTU/hr)
Cooling	0.0%
Heating	97.0%
Pumps	0.0%
Lighting	2.0%
Fans	0.6%
Domestic Hot Water	0.0%
Plug Load (Include Computers)	0.5%
Total	100.0%

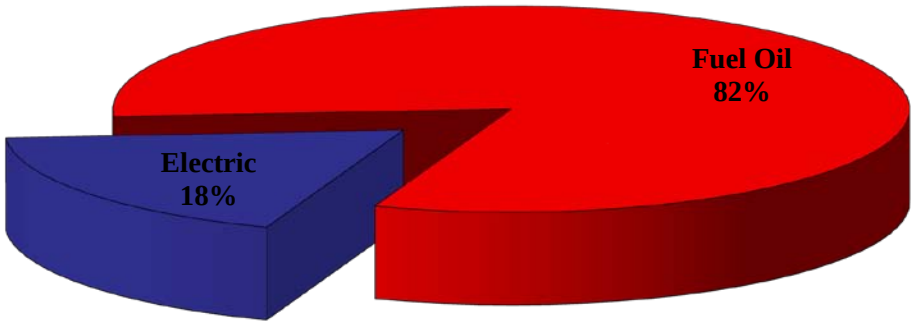
Town of Atkinson, New Hampshire
Kimball House
Utility Analysis Period:

8/01/2009 to 7/31/2010

	Current Year 8/1/2009 to 7/31/2010			Previous Year 8/1/2008 to 7/31/2009		
	Electric		Fuel Oil	Electric		Fuel Oil
Utility Costs	$405		$1,814	$550		$2,001
Utility Usage	979		763	1,407		926
$ Cost/Unit (kWh, Therm, Gal)	$0.41		$2.38	$0.39		$2.16
	CDD		HDD	CDD		HDD
	419		6,689	324		7,366
Current Year Vs Previous Year	**Electric**		**Fuel Oil**			
Change in Cost	-26%		-9%			
Change in Usage	-30%		-18%			
Change in $ Cost/Unit	6%		10%			
Change in Degree Day	29%		-9%			

CDD - Cooling Degree Day
HDD - Heating Degree Day

Utility Cost Comparison Current Year



Energy Benchmarking: Atkinson Town Hall

The calculation of EUI (Energy Use Intensity) is shown below. EUI, expressed in kBtu/sf, is normalized for floor area, the most dominant influence on energy use in most buildings. Its use usually provides a good approximation of how your building's energy performance compares to others. Site EUI indicates the rate at which energy is used at your building (the point of use). Source EUI indicates the rate at which energy is used at the generation sources serving your building (the point of source) and indicates the societal energy penalty due to your building The lower the EUI, the higher the rating, indicating that the building is more efficient than other buildings. The greater the EUI, the lower the rating, indicating that there is an opportunity for higher potential benefits from operational improvements.

To compare the buildings shown below to each other, and to determine the ranking of the buildings from having the most to the least opportunity for demand-side improvements from a financial perspective, please see the Site EUI ranking below.

The Site EUI below has been applied to a Department of Energy statistical model from the Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark. The Department of Energy has estimated energy use and cost reductions for building source EUI ratings (percentiles) in the table below. Please see the DOE Regional Source EUI Comparison graph below to rate your building in relation to the regional distribution of similar type buildings. (Note: The Source EUI includes the inefficiencies of electrical generation and transmission. A reduction in 'electrical' source EUI includes a benefit in terms of reduction of air pollution emissions and green house gasses, and is thus an indicator of societal benefit.)

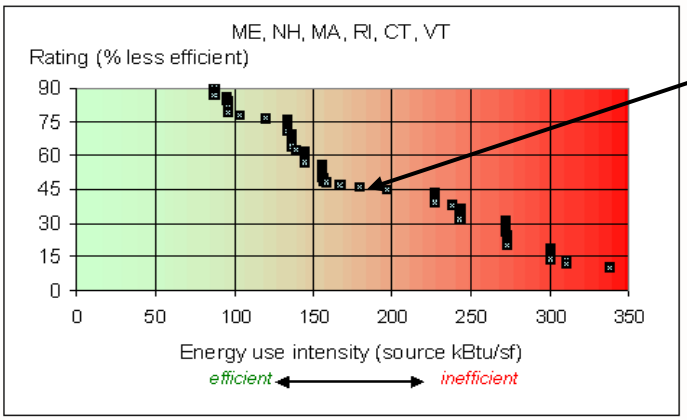
Source EUI Rating for your Building	Energy use and cost reduction potential (%)	Walk-thru energy assessment recommended?
above 60%	below 25%	No
40 to 60%	20 to 35%	Maybe
20 to 40%	35 to 50%	Yes
Below 20%	above 50%	Definitely

Rating from the most efficient to the least efficient - 2010 consumption

Site EUI Rank	Building	Annual Total Electrical Use (kWh)	Annual Total Non-Electrical Fuel Use (Gals)	Occupied Building Gross Floor Area (sq-ft)	Site EUI Rating	Source EUI: Annual Total Source Energy Use per Sq-Ft (kBtu/sf)	Rating (Regional Source EUI Comparison)
1	Atkinson Town Hall	91,397	83	6,567	**49**	**171**	**0.45**

Building Type

Office Building



Source EUI	Est Regional Rating	Building
171	45%	Atkinson Town Hall

Source: Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 38**

Finding Description: **Door weather stripping**

Building: **Kimball House**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Overall, the door weather stripping is in poor condition at the Kimball House. Weather stripping a breaks down over time and with use. Therefore, it is recommended that the door weather stripping at this building be given a high priority at this time. For this type of building and use, it is anticipated that the weather stripping for these doors should be replaced every 8 to 10 years.

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Area	Speed -	Factor	Constant	Temp	Avg OA Temp	Hours per Year	n
0.19	589.6	0.28	1.08	68	34	6,048	114,800

Cooling Savings

Area	Speed -	Factor	Constant	Enthalpy	Enthalpy	Hours per Year	Btu/KWH
0.19	589.6	0.28	0	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	59.88	Gallons	$162.88
Total Annual Cost Savings			$166.56
Life Expectancy of Equipment (Years)			8
Lifetime Energy Savings			$1,332.50
Estimated Annual Operational Savings			$0.00
Simple Payback Years			2.48
Lifetime Return On Investment			322.99%

Implementation Plan:

The entire perimeter of the entrance doors should be sealed to eliminate heat loss, sealing kits from American Garage Door Supply are listed in the appendix of this report.

Estimated cost for this installation: $412.55

Description	# Units	Labor and Material Cost/Unit	Total	Source
Entrance Doorjamb Kit	3	$72.70	$218.10	
Entrance Door Bottom Kit	3	$32.50	$97.50	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$412.55	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 39**

Finding Description: **Weatherization - Add insulation above kitchen**

Building: **Kimball House**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

There is no insulation or air/vapor barrier above the kitchen area of the Kimball house. A vapor/air barrier should be installed with R-30 insulation, and should be installed between the ceiling joists. A layer of 3/8" plywood should be installed to protect the insulation from future damage.

Building Envelope R-Value improvement – including windows

Energy Savings Heating = Area X (Existing U-Value – New U-Value) X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/day X Days/Year

Energy Savings Cooling = Area X (Existing U-Value – New U-Value) X (Avg. OA Temperature Cooling Season - Interior Temperature) X Hours/Day X Days/Year

Heating Savings

Area	Existing U-Value	New U-Value	Constant	Interior Temp	Avg OA Temp	Hours per year	Btu/Gal
120.00	0.75	0.3	1	55	34	6,048	112,000

Cooling Savings

Area	Existing U-Value	New U-Value	Constant	Avg OA Temp	Interior Temp	Hours per year	Btu/KWH
120.00	0.75	0.3	0	28	25.5	2,688	112,000

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	61.24	Gallons	$166.56

Total Annual Cost Savings	$166.56
Life Expectancy of Equipment (Years)	20
Lifetime Energy Savings	$3,331.24
Estimated Annual Operational Savings	$0.00
Simple Payback Years	4.43
Lifetime Return On Investment	451.30%

Implementation Plan:

The space above the kitchen should be cleared and a vapor/air barrier should be installed on top of the ceiling. Then R-30 insulation should be installed between the joists above the vapor/air barrier. A layer of 3/8" plywood should be installed to protect the insulation from future damage.

Estimated cost for this installation: $738.14

Description	# Units	Labor and Material Cost/Unit	Total	Source
Fiberglass Insulation - R-30	6	$31.98	$191.88	
Vapor/Air barrier. - 6 mil plastic	1	$93.98	$93.98	
3/8" plywood sheets	6	$46.47	$278.82	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$738.14	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **40**

Finding Description: **Weatherization - Install plywood for storage**

Building: **Kimball House**

General Finding Impacts

Energy Savings	No
Fuel Savings	No
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	Yes
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

There is no protection of the Insulation in the attic of the Kimball House. If this space is going to be used as storage area, then plywood should be installed to protect the insulation or this space should not be used for storage.

Building Envelope R-Value improvement – including windows
Energy Savings heating = Area X (Existing U-Value – New U-Value) X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/day X Days/Year
Energy Savings Cooling = Area X (Existing U-Value – New U-Value) X (Avg. OA Temperature Cooling Season - Interior Temperature) X Hours/Day X Days/Year

Heating Savings

Area	Value	Value	Constant	Temp	Avg OA Temp	Hours per year	Btu/Gal
200.00	0.75	0.25	0.5	55	34	6,048	112,000

Cooling Savings

Area	Value	Value	Constant	Temp	Interior Temp	Hours per year	Btu/KWH
200.00	0.75	0.25	0	28	25.5	2,688	11,942

Estimated Annual Electrical Savings	0.00 KWH	$0.00
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	0.00 Gallons	$0.00
Estimated Annual Fuel Oil Savings	56.70 Gallons	$154.22
	Total Annual Cost Savings	$154.22
	Life Expectancy of Equipment (Years)	20
	Lifetime Energy Savings	$3,084.48
	Estimated Annual Operational Savings	$0.00
	Simple Payback Years	5.17
	Lifetime Return On Investment	386.75%

Implementation Plan:

The insulation should be repaired and plywood should be installed on top of the insulation to provide protection. T
2X6 pine board should be installed to support the plywood. A total of 4 sheets of plywood have been estimated; however, more or less area may be desired for storage.

Estimated cost for this installation: $797.54

Description	# Units	Labor and Material Cost/Unit	Total	Source
Fiberglass Insulation - R-30	0	$31.98	$0.00	
Vapor/Air barrier. - 6 mil plastic	0	$93.98	$0.00	
Insulation Repair	1	$70.00	$70.00	
5/4X6X8	8	$44.28	$354.24	
3/8" plywood sheets	4	$46.47	$185.88	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$797.54	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Damaged Insulation and Storage

Items Stored in Attic

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 41**

Finding Description: **Weatherization - Blow insulation into walls**

Building: **Kimball House**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

The walls in the Kimball House have a very low R-Value and should have insulation blown into them. In addition, fiberglass batt insulation should be installed in the wall between the kitchen and the barn.

Building Envelope R-Value improvement – including windows
Energy Savings Heating = Area X (Existing U-Value – New U-Value) X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/day X Days/Year
Energy Savings Cooling = Area X (Existing U-Value – New U-Value) X (Avg. OA Temperature Cooling Season - Interior Temperature) X Hours/Day X Days/Year

Heating Savings

Area	Existing U-	New U-	Constant	Interior	Avg OA Temp	Hours per year	Btu/Gal
2800.00	0.7	0.6	0.5	55	34	6,048	112,000

Cooling Savings

Area	Existing U-	New U-	Constant	Avg OA	Interior Temp	Hours per year	Btu/KWH
2800.00	0.7	0.6	0	28	25.5	2,688	11,942

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	158.76	Gallons	$431.83
Total Annual Cost Savings			$431.83
Life Expectancy of Equipment (Years)			30
Lifetime Energy Savings			$12,954.82
Estimated Annual Operational Savings			$0.00
Simple Payback Years			11.29
Lifetime Return On Investment			265.67%

Implementation Plan:

Insulation should be blown into the walls to improve R-Value.

Estimated cost for this installation: $4,876.24

Description	# Units	Labor and Material Cost/Unit	Total	Source
Insulation	132	$28.26	$3,730.32	
Vapor/Air barrier. - 6 mil plastic	0	$93.98	$0.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$4,876.24	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 42**

Finding Description: **HVAC - Seal and insulate ductwork**

Building: **Kimball House**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

The ductwork in the basement of the Kimball House is not sealed or insulated, and the space does not need to be heated. Each joint of the ductwork should be wrapped with aluminum tape, and ductwork should be insulated with duct insulation

Estimated Economic Impact Summary

It is estimated that 10% of the heat from this furance is lost through duct leaks and lack of insulation.

Estimated Annual Electrical Savings	0.00 KWH	$0.00
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	0.00 Gallons	$0.00
Estimated Annual Fuel Oil Savings	76.00 Gallons	$206.72
Total Annual Cost Savings		$206.72
Life Expectancy of Equipment (Years)		30
Lifetime Energy Savings		$6,201.60
Estimated Annual Operational Savings		$0.00
Simple Payback Years		3.23
Lifetime Return On Investment		929.06%

Implementation Plan:

Each joint of the ductwork should be wrapped with aluminum tape, and ductwork should be insulated with duct insulation. Insulation should be a minimum thickness of 2".

Estimated cost for this installation: $667.52

Description	# Units	Labor and Material Cost/Unit	Total	Source
Tape	1	$77.15	$77.15	
Duct Wrap Insualation per foot	150	$2.89	$433.50	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$667.52	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Uninsulation Ductwork

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 43**

Finding Description: **Weatherization - Install insulation in basement**

Building: **Kimball House**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

There is no insulation between the basement and the occupied first floor.

Building Envelope R-Value improvement – including Windows
Energy Savings heating = Area X (Existing U-Value – New U-Value) X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/day X Days/Year
Energy Savings Cooling = Area X (Existing U-Value – New U-Value) X (Avg. OA Temperature Cooling Season - Interior Temperature) X Hours/Day X Days/Year

Heating Savings

Area	Value	Value	Constant	Temp	Avg OA Temp	Hours per year	Btu/Gal
1253.00	0.75	0.6	0.5	55	34	6,048	112,000

Cooling Savings

Area	Value	Value	Constant	Temp	Interior Temp	Hours per year	Btu/KWH
1253.00	0.75	0.6	0	28	25.5	2,688	11,942

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	106.57	Gallons	$289.86
Total Annual Cost Savings			$289.86
Life Expectancy of Equipment (Years)			30
Lifetime Energy Savings			$8,695.92
Estimated Annual Operational Savings			$0.00
Simple Payback Years			3.88
Lifetime Return On Investment			773.68%

Implementation Plan:

Install batt insulation in the joist space between the basement and the first floor.

Estimated cost for this installation: $1,123.97

Description	# Units	Labor and Material Cost/Unit	Total	Source
Insulation - R-13	32	$26.87	$859.84	
Vapor/Air barrier. - 6 mil plastic	0	$93.98	$0.00	
Insulation Repair	0	$70.00	$0.00	
5/4X6X8	0	$44.28	$0.00	
3/8" plywood sheets	0	$46.47	$0.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$1,123.97	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 44**

Finding Description: **Lighting Upgrade**

Building: **Kimball House**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:
See following detail sheet.

Energy Savings = [Watts of Existing Fixture-Watts of New Fixture] x Number of Fixtures x Lighting Hours per Year

Estimated Annual Electrical Savings	1105.44	KWH	$114.10
Estimated Annual Electric Demand Savings	17.03	KW	$134.54
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$248.64
		Life Expectancy of Equipment (Years)	8
		Lifetime Energy Savings	$1,989.11
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	0.63
		Lifetime Return On Investment	1277.64%

Implementation Plan:
Please see attached detail lighting sheet and sketch for detail of work.

Estimated cost for this installation after rebate: $155.69

Description	# Units	Labor and Material Cost/Unit	Total	Source
11 Watt CFL	14	$6.50	$20.00	
9 Watt LED	5	$22.50	$112.50	
T-8 Bulbs	8	$2.15	$17.20	
T-8 Ballast	4	$40.28	$161.12	
Contractor Markup			31%	Equivalent of 10% Overhead and 10% Profit
Rebates			$40.00	
Total			$195.69	

Recommend work to be performed by: Town Maintenance

Owner action: Purchase light bulbs.

Lighting Audit Report

Atkinson, New Hampshire - Kimball House

1	Location:	Recommendation:							
	Second Floor	Replace with CFL	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	60 Watt Incandescent	11	60	360	237.6	0.66		
	Proposed:	Compact Fluorescent	11	11	300	36.3	0.121	201.3	0.539
		Proposed lighting controls:	none						
2	Location:	Recommendation:							
	First floor incandescent	Replace with LED	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	60 Watt Incandescent	3	60	360	64.8	0.18		
	Proposed:	Compact Fluorescent	3	11	300	9.9	0.033	54.9	0.147
		Proposed lighting controls:	none						
3	Location:	Recommendation:							
	First Floor Floods	Replace with 9 watt LED Floods	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	75 Watts	5	75	2080	780	0.375		
	Proposed:	LED	5	9	2080	93.6	0.045	686.4	0.33
		Proposed lighting controls:							
4	Location:	Recommendation:							
	Basement	No Work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	13 Watt CP	2	13	360	9.36	0.026		
	Proposed:	13 Watt CP	2	13	300	7.8	0.026	1.56	0
		Proposed lighting controls:							
5	Location:	Recommendation:							
	Front Room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4-F40T12	4	168	360	241.92	0.672		
	Proposed:	2-F32T8	4	67.2	300	80.64	0.2688	161.28	0.4032
		Proposed lighting controls:							

Lighting Cost/Payback Analysis
Atkinson, New Hampshire - Kimball House

			KW Rate: 12.82		KWH Rate: 0.08008
Existing System	**Annual**	**Monthly**	**Annual $**	**Monthly $**	
KWH:	1,334		$107		
KW:	22.956	1.913	$294.30	$24.52	
Proposed System	**Annual**	**Monthly**	**Annual $**	**Monthly $**	
KWH:	228.24		$18		
KW:	5.9256	0.4938	$75.97	$6.33	
Saved	**Annual**	**Monthly**	**Annual $**	**Monthly $**	
KWH:	1105.44		$89		
KW:	17.0304	1.4192	$218.33	$18.19	

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 45**

Finding Description: **Provide smart power strips for plug-in loads**

Building: **Kimball House**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	No

Recommendation:

Estimated Economic Impact Summary

Energy Saving = KW of Phantom Loads * Reduced Runtime of Phantom Loads

KW	Reduced Run Hours	
0.009	7,488	Equipment idle load

Estimated Annual Electrical Savings	67.39 KWH	$6.96
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	0.00 Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00 Gallons	$0.00
	Total Annual Cost Savings	$6.96
	Life Expectancy of Equipment (Years)	12
	Lifetime Energy Savings	$83.47
	Estimated Annual Operational Savings	$0.00
	Simple Payback Years	7.08
	Lifetime Return On Investment	169.45%

Implementation Plan:

Town purchase power strips

Estimated cost for this installation: $49.26

Description	# Units	Labor and Material Cost/Unit	Total	Source
Power Strip	2	$19.95	$39.90	
	0	$0.00	$0.00	
Contractor Markup			23%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$49.26	

Recommend Work to be performed by – Town Maintenance

Owner Action – Purchase Power Strips

Observations: Mediation Center

Original Design and Current Use

- The Family Mediation Center is an old schoolhouse which has been converted into office space. The building has 1,131 square feet and is staffed by 2 employees.

Retrofits

- The building has had many retrofits throughout the history of its life. The recommended retrofit for this building is focused around the improvement of building weatherization and mechanical equipment upgrades.

On-Site Renewable Energy

- There are no recommendations for on-site renewable projects for the Mediation Center.

Age and Condition of the Mechanical Equipment

- The HVAC equipment in the building is a newer oil-fired furnace which is in good condition, and operating efficiently. However, the furnace is oversized for the space. The oversized furnace short-cycles which wastes fuel and causes comfort issues.

Indoor Air Quality

- The air quality in this building is very good with CO2 reading ranging from 384 ppm to 481 ppm and air particle counts as follows:

Size		Count	Size		Count
.3 Microns	-	11,650	.5 Microns	-	1,464
1 Microns	-	501	2 Microns	-	290
5 Microns	-	32	10 Microns	-	4

Space Temperature and Humidity

- During the energy audit, the space temperature was maintained within an acceptable range during business hours and was set back during unoccupied time.

R- Value

- The R-Value of the building walls is what is expected from a building of this age. The walls have a calculated R-Value of 2.67 using thermal imaging to determine the value. The attic has been insulated. Window retrofits should be considered; however, window repair and the addition of Solarize Inflectors will be a more cost-effective approach. The building is a wood framed structure with vinyl siding. The windows are single pane-windows which are covered in plastic during the winter.

Maintenance

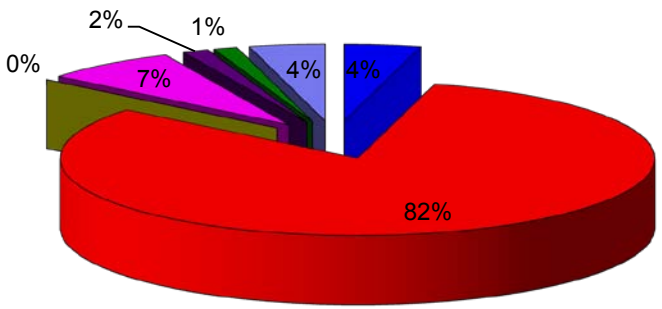
- The maintenance in this building is completed on an as needed basis to address an issue. Implementing a preventive or condition-based maintenance program would save the town money on both energy and equipment maintenance cost.

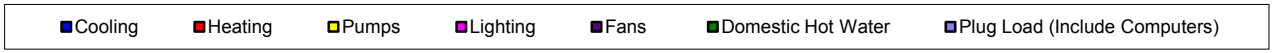
People's Energy Awareness

- The overall energy awareness of the people using this building was good. Lights were turned off at night, and a building programmable thermostat sets back the HVAC unit during unoccupied times.

Mediation Center

ENERGY USAGE PROFILE





Total Facility Consumption	104 (Millions of BTU/hr)
Cooling	4.2%
Heating	81.6%
Pumps	0.0%
Lighting	7.3%
Fans	1.4%
Domestic Hot Water	1.3%
Plug Load (Include Computers)	4.1%
Total	100.0%

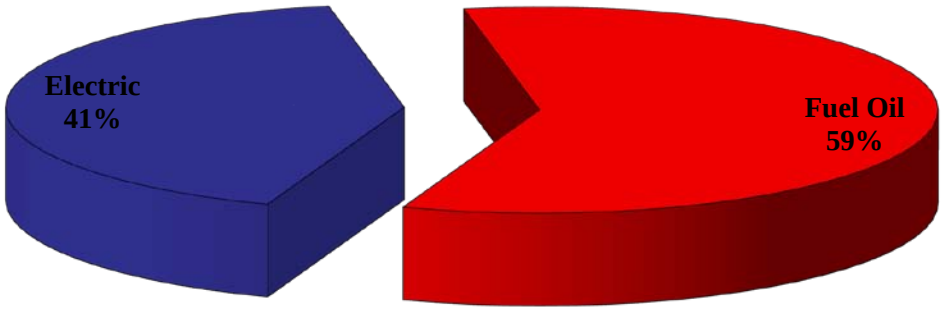
Town of Atkinson, New Hampshire
Mediation Center
Utility Analysis Period:

8/01/2009 to 7/31/2010

	Current Year			Previous Year		
	8/1/2009	to	7/31/2010	8/1/2008	to	7/31/2009
	Electric		Fuel Oil	Electric		Fuel Oil
Utility Costs	$1,015		$1,436	$1,134		$1,590
Utility Usage	5,570		604	5,954		485
$ Cost/Unit (kWh, Therm, Gal)	$0.18		$2.38	$0.19		$3.28
	CDD		HDD	CDD		HDD
	419		6,689	324		7,366
Current Year Vs Previous Year	**Electric**		**Fuel Oil**			
Change in Cost	-10%		-10%			
Change in Usage	-6%		24%			
Change in $ Cost/Unit	-4%		-27%			
Change in Degree Day	29%		-9%			

CDD - Cooling Degree Day
HDD - Heating Degree Day

Utility Cost Comparison Current Year



Energy Benchmarking: Mediation Center

The calculation of EUI (Energy Use Intensity) is shown below. EUI, expressed in kBtu/sf, is normalized for floor area, the most dominant influence on energy use in most buildings. Its use usually provides a good approximation of how your building's energy performance compares to others. Site EUI indicates the rate at which energy is used at your building (the point of use). Source EUI indicates the rate at which energy is used at the generation sources serving your building (the point of source) and indicates the societal energy penalty due to your building The lower the EUI, the higher the rating, indicating that the building is more efficient than other buildings. The greater the EUI, the lower the rating, indicating that there is an opportunity for higher potential benefits from operational improvements.

To compare the buildings shown below to each other, and to determine the ranking of the buildings from having the most to the least opportunity for demand-side improvements from a financial perspective, please see the Site EUI ranking below.

The Site EUI below has been applied to a Department of Energy statistical model from the Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark. The Department of Energy has estimated energy use and cost reductions for building source EUI ratings (percentiles) in the table below. Please see the DOE Regional Source EUI Comparison graph below to rate your building in relation to the regional distribution of similar type buildings. (Note: The Source EUI includes the inefficiencies of electrical generation and transmission. A reduction in 'electrical' source EUI includes a benefit in terms of reduction of air pollution emissions and green house gases, and is thus an indicator of societal benefit.)

Source EUI Rating for your Building	Energy use and cost reduction potential (%)	Walk-thru energy assessment recommended?
above 60%	below 25%	No
40 to 60%	20 to 35%	Maybe
20 to 40%	35 to 50%	Yes
Below 20%	above 50%	Definitely

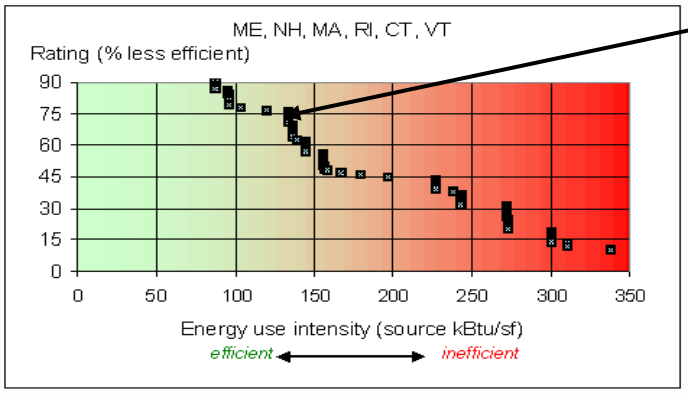
Rating from the most efficient to the least efficient - 2010 consumption

Site EUI Rank	Building	Annual Total Electrical Use (kWh)	Annual Total Non-Electrical Fuel Use (Gals)	Occupied Building Gross Floor Area (sq-ft)	Site EUI Rating	Source EUI: Annual Total Source Energy Use per Sq-Ft (kBtu/sf)	Rating (Regional Source EUI Comparison)
1	Mediation Center	5,570	604	1,131	**92**	**135**	**0.75**

Building Type

Office

Source EUI	Est Regional Rating	Building
135	75%	Mediation Center



Source: Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 51**

Finding Description: **Door weather stripping**

Building: **Mediation Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Overall, the door weather stripping is in poor condition at the Family Mediation Center. Weather stripping a breaks down over time and with use. Therefore, it is recommended that the door weather stripping at this building be given a high priority at this time. For this type of building and use, it is anticipated that the weather stripping for these doors should be replaced every 8 to 10 years.

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Area	Speed -	Factor	Constant	Temp	Avg OA Temp	Hours per Year	n
0.19	589.6	0.28	1.08	68	34	6,048	114,800

Area	Speed -	Factor	Constant	Enthalpy	Enthalpy	Hours per Year	Btu/KWH
0.19	589.6	0.28	0	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	59.88	Gallons	$162.88
Total Annual Cost Savings			$162.88
Life Expectancy of Equipment (Years)			8
Lifetime Energy Savings			$1,303.01
Estimated Annual Operational Savings			$0.00
Simple Payback Years			2.53
Lifetime Return On Investment			315.84%

Implementation Plan:

The Entire perimeter of the entrance doors should be sealed to eliminate heat loss. See sealing kits from American Garage Door Supply in the appendix of this report.

Estimated cost for this installation: $412.55

Description	# Units	Labor and Material Cost/Unit	Total	Source
Entrance Doorjamb Kit	3	$72.70	$218.10	
Entrance Door Bottom Kit	3	$32.50	$97.50	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$412.55	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 52**

Finding Description: **Weatherization - Install Solarize Inflectors**

Building: **Mediation Center**

General Finding Impacts

Energy Savings	No
Fuel Savings	No
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	Yes
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

This building has older windows and is losing a lot of heat. If windows are not going to be replaced with low-e glass windows, then an interior window treatment that will act as a heat reflector should be installed.

Estimated Economic Impact Summary

Energy Savings Cooling = Area X (Existing SHGC – New SHGC) X (Incident Total Irradiance) X Hours/Day X Days/Year

Area	Existing SHGC	New SHGC	Incident Total Irradiance	Hour/Day	Days per year
161.7	0.85	0.45	105.105	8	104

Estimated Annual Electrical Savings	259.24	KWH	$26.76
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	97.12	Gallons	$264.16
Total Annual Cost Savings			$290.92
Life Expectancy of Equipment (Years)			10
Lifetime Energy Savings			$2,909.16
Estimated Annual Operational Savings			$0.00
Simple Payback Years			7.41
Lifetime Return On Investment			134.88%

Implementation Plan:

Install Solarize Inflector roller blind system on all windows on the first floor. These vertical blinds will allow natural light to enter the space while reflecting the radiation heat in the direction desired. Note that this recommendation has a high priority because it will also increase comfort as well as save energy.

Estimated cost for this installation: $2,156.86

Description	# Units	Labor and Material Cost/Unit	Total	Source
Inflector system Roller shade	10	$165.00	$1,650.00	
Contractor Markup			31%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$2,156.86	

Recommend Work to be performed by – Town employee

Owner Action – order blinds

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 53**

Finding Description: **Weatherization - Repair and seal windows**

Building: **Mediation Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	No

Recommendation:

The windows in the Family Mediation Center leak, and if there is no plan to replace them, they should be repaired and caulked. Windows are currently being covered with plastic, and therefore there is an operational savings of 4 hours at $35.00/hour.

Estimated Economic Impact Summary

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Interior Temp	Avg OA Temp	Hours per Year	BTU/gal
0.38	589.6	0.1	1.08	68	34	6,048	112,000

Cooling Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Avg OA Enthalpy	Interior Enthalpy	Hours per Year	BTU/gal
0.38	589.6	0.1	1	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	14.52 KWH	$1.50
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	0.00 Gallons	$0.00
Estimated Annual Fuel Oil Savings	43.84 Gallons	$119.25
	Total Annual Cost Savings	$120.75
	Life Expectancy of Equipment (Years)	10
	Lifetime Energy Savings	$1,207.47
	Estimated Annual Operational Savings	$140.00
	Simple Payback Years	6.74
	Lifetime Return On Investment	148.33%

Implementation Plan:

Caulk windows to stop air leakage.

Estimated cost for this installation: $814.07

Description	# Units	Labor and Material Cost/Unit	Total	Source
Caulking	10	$43.48	$434.80	
	2	$93.98	$187.96	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$814.07	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **54**

Finding Description: **Weatherization, Replace windows**

Building: **Mediation Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

The windows in the Family Mediation Center leak and should be replaced. Window are currently being covered with plastic, and therefore there is an operational savings of 4 hours at $35.00/hour.

Estimated Economic Impact Summary

Building Envelope R-Value improvement – including windows

Energy Savings heating = Area X (Existing U-Value – New U-Value) X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/day X Days/Year

Energy Savings Cooling = Area X (Existing U-Value – New U-Value) X (Avg. OA Temperature Cooling Season - Interior Temperature) X Hours/Day X Days/Year

Heating Savings

Area	Value	Value	Constant	Temp	Avg OA Temp	Hours per year	Btu/Gal
80.00	1.2	0.5	1	55	34	6,048	112,000

Cooling Savings

Area	Value	Value	Constant	Temp	Interior Temp	Hours per year	Btu/KWH
80.00	1.2	0.5	1	28	25.5	2,688	11,942

Estimated Annual Electrical Savings	31.51	KWH	$3.25
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	63.50	Gallons	$172.73
Total Annual Cost Savings			$175.98
Life Expectancy of Equipment (Years)			50
Lifetime Energy Savings			$8,799.17
Estimated Annual Operational Savings			$140.00
Simple Payback Years			36.40
Lifetime Return On Investment			137.37%

Implementation Plan:

Install 10 new windows on first floor of Family Mediation Center.

Estimated cost for this installation: $6,405.23

Description	# Units	Labor and Material Cost/Unit	Total	Source
Replacement windows	10	$490.00	$4,900.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$6,405.23	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **55**

Finding Description: **Lighting upgrade**

Building: **Mediation Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	No

Recommendation:
See Attached detail sheet.

Estimated Economic Impact Summary

Energy Savings = [Watts of Existing Fixture-Watts of New Fixture] x Number of Fixtures x Lighting hours per year

Estimated Annual Electrical Savings	203.84	KWH	$21.04
Estimated Annual Electric Demand Savings	1.18	KW	$9.29
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$30.33
Life Expectancy of Equipment (Years)			8
Lifetime Energy Savings			$242.64
Estimated Annual Operational Savings			$0.00
Simple Payback Years			0.84
Lifetime Return On Investment			951.89%

Implementation Plan:
Please see attached detail lighting sheet and sketch for detail of work.

Estimated cost for this installation: $25.49

Description	# Units	Labor and Material Cost/Unit	Total	Source
11-watt CFL	3	$6.50	$19.50	
Contractor Markup			31%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$25.49	

Recommend Work to be performed by – Town Maintenance

Owner Action – Purchase Bulbs

Lighting Audit Report

Atkinson, New Hampshire - Family Mediation Center

1	Location:	Recommendation:							
	Rear Storage Area		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
2	Location:	Recommendation:							
	director office		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
3	Location:	Recommendation:							
	Front Vestibule area		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 -	4	67.2	2080	559.104	0.2688		
	Proposed:	2-F32T8 -	4	67.2	2080	559.104	0.2688	0	0
		Proposed lighting controls:							
4	Location:	Recommendation:							
	main office area		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 -	4	67.2	2080	559.104	0.2688		
	Proposed:	2-F32T8 -	4	67.2	2080	559.104	0.2688	0	0
		Proposed lighting controls:							
5	Location:	Recommendation:							
	front office	motion	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 -	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8 -	1	67.2	2080	139.776	0.0672	0	0
		Proposed lighting controls:							
6	Location:	Recommendation:							
	kitchenette		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	Round Fluorescent	1	22	2080	45.76	0.022		
	Proposed:	Round Fluorescent	1	22	2080	45.76	0.022	0	0
		Proposed lighting controls:							
7	Location:	Recommendation:							
	meeting room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8	1	67.2	2080	139.776	0.0672	0	0

		Proposed lighting controls:	3 total bulbs burning						
8	Location:	Recommendation:							
	equipment room	motion	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	Round Fluorescent	2	22	2080	91.52	0.044		
	Proposed:	Round Fluorescent	2	22	2080	91.52	0.044	0	0
		Proposed lighting controls:							
9	Location:	Recommendation:							
	rear vestibule		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	Incandescent	1	60	2080	124.8	0.06		
	Proposed:	11 watt CFL	1	11	2080	22.88	0.011	101.92	0.049
		Proposed lighting controls:	None						
10	Location:	Recommendation:							
	Outdoor Lights		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	Incandescent	1	60	2080	124.8	0.06		
	Proposed:	11 watt CFL	1	11	2080	22.88	0.011	101.92	0.049
		Proposed lighting controls:	None						

Lighting Cost/Payback Analysis
Atkinson, New Hampshire - Family Mediation Center

KW Rate: 12.82 KWH Rate: 0.08008

Existing System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	1,863		$149	
KW:	10.7472	0.8956	$137.78	$11.48
Proposed System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	1862.848		$149	
KW:	10.7472	0.8956	$137.78	$11.48
Saved	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	203.84		$16	
KW:	1.176	0.098	$15.08	$1.26

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 56**

Finding Description: **HVAC - Install high-efficiency Propane Furnace**

Building: **Mediation Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

The existing furnace in the Family Mediation Center is oversized which causes its system efficiency to be low. Therefore, a smaller high-efficiency propane furnace should be installed.

Estimated Economic Impact Summary

Energy Savings = Existing Btu * (New Efficiency - Old Efficiency)/Old Efficiency))/Btu/Gallon Propane

Existing kBtu	New system Eff	Old Eff		kBtu/Gallon
106540	84%	69%		91

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	-923.97	Gallons	-$1,635.42
Estimated Annual Fuel Oil Savings	761.00	Gallons	$2,069.92
Total Annual Cost Savings			$434.50
Life Expectancy of Equipment (Years)			20
Lifetime Energy Savings			$8,689.91
Estimated Annual Operational Savings			$0.00
Simple Payback Years			13.48
Lifetime Return On Investment			148.39%

Implementation Plan:

Install 40,000 Btu input propane-fired furnace with a minimum AFUE of 93.5 equal to Carrier 58HDV040 in place of existing oil-fired furnace. Please note that this furnace sizing assumes finding #51 and finding #52 have been completed prior to this installation.

Estimated cost for this installation: $5,856.21

Description	# Units	Labor and Material Cost/Unit	Total	Source
Installed Furnace	1	$3,280.00	$3,280.00	
Furnace and Oil tank removal	1	$1,200.00	$1,200.00	
Contractor Markup			31%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$5,856.21	

Recommend work to be performed by: Qualified Contractor

Observations: Fire Station

Original Design and Current Use

- The building was built to be a fire station in 2000 and still meets the needs of the town of Atkinson as a Fire Station. The building is 11,447 square feet housing 38 total employees: 2 full-time and 36 part-time volunteers. The fire station averages 30 to 40 fire runs per month and 6 to 7 ambulance runs per night.

Retrofits

- The Building was built in 2000 and has not had any retrofits. The recommended retrofits for this building are adding an economizer to the HVAC units along with lighting upgrades. It was noted that during the energy audit that the roof had been leaking and should be repaired as it is affecting energy usage.

On-Site Renewable Energy

- There are no recommendations for on-site renewable projects for the Fire Station.

Age and Condition of the Mechanical Equipment

- All equipment in the building is new from construction of 2000. The town should plan to have the equipment evaluated for replacement in 10 years, when the equipment reaches 20 years of age and each year after that.

Indoor Air Quality

- The air quality in this building is good with the CO2 reading ranging from 555 ppm to 1,135 ppm and air particle counts on the first floor was as follows: Note that the basement and second floor had lower particle counts.

Size		Count	Size		Count
.3 Microns	-	44,277	.5 Microns	-	3,724
1 Microns	-	814	2 Microns	-	438
5 Microns	-	62	10 Microns	-	15

- The ability of the HVAC units to bring in outside air needs to be increased and controlled with a demand control ventilation.
- The building is currently getting outside air because the exhaust fans are creating a negative pressure within the building and the air is infiltrating the building through leaks. The building should be sealed and a heat recovery unit should be installed to recover the heat being exhausted, optimally keeping the building at a neutral to positive pressure relative to the outside air pressure.

Space Temperature and Humidity

- During the energy audit, the space temperature was maintained within acceptable range during business hours and was set back during unoccupied time

R- Value

- The R-Value of the building walls is what is expected from a building of this age. All doors are showing air leakage, and these leaks should be repaired in the future. There is also damage to the insulation and vapor/air barrier in the attic. The building is a combination of metal and wood frame with vinyl siding. The windows are double-pane windows.

Maintenance

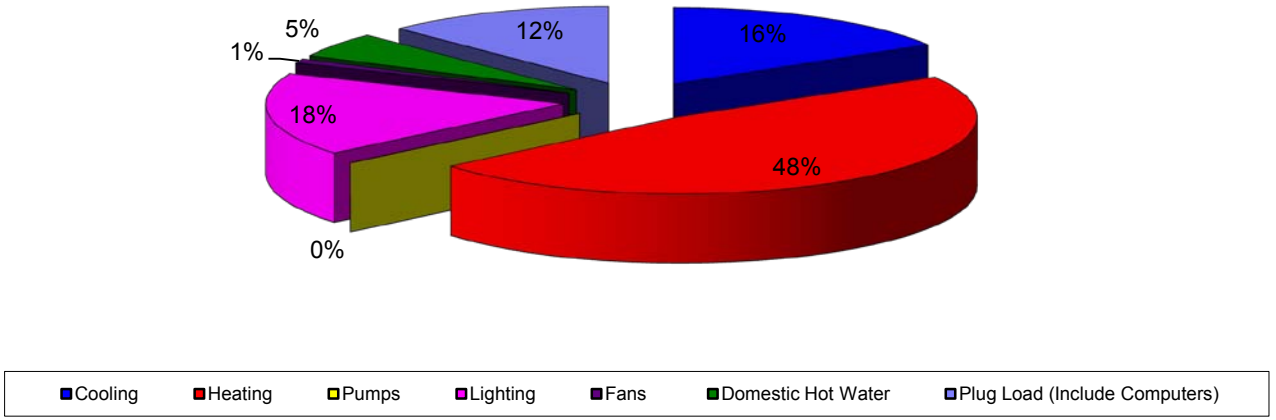
- The maintenance on this building is completed on an as needed basis to address an issue. Implementing a preventive or condition-based maintenance program would save the town money on both energy and equipment maintenance cost.

People's Energy Awareness

- Overall, the energy awareness of the people using this building was good. Computers and lights were turned off at night, and HVAC have programmable thermostats. The outdoor lights are controlled by an Astronomic time clock.

Fire Station

ENERGY USAGE PROFILE



Total Facility Consumption	489 (Millions of BTU/hr)
Cooling	16.4%
Heating	47.5%
Pumps	0.0%
Lighting	17.5%
Fans	0.9%
Domestic Hot Water	5.3%
Plug Load (Include Computers)	12.4%
Total	100.0%

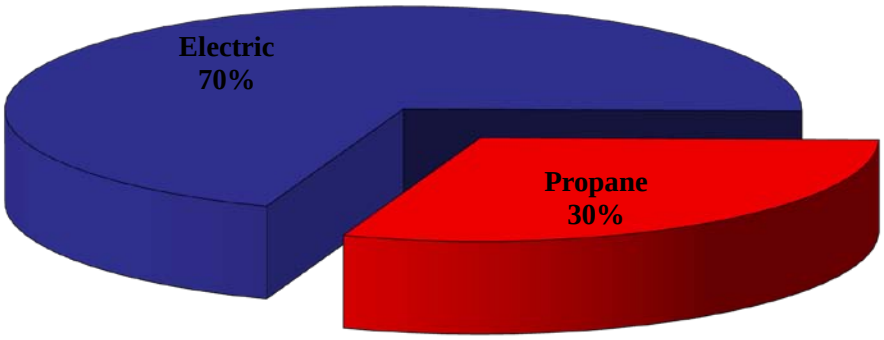
Town of Atkinson, New Hampshire
Fire Station
Utility Analysis Period:

8/01/2009 to 7/31/2010

	Current Year			Previous Year		
	8/1/2009	to	7/31/2010	8/1/2008	to	7/31/2009
	Electric		Propane	Electric		Propane
Utility Costs	$9,714		$4,218	$9,888		$7,837
Utility Usage	67,582		2,835	61,446		4,394
$ Cost/Unit (kWh, Therm, Gal)	$0.14		$1.49	$0.16		$1.78
	CDD		HDD	CDD		HDD
	419		6,689	324		7,366
Current Year Vs Previous Year	**Electric**		**Propane**			
Change in Cost	-2%		-46%			
Change in Usage	10%		-35%			
Change in $ Cost/Unit	-11%		-17%			
Change in Degree Day	29%		-9%			

Electric usage increase proportional to CDD and Propane Usage decrease proportional to HDD
CDD - Cooling Degree Day
HDD - Heating Degree Day

Utility Cost Comparison Current Year



Energy Benchmarking: Fire Station

The calculation of EUI (Energy Use Intensity) is shown below. EUI, expressed in kBtu/sf, is normalized for floor area, the most dominant influence on energy use in most buildings. Its use usually provides a good approximation of how your building's energy performance compares to others. Site EUI indicates the rate at which energy is used at your building (the point of use). Source EUI indicates the rate at which energy is used at the generation sources serving your building (the point of source) and indicates the societal energy penalty due to your building The lower the EUI, the higher the rating, indicating that the building is more efficient than other buildings. The greater the EUI, the lower the rating, indicating that there is an opportunity for higher potential benefits from operational improvements.

To compare the buildings shown below to each other, and to determine the ranking of the buildings from having the most to the least opportunity for demand-side improvements from a financial perspective, please see the Site EUI ranking below.

The Site EUI below has been applied to a Department of Energy statistical model from the Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark. The Department of Energy has estimated energy use and cost reductions for building source EUI ratings (percentiles) in the table below. Please see the DOE Regional Source EUI Comparison graph below to rate your building in relation to the regional distribution of similar type buildings. (Note: The Source EUI includes the inefficiencies of electrical generation and transmission. A reduction in 'electrical' source EUI includes a benefit in terms of reduction of air pollution emissions and green house gasses, and is thus an indicator of societal benefit.)

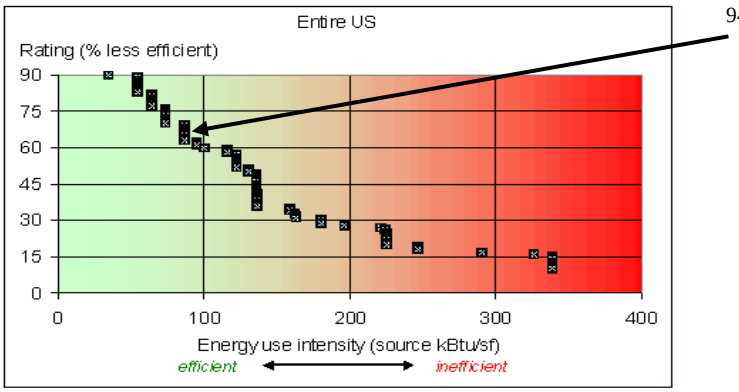
Source EUI Rating for your Building	Energy use and cost reduction potential (%)	Walk-thru energy assessment recommended?
above 60%	below 25%	No
40 to 60%	20 to 35%	Maybe
20 to 40%	35 to 50%	Yes
Below 20%	above 50%	Definitely

Rating from the most efficient to the least efficient - 2010 consumption

Site EUI Rank	Building	Annual Total Electrical Use (kWh)	Annual Total Non-Electrical Fuel Use (Gals)	Occupied Building Gross Floor Area (sq-ft)	Site EUI Rating	Source EUI: Annual Total Source Energy Use per Sq-Ft (kBtu/sf)	Rating (Regional Source EUI Comparison)
1	Fire Station	67,582	2,835	11,447	**43**	**94**	**0.62**

Building Type

Fire Station



Source EUI	Est Regional Rating	Building
94	62%	Fire Station

Source: Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **20**

Finding Description: **Door weather stripping**

Building: **Fire Station**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	No

Recommendation:

Overall,the door weather stripping is in fair condition at the Fire Station. Weather stripping a breaks down over time and with use. Therefore, it is recommended that the door weather stripping at this building be given a high priority at this time. For this type of building and use it is anticipated that the weather stripping for these doors should be replaced every 8 to 10 years.

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open Area Sqare Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Interior Temp	Avg OA Temp	Hours per Year	BTU/Gallon
0.81	589.6	0.2	1.08	68	34	6,048	84,630

Cooling Savigns

Open Area Sqare Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Avg OA Enthalpy	Interior Enthalpy	Hours per Year	Btu/KWH
0.81	589.6	0.2	1	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	62.90	KWH	$6.49
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	251.42	Gallons	$445.01
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$451.51
Life Expectancy of Equipment (Years)			8
Lifetime Energy Savings			$3,612.05
Estimated Annual Operational Savings			$0.00
Simple Payback Years			8.32
Lifetime Return On Investment			96.17%

Implementation Plan:

The entire perimeter of the entrance doors should be sealed to eliminate heat loss. Sealing kits from American Garage Door Supply are listed in the appendix of this report.

Estimated cost for this installation: $3,755.95

Description	# Units	Labor and Material Cost/Unit	Total	Source
Overhead - Top Seal Cap	9	$71.00	$639.00	
Over Head - Perimeter Seal	9	$108.00	$972.00	
Overhead - Bottom Seal	9	$93.50	$841.50	
Overhead Felt	0	$65.00	$0.00	
Entrance Doorjamb Kit	4	$72.70	$290.80	
Entrance Door Bottom Kit	4	$32.50	$130.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$3,755.95	

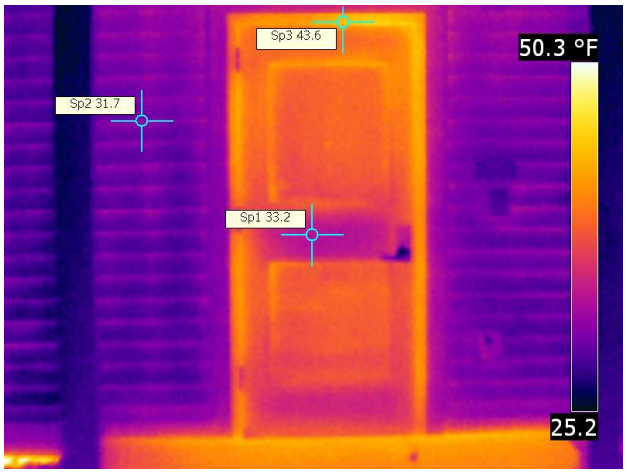
Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Inspection Report

Report Date 2/27/2011

Company	Arbogast Energy Auditing	**Customer**	Town of Atkinson, NH
Address	317 Austin St #4	**Site Address**	New Hampshire
Thermographer	Elmer Arbogast	**Contact Person**	Michelle Veasey



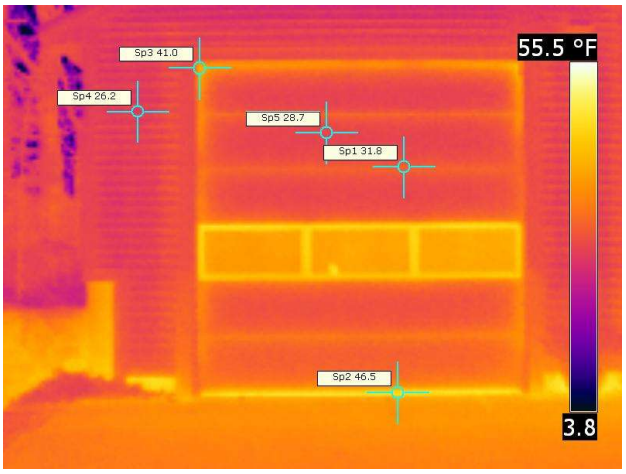


Image and Object Parameters

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Image Date	11/1/2010 10:39:25 AM
Image Name	IR_2104.jpg
Emissivity	0.95
Reflected apparent temperature	27.0 °F
Object Distance	3.2 ft

Text Comments

Description

Fire station entrance door	Fire Station Overhead door

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **21**

Finding Description: **HVAC - Install economizer on furnaces**

Building: **Fire Station**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Install a mixed-air box on back of each of the 3 furnaces along with economizer controls.

Estimated Economic Impact Summary

[[Energy Savings cooling = CFM / 13.8 X (Interior Enthalpy Avg. - OA Enthalpy Cooling Season) X Hours per Day X Days/Year]/ 12000 Btu/ton]*1.1 KWH/ton

CFM	Constant	OA	Interior	Hours per	Days Per Year	BTU/Ton	KWH/Ton
5200	13.8	15.5	26	8	30	12,000	1.1

Estimated Annual Electrical Savings	16,576.56 KWH	$1,710.95
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	0.00 Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00 Gallons	$0.00
	Total Annual Cost Savings	$1,710.95
	Life Expectancy of Equipment (Years)	15
	Lifetime Energy Savings	$25,664.24
	Estimated Annual Operational Savings	$0.00
	Simple Payback Years	7.05
	Lifetime Return On Investment	212.69%

Implementation Plan:

Carrier and Bryant do not sell a mixing-box for these furnaces; therefore, one would need to be built. Mixing-air box should be constructed out of 22 ga sheet metal and have three openings equal to the return air opening of the furnace. One opening should be attached to the return of the furnace, one to the return air duct, and the other should be ducted to the outside. A louver with free air opening equal to the return air of the duct sould be installed in the outside wall of the building. Louver should include screen to eliminate bugs from entering. A damper should be installed at the connection to the outside air duct and the return air duct. These dampers should be attached to an actuator which would be controlled by a stand-alone air-handler controller with economizer capability.

Estimated cost for this installation: $12,066.67

Description	# Units	Labor and Material Cost/Unit	Total	Source
Mixing Box Fabrication	3	$480.00	$1,440.00	
Damper	6	$250.00	$1,500.00	
Actuator	6	$161.00	$966.00	
Controller and Programming	3	$1,200.00	$3,600.00	
Power and Control Wiring	3	$275.00	$825.00	
Louver	3	$300.00	$900.00	
Contractor Mark Up			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$12,066.67	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 22**

Finding Description: **HVAC - See Finding #21**

Building: **Fire Station**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	No

Recommendation:

Estimated Economic Impact Summary

Energy Savings heating = CFM of Ventilation X 1.08 X (Avg. Unit Discharge Temperature – Avg. OA Temperature Heating Season) X Hours per Day X Days/Year
Energy Savings cooling = CFM of Ventilation / 13.8 X (Avg. OA Enthalpy Cooling Season - Avg. Unit Discharge Enthalpy) X Hours per Day X Days/Year

CFM	Constant	Avg. Discharge Temp	Avg. OA Temp	Hours per day	Days Per Year	BTU/Gallon	
CFM	Constant	OA Enthalpy	Interior Enthalpy	Hours per day	Days Per Year	BTU/Ton	KWH/Ton

Estimated Annual Electrical Savings	0.00	KWH
Estimated Annual Electric Demand Savings	0.00	KW
Estimated Annual Propane Savings	0.00	Gallons
Estimated Annual Fuel Oil Savings	0.00	Gallons

Implementation Plan:

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
Heat Recovery Unit	0	0.00	0.00	
Ductwork and Diffuser	0	0.00	0.00	
Drain Piping	0	0.00	0.00	
Power and Control Wiring	0	0.00	0.00	
Contractor Markup			#DIV/0!	Equivalent of 10% Overhead and 10% Profit
Total			$0.00	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **23**

Finding Description: **Lighting upgrade**

Building: **Fire Station**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	No
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

Replace lighting per attached detail sheet.

Estimated Economic Impact Summary

Energy Savings = [Watts of Existing Fixture-Watts of New Fixture] x Number of Fixtures x Lighting hours per year
See attached calculation sheet.

Estimated Annual Electrical Savings	1,056.38	KWH	$109.03
Estimated Annual Electric Demand Savings	4.84	KW	$38.22
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$147.26
		Life Expectancy of Equipment (Years)	8
		Lifetime Energy Savings	$1,178.06
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	4.63
		Lifetime Return On Investment	172.73%

Implementation Plan:

See following detail sheet.

Estimated cost for this installation after rebate: $682.03

Description	# Units	Labor and Material Cost/Unit	Total	Source
Motion Sensor	1	$140.00	$140.00	
Delamping	1	$420.00	$420.00	
Contractor Markup			31%	Equivalent of 10% Overhead and 10% Profit
Rebates			$50.00	
Total			$732.03	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Lighting Audit Report

Atkinson, New Hampshire - Fire Station

Fire Station **Page 1**

1	Location:	Recommendation:							
	Basement Mechanical		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8	1	67.2	2080	139.776	0.0672	0	0
		Proposed lighting controls:							
2	Location:	Recommendation:							
	Basement East Storage Rm		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	3	67.2	2080	419.328	0.2016		
	Proposed:	2-F32T8	3	67.2	2080	419.328	0.2016	0	0
		Proposed lighting controls:							
3	Location:	Recommendation:							
	Basement Hallway		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	5	67.2	2080	698.88	0.336		
	Proposed:	2-F32T8 - U	5	67.2	2080	698.88	0.336	0	0
		Proposed lighting controls:							
4	Location:	Recommendation:							
	East App room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	3	67.2	2080	419.328	0.2016		
	Proposed:	2-F32T8	3	67.2	2080	419.328	0.2016	0	0
		Proposed lighting controls:							
5	Location:	Recommendation:							
	Elevator Room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	3	67.2	2080	419.328	0.2016		
	Proposed:	2-F32T8	3	67.2	2080	419.328	0.2016	0	0
		Proposed lighting controls:							
6	Location:	Recommendation:							
	Restrooms		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	4	67.2	2080	559.104	0.2688		
	Proposed:	2-F32T8	4	67.2	2080	559.104	0.2688	0	0
		Proposed lighting controls:							
7	Location:	Recommendation:							
	Basement Kitchen		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	3-F32T8	2	100.8	2080	419.328	0.2016		
	Proposed:	3-F32T8	2	100.8	2080	419.328	0.2016	0	0
		Proposed lighting controls:							

8	Location:	Recommendation:							
	Coat Room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8	1	67.2	2080	139.776	0.0672	0	0
		Proposed lighting controls:							
9	Location:	Recommendation:							
	Training Room	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	3-F32T8	12	100.8	2080	2515.97	1.2096		
	Proposed:	3-F32T8	12	100.8	2080	2515.97	1.2096	0	0
		Proposed lighting controls:	None						
10	Location:	Recommendation:							
	Training Room Storage rooms	No Work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	11 watt compact fluorescent	3	11	2080	68.64	0.033		
	Proposed:	None	3	11	2080	68.64	0.033	0	0
		Proposed lighting controls:							
11	Location:	Recommendation:							
	West and Center Stair well	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	Compact Flour 2 bulb	8	33.6	8760	2354.69	0.2688		
	Proposed:	No work in this area	8	33.6	8760	2354.69	0.2688	0	0
		Proposed lighting controls:	none						
12	Location:	Recommendation:							
	First Floor Break Room	remove 1 bulb from fixtures, and rewire ballast	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	3-F32T8	12	100.8	2080	2515.97	1.2096		
	Proposed:	2-F32T8	12	67.2	2080	1677.31	0.8064	838.656	0.4032
		Proposed lighting controls:	Over light -137 fc on - table 100 watt lamp						
13	Location:	Recommendation:							
	First Floor Hallway	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 - U	6	67.2	2080	838.656	0.4032		
	Proposed:	2-F32T8 - U	6	67.2	2080	838.656	0.4032	0	0
			25 to 76 fc						
		Proposed lighting controls:	2 On all the time 4 controlled by switch						
14	Location:	Recommendation:							
	East Dispatch Area	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	3-F32T8	2	100.8	2080	419.328	0.2016		
	Proposed:	3-F32T8	2	100.8	2080	419.328	0.2016	0	0
		Proposed lighting controls:	None						

15	Location:	Recommendation:							
	Chief Office	No work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	3-F32T8	2	100.8	2080	419.328	0.2016		
	Proposed:	3-F32T8	2	100.8	2080	419.328	0.2016	0	0
		Proposed lighting controls:	None						
16	Location:	Recommendation:							
	Fire Prevention		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	3-F32T8	2	100.8	2080	419.328	0.2016		
	Proposed:	3-F32T8	2	100.8	2080	419.328	0.2016	0	0
		Proposed lighting controls:							
17	Location:	Recommendation:							
	Dispatch		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	3-F32T8	2	100.8	2080	419.328	0.2016		
	Proposed:	3-F32T8	2	100.8	2080	419.328	0.2016	0	0
		Proposed lighting controls:							
18	Location:	Recommendation:							
	First Floor Locker room	Motion	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	3	67.2	2080	419.328	0.2016		
	Proposed:	2-F32T8	3	67.2	1000	201.6	0.2016	217.728	0
		Proposed lighting controls:	Motion - One Bulb out						
19	Location:	Recommendation:							
	First Floor Rest room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2- F32T8 + 13 watt cp	1	80.2	2080	166.816	0.0802		
	Proposed:		1	80.2	2080	166.816	0.0802	0	0
		Proposed lighting controls:							
20	Location:	Recommendation:							
	Janitor Room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	1	67.2	2080	139.776	0.0672		
	Proposed:	2-F32T8	1	67.2	2080	139.776	0.0672	0	0
		Proposed lighting controls:	Motion Sensor						
21	Location:	Recommendation:							
	Furnace Room	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							

22	Location:	Recommendation:							
	East Office		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
23	Location:	Recommendation:							
	West office		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	3	67.2	2080	419.328	0.2016		
	Proposed:	2-F32T8	3	67.2	2080	419.328	0.2016	0	0
		Proposed lighting controls:							
24	Location:	Recommendation:							
	West Storage	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
25	Location:	Recommendation:							
	Rest rooms	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 + cp	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
26	Location:	Recommendation:							
	East Bed room	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:							
27	Location:	Recommendation:							
	West Bed room	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	2080	279.552	0.1344		
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:	2 - lamps out						
28	Location:	Recommendation:							
	West Bed room	no work	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	7	67.2	2080	978.432	0.4704		
	Proposed:	2-F32T8	7	67.2	2080	978.432	0.4704	0	0
		Proposed lighting controls:	Plus 1 lamp with cp						

29	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	High bay area	no work							
	Existing:	1-F32T8	45	33.6	2080	3144.96	1.512		
	Proposed:	1-F32T8	45	33.6	2080	3144.96	1.512	0	0
		Proposed lighting controls:	Plus 1 lamp with cp						

30	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	apparatus	no work							
	Existing:	2-F32T8	7	67.2	2080	978.432	0.4704		
	Proposed:	2-F32T8	7	67.2	2080	978.432	0.4704	0	0
		Proposed lighting controls:	plus 1 cp in closet						

31	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Shower/laundry room	Motion sensor							
	Existing:	2-F32T8	2	67.2	2080	279.552	0.1344		
			0						
	Proposed:	2-F32T8	2	67.2	2080	279.552	0.1344	0	0
		Proposed lighting controls:	Motion sensor						

32	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Outdoor								
	Existing:		4	250	3640	3640	1		
			0						
	Proposed:		4	250	3640	3640	1	0	0
		Proposed lighting controls:							

Lighting Cost/Payback Analysis
Fire Station

KW Rate: 7.9 KWH Rate: 0.10322

Existing System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	25,030		$0	
KW:	10.4204	10.4204	$0.00	$0.00
Proposed System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	23973.632		$0	
KW:	120.2064	10.0172	$0.00	$0.00
Saved	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	1056.384		$0	
KW:	4.8384	0.4032	$0.00	$0.00

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 24**

Finding Description: **Weatherization - Repair insulation and air barrier**

Building: **Fire Station**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

There is damage to the Vapor/Air barrier between the occupied space and the attic. This should be repaired to stop air from rising from the occupied space into the attic. This creates a twofold issue in that the air rising from the occupied space to the attic has to be replaced with outside air which is then heated. In addition, keeping the attic too warm during the winter when there is a snow load can create ice and ice jams.

Estimated Economic Impact Summary

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Area	FPM	Factor	Constant	Temp	Avg OA Temp	Hours per year	BTU/gal
16.42	20	0.1	1.08	68	34	6,048	84,630

Cooling Savings

Area	FPM	Factor	Constant	Enthalpy	Enthalpy	Hours per year	BTU/gal
16.42	20	0.1	1	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	21.56	KWH	$2.22
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	86.16	Gallons	$152.51
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$154.74
Life Expectancy of Equipment (Years)			20
Lifetime Energy Savings			$3,094.71
Estimated Annual Operational Savings			$0.00
Simple Payback Years			4.42
Lifetime Return On Investment			452.53%

Implementation Plan:

The plastic vapor barrier which is hanging should be reattached with tape, and any missing barrier should be replaced. In addition, the insulation pushed down in the attic should be fixed for maximum cover. It is estimated that it should take about 8 man-hours to complete these tasks.

Estimated cost for this installation: $683.87

Description	# Units	Labor and Material Cost/Unit	Total	Source
Fiberglass Insulation - roll 13	0	$20.98	$0.00	
Vapor/Air barrier. - 6 mil plastic	2	$93.98	$187.96	
Taping	1	$335.20	$335.20	
	0	0	0	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$683.87	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Damaged Insulation & Vapor/Air Barrier

Damaged Insulation & Vapor/Air Barrier

Damaged Vapor/Air Barrier

Observations: Highway Garage

Original Design and Current Use

- The building was built to be a highway garage in 1999 and still meets the needs of the town of Atkinson as a highway garage. The Garage is occupied by 4 employees who spend only part of their time in the garage. The garage averages 120 vehicle entries during the summer and 240 vehicle entries during the winter months.

Retrofits

- The building was built in 1999 and has not had many retrofits. The recommended retrofits for this building are adding a waste oil furnace along with lighting upgrades

On-Site Renewable Energy

- There are no recommendations for on-site renewable projects for the Highway Garage.

Age and Condition of the Mechanical Equipment

- All equipment in the building is new from construction in1999. The town should plan to have the equipment evaluated for replacement in 9 years when the equipment reaches 20 years of age and each year there after.

Indoor Air Quality

- The air quality in this building was good during the energy audit; however, there is concern that vehicles are running in this building with no CO and CO2 monitoring.

Space Temperature and Humidity

- During the energy audit, the space temperature was maintained within acceptable range during business hours.

R- Value

- The R-Value of this building's wall is what is expected from a building of this age. The walls have a calculated R-Value of 6.48 using thermal imaging to determine the value. All doors are showing air leakage, and these leaks should be repaired.

Maintenance

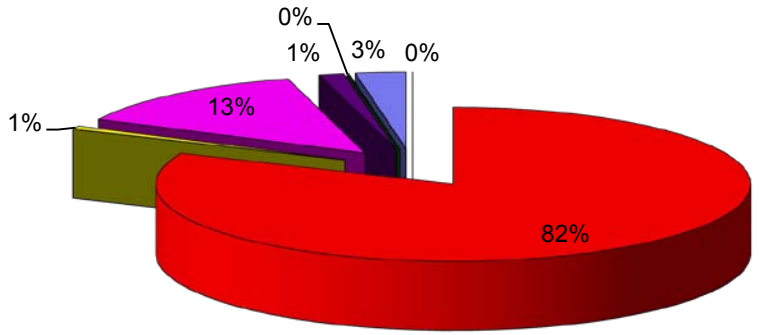
- The maintenance on this building is completed on an as needed basis to address an issue. Implementing a preventive or condition-based maintenance program would save the town money on both energy and equipment maintenance costs.

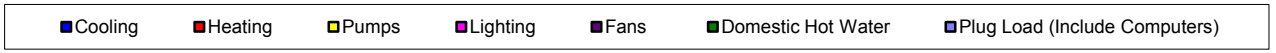
People's Energy Awareness

- Overall, the energy awareness of the people using this building was good. Computers and lights were turned off at night. The outdoor lights are controlled by an Astronomic time clock.

Highway Garage

ENERGY USAGE PROFILE





Total Facility Consumption	112 (Millions of BTU/hr)
Cooling	0.0%
Heating	81.5%
Pumps	0.7%
Lighting	13.6%
Fans	1.4%
Domestic Hot Water	0.1%
Plug Load (Include Computers)	2.7%
Total	100.0%

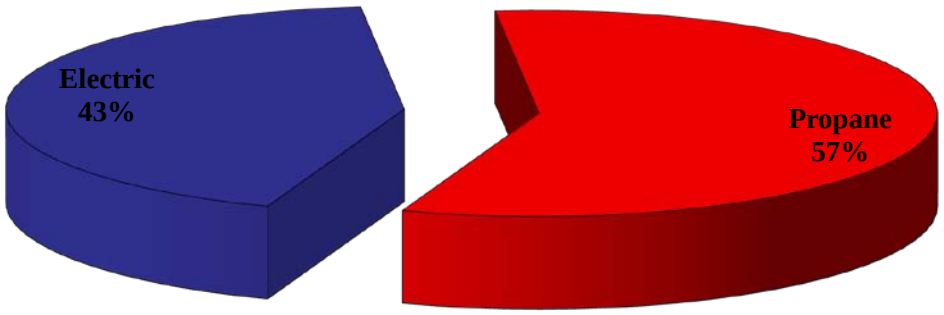
Town of Atkinson, New Hampshire
Highway Garage
Utility Analysis Period:

8/01/2009 to 7/31/2010

	Current Year			Previous Year		
	8/1/2009	to	7/31/2010	8/1/2008	to	7/31/2009
	Electric		Propane	Electric		Propane
Utility Costs	$1,190		$1,598	$1,178		$2,909
Utility Usage	6,077		1,006	5,433		1,553
$ Cost/Unit (kWh, Therm, Gal)	$0.20		$1.59	$0.22		$1.87
	CDD		HDD	CDD		HDD
	419		6,689	324		7,366
Current Year Vs Previous Year	**Electric**		**Propane**			
Change in Cost	1%		-45%			
Change in Usage	12%		-35%			
Change in $ Cost/Unit	-10%		-15%			
Change in Degree Day	29%		-9%			

CDD - Cooling Degree Day
HDD - Heating Degree Day

Utility Cost Comparison Current Year



Energy Benchmarking: Highway Garage

The calculation of EUI (Energy Use Intensity) is shown below. EUI, expressed in kBtu/sf, is normalized for floor area, the most dominant influence on energy use in most buildings. Its use usually provides a good approximation of how your building's energy performance compares to others. Site EUI indicates the rate at which energy is used at your building (the point of use). Source EUI indicates the rate at which energy is used at the generation sources serving your building (the point of source) and indicates the societal energy penalty due to your building The lower the EUI, the higher the rating, indicating that the building is more efficient than other buildings. The greater the EUI, the lower the rating, indicating that there is an opportunity for higher potential benefits from operational improvements.

To compare the buildings shown below to each other, and to determine the ranking of the buildings from having the most to the least opportunity for demand-side improvements from a financial perspective, please see the Site EUI ranking below.

The Site EUI below has been applied to a Department of Energy statistical model from the Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark. The Department of Energy has estimated energy use and cost reductions for building source EUI ratings (percentiles) in the table below. Please see the DOE Regional Source EUI Comparison graph below to rate your building in relation to the regional distribution of similar type buildings. (Note: The Source EUI includes the inefficiencies of electrical generation and transmission. A reduction in 'electrical' source EUI includes a benefit in terms of reduction of air pollution emissions and green house gases, and is thus an indicator of societal benefit.)

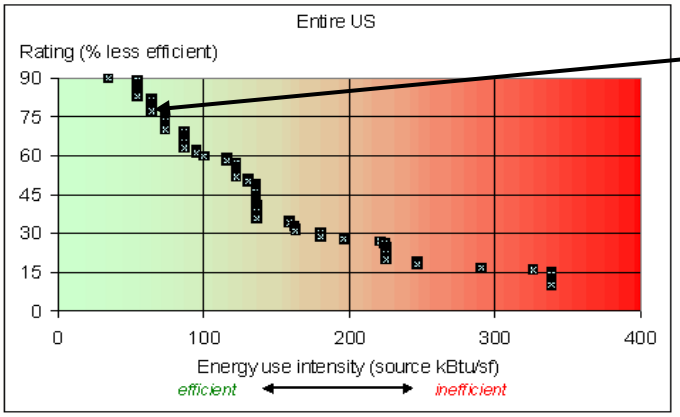
Source EUI Rating for your Building	Energy use and cost reduction potential (%)	Walk-thru energy assessment recommended?
above 60%	below 25%	No
40 to 60%	20 to 35%	Maybe
20 to 40%	35 to 50%	Yes
Below 20%	above 50%	Definitely

Rating from the most efficient to the least efficient - 2010 consumption

Site EUI Rank	Building	Annual Total Electrical Use (kWh)	Annual Total Non-Electrical Fuel Use (Gals)	Occupied Building Gross Floor Area (sq-ft)	Site EUI Rating	Source EUI: Annual Total Source Energy Use per Sq-Ft (kBtu/sf)	Rating (Regional Source EUI Comparison)
1	Highway Garage	6,077	1,006	2,970	**38**	**56**	**0.76**

Building Type

Garage



Source EUI	Est Regional Rating	Building
56	76%	Highway Garage

Source: Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **46**

Finding Description: **Door weather stripping**

Building: **Hwy Garage**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Overall, the door weather stripping is in poor condition at the Highway Garage. Weather stripping a breaks down over time and with use. Therefore, it is recommended that the door weather stripping at this building be given a high priority at this time. For this type of building and use, it is anticipated that the weatherstripping for these doors should be replaced every 8 to 10 years.

Estimated Economic Impact Summary

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open Area Sqare Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Interior Temp	Avg OA Temp	Hours per year	BTU/Gallon
0.19	589.6	0.35	1.08	68	34	6,048	74,620

Cooling Savings

Open Area Sqare Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Avg OA Enthalpy	Interior Enthalpy	Hours per year	Btu/KWH
0.19	589.6	0.35	0	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	115.16	Gallons	$203.83
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$203.83
Life Expectancy of Equipment (Years)			9
Lifetime Energy Savings			$1,834.43
Estimated Annual Operational Savings			$0.00
Simple Payback Years			8.34
Lifetime Return On Investment			107.93%

Implementation Plan:

The entire perimeter of the entrance doors should be sealed to eliminate heat loss. Sealing kits from American Garage Door Supply are listed in the appendix of this report.

Estimated cost for this installation: $1,699.61

Description	# Units	Labor and Material Cost/Unit	Total	Source
Overhead - Top Seal Cap	2	$71.00	$142.00	
Over Head - Perimeter Seal	2	$108.00	$216.00	
Overhead - Bottom Seal	2	$93.50	$187.00	
Overhead Felt	0	$65.00	$0.00	
Repair to Overhead Door	1	$650.00	$650.00	
Entrance Doorjamb Kit	1	$72.70	$72.70	
Entrance Door Bottom Kit	1	$32.50	$32.50	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$1,699.61	

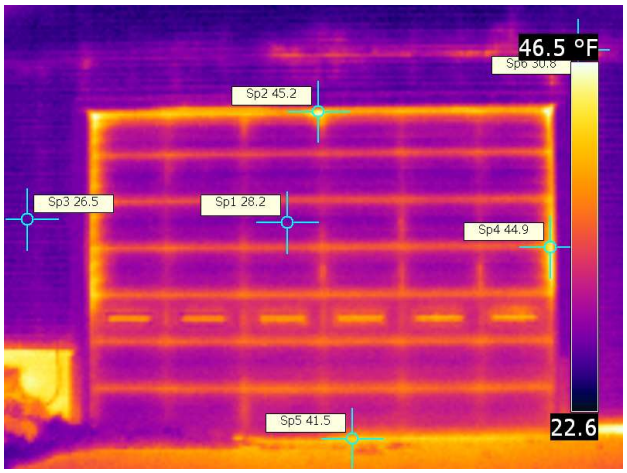
Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Inspection Report

Report Date 11/24/2010

Company	Arbogast Energy Auditing	**Customer**	Town of Atkinson NH
Address	317 Austin St #4	**Site Address**	Highway Garage
Thermographer	Elmer Arbogast	**Contact Person**	Michelle Veasey



Camera Model	FLIR FLIR T200_ Western
Image Date	11/1/2010 10:41:26 AM
Image Name	Town Garage Door.jpg
Emissivity	0.95
Reflected apparent temperature	0.0 °F
Object Distance	3.2 ft

Description

Front door showing leakage and damage at the bottom.

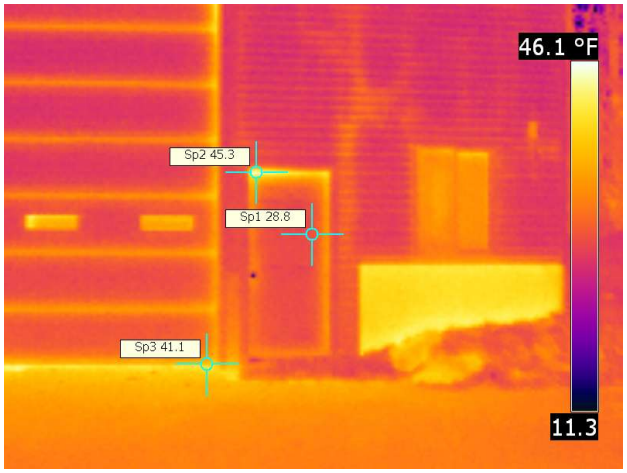


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Image Date	11/1/2010 10:42:31 AM
Image Name	IR_2128.jpg
Emissivity	0.95
Reflected apparent temperature	0.0 °F
Object Distance	3.2 ft

Description

Door showing leakage at highway garage

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 47**

Finding Description: **Weatherization - Repair bottom of door**

Building: **Hwy Garage**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

The bottom of the front garage door is damaged and should be repaired to stop leakage.

Estimated Economic Impact Summary

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Interior Temp	Avg OA Temp	Hours per year	BTU/Gallon
0.21	589.6	0.35	1.08	68	34	6,048	74,620

Cooling Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Avg OA Enthalpy	Interior Enthalpy	Hours per year	Btu/KWH
0.00	589.6	0.35	0	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	127.95	Gallons	$226.47
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$226.47
		Life Expectancy of Equipment (Years)	25
		Lifetime Energy Savings	$5,661.83
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	5.19
		Lifetime Return On Investment	481.26%

Implementation Plan:

The bottom door panel should be replaced; this panel can be ordered from the door manufacturer.

Estimated cost for this installation: $1,176.47

Description	# Units	Labor and Material Cost/Unit	Total	Source
Bottom door panel	1	$900.00	$900.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$1,176.47	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **48**

Finding Description: **Install CO and CO2 monitoring**

Building: **Hwy Garage**

General Finding Impacts

Energy Savings	No
Fuel Savings	No
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

The Hwy Garage has vehicles that run inside the building. Dangerous levels of carbon monoxide along with carbon dioxide could build up in this space and cause harm. It is recommended that a monitor capable of detecting and reporting CO and CO2 be installed in the space and trip an audible alarm. Note that this unit can be tied into a future vehicle exhaust extraction system.

Estimated Economic Impact Summary

Informational only recommendation

Estimated Annual Electrical Savings	0.00	KWH
Estimated Annual Electric Demand Savings	0.00	KW
Estimated Annual Propane Savings	0.00	Gallons
Estimated Annual Fuel Oil Savings	0.00	Gallons

Implementation Plan:

It is recommended that a Honeywell Multi-point sample draw gas monitor model VASQN82 CO CO2 8XTL3 be installed in the Fire Station. Unit should be located outside of the office area with draw points 3 feet above the floor in the shop area.

Estimated cost for this installation: $9,359.48

Description	# Units	Labor and Material Cost/Unit	Total	Source
Gas Monitor	1	$7,160.00	$7,160.00	Kele quoted price
Unit setup	1	$220.00	$220.00	AEA quoted price
Contractor Markup			31%	Equivalent of 10% Overhead and 10% Profit
Total Prior to Unitil Rebate			$9,359.48	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 49**

Finding Description: **HVAC - Install waste oil furnace**

Building: **Hwy Garage**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

The town of Atkinson could burn waste oil to heat the Hwy Garage; this would reduce the need to purchase propane. The town would need to plan to collect 760 gallons to make this a viable project.

Estimated Economic Impact Summary

The town would need to collect 760 gallons of waste oil.

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	760.00	Gallons	$1,345.20
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$1,345.20
Life Expectancy of Equipment (Years)			15
Lifetime Energy Savings			$20,178.00
Estimated Annual Operational Savings			$0.00
Simple Payback Years			10.91
Lifetime Return On Investment			137.45%

Implementation Plan:

Clean Burn CB 2500 used-oil(waste oil) furnace with 250-gallon tank, tank stands, tank drain, pump mount, draw assembly, gauge, copper line, sheathing, and pump wiring should be installed in the northeast corner of the garage.

Estimated cost for this installation: $14,679.74

Description	# Units	Labor and Material Cost/Unit	Total	Source
Clean Burn CB 2500	1	$7,495.00	$7,495.00	
Exhaust Venting	1	$1,800.00	$1,800.00	
Power and Control Wiring	1	$375.00	$375.00	
Oil Piping	1	$1,560.00	$1,560.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$14,679.74	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **50**

Finding Description: **Lighting upgrade**

Building: **Hwy Garage**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:
See following detail sheet.

Energy Savings = [Watts of Existing Fixture-Watts of New Fixture] x Number of Fixture x Lighting hours per year

Estimated Annual Electrical Savings	3844.62	KWH	$396.82
Estimated Annual Electric Demand Savings	16.30	KW	$128.80
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
Total Annual Cost Savings			$525.63
Life Expectancy of Equipment (Years)			8
Lifetime Energy Savings			$4,205.02
Estimated Annual Operational Savings			$0.00
Simple Payback Years			4.62
Lifetime Return On Investment			173.08%

Implementation Plan:
Please see attached detail sheet.

Estimated cost for this installation after rebate: $2,429.57

Description	# Units	Labor and Material Cost/Unit	Total	Source
LUMAPRO Model #: 2ZE23	1	$61.62	$61.62	
DuroSiteTM LED High-Bay Fixture Options and Accessories Occupancy Sensor Version With Oval Light Pattern Part # HB6C4T	2	$975.00	$1,950.00	
Streetlight	0	$0.00	$0.00	
3 Watt LED	0	$0.00	$0.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$200.00	
Total			$2,629.57	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Lighting Audit Report

Atkinson, New Hampshire - Hwy Garage

1	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Office								
	Existing:	2 - F40T12	1	71.4	2600	185.64	0.0714		
	Proposed:	LUMAPRO Model #: 2ZE23 - 22 Watt bulb	1	22	2600	57.2	0.022	128.44	0.0494
		Proposed lighting controls:							

2	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	bathroom								
	Existing:	incandescent	1	60	2600	156	0.06		
	Proposed:	CFL	1	11	2600	28.6	0.011	127.4	0.049
		Proposed lighting controls:	none						

3	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Garage	Remove							
	Existing:	2-F40 t12	1	142.8	2600	371.28	0.1428		
	Proposed:	2-F40T12	0	142.8	2600	0	0	371.28	0.1428
		Proposed lighting controls:							

4	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Garage	Remove existing channel strip light fixture and replace with LED high bay fixture							
	Existing:	2-F40 t12 - 8 footers	9	157.5	2600	3685.5	1.4175		
	Proposed:	DuroSiteTM LED High Bay Fixture Options and Accessories Occupancy Sensor Version With Oval Light Pattern Part # HB6C4T	2	150	1560	468	0.3	3217.5	1.1175
		Proposed lighting controls:							

5	Location:	Recommendation:	# of Fixtures	Watts	(hrs	(Used)	(Used)	(Saved)	(Saved)
	Outdoor								
	Existing:		2	250	3640	1820	0.5		
	Proposed:		2	250	2080	1040	0.5	780	0
		Proposed lighting controls:							

Lighting Cost/Payback Analysis
Atkinson, New Hampshire - Hwy Garage

KW Rate: 12.82 KWH Rate: 0.08008

Existing System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	4,398		$352	
KW:	20.3004	1.6917	$260.25	$21.69

Proposed System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	553.8		$44	
KW:	3.996	0.333	$51.23	$4.27

Saved	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	3844.62			
KW:	16.3044	1.3587		

Observations: Community Center

Original Design and Current Use

- This Community Center was originally a house built in 1914, with a hall added in 1950. The current use of this building as a community center fits this building well. The building is used by the community for different functions and programs and has an average of 40 to 50 visitors per day, with occupancy averaging 4 to 6 hours a day. One full-time director occupies the building during normal business hours.

Retrofits

- This building has had many retrofits over the years as it transitioned from a house into the Community Center it is today. The recommended retrofit is to add central air conditioning and continue with lighting upgrades.

On-Site Renewable Energy

- There are no recommendations for on-site renewable projects for the Community Center.

Age and Condition of the Mechanical Equipment

- The mechanical equipment in this building is midway through its life expectancy, and is in good condition. The window air conditioners are not the most efficient way to cool the building, and should be replaced with a central air-conditioning system.

Indoor Air Quality

- The indoor air quality in this building was very good during the energy audit. However, the audit was performed during an unoccupied period. It is recommended that the building be sealed, and ventilated through a central air-conditioning unit with demand control ventilation.

Space Temperature and Humidity

- The space temperature was maintained within an acceptable range during the energy audit, and no humidity problems were noted.

R- Value

- The R-Value of this building is what was expected from the age of this building. Even though the R-Value of the walls could be improved, it was determined that other upgrades to the building would produce a better return on investment.

Maintenance

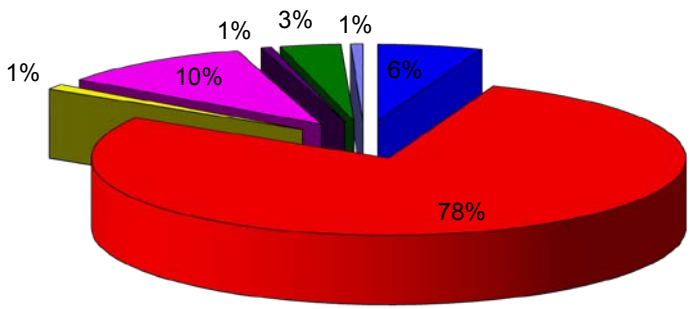
- The maintenance of this building is completed on an as needed basis. Implementing a preventive or condition-based maintenance program would save the town money on both energy and equipment maintenance costs.

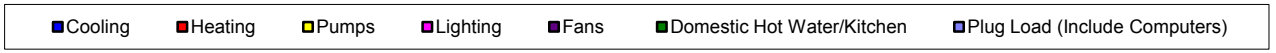
People's Energy Awareness

- Overall, the energy awareness of the people using this building was good. Computers and lights were turned off at night, and HVAC was set back during unoccupied times.

Community Center

ENERGY USAGE PROFILE





Total Facility Consumption	284 (Millions of BTU/hr)
Cooling	5.7%
Heating	78.0%
Pumps	1.1%
Lighting	10.6%
Fans	0.6%
Domestic Hot Water/Kitchen	3.3%
Plug Load (Include Computers)	0.7%
Total	100.0%

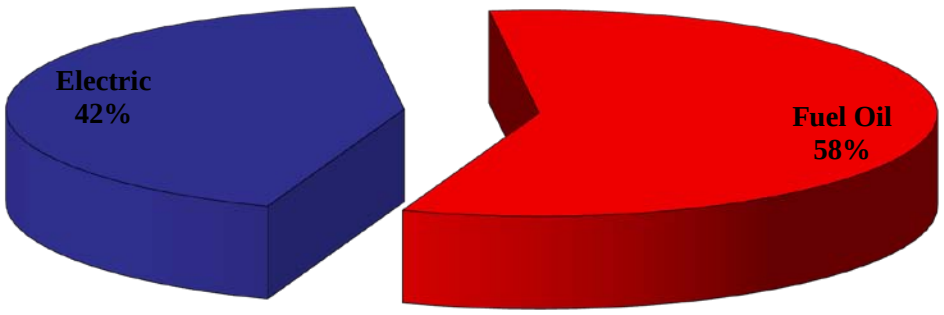
Town of Atkinson, New Hampshire
Community Center
Utility Analysis Period:

8/01/2009 to 7/31/2010

	Current Year			Previous Year		
	8/1/2009	to	7/31/2010	8/1/2008	to	7/31/2009
	Electric		Fuel Oil	Electric		Fuel Oil
Utility Costs	$2,774		$3,761	$3,282		$3,290
Utility Usage	15,517		1,581	15,063		1,775
$ Cost/Unit (kWh, Therm, Gal)	$0.18		$2.38	$0.22		$1.85
	CDD		HDD	CDD		HDD
	419		6,689	324		7,366
Current Year Vs Previous Year	**Electric**		**Fuel Oil**			
Change in Cost	-15%		14%			
Change in Usage	3%		-11%			
Change in $ Cost/Unit	-18%		28%			
Change in Degree Day	29%		-9%			

CDD - Cooling Degree Day
HDD - Heating Degree Day

Utility Cost Comparison Current Year



Energy Benchmarking: Community Center

The calculation of EUI (Energy Use Intensity) is shown below. EUI, expressed in kBtu/sf, is normalized for floor area, the most dominant influence on energy use in most buildings. Its use usually provides a good approximation of how your building's energy performance compares to others. Site EUI indicates the rate at which energy is used at your building (the point of use). Source EUI indicates the rate at which energy is used at the generation sources serving your building (the point of source) and indicates the societal energy penalty due to your building The lower the EUI, the higher the rating, indicating that the building is more efficient than other buildings. The greater the EUI, the lower the rating, indicating that there is an opportunity for higher potential benefits from operational improvements.

To compare the buildings shown below to each other, and to determine the ranking of the buildings from having the most to the least opportunity for demand-side improvements from a financial perspective, please see the Site EUI ranking below.

The Site EUI below has been applied to a Department of Energy statistical model from the Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark. The Department of Energy has estimated energy use and cost reductions for building source EUI ratings (percentiles) in the table below. Please see the DOE Regional Source EUI Comparison graph below to rate your building in relation to the regional distribution of similar type buildings. (Note: The Source EUI includes the inefficiencies of electrical generation and transmission. A reduction in 'electrical' source EUI includes a benefit in terms of reduction of air pollution emissions and green house gases, and is thus an indicator of societal benefit.)

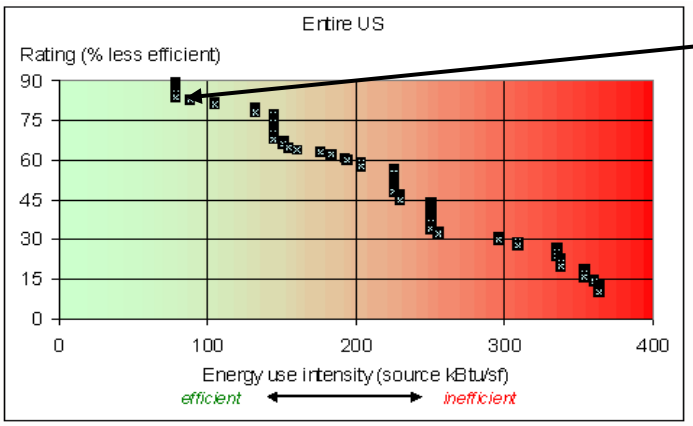
Source EUI Rating for your Building	Energy use and cost reduction potential (%)	Walk-thru energy assessment recommended?
above 60%	below 25%	No
40 to 60%	20 to 35%	Maybe
20 to 40%	35 to 50%	Yes
Below 20%	above 50%	Definitely

Rating from the most efficient to the least efficient - 2010 consumption

Site EUI Rank	Building	Annual Total Electrical Use (kWh)	Annual Total Non-Electrical Fuel Use (Gals)	Occupied Building Gross Floor Area (sq-ft)	Site EUI Rating	Source EUI: Annual Total Source Energy Use per Sq-Ft (kBtu/sf)	Rating (Regional Source EUI Comparison)
1	Community Center	15,517	1,684	6,826	**42**	**58**	**0.80**

Building Type

Public Gathering Space



Source EUI	Est Regional Rating	Building
58	80%	Community Center

Source: Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 25**

Finding Description: **Door weather stripping**

Building: **Community Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Overall, the door weather stripping is in poor condition at the community center. Weather stripping a breaks down over time and with use. Therefore, it is recommended that the door weather stripping at this building be given a high priority at this time. For this type of building and use, it is anticipated that the weather stripping for these doors should be replaced every 8 to 10 years.

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Interior Temp	Avg OA Temp	Hours per Year	BTU/Gallon
0.38	589.6	0.28	1.08	68	34	6,048	117,600

Cooling Savings

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Avg OA Enthalpy	Interior Enthalpy	Hours per Year	Btu/KWH
0.38	589.6	0.28	1	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	40.64 KWH	$4.19
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	0.00 Gallons	$0.00
Estimated Annual Fuel Oil Savings	116.91 Gallons	$318.00
Total Annual Cost Savings		$322.19
Life Expectancy of Equipment (Years)		8
Lifetime Energy Savings		$2,577.53
Estimated Annual Operational Savings		$0.00
Simple Payback Years		2.56
Lifetime Return On Investment		312.39%

Implementation Plan:

The entire perimeter of the entrance doors should be sealed to eliminate heat loss. Sealing kits from American Garage Door Supply are listed in the appendix of this report.

Estimated cost for this installation: $825.10

Description	# Units	Labor and Material Cost/Unit	Total	Source
Entrance Doorjamb Kit	6	$72.70	$436.20	
Entrance Door Bottom Kit	6	$32.50	$195.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$825.10	

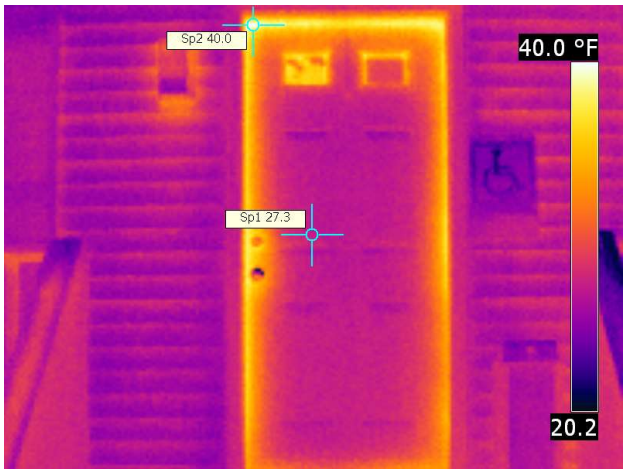
Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Inspection Report

Report Date 11/24/2010

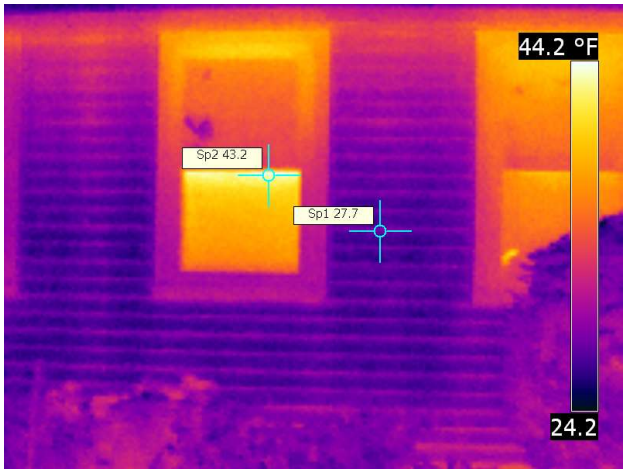
Company	Arbogast Energy Auditing	**Customer**	Town of Atkinson NH
Address	317 Austin St #4	**Site Address**	Community Center
Thermographer	Elmer Arbogast	**Contact Person**	Michelle Veasey



Camera Model	FLIR FLIR T200_ Western
Image Date	11/1/2010 11:42:06 AM
Image Name	IR_2290.jpg
Emissivity	0.95
Reflected apparent temperature	0.0 °F
Object Distance	3.2 ft

Description

Door leakage at the community center



Camera Model	FLIR FLIR T200_ Western
Image Date	11/1/2010 11:41:11 AM
Image Name	IR_2282.jpg
Emissivity	0.95
Reflected apparent temperature	0.0 °F
Object Distance	3.2 ft

Description

Air Leakage around window air conditioner

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 26**

Finding Description: **HVAC - Install central HVAC unit**

Building: **Community Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Install a 4-ton fan coil unit above the ceiling of the main hall and duct to the hall, front meeting rooms, and offices. Unit should have a mixing box and economizer controls. Main thermostat should be located in the hall, and each meeting room should get a thermostat and zone damper. Condensing unit should be located outside and have a minimum SEER rating of 14.

Estimated Economic Impact Summary

Usage in BTU X [(New Eff. – Existing Eff.)/Existing Eff.] Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling Efficiency Improvements

Existing Usage KWH	New Eff.	Existing Eff
3801.6	14	9

Heating Savings- Air leakage

Open Area Square Foot	Avg. Wind Speed - FPM	Diversity Factor	Constant	Interior Temp	Avg OA Temp	Hours per year	BTU/Gallon
0.25	589.6	1	1.08	68	34	6,048	117,600

Estimated Annual Electrical Savings	1,689.60	KWH	$174.39
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	278.36	Gallons	$757.14
Total Annual Cost Savings			$931.53
Life Expectancy of Equipment (Years)			20
Lifetime Energy Savings			$18,630.55
Estimated Annual Operational Savings			$0.00
Simple Payback Years			17.31
Lifetime Return On Investment			115.54%

Implementation Plan:

Install a 4-ton fan coil unit with a DX coil above the ceiling of the main hall. The unit should include a mixing box and have a full size duct run to the outside of economizer and include economizer controls. The air-cooled condensing unit should be located outside next to the hall area in the location most desirable to the town. The unit should be ducted to the hall, two meeting rooms, and the office; a zone damper should be installed for the office and the meeting rooms. The unit should be controlled by a Honeywell HZ 311 zone controller: zone 1, main hall, zone 2, meeting rooms, and zone 3, offices.

Estimated cost for this installation: $16,124.71

Description	# Units	Labor and Material Cost/Unit	Total	Source
Fan Coil Unit	1	$1,240.00	$1,240.00	
Air Cooled Condensing unit	1	$1,355.00	$1,355.00	
Ductwork	1	$8,250.00	$8,250.00	
Refrigeration Piping - Line Set	1	$440.00	$440.00	
Honeywell HZ311 controller	1	$280.00	$280.00	
Honeywell TH4110D1007	3	$71.80	$215.40	
Honeywell ZD damper	3	$185.00	$555.00	
	0	0	0	
Rebates			$0.00	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Total			$16,124.71	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 27**

Finding Description: **HVAC - See Finding #26**

Building: **Community Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Estimated Economic Impact Summary

Estimated Annual Electrical Savings	0.00	KWH
Estimated Annual Electric Demand Savings	0.00	KW
Estimated Annual Propane Savings	0.00	Gallons
Estimated Annual Fuel Oil Savings	0.00	Gallons

Implementation Plan:

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
Honeywell TH4110D1007	0	$0.00	$0.00	
	0	$0.00	$0.00	
Contractor Markup			#DIV/0!	Equivalent of 10% Overhead and 10% Profit
Total			$0.00	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 28**

Finding Description: **HVAC - See Finding #26**

Building: **Community Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

Estimated Economic Impact Summary

Estimated Annual Electrical Savings	0.00	KWH
Estimated Annual Electric Demand Savings	0.00	KW
Estimated Annual Propane Savings	0.00	Gallons
Estimated Annual Fuel Oil Savings	0.00	Gallons

Implementation Plan:

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
	0	$0.00	$0.00	
	0	$0.00	$0.00	
Contractor Markup			#DIV/0!	Equivalent of 10% Overhead and 10% Profit
Total Prior to Unitil Rebate			$0.00	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 29**

Finding Description: **HVAC - Install a high-efficiency propane boiler**

Building: **Community Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

Installing a high-efficiency propane-fired boiler will reduce fuel cost, improve the system efficiency, and pave the way to natural gas conversion.

Estimated Economic Impact Summary

See following calculation sheet.

Estimated Annual Electrical Savings	0.00 KWH	$0.00
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	-1894.52 Gallons	-$3,353.30
Estimated Annual Fuel Oil Savings	1581.00 Gallons	$4,300.32
	Total Annual Cost Savings	$947.02
	Life Expectancy of Equipment (Years)	20
	Lifetime Energy Savings	$18,940.41
	Estimated Annual Operational Savings	$0.00
	Simple Payback Years	5.76
	Lifetime Return On Investment	347.47%

Implementation Plan:

Install a Lochinvar KBN 151 in place of existing Weil McLain oil-fired boiler.

Estimated cost for this installation: $5,450.98

Description	# Units	Labor and Material Cost/Unit	Total	Source
Lochinvar KBN 151	1	$3,650.00	$3,650.00	
Boiler removal	1	$520.00	$520.00	
Boiler installation	1	$1,040.00	$1,040.00	
Contractor Markup			31%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$5,450.98	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

Energy Savings Estimate for:
Boiler Temperature Reset
Community Center
Atkinson NH

Prepared by Elmer Arbogast

10/8/2010

1.2 Boiler Temperature Reset

Baseline average boiler combustion efficiency is 80%
Baseline average boiler jacket, Heat Exchanger and Piping loss is 10%
The average boiler temperature is the temperature of the hot water produced

A. General Data for Baseline and Proposed Operation

B. Baseline Operation

1	Baseline annual boiler BC	1,581	Gallons	Based on usage provided by Customer
2	Baseline average boiler temperature (BT)	200	deg F	Based on Temp of Observed Operation
3	Baseline ave boiler comb efficiency (BBCE)	84.0%		Verified
4	Baseline average boiler jacket loss (BBJL)	15.0%		Baxi Jacket Loss
5	Baseline ave boiler overall efficiency (BBOE)	69.0%		= BBCE - BBJL
6	Annual facility heating requirement (AFHR)	1,091	Gallons	= BC x BBOE

C. Proposed Operation

1	Annual facility heating requirement (AFHR)	1,091	Gallons	= BC x BBOE (same as baseline)
2	Proposed Ave Boiler comb Eff(PBCE)	94%		Lochinvar Published Efficiency
3	Proposed average boiler temperature (PT)	130	deg F	Based Baxi Programming
4	Average reduction in boiler temperature (BTR)	70	deg F	= BT - PT
5	Combustion efficiency improvement (CEI)	13.8%		= (PBCE-BBCE/BBCE) + BTR/36/100
	see http://oee.nrcan.gc.ca/industrial/technical-info/'benchmarking/apma/chapter2.cfm?attr=24			
6	Jacket loss reduction (JLR)	5.3%		= BBJL x (1 - PT/BT)
7	Condensing Boiler Jacket Size Reduction(CBJSR)	5.0%		Jacket Comparison of New to Existing Boilers
8	Proposed ave boiler overall efficiency (PBOE)	88.6%		= BBCE + CEI - (BBJL - JLR)+(CBJSR*(BBJL-JLR)
9	Proposed boiler Condition (PC)	1,231	Gallons	= AFHR/PBOE

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 30**

Finding Description: **Lighting Upgrade**

Building: **Community Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	Yes
Comfort	Yes
Maintenance and Reliability	No

Recommendation:
Replace lighting per attached detail sheet.

Estimated Economic Impact Summary

Energy Savings = [Watts of Existing Fixture-Watts of New Fixture] x Number of Fixtures x Lighting hours per year
See Attached Calculation Sheet

Estimated Annual Electrical Savings	2,798.72	KWH	$288.87
Estimated Annual Electric Demand Savings	33.24	KW	$262.58
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$551.45
		Life Expectancy of Equipment (Years)	8
		Lifetime Energy Savings	$4,411.58
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	6.23
		Lifetime Return On Investment	128.32%

Implementation Plan:
Install recommended lights.

Estimated cost for this installation after rebate: $3,438.06

Description	# Units	Labor and Material Cost/Unit	Total	Source
11-Watt CFL	2	$6.50	$20.00	
9-Watt LED	0	$22.50	$0.00	
T-8 bulbs	42	$2.15	$90.30	
T-8 Ballast	21	$40.28	$845.88	
Wall Packs	5	$420.00	$2,100.00	
	0	$0.00	$0.00	
Contractor Markup			23%	Equivalent of 10% Overhead and 10% Profit
Rebates			$335.00	
Total			$3,773.06	

Recommend Work to be performed by – Town Maintenance

Owner Action – Purchase lights

Lighting Audit Report

Atkinson, New Hampshire

Community Center **Page** **1**

1	Location:	Recommendation:							
	Room 1		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	2	67.2	1800	241.92	0.1344		
	Proposed:	2-F32T8	2	67.2	1800	241.92	0.1344	0	0
		Proposed lighting controls:							
2	Location:	Recommendation:							
	room 2		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	4	67.2	1800	483.84	0.2688		
	Proposed:	2-F32T8	4	67.2	1800	483.84	0.2688	0	0
		Proposed lighting controls:							
3	Location:	Recommendation:							
	Table Storage	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8 -	2	67.2	1800	241.92	0.1344		
	Proposed:	2-F32T8	2	67.2	1800	241.92	0.1344	0	0
		Proposed lighting controls:							
4	Location:	Recommendation:							
	rest room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	CFL	1	13	1800	23.4	0.013		
	Proposed:	CFL	1	13	1800	23.4	0.013	0	0
		Proposed lighting controls:	exhaust not working						
5	Location:	Recommendation:							
	Restrooms		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	CFL	1	13	1800	23.4	0.013		
	Proposed:	CFL	1	13	1800	23.4	0.013	0	0
		Proposed lighting controls:							
6	Location:	Recommendation:							
	Office		**# of Fixtures**	**Watts**	**(hrs**	**(Used)**	**(Used)**	**(Saved)**	**(Saved)**
	Existing:	2-F32T8	2	67.2	1800	241.92	0.1344		
	Proposed:	2-F32T8	2	67.2	1800	241.92	0.1344	0	0
		Proposed lighting controls:							
7	Location:	Recommendation:							
	Hall		**# of Fixtures**	**Watts**	**(hrs**	**(Used)**	**(Used)**	**(Saved)**	**(Saved)**
	Existing:	3-F32T8	20	100.8	1800	3628.8	2.016		
	Proposed:	3-F32T8	20	100.8	1800	3628.8	2.016	0	0
		Proposed lighting controls:							

8	Location:	Recommendation:							
	kitchen	No work in this area	**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	2-F32T8	7	67.2	1800	846.72	0.4704		
	Proposed:	2-F32T8	7	67.2	1800	846.72	0.4704	0	0
		Proposed lighting controls:	None						
9	Location:	Recommendation:							
	Trinity room		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4 - F40T12	6	142.8	1800	1542.24	0.8568		
	Proposed:	2-F32T8	6	33.6	1800	362.88	0.2016	1179.36	0.6552
		Proposed lighting controls:							
10	Location:	Recommendation:							
	Trinity room first floor vest		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4 - F40T12	1	142.8	1800	257.04	0.1428		
	Proposed:	2-F32T8	1	33.6	1800	60.48	0.0336	196.56	0.1092
		Proposed lighting controls:	none						
11	Location:	Recommendation:							
	Trinity Room front vestibule		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4 - F40T12	1	142.8	1800	257.04	0.1428		
	Proposed:	2-F32T8	1	33.6	1800	60.48	0.0336	196.56	0.1092
		Proposed lighting controls:							
12	Location:	Recommendation:							
	bathroom		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	Incandescent	1	60	1040	62.4	0.06		
	Proposed:	CFL	1	11	1040	11.44	0.011	50.96	0.049
		Proposed lighting controls:							
13	Location:	Recommendation:							
	2nd floor office		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4 - F40T12	2	142.8	1040	297.024	0.2856		
	Proposed:	2-F32T8	2	33.6	1040	69.888	0.0672	227.136	0.2184
		Proposed lighting controls:	None						
14	Location:	Recommendation:							
	2nd floor storage		**# of Fixtures**	**Average Watts**	**Usage (hrs ann.)**	**KWH (Used)**	**KW (Used)**	**KWH (Saved)**	**KW (Saved)**
	Existing:	4 - F40T12	10	142.8	600	856.8	1.428		
	Proposed:	2-F32T8	10	33.6	600	201.6	0.336	655.2	1.092
		Proposed lighting controls:	None						

15	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	rear unheated storage								
	Existing:	Incandescent	1	60	600	36	0.06		
	Proposed:	CFL	1	11	600	6.6	0.011	29.4	0.049
		Proposed lighting controls:							

16	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	Side Storage								
	Existing:	2- F40T12	1	71.4	600	42.84	0.0714		
	Proposed:	2-F32T8	1	33.6	600	20.16	0.0336	22.68	0.0378
		Proposed lighting controls:							

17	Location:	Recommendation:	# of Fixtures	Average Watts	Usage (hrs ann.)	KWH (Used)	KW (Used)	KWH (Saved)	KW (Saved)
	basement and rear stair								
	Existing:	CFL	7	11	600	46.2	0.077		
	Proposed:	CFL	7	11	600	46.2	0.077	0	0
		Proposed lighting controls:							

1	Location:	Recommendation:	# of Fixtures	Watts	(hrs	(Used)	(Used)	(Saved)	(Saved)
	Outdoor								
	Existing:	Wall Pack	5	126	2000	1260	0.63		
	Proposed:	LED Wall Pack	5	36	2000	360	0.18	900	0.45
		Proposed lighting controls:							

Lighting Cost/Payback Analysis
Community Center

KW Rate: 12.82 KWH Rate: 0.08008

Existing System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	6,761		$0	
KW:	4.9228	4.9228	$0.00	$0.00
Proposed System	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	3302.848		$0	
KW:	25.836	2.153	$0.00	$0.00
Saved	**Annual**	**Monthly**	**Annual $**	**Monthly $**
KWH:	3457.856		$0	
KW:	33.2376	2.7698	$0.00	$0.00

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 31**

Finding Description: **Install Timer on water heater**

Building: **Community Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	Yes
Maintenance and Reliability	Yes

Recommendation:

It was observed during the energy audit that the electric hot water heater was on when the space was not occupied. Installing a time clock will shut off the water heater when space is unoccupied but ensure hot water when needed.

Estimated Economic Impact Summary

Energy Savings = KW of Water Heater * Reduce Run-time from Time Clock

Btu/hr	Reduced Run Hours	
40,000	182.5	Based on reducing the run-time of the water heater by 1/2 hour per day

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	80.22	Gallons	$141.99
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$141.99
		Life Expectancy of Equipment (Years)	15
		Lifetime Energy Savings	$2,129.84
		Estimated Annual Operational Savings	$0.00
		Simple Payback Years	1.24
		Lifetime Return On Investment	1214.10%

Implementation Plan

Time clock should be installed in the power wiring of the water heater and set 1 hour prior to space being occupied and shut off 1/2 hour prior to space being unoccupied.

Estimated cost for this installation: $175.42

Description	# Units	Labor and Material Cost/Unit	Total	Source
INTERMATIC Model # EI600WC	1	$134.20	$134.20	
	0	$0.00	$0.00	
Contractor Markup			31%	Equivalent of 10% Overhead and 10% Profit
Rebates			$0.00	
Total			$175.42	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 64**

Finding Description: **Weatherization - Convert windows to inoperable and caulk**

Building: **Community Center**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

The windows in the Community Center leak, and if there is no plan to replace them, they should be repaired and caulked.

Energy Savings Heating = Open Area X Avg. Wind Speed X Diversity Factor X 1.08 X (Interior Temperature – Avg. OA Temperature Heating Season) X Hours/Day X Days/Year

Energy Savings Cooling = [(Open Area X Avg. Wind Speed X Diversity Factor)/13.8] X (Avg. OA Enthalpy Cooling Season - Interior Enthalpy) X Hours/Day X Days/Year

Heating Savings

Open Area	Avg. Wind	Diversity	Constant	Interior	Avg OA Temp	Hours per year	BTU/gal
1.13	589.6	0.1	1.08	68	34	6,048	112,000

Cooling Savings

Open Area	Avg. Wind	Diversity	Constant	Avg OA	Interior Enthalpy	Hours per year	BTU/gal
1.13	589.6	0.1	1	28	25.5	2,688	10,236

Estimated Annual Electrical Savings	43.55	KWH	$4.49
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	131.52	Gallons	$357.75
Total Annual Cost Savings			$362.24
Life Expectancy of Equipment (Years)			10
Lifetime Energy Savings			$3,622.41
Estimated Annual Operational Savings			$140.00
Simple Payback Years			8.10
Lifetime Return On Investment			123.48%

Implementation Plan:

Caulk windows to stop air leakage.

Estimated cost for this installation: $2,933.59

Description	# Units	Labor and Material Cost/Unit	Total	Source
Caulking	30	$43.48	$1,304.40	
Repairs	10	$93.98	$939.80	
Contractor Markup			31%	Equivalent of 15% Overhead and 10% Profit
Rebates			$0.00	
Total			$2,933.59	

Recommend work to be performed by: Qualified Contractor

Owner action: Solicit bids from contractor

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **57**

Finding Description: **Thermal Solar**

Building: **All Buildings - Except Police**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

When evaluating Thermal solar application for the town of Atkinson building, I found one building with a potential fit. The best candidate would be the Police Department and an evaluation of this application is in this report. The main reason the town of Atkinson buildings do not have a good fit with PV solar is the lack of south-facing roofs that do not have shading

Estimated Economic Impact Summary

Thermal solar is an on-site renewable energy which would reduce the town's purchased fuel.

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$0.00
		Life Expectancy of Equipment (years)	1
		Life Time Energy Savings	$0.00
		Estimated Annual Operational Savings	$0.00

Implementation Plan:

As Thermal solar technology improves and the price of the panels decreases the town should have buildings reevaluated for the application of Thermal Solar.

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
Contractor Markup			0%	Equivalent of 10% Overhead and 10% Profit
Total			$0.00	

Recommend work to be performed by: Qualified Consultant

Owner action: Have Application revaluated in 3 years

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS | **Finding #** 58

Finding Description: Wind energy

Building: All Buildings

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	No

Recommendation:

When evaluating wind energy application for the town of Atkinson buildings I did not find a fit. The main reason the town of Atkinson buildings do not fit with wind energy is the lack of maintained wind.

Estimated Economic Impact Summary

Wind power is an on-site renewable energy which would reduce the town's purchased electric.

Estimated Annual Electrical Savings	0.00 KWH	$0.00
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	0.00 Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00 Gallons	$0.00
	Total Annual Cost Savings	$0.00
	Life Expectancy of Equipment (years)	1
	Life Time Energy Savings	$0.00
	Estimated Annual Operational Savings	$0.00

Implementation Plan:

As wind power technology improves and the price of the panels decreases the town should have buildings reevaluated for the application of wind power.

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
Contractor Markup			0%	Equivalent of 10% Overhead and 10% Profit
Total			$0.00	

Recommend work to be performed by: Qualified Consultant

Owner action: Have Application revaluated in 3 years

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 59**

Finding Description: **Combine Heat and Power**

Building: **All Buildings - Except Town Hall**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	No
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

When evaluating combined heat and power application for the town of Atkinson buildings, the best fit would be the Town Hall. The best potential fit would be Micro-CHP, The town of Atkinson does not have a central heating plant and therefore is not a fit for the steam-based CHP.

Estimated Economic Impact Summary

Combined Heat and Power (CHP) is an on-site electrical production which would reduce the town's purchased electric while using the waste heat from this process to heat their buildings.

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$0.00
		Life Expectancy of Equipment (years)	1
		Life Time Energy Savings	$0.00
		Estimated Annual Operational Savings	$0.00

Implementation Plan:

If the town was going to build a central district heat plant, then CHP should be part of that project. District heating is addressed later in this report.

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
Contractor Markup			0%	Equivalent of 10% Overhead and 10% Profit
Total			$0.00	

Recommend work to be performed by: Qualified Consultant

Owner action: Have Application revaluated in 3 years

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **60**

Finding Description: **District Heating**

Building: **All Buildings**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

When evaluating district heat application for the town of Atkinson, I did not find a fit. I would not recommend that the town build a district heating plant; however, if an outside source was planning to build a large heating plant to burn waste wood and was willing to sell the town heat then, I would recommend the town investigate this option. The contract should be written such that it guarantees the town a lower BTU cost than oil or propane.

Estimated Economic Impact Summary

District heating is a heat production and delivery method that allows small communities to take advantage of large-scale heat production. This includes burning of waste wood products and combining heat and power and other central heating plant-saving methods.

Estimated Annual Electrical Savings	0.00 KWH	$0.00
Estimated Annual Electric Demand Savings	0.00 KW	$0.00
Estimated Annual Propane Savings	0.00 Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00 Gallons	$0.00
	Total Annual Cost Savings	$0.00
	Life Expectancy of Equipment (years)	1
	Life Time Energy Savings	$0.00
	Estimated Annual Operational Savings	$0.00

Implementation Plan:

No action at this time unless approached by outside source that wants to install a district heating source.

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
Contractor Markup			0%	Equivalent of 10% Overhead and 10% Profit
Total			$0.00	

Recommend work to be performed by: Qualified Consultant

Owner action: Have Application revaluated in 3 years

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **61**

Finding Description: **Bio Energy**

Building: **All Buildings**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	No
Demand Savings	No
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

When evaluating bioenergy application for the town of Atkinson buildings, I did not find a fit. The best fit for bioenergy for the town's buildings would be wood pellets. However, due to to the low usage of fuel by the town's buildings, I could not justify an application at any of the buildings.

Estimated Economic Impact Summary

Biownergy is the use of bio products such as wood that is renewable to heat buildings versus using fossil fuels which are . in limited supply.

Estimated Annual Electrical Savings	0.00	KWH	$0.00
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	0.00	Gallons	$0.00
Estimated Annual Fuel Oil Savings	0.00	Gallons	$0.00
		Total Annual Cost Savings	$0.00
		Life Expectancy of Equipment (years)	1
		Life Time Energy Savings	$0.00
		Estimated Annual Operational Savings	$0.00

Implementation Plan:

No action at this time.

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
Contractor Markup			0%	Equivalent of 10% Overhead and 10% Profit
Total			$0.00	

Recommend work to be performed by: Qualified Consultant

Owner action: Have Application revaluated in 3 years

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding #** **62**

Finding Description: **Yearly Energy Review**

Building: **All Buildings**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	No
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

Energy usage tends to drift higher as people lose focus on saving energy. In addition, technology is constantly advancing, and recommendations that did not make sense today might make sense in a few years. In addition continually reviewing energy usage would create behavior changes that would reduce energy usage.

Estimated Economic Impact Summary

Energy awareness creates energy savings by having people stay focused on energy savings and latest technology. .

Estimated Annual Electrical Savings	4801.83	KWH	$495.62
Estimated Annual Electric Demand Savings	0.00	KW	$0.00
Estimated Annual Propane Savings	414.24	Gallons	$733.20
Estimated Annual Fuel Oil Savings	45.45	Gallons	$123.63
		Total Annual Cost Savings	$1,352.44
		Life Expectancy of Equipment (years)	1
		Life Time Energy Savings	$1,352.44
		Estimated Annual Operational Savings	$0.00

Implementation Plan:

Have a qualified consultant review energy usage and Energy Star Portfolio Manager yearly. Cost would be $720.00 for 2011, and anticipate an increase of 5% per year thereafter.

Estimated cost for this installation: $0.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
Contractor Markup			0%	Equivalent of 10% Overhead and 10% Profit
Total			$0.00	

Recommend Work to be performed by – Qualified Consultant

Owner Action – Hire Qualified consultant

FINDINGS, RECOMMENDATIONS & IMPLEMENTATION

DETAILED FINDINGS **Finding # 63**

Finding Description: **Real-time Monitoring**

Building: **All Buildings**

General Finding Impacts

Energy Savings	Yes
Fuel Savings	Yes
Electrical Energy Savings	Yes
Demand Savings	Yes
Indoor Air Quality	No
Comfort	No
Maintenance and Reliability	Yes

Recommendation:

The best way to increase energy awareness and improve the energy behavior of the occupants of a building is to provide feedback to them as quickly as possible. Providing real-time utility monitoring would improve the occupant's energy awareness and also identify problems much more quickly. The monitoring could be fed back to a website which could be made viewable by the public at large or can be password protected.

Estimated Economic Impact Summary

Energy awareness creates energy savings by having people stay focused on energy savings and the latest technology. In addition, real-time monitoring identifies increases in energy usage very quickly. Alarms can be set up on high-energy usage at different times of the day. These alarms can identify problems in the buildings that are causing increased energy usage, e.g., night setback overridden and boiler running at night when it should be shut off. Savings of 5% of utility cost is the average of sites that have implemented this program, for example the University of Wisconsin, Madison Campus, and the U.S. Department of Defense.

Estimated Annual Electrical Savings	4,801.83	KWH	$495.62
Estimated Annual Electric Demand Savings	5.51	KW	$43.55
Estimated Annual Propane Savings	414.24	Gallons	$733.20
Estimated Annual Fuel Oil Savings	151.51	Gallons	$412.09
		Total Annual Cost Savings	$1,684.46
		Life Expectancy of Equipment (years)	1
		Life Time Energy Savings	$1,684.46
		Estimated Annual Operational Savings	$0.00

Implementation Plan:

Have a qualified firm monitor energy usage in real time. Arbogast Energy Auditing would provide this service at an annual cost of $4,800.00 for 2011, 2012, and 2013 and would require a 3-year contract. Anticipate an increase of 5% per year after the first 3 years. This cost includes all of the town buildings included in this report.

Estimated cost for this installation: $4,800.00

Description	# Units	Labor and Material Cost/Unit	Total	Source
Contractor Markup			0%	Equivalent of 10% Overhead and 10% Profit
Total			$0.00	
Rebates - Estimated Potential			$0.00	

Recommend Work to be performed by – Qualified Consultant

Owner Action – Hire Qualified consultant

Glossary of Standard Energy Auditing Terms

Absolute Pressure
Gauge pressure plus atmospheric pressure.

Absolute Temperature
Temperature measured from absolute zero.

Absolute Zero Temperature
Temperature at which all molecular motion ceases(-460 F. and -273 C.)

Absorbent
Substance with the ability to take up or absorb another substance.

Absorption Refrigerator
Refrigerator which creates low temperature by using the cooling effect formed when a refrigerant is absorbed by chemical substance.

ACCA
A leading HVAC/R Association - http://www.acca.org/

Accumulator
Storage tank which receives liquid refrigerant from evaporator and prevents it from flowing into suction line before vaporizing.

ACH, Air Changes Per Hour
The number of times that air in a house is completely replaced with outdoor air in one hour.

Actuator
That portion of a regulating valve which converts mechanical fluid, thermal energy or electrical energy into mechanical motion to open or close the valve seats.

Add On Heat Pump
Installing a heat pump in conjunction with an existing fossil fuel furnace.

Adiabatic Compression
Compressing refrigerant gas without removing or adding heat.

Adsorbent
Substance with the property to hold molecules of fluids without causing a chemical or physical damage.

Aeration
Act of combining substance with air.

AFUE
Annual Fuel Utilization Efficiency -ratio of annual output of useful energy or heat to the annual energy input to the furnace

Agitator
Device used to cause motion in confined fluid.

AHU (Air Handler Unit)
The inside part of the A/C system that contains the blower, cooling (evaporator) coil, and heater.

Air Change
The amount of air required to completely replace the air in a room or building; not to be confused with recirculated air

Air Cleaner
Device used for removal of airborne impurities.

Air Coil
Coil on some types of heat pumps used either as an evaporator or condenser.

Air Conditioner
Device used to control temperature, humidity, cleanliness and movement of air in a confined space.

Air Conditioning
Control of the temperature, humidity, air movement and cleaning of air in a confined space.

Air Cooler
Mechanism designed to lower temperature of air passing through it.

Air Diffuser
Air distribution outlet or grille designed to direct airflow into desired patterns.

Air Diffusion
Distribution of the air in a space, called the treated space, by means of devices, called air terminal devices, in a manner so as to meet certain specified conditions, such as air change rate, pressure, cleanliness, temperature, humidity, air velocity and noise level.

Air Distribution
The transportation of a specified air flow to or from the treated space or spaces, generally by means of ductwork.

Air Gap
The space between magnetic poles or between rotating and stationary assemblies in a motor or generator.

Air Handler
Fan-blower, filter and housing parts of a system.

Air Infiltration
Leakage of air into rooms through cracks, windows doors and other openings.

Air Source Equipment
Heat pumps or air conditioners that uses the outdoor air to transfer heat to and from the refrigerant in the unit.

Air Terminal Device
A device located in an opening provided at the boundaries of the treated space to ensure a predetermined motion of air in this space.

Air-Cooled Condenser
Heat of compression, plus the heat of absorption, is transferred from refrigerant within coil to surrounding air, either by convection or fan or blower.

Airflow
The distribution or movement of air

Ak value (of an air terminal device)
Quotient obtained by dividing a measured air flow rate by a measured air velocity according to a specific process and a specific instrument.

ARI (Air-Conditioning and Refrigeration Institute)
Air-Conditioning and Refrigeration Institute is a nonprofit, voluntary organization comprised of heating, air conditioning and refrigeration manufacturers. ARI publishes standards for testing and rating heat pumps and air conditioners to provide you with a standardized measure of comparison. So, ARI ensures a level of performance within the industry.

ASHRAE
A leading HVAC/R Association - American Society of Heating, Refrigerating and Air Conditioning Engineers - http://www.ashrae.org/

ASTM
American Society for Testing and Materials.

Backdrafting
Reverse flow of combustion gases down the chimney of a vented combustion appliance, which is often caused by depressurization of the room where the appliance is located.

Balance Point
The lowest outdoor temperature at which the refrigeration cycle of a heat pump will supply the heating requirements without the aid of a supplementary heat source.

Balancing
Process of adjusting the flow of air in duct systems, or water flow in hot-water heating systems.

BAS (Building Automation System)
A building automation system (BAS) is an example of a distributed control system. The control system is a computerized, intelligent network of electronic devices, designed to monitor and control the mechanical and lighting systems in a building.

Blower (Fan)
An air handling device for moving air in a distribution system.

BTU (British Thermal Unit)
Quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

CAE (Combined Annual Efficiency)
A measure of the amount of heat produced for every dollar of fuel consumed for both home heating and water heating.

Capacity
The ability of a heating or cooling system to heat or cool a given amount of space. For heating, this is usually expressed in BTUs. For cooling, it is usually given in tons.

Carbon Monoxide
A colorless, odorless, highly poisonous gas produced when carbon burns without sufficient air nearby.

Carboxyhemogoblin Saturation
Carbon monoxide poisoning.

CDD
"Cooling degree days", or "CDD", are a measure of how much (in degrees), and for how long (in days), outside air temperature was higher than a specific base temperature. They are used for calculations relating to the energy consumption required to cool buildings.

CFC (Chlorofluorocarbon)
A class of refrigerants. Generally refers to the Chlorofluorocarbon family of refrigerants. Sometimes called Freon

CFM (Cubic Feet per Minute)
A standard measurement of airflow that indicates how many cubic feet of air pass by a stationary point in one minute. The higher the number, the more air is being forced through the system. A typical system produces 400 CFM per ton of air conditioning.

CHP
Combine Heat and Power

Charge
Amount of refrigerant placed in a refrigerating unit.

Comfort Zone
The range of temperatures, humidities and air velocities at which the greatest percentage of people feel comfortable.

Compressor
Pump of a refrigerating mechanism which draws a low pressure on cooling side of refrigerant cycle and squeezes or compresses the gas into the high pressure or condensing side of the cycle.

Condenser Coil
Part of the outdoor portion of a split-system air conditioner or heat pump. By converting refrigerant that is in a gas form back to a liquid, the coil sends heat carried by the refrigerant to the outside.

Condensing Unit
Part of a refrigerating mechanism which pumps vaporized refrigerant from the evaporator, compresses it, liquefies it in the condenser and returns it to the refrigerant control

Conduction
The transfer of heat through a solid material.

Convection
The movement of heat by air flow.

COP (Coefficient Of Performance)
COP compares the heating capacity of a heat pump to the amount of electricity required to operate the heat pump in the heating mode.

DAMPER
A device that is located in ductwork to adjust air flow.

DB
Dry Bulb Temperature

db (Decibel)
A decibel describes the relative loudness of a sound

Demand Charge - Electric
The charge that recovers certain costs which vary with the demand for, or the rate at which, general service customers consume electricity. Electric demand is expressed in kilowatts (kW) or in kilovoltamperes (kVA).

Defrost Cycle
The process of removing ice or frost buildup from the outdoor coil during the heating season.

Dehumidification
The reduction of water vapor in air by cooling the air below the dew point; removal of water vapor from air by chemical means, refrigeration, etc.

Design Conditions
Cooling loads vary with inside and outside conditions. A set of conditions specific to the local climate are necessary to calculate the expected cooling load for a home. Inside conditions of 75 degrees Fahrenheit and 50% relative humidity are usually recommended as a guideline. Outside conditions are selected for the 2.5% design point.

Direct Gas-Fired Heater
The burner fires directly in the air stream being heated, rather than through a heat exchanger. 100% of available BTUs are delivered to the heated space because no flue or heat exchanger is required. This results in no wasted energy.

DOE (Department of Energy)
The Department of Energy is a federal agency in charge of setting industry efficiency standards and monitoring the consumption of energy sources.

Downflow
A type of furnace that takes cool air from the top and blows warm air to the bottom.

Drier
Sometimes called filter/drier, it removes moisture and keeps the refrigerant clean.

Duct
A pipe or closed conduit made of sheet metal, fiberglass board, or other suitable material used for conducting air to and from an air handling unit.

DUCTWORK
The delivery system through which warm air from the furnace is brought to where it's needed.

EER (Energy Efficiency Ratio)
A ratio calculated by dividing the cooling capacity in Btu's per hour (Btuh) by the power input in watts at any given set of rating conditions, expressed in Btuh per watt (Btuh/watt). EER & SEER can not be compared equally. Air source equipment is rated by SEER and geothermal equipment is rated by EER. EER changes with the inside and outside conditions, falling as the temperature difference between inside and outside gets larger.

Efficiency
A rating on comfort equipment is similar to the miles per gallon rating on your car.

ENERGY RECOVERY VENTILATOR (ERV)
This device preheats incoming outside air during the winter and pre-cools incoming air during the summer to reduce the impact of heating and or cooling the indoor air.

EPA (Environmental Protection Agency)
Environmental Protection Agency - http://www.epa.gov/

Evaporator Coil
Part of a split-system air conditioner or heat pump located indoors. The evaporator coil cools and dehumidifies the air by converting liquid refrigerant into a gas, which absorbs the heat from the air. The warmed refrigerant is then carried through a tube to the outdoor unit (condenser coil).

Exfiltration
Uncontrolled air leakage out of a building.

Exhaust
The air flow leaving the treated space.

Filter
A device for removing dust particles from air or unwanted elements from liquids.

Filter
A device for removing dust particles from air or unwanted elements from liquids.

Flow hood
A diagnostic tool used to measure air flow through ducts, supply registers, and return grilles.

FORCED AIR
This describes a type of heating system that uses a blower motor to move air through the furnace and into the ductwork.

Forced Air
This describes a type of heating system that uses a blower motor to move air through the furnace and into the ductwork.

Furnace
That part of an environmental system which converts gas, oil, electricity or other fuel into heat for distribution within a structure.

Geothermal Equipment
Heat pumps that uses the ground to transfer heat to and from the refrigerant in the unit. The unit circulates water through a heat exchanger in the to a closed loop buried in the ground or by pumping water from a well through the unit.

HCFC (Hydrochlorofluorocarbon)
A class of refrigerants. Generally refers to Halogenated Chlorofluorocarbon family of refrigerants.

HDD
"Heating degree days", or "HDD", are a measure of how much (in degrees), and for how long (in days), outside air temperature was lower than a specific "base temperature" (or "balance point"). They are used for calculations relating to the energy consumption required to heat buildings.

HEAT EXCHANGER
Device that enables furnaces to transfer heat from combustion safely into breathable air. The primary heat exchanger transfers heat from combustion gases to the air blowing through the ductwork.

Heat Exchanger
This is a device that enables furnaces to transfer heat from combustion safely into breathable air. The primary heat exchanger transfers heat from combustion gases to the air blowing through the ductwork.

Heat Gain
The amount of heat gained, measured in BTU's, from a space to be conditioned, at the local summer outdoor design temperature and a specified indoor design condition.

Heat Loss
The amount of heat lost, measured in BTU's from a space to be conditioned, at the local winter outdoor design temperature and a specified indoor design condition.

Heat Pump
Compression cycle system used to supply heat to a temperature controlled space. Same system can also remove heat from the same space.

HEAT RECOVERY VENTILATOR (HRV)
This device bring fresh, outside air into a home while simultaneously exhausting stale indoor air outside. In the process of doing this, an HRV removes heat from the exhaust air and transfers it to the incoming air, pre-heating it.

HFC (Hydrofluorocarbon)
A class of refrigerants. Generally refers to Hydrofluorocarbon family of refrigerants

Humidifier
A device that adds moisture to warm air being circulated or directed into a space.

Humidistat
A device designed to regulate humidity input by reacting to changes in the moisture content of the air.

Humidity
The amount of moisture in the air. Air conditioners remove moisture for added comfort.

HVAC
Heating, Ventilating and Air Conditioning

HVAC/R
Heating, Ventilating, Air Conditioning, & Refrigeration

IAQ
Indoor Air Quality

Induction
Process by which the primary air sets into motion an air volume, called secondary air, in the room.

Induction ratio (i)
Ratio of the total air flow rate to the primary air flow rate.

Infiltration
Air flow inward into a space through walls, leaks around doors and windows or through the building materials used in the structure.

ISO 9000
A family of international standards for quality management and assurance by the ISO (International Standards Organization).

kBTU (Kilo British Thermal Unit)
1000 BTUs Quantity of heat required to raise the temperature of one thousand pounds of water one degree Fahrenheit.

kW
kilowatt, equals 1,000 watts.

kWh
kilowatt hour is the amount of kilowatts of electricity used in one hour of operation of any equipment.

Latent Cooling Load
The net amount of moisture added to the inside air by plants, people, cooking, infiltration, and any other moisture source. The amount of moisture in the air can be calculated from a combination of dry-bulb and wet-bulb temperature measurements.

Latent Heat
Heat, that when added or removed, causes a change in state - but no change in temperature.

Load Estimate
A series of studies performed to determine the heating or cooling requirements of your home. An energy load analysis uses information such as the square footage of your home, window and door areas, insulation quality and local climate to determine the heating and cooling capacity needed by your furnace, heat pump or air conditioner.

Lon or LonWorks
LonWorks is a networking platform specifically created to address the needs of control applications. The platform is built on a protocol created by Echelon Corporation for networking devices over media such as twisted pair, power lines, fiber optics, and RF.

Manometer
An instrument that measures air pressure differences between locations. Tubes are usually attached to a manometer and run to the spaces where pressures are measured.

OAT
Outside Air Temperature

Pascals (Pa)
A small unit of air pressure.

ppm
Parts per million

Plenum
Air flow passage made of duct board, metal, drywall, or wood. Joins supply and return ducts with HVAC equipment.

Radiation
The transfer of heat directly from one surface to another (without heating the intermediate air acting as a transfer mechanism).

Reciprocating Compressor
A type of compressor used in air conditioners that compresses refrigerant by using a type of "piston" action.

Refrigerant
Substance used in refrigerating mechanism. It absorbs heat in evaporator by change of state from a liquid to a gas, and releases its heat in a condenser as the substance returns from the gaseous state back to a liquid state.

Register
Combination grille and damper assembly covering an air opening or end of an air duct.

Return Air
Air drawn into a heating unit after having been circulated from the heater's output supply to a room.

RH
Relative Humidity

RSES
A leading HVAC/R Association - Refrigeration Service Engineers Society - http://www.rses.org/

Saturation Temperature
Also referred to as the boiling point or the condensing temperature. This is the temperature at which a refrigerant will change state from a liquid to a vapor or visa versa.

SEER (Seasonal Energy Efficiency Ratio)
The total cooling of a central unitary air conditioner or unitary heat pump in Btu's during its normal annual usage period for cooling divided by the total electric energy input in watt-hours during the same period.

Sensible Cooling Load
The heat gain of the home due to conduction, solar radiation, infiltration, appliances, people, and pets. Burning a light bulb, for example, adds only sensible load to the house. This sensible load raises the dry-bulb temperature.

Sensible Heat
Heat, that when added or removed, causes a change in temperature but not in state.

Setpoint
The temperature to which a thermostat is set to result in a desired heated space temperature.

Sizing
Refers to the procedure a heating contractor goes through to determine how large a furnace (measured in btuh) is needed to heat a house efficiently.

Solarize Window Inflectors (Solarize Inflectors)
See through insulating system that can be installed on the inside of any window that will reduce both Summer air conditioning and Winter heating costs. More Information can be found at http://solarizewindowinsulators.com/

Sound Attenuators
Components which are inserted into the air distribution system and designed to reduce airborne noise which is propagated along the ducts.

Split System
Refrigeration or air conditioning installation, which places condensing unit outside or away from evaporator. These unit are connected together by a supply and return refrigerant lines.

Spread (LS)
Maximum distance between two vertical planes tangent to a specified envelope and perpendicular to a plane through the core center. The spread are generally referred to the envelope corresponding to 0.25 m/s for zero supply temperature differential (i.e., under isothermal conditions).

Subcooled Liquid
Liquid refrigerant which is cooled below its saturation temperature.

Superheated Vapor
Refrigerant vapor which is heated above its saturation temperature. If a refrigerant is superheated, there is no liquid present.

Supply
The ductwork that carries air from the air handler to the rooms in the house.

Switchover Valve
A device in a heat pump that reverses the flow of refrigerant as the system is switched from cooling to heating. Also called a reversing valve or four-way valve.

THERM
Another measurement of heat. One therm equals 100,000 BTUH.

Thermostat
A temperature sensitive switch for controlling the operation of a heater or furnace.

Throw (Lt)
The maximum distance between the center of the core and a plane which is tangent to a specified envelope and perpendicular to the intended direction of flow The throw is generally referred to as the envelope corresponding to 0.25 m/s for zero supply temperature differential (i.e., under isothermal conditions).

Time Delay
Usually refers to a device that will not allow the condenser to restart for an average of 5 minutes.

Ton
A unit of measure for cooling capacity. One ton = 12,000 BTUs per hour.

Total air flow rate (QL)
Sum of the primary and secondary air flow rates which are moved in the treated space.

Upflow
A type of furnace that draws cool air from the bottom and blows the warmed air out the top into the duct work. This type of furnace is usually installed in a basement or an out-of-the-way closet.

VAV
Variable Air Volume.

Ventilator
Captures heating or cooling energy from stale indoor air and transfers it to fresh incoming air.

VFD
Variable Frequency Drive, Electronic speed control for motors.

W
Watt, a unit of electricity.

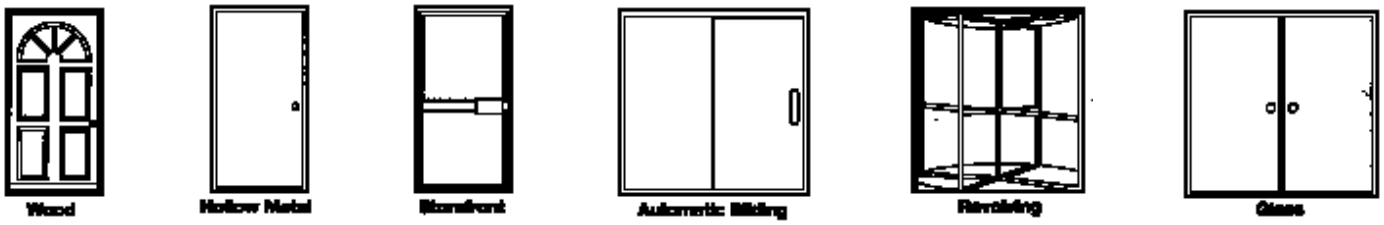
WB
Wet Bulb

WC (Water Column)
Common measure of air pressure used in HVAC systems.

Wet-bulb Temperature
When a wet wick is placed over a standard thermometer and air is blown across the surface, the water evaporates and cools the thermometer below the dry-bulb temperature. This cooler temperature (called the wet-bulb temperature) depends on how much moisture is in the air.

Zone
1) Conditioned space in a house under the control of a thermostat. 2) A space within a house with a distinct pressure compared to other pressure zones.

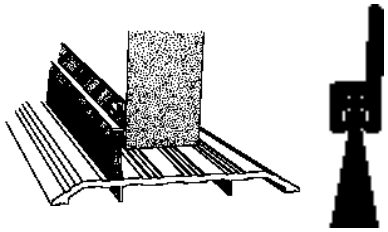
Zoning
A system in which living areas or groups of rooms are divided into separate spaces and each space's heating/air conditioning is controlled independently.



Keeps Out: • **Drafts** • **Wind** • **Light** • **Rain** • **Insects** • **Snow** • **Noise** • **Sleet** • **Dust** • **Fumes** • **Sand** • **Rodents**

The importance of sealing openings in a building applies to entrance doors just as it does to overhead doors. Any gap around a door causes energy loss due to air infiltration. Dirt and debris are just as much of a problem. Brush designed Door Bottom Seals and Door Jamb Seals provide the most effective means of solving these problems. Mounted using special finished holders, brush weatherseals provide an attractive and effective solution to gaps for any door.

Door Bottom Seal Kits



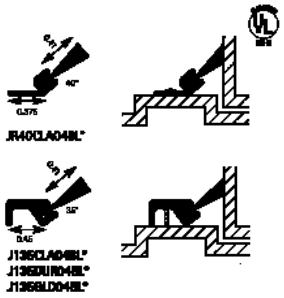
Kit Product Code	Brush Length	Door Bottom Width	Price ea.
A180CLA04BL3	0.41″	3′	$10.40
A180CLA04BL3.5	0.41″	3.5	12.00
A180CLA04BL4	0.41″	4′	13.65
B210CLA05BL3	0.53″	3′	11.40
B210CLA05BL3.5	0.53″	3.5′	13.00
B210CLA05BL4	0.53″	4′	14.65
C380CLA06BL3	0.59″	3′	12.35
C380CLA06BL3.5	0.59″	3.5′	13.65
C380CLA06BL4	0.59″	4′	15.60
D480CLA09BL3	0.94″	3′	14.95
D480CLA09BL3.5	0.94″	3.5′	17.55
D480CLA09BL4	0.94″	4′	19.85

Other lengths and finishes available

Aluminum door sweeps in both clear and adonized finish with black brush are the perfect compliment to corresponding door jamb seals. The Aluminum holders are pre-slotted for ease of installation and sweeps are prepackaged for fasteners for 3′, 3.5′ and 4′ doors.

Jamb Seal Kits

Kit Product Code	Door Size	Holder Length	Brush Size	Price ea.
JR40CLA04BL17	3′ x 7′	.375	.41	$34.80
JR40CLA04BL18	4′ x 7′	.375	.41	36.40
JR40CLA04BL20	6′ x 7′	.375	.41	40.65
J135CLA04BL17	3′ x 7′	.450	.41	55.25
J135CLA04BL18	4′ x 7′	.450	.41	59.80
J135CLA04BL20	6′ x 7′	.450	.41	62.40

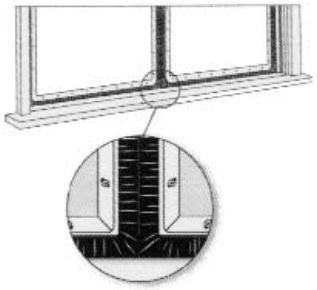


Kit Product Code	Door Size	Holder Length	Brush Size	Price ea.
J140CLA04BL17	3′ x 7′	.750	.41	56.00
J140CLA04BL48	4′ x 7′	.750	.41	58.50
J140CLA04BL20	6′ x 7′	.750	.41	66.50
VX75BLK				1.95/Ft.

JR40 and J140 kits come with screw slots for after-installation adjustments. J135 kits have countersunk screw holes for a neat flush finish. Fasteners and installation instructions are provided with all kits.

All jamb seals have clear anodoized finish.
Other finishes are available.

Jamb seal kits apply to the header and jamb only.



AstraSweep™ Jamb Seal Kits

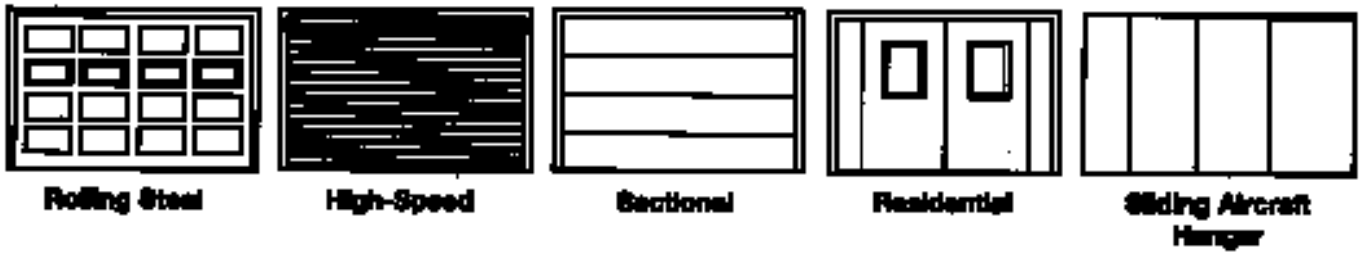
Kit Product Code	Door Size W x H	Finish Color	Price ea.
C380CLA06BL67	6′ x 7′	Clear Andodized	97.50
C380DUR06BL67	6′ x 7′	Duradonic	122.00
C380CLA06BL68	6′ x 8′	Clear Andodized	104.00
C380DUR06BL68	6′ x 8′	Duradonic	131.00
C380CLA06BL77	7′ x 7′	Clear Andodized	100.00
C380DUR06BL77	7′ x 7′	Duradonic	126.00
C380CLA06BL78	7′ x 8′	Clear Andodized	108.00
C380DUR06BL78	7′ x 8′	Duradonic	135.00
C380CLA06BL87	8′ x 7′	Clear Andodized	104.00
C380DUR06BL87	8′ x 7′	Duradonic	131.00
C380CLA06BL88	8′ x 8′	Clear Andodized	112.00
C380DUR06BL88	8′ x 8′	Duradonic	140.00

Corner Seal Kits (3″ Legs)

Kit Product Code	Finish Color	Price ea.
C38090CLA06BL	Clear Andodized	38.00
C38090DUR06BL	Duradonic	52.00

AstraSweep™ corner seals seal the hole between the astragal seal and the door sweep. AstraSweep Kits include two corner seals, two door sweeps and two astragal seals- all the materials neccessary to seal theinside (gaps up to 1 inch) and bottoms of a double door. Holders are preslotted for easy installation.

WEATHERSTRIPPING - BRUSH SEALS

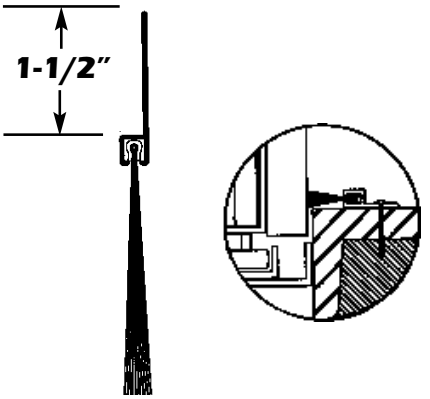


Keeps Out:	• **Drafts**	• **Rain**	• **Snow**	• **Wind**	• **Sand**	• **Debris**
	• **Light**	• **Noise**	• **Insects**	• **Rodents**	• **Birds**	• **Bats**

To minimize air dirt infiltration around rolling steel, sectional and sliding doors, install the best weatherseals available. Our brush weatherseals' unique property of conforming to irregular surfaces provides the most effective seal. Thousands of filaments form a solid wall for a complete weather tight seal without impairing door movement.

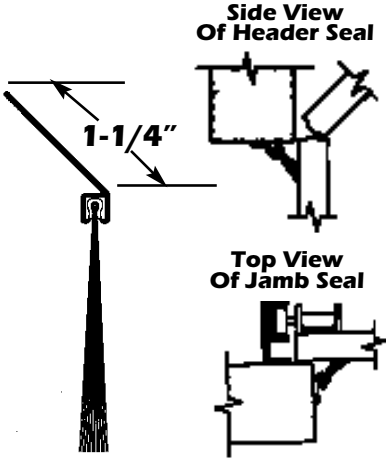
Standard Commercial Brush Seal

1-1/2" Straight



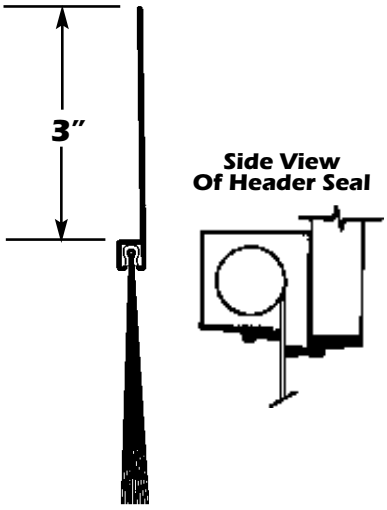
Part #	Brush Type	Length	Price/ft
BPS151	Polypropylene	1"	$3.90
BPS155	Polypropylene	1.5"	$4.55
BPS152	Polypropylene	2"	$4.90
BPS153	Polypropylene	3"	$5.55

1-1/4" x 45°



Part #	Brush Type	Length	Price/ft
BP4121	Polypropylene	1"	$3.60
BP4125	Polypropylene	1.5"	$4.25
BP4122	Polypropylene	2"	$4.55
BP4123	Polypropylene	3"	$5.20

3" Straight



Part #	Brush Type	Length	Price/ft
BPS31	Polypropylene	1"	$5.20
BPS35	Polypropylene	1.5"	$5.85
BPS32	Polypropylene	2"	$6.20
BPS33	Polypropylene	3"	$6.50

Heavy Duty Commercial Brush Seal

These nylon seals are designed for the largest gap on large sectional, industrial rolling steel and aircraft hangar doors.

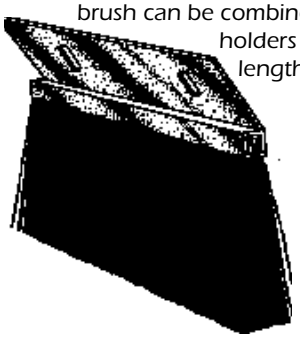
	Part #	Brush Type	Length	Price/ft
1-3/8" Straight	GS34	Nylon	1-3/4"	$12.35
	GS25	Nylon	2-1/2"	$13.35
	GS30	Nylon	3"	$14.65
	GS40	Nylon	4"	$15.95
	GS50	Nylon	5"	$18.20
1-1/2" 45° Angle	GA34	Nylon	1-3/4"	$12.35
	GA25	Nylon	2-1/2"	$13.35
	GA30	Nylon	3"	$14.65
	GA40	Nylon	4"	$15.95
	GA45	Nylon	5"	$18.20
5-1/2" Straight	GLS34	Nylon	1-3/4"	$14.30
	GLS25	Nylon	2-1/2"	$15.30
	GLS30	Nylon	3"	$16.90
	GLS40	Nylon	4"	$17.90
	GLS50	Nylon	5"	$20.50

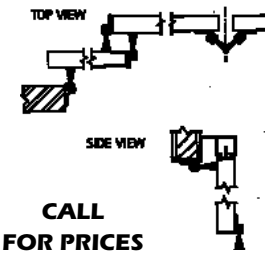
Nylon Construction

The heaviest seals available anywhere. Our heavy duty brushes seal out the elements around large industrial rolling steel doors, sectional doors, and other large doors including aircraft hangar doors. available in brush lengths up to 7". UL Rating for smoke seals on all brushes up to 4" in length

Aircraft Hangar Brush

Crimped polypropylene brush was developed for special use in sealing aircraft doors. This lower priced brush seals the largest gaps usually associated with hangar doors while providing the advantages of nylon brush weather seal. The brush can be combined with angled or straight holders and is available in brush trim lengths of 2", 3" and 4"



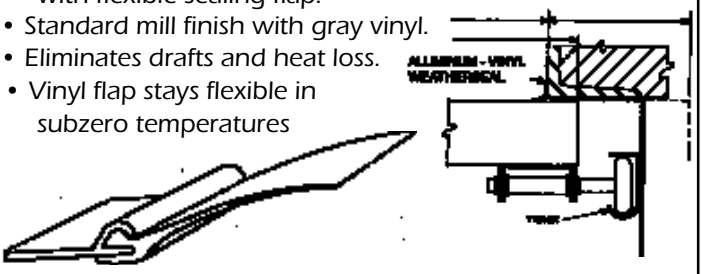


CALL FOR PRICES

American Garage Door Supply Inc.
1-800-233-1487 Fax: (218) 751-6551

Aluminum/Vinyl Perimeter Seal

- Heavy duty aluminum extrusion with flexible sealing flap.
- Standard mill finish with gray vinyl.
- Eliminates drafts and heat loss.
- Vinyl flap stays flexible in subzero temperatures



AV21

Standard Sizes 7', 8', 10', 12', 14', 16'

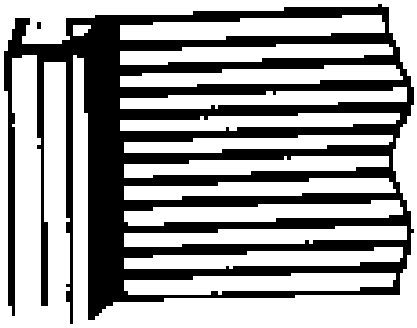
14', 16' Lengths Extrusion Folded in Half with Single Length Blade.
8', 10', 12'- Single Lengths

Part#	Description	Price ea.
AV21-10	1" Aluminum, 2" Vinyl, 10'1"	$17.50
AV21-12	1" Aluminum, 2" Vinyl, 12'1"	$21.00
AV21-14	1" Aluminum, 2" Vinyl, 14'1"	$24.50
AV21-16	1" Aluminum, 2" Vinyl, 16'1"	$28.00

Note: UPS up to 84" only

Rolling Steel Clip-on Brush Seals

For use on commercial rolling steel doors. The WGS combines a 3/4" plastic guide with efficient brush seal.
Fits 3/16" guides use alone or with epoxy for additional hold.



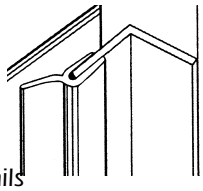
Clips on to guides up to 1/4"

Part#	Description	Price/ft.
WGS10	With 1" Nylon Brush	$4.55
WGS150	With 1 1/2" Nylon Brush	$5.55
WGS520	With 2" Nylon Brush	$6.20
WGS530	With 3" Nylon Brush	$7.15

Note: UPS up to 84" only

Clip On Vinyl Guide Seal

For Rolling Steel Doors



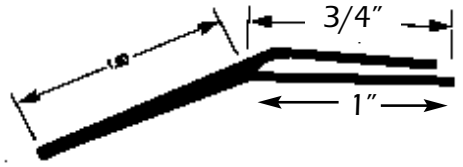
- Use as vinyl perimeter seal on rolling steel or curtain doors
- Use as bottom seal on curtain doors with double or single angle bottom rails
- Fits 3/16" or 1/4" thick steel angle guides
- Standard grey color
- Standard cut lengths; 8'6", 10'6", 12'6", 14'6", 16'6".

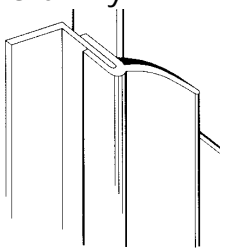
Part#	Description	Price/Box
GS-20-8.5*	**Clip On Vinyl Seal, 8'6"**	**$220.00**
GS-20-10.5	Clip On Vinyl Seal, 10'6"	$275.00
GS-20-12.5	Clip On Vinyl Seal, 12'6"	$330.00
GS-20-14.5	Clip On Vinyl Seal, 14'6"	$385.00
GS-20-16.5	Clip On Vinyl Seal, 16'6"	$440.00

Available in Unit Quantities of 25 Lengths only
***GS-20-8.5 available as (per ea.) at $10.00 each.**

Reverse Angle Clip-on Vinyl Seal

For use on commercial sectional doors. Dual duometer construction provides a hard vinyl holding section and a flexible flap.

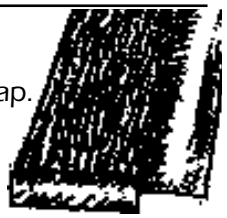




Part#	Description	Price/ft
WRJ-G	Clip-On Vinyl Seal- Gray	$1.65/ft
WRJ-B	Clip-On Vinyl Seal- Brown	$1.65/ft
WRJ-W	Clip-On Vinyl Seal- White	$1.65/ft

Any lengths UPSable

Climate Seals



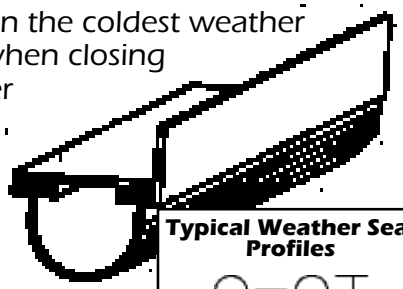
2" Extruded PVC stop w/ 1" Vinyl Flap.
Will Not Rot, Low Maintenance
Available in white or brown
7', 8', 9', 10', 12', 14', or 16' Lengths
Can be UPS'd in 7' and 8' lengths
Larger sizes and other colors also available

Part#	Description	Price ea.
CS100W-8	Climate Seal, White, 8'	$14.00
CS100W-10	Climate Seal, White, 10'	$17.50
CS100W-12	Climate Seal, White, 12'	$21.00
CS100W-14	Climate Seal, White, 14'	$24.50
CS100W-16	Climate Seal, White, 16'	$28.00
CS100B-8	Climate Seal, Brown, 8'	$14.00
CS100B-10	Climate Seal, Brown, 10'	$17.50
CS100B-12	Climate Seal, Brown, 12'	$21.00
CS100B-14	Climate Seal, Brown, 14'	$24.50
CS100B-16	Climate Seal, Brown, 16'	$28.00

WEATHERSTRIPPING - BOTTOM SEALS

Aluminum Retainer With Bulb Seal

- Black Vinyl Seal
- Won't tear or deform
- Remains pliable in the coldest weather
- Cushions door when closing
- Aluminum holder comes slotted allowing for adjustment and perfect fit.



Typical Weather Seal Profiles

Choose From 2 Popular Retainers

G Type

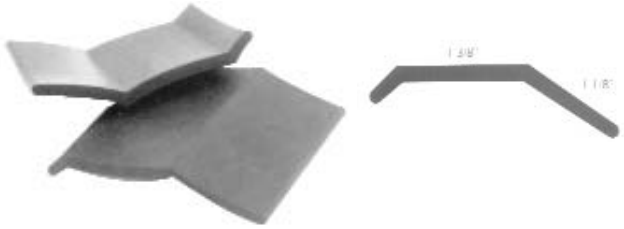
L Type

Part#	Description	Price
WRG10	Bulb Seal Retainer, T & G Type 10'2"	$12.50 ea.
WRG12	Bulb Seal Retainer, T & G Type 12'2"	$15.00 ea.
WRG14	Bulb Seal Retainer, T & G Series 14'2".	$17.50 ea.
WRL-10	Bulb Seal Retainer, L-Type, 119-1/2"	$28.50 ea
WRL-12	Bulb Seal Retainer, L-Type, 145 -1/2"	$31.50 ea
WRR-400-V	4" Vinyl Bottom Bulb Seal, T	$2.25 ft.

Bottom Bulb Seal Also Available In Bulk Rolls

Need bottom replacement seal for your National Brand door?
Call our professionals and let us help you.

Bottom Rubber Seal For Wood Doors



Part#	Description	Price/ft	Price/Roll
WS138	1-3/8" Door Thickness, Soft Sponge	$1.70	$130.00
WD138	1-3/8" Door Thickness, Dense Rubber	$2.00	$150.00
WD134	1-3/4" Door Thickness, Dense Rubber	$2.20	$160.00

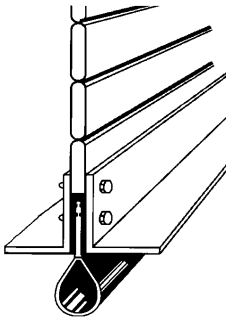
Bulk Rolls 100' Lengths

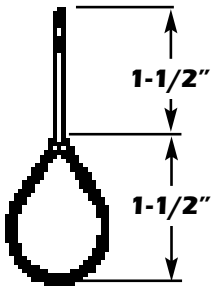
Rolling Steel Bottom Seal

- Dual Durometer Rigid & Flexible
- Standard Colors Black & Grey.

RB-21

$1.85/ft

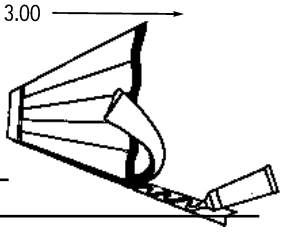




Garage Door Threshold

- Solid black vinyl garage door threshold • Seals out the elements
- Prevents driving rains and snow from backing into the garage
- Helps keep out dirt & leaves
- Keeps door bottom from contact with concrete to prevent rust on metal doors and water damage on wood doors
- Easy to install

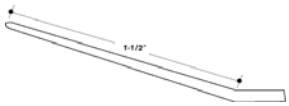
One tube comes with every 20 feet of threshold. Installation works best when temperatures are above 50° F.

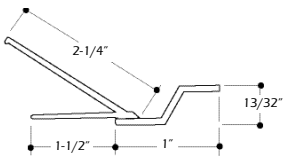


Part#	Description	Price/ Ft.	100 ft. roll
TV35BLN	Threshold	$5.85	$526.50

Part#	Description	Price/Tube
TV35	Adhesive only	$13.00

Top Seal - Sectional

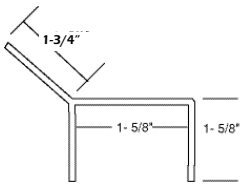




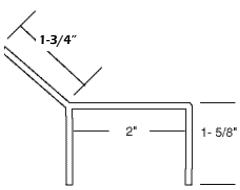
- Rigid and Flexible PVC
- Lengths Cut To Order
- Standard Cut Lengths; 8'2", 9'2", 10'2", 12'2", 14'2", 16'2"
- Standard Color: Black
- Can Be Used On Both Shiplap and T & G Steel Door

Part#	Description	Price/ft
TS-14	Dual Contact Top Seal	$1.45/ft.
TS-15	Single Contact Top Seal	$1.35/ft.

Top Seal Caps - Sectional Doors



1- 5/8" Top Seal Cap
TC-158
$2.75/Ft

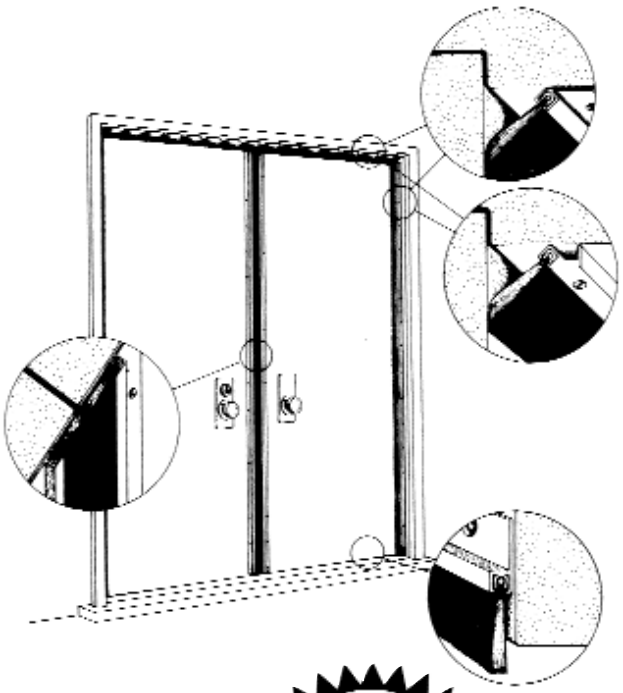


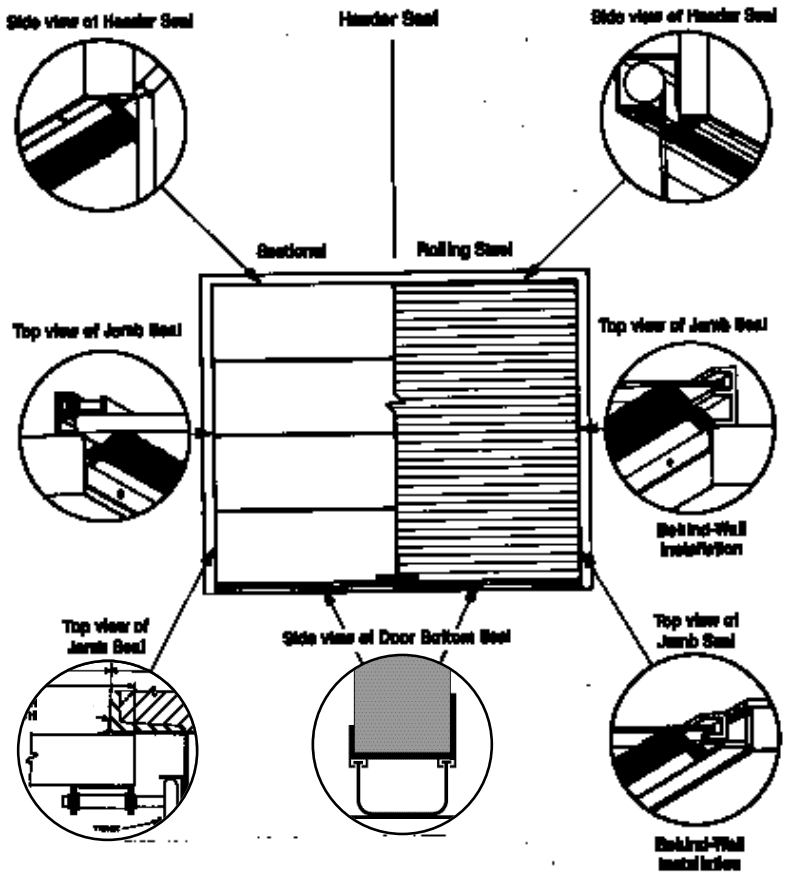
2" Top Seal Cap
TC-200
$3.00/Ft

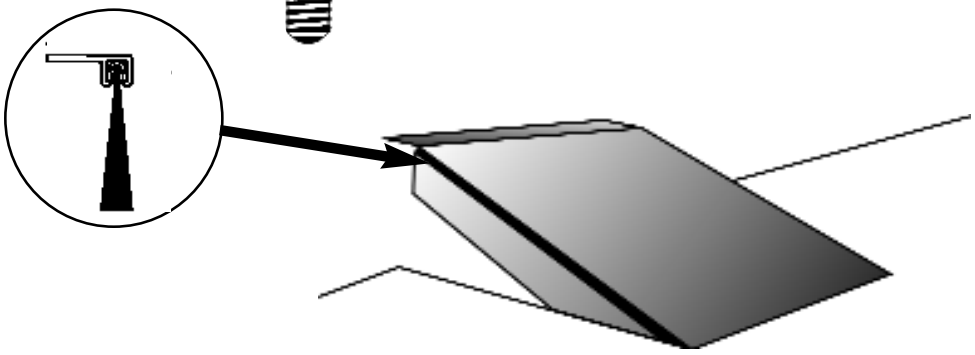
21 TWENTY-ONE YEARS Of Great Service

SECTION 3

Weatherstripping







American™
garage door supply inc.

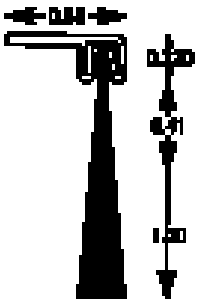
We can help you select the best system.

1-800-233-1487 Fax: (218) 751-6551

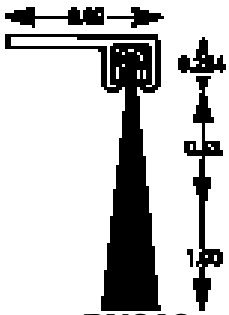
WEATHERSTRIPPING - DOCK LEVELER SEALS

Brush Seals

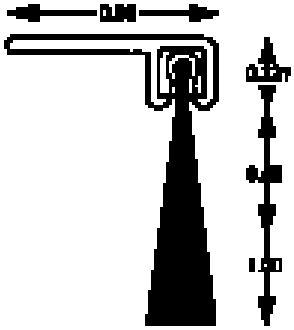
Loading Dock areas present a great opportunity to seal around the many openings of a building. Not only do doors provide areas for air infiltration but the dock levelers themselves can act as wind tunnels robbing a building of heat resources. Our 90° retainer & seal forms the perfect fit for dock leveler seals and other specialty applications. Order your choice of retainer size, brush length and seal width.



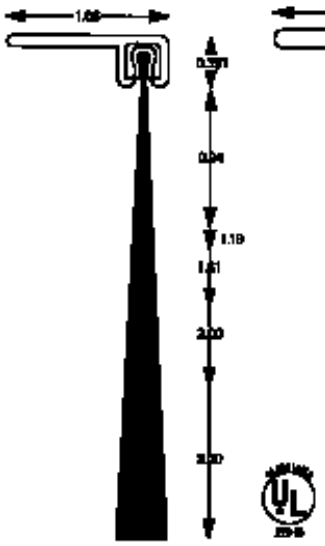
BN955



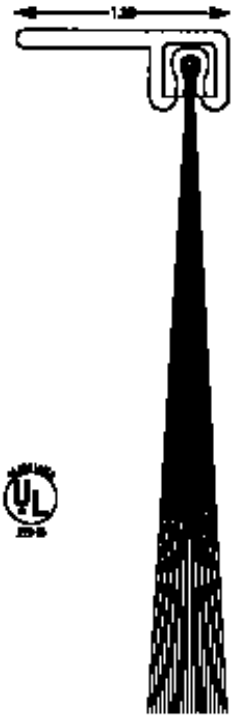
BN969



BN996



BN916



BN913

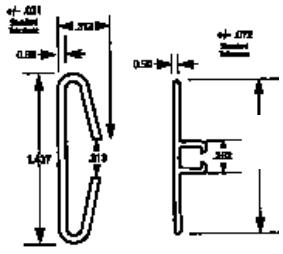
Part Number	Holder Length	Brush Length	Brush Type	Price Ft.
BN9554	0.55″	.41″	Nylon	$3.25
BN9551	0.55″	1.00″	Nylon	$3.90
BN9695	0.69″	.53″	Nylon	$3.60
BN9691	0.69″	1.00″	Nylon	$3.90
BN9965	0.96″	.59″	Nylon	$3.90
BN9961	0.96″	1.00″	Nylon	$4.25
BN9169	1.06″	.94″	Nylon	$4.90
BN9161	1.06″	1.19″	Nylon	$5.20
BN9166	1.06″	1.61″	Nylon	$5.55
BN9162	1.06″	2.00″	Nylon	$6.20
BN9163	1.06″	3.00″	Nylon	$7.15
BN9131	1.38″	1.75″	Nylon	$12.35
BN9132	1.38″	2.53″	Nylon	$13.65
BN9133	1.38″	3.00″	Nylon	$14.65
BN9134	1.38″	4.00″	Nylon	$15.95

Rope Seal

For use in sealing the back portion of a dock leveler. Constructed of neoprene molded in a rope, Our Rope seal is placed near the hinge of a dock leveler and is held in place with hooks. The seal is formed as the leveler lowers compressing against the rope. Order by specifiing the length in feet.

RS10NEOPR. 3.90/ft

Welded Dock Leveler Brush Seal



WH15 **XTBT90**

Part #	Description	Price
WDL71	**Welded Dock Leveler Kit** for 8′ leveler includes: (2- WH15) (2- XTB90) (2- BN100)	**$149.50 ea.**
WDL73	**Welded Dock Leveler Kit** same as above with 1-1/2″ Brush	**$162.50 ea.**
WH15	*Weldable Holder (8′)	$32.50/ea.
XTBT90	* T-Retainer(8′)	$15.60/ea.
BN100	1″ Nylon Brush only	$2.30/ft.
BN112	1-1/2″ Nylon Brush only	$3.25/ft.
BT90	1-1/2″ Flexible PVC Blade Seal Grey, Brown or White	$.65/ft.
B90	90° Bracket for Mechanical (Screw On)	$1.65/ft.