

Energy Audit Report

St. Lawrence University Canton, NY
70 Park St. - Residence

Prepared By:

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Community Energy Services, Inc.
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Canton, NY 13617

August 2008

Facility Name: **70 Park St. - Residence**
Facility Location: **St. Lawrence University**

Facility Address: **70 Park St.**
Facility City: **Canton**
Facility State: **NY**
Facility Zip: **13617**
Facility County: **St. Lawrence**

Contact Name: **Louise Gava**
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Size of Facility: **2,096 Sq. Ft.**

Total Annual Energy Costs	\$2,753.59
Electric	\$773.83
Natural Gas	\$1,979.76
Water and Sewer	\$998.08

Type of Facility (included in Abstract):
Student Residence

70 Park St. - Student Residence

ABSTRACT

The purpose of this study was to investigate and report on the effects of installing various energy and water conservation measures for this building. An on-site visit was conducted by an experienced energy auditor from Community Energy Services, Inc. familiar with this type of facility. During a site survey conducted on August 7, 2008 data was gathered through visual inspections of the building shell and its equipment and through the use of diagnostic testing where appropriate. Data was used to produce a computer model of the facility using TREAT modeling software to predict potential energy savings from recommended improvements. Provided utility bills were reviewed to correlate the building model with actual usage. Results were compiled by L & S Energy Services, Inc. to produce this report.

SUMMARY

A summary of the recommended energy improvement measures is shown at the end of the report titled Improvement Packages. Projected savings are expressed in terms of simple payback and SIR (Savings to Investment ratio). Simple payback is calculated by dividing the estimated cost by the annual estimated savings. Simple payback is the estimated number of years it takes for energy saving to pay back your investment in the cost of improvements if interest and inflation rates are zero. SIR is a calculation that compares the return of investing capital in an interest bearing account versus in the improvements. An SIR greater than 1 means an investment in the projected measures has a better than projected return than an interest bearing account.

The estimate may include items that do not produce enough energy cost savings to justify implementation. However these measures can save significant energy in the building and/or improve the comfort and/or safety of the residence. The estimate may also include items that produce no savings but can improve the comfort and/or safety of the residence. These items have a negative impact on the payback and the SIR of the overall package.

If all the recommended energy improvement measures are implemented the total cost of the project is estimated at \$9,590. The annual cost savings is estimated to be \$774. The recommended measures are projected to save 18.7% of the buildings current energy use. The energy improvement measures have a combined SIR of 1.12. Annual emissions savings are listed in Table 1.

If all the recommended water saving measures are implemented the total cost of water savings measures is estimated at \$800. The annual water cost savings is estimated to be \$70. The water saving measures have a combined SIR of 1.5. The water savings measures are projected to save 6,919 gallons per year.

70 Park St. - Student Residence

Description of Existing Building Systems

1.1 BUILDING ENVELOPE

70 Park Street is a two story building with a full basement. This is a residential structure for students with six rooms and a maximum occupancy of ten. Occupancy is reduced in the summer and during school breaks. The building contains a laundry facility in the basement. The building has recently been partially renovated due to a tree damaging the roof.

The interior of this building primarily consists of residential living space. Additional spaces are hallways, bedrooms, and bathrooms. The basement is entered from the kitchen. The attic is accessed through a hatch in the second floor ceiling.

Exterior walls are wood framed. The building appears to have 2x4 walls with cellulose insulation. The basement is unheated and uninsulated.

Windows are double glaze replacement windows. The front exterior door is solid wood. The rear exterior door is insulated steel. The basement does not have an exterior door. The basement contains double glazed windows.

The unconditioned basement is used for mechanical systems and the walls are uninsulated masonry. The floor of the basement is concrete slab. There is significant moisture in the basement that appears to be damaging the furnace and hot water heater.

The attic of the building has been reinsulated with 10 inches of cellulose insulation. The attic entrance is a metal insulated hatch in the ceiling of the second floor.

A blower door test performed on the building found moderate leakage. Major areas of identified infiltration include: the basement and associated duct work. A makeup air vent in the furnace room is a source of significant infiltration.

1.2 HEATING AND COOLING SYSTEMS

The heat is supplied by an older Bard natural gas furnace. The furnace is not original to the building. Annual efficiency is assumed to be 82% based on manufacturer's specifications and the historical energy usage of the building. The heating distribution ductwork in the basement is not sealed or insulated. The furnace was shut off at the time of the visit.

The heat is controlled by a non-programmable thermostat. Winter temperature setting is assumed to be approximately 68F.

1.3 LIGHTING SYSTEMS

Lighting for the common spaces for this building is provided primarily by compact fluorescent ceiling fixtures. Student lighting is assumed to be provided by incandescent bulbs.

1.4 WATER HEATING SYSTEMS

Domestic hot water is provided by an A.O. Smith 100 gallon natural gas hot water heater. The hot water temperature is assumed to be 120F. The hot water heater was shut off at the time of the visit. Domestic hot water piping in the unconditioned basement is uninsulated.

1.5 WATER USAGE

Water flow rates were measured at 1-3 gallons per minute at sinks with all sinks in an acceptable range except one bath sink on the second floor that has a flow rate of 3 gpm. Water usage in the three toilets was measured between 2.4 gallons to 3.5 gallons per flush.

1.6 APPLIANCES

This building has laundry equipment in the basement. Laundry equipment was not on site at the time of the site visit but is assumed to be an electric dryer and a high efficiency washer. The refrigerator is a newer unit.

1.7 VENTILATION

The bathrooms contain working bath fans. Installing humidistats or automatic fan controls can help to reduce humidity and improve indoor air quality. Any attic work should include verification that the bath vents exit to the exterior and do not vent into the attic.

1.8 OTHER OBSERVATIONS

- 1) Organic materials are stored in the wet basement, and are becoming moldy there.
- 2) Moisture in the basement appears to be damaging the heating and hot water system.
- 3) Water was pooling on the floor of the basement.
- 4) A bulb is broken in the basement laundry light fixture.

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Description of Improvements

2.1 Increase Attic Insulation

Existing Conditions:

The attic of the building has been reinsulated with 10 inches of cellulose insulation. The attic entrance is a metal insulated hatch in the ceiling of the second floor.

Improvement Specifications:

Increase attic insulation to a minimum of 14 inches by adding blown in cellulose above the existing insulation where possible. Install a sealable attic hatch over the existing opening. Insulate the attic hatch to a minimum of R20. Weatherstrip the hatch to prevent infiltration. Investigate the attic floor for possible pathways for humidity to enter the attic. Conduct air sealing prior to insulating. Correct any electrical wiring issues prior to insulating.

2.2 Install Programmable Thermostats

Existing Conditions:

The heat is controlled by a non-programmable thermostat. Winter temperature setting is assumed to be approximately 68F.

Improvement Specifications:

Install two programmable thermostats. Savings is based on a three degree set back per for 8 hours per day.

2.3 Replace Furnace

Existing Conditions:

The heat is supplied by an older Bard natural gas furnace. The furnace is not original to the building. Annual efficiency is assumed to be 82% based on manufacturer's specifications and the historical energy usage of the building. The heating distribution ductwork in the basement is not sealed or insulated. The furnace was shut off at the time of the visit.

Improvement Specifications:

Replace the existing furnace with an appropriately sized high efficiency system. Savings is based on a new efficiency of 94%. Duct work should be assessed and corrected as needed to ensure the highest system performance. Maximizing increase in the efficiency of the system depends also on improving the overall efficiency of the distribution system. Seal the ductwork with mastic.

2.4 Insulate Domestic Hot Water Piping

Existing Conditions:

Domestic hot water piping in the unconditioned basement is uninsulated.

Improvement Specifications:

Insulate the Domestic Hot Water Piping to an average R-value of 5.0 using rigid foam or fiberglass wrap insulation.

2.5 Reduce Infiltration

Existing Conditions:

A blower door test performed on the building found moderate leakage. Major areas of identified infiltration include: the basement and associated duct work. A makeup air vent in the furnace room is a source of significant infiltration.

Improvement Specifications:

Install weatherstripping on doors as needed. Conduct comprehensive airsealing in conjunction with a blower door to identify areas for sealing. Close off the attic hatch with an insulated removable cover. Conduct air sealing in attic prior to insulating. Installing dense pack insulation in walls can help to reduce infiltration.

2.6 Replace Incandescent Lighting with Compact Fluorescent Lamps

Existing Conditions:

Lighting for the common spaces for this building is provided primarily by compact fluorescent ceiling fixtures. Student lighting is assumed to be provided by incandescent bulbs.

Improvement Specifications:

Replace all incandescent lighting with compact fluorescent lamps that provide equivalent light.

2.7 Install Aeretor

Existing Conditions:

Water flow rates were measured at 1-3 gallons per minute at sinks with all sinks in an acceptable range except one bath sink on the second floor that has a flow rate of 3 gpm. Water usage in the three toilets was measured between 2.4 gallons to 3.5 gallons per flush.

Improvement Specifications:

Replace aeretors on all faucets with flow rates above 1.5 gallons per minute. Verify flow rates.

2.8 Install Natural Gas Dryer

Existing Conditions:

This building has laundry equipment in the basement. Laundry equipment was not on site at the time of the site visit but is assumed to be an electric dryer and a high efficiency washer.

Improvement Specifications:

Replace existing electric dryer with a natural gas unit. Install a solid metal flue to exhaust gases and humidity.

2.9 Install Low Flush Toilet

Existing Conditions:

Water usage in the three toilets was measured between 2.4 gallons to 3.5 gallons per flush.

Improvement Specifications:

Replace the existing high flush toilets with low flush units with a maximum flush rate of 1.6 gallons per flush. For increased potential savings dual flush toilets are now available that can reduce water usage per flush as low as 1.0 gallon per flush.

IMPROVEMENT PACKAGES

70 Park St.

For: Louise Gava

By:

Date: 8/12/2008

Evaluated Packages:

Package Name	Cost \$	Annual Savings, MMBtu	Annual Savings, \$	Payback years	Cashflow \$/year	SIR
Improvement Package 1	9,590	38.87	774	12.4	-71	1.12

Package Description:

1. Improvement Package 1

Improvement Name	Cost (\$)	Annual Savings MMBtu	Annual Savings (\$)	Payback (years)	Cashflow (\$/year)	Improve- ment Life (Years)	SIR in Package
Increase Attic Insulation	1,000	2.27	33	30.3	-55	40	0.77
Replace Furnace	5,500	16.28	236	23.3	-248	20	0.64
Reduce Infiltration	1,500	6.18	90	16.7	-42	20	0.9
Insulate Hot Water Piping	500	2.19	32	15.7	-12	20	0.95
Install Low Flow Device	15	0.25	4	4.1	2	10	2.1
Natural Gas Dryer	850	5.68	233	3.6	158	15	3.29
Install Programmable Thermostat	150	5.56	81	1.9	67	15	6.45
Replace Incandescents	75	0.46	66	1.1	60	7	5.51
Total for Package	9,590	38.87	774	12.4	-71	N/A	1.12

Table 1
Annual Emissions Savings

Fuel Type	NOx (LBS)	SO2 (LBS)	CO2 (LBS)
Electricity	3	7	2,047
Natural Gas	3	0	3,639
Oil	0	0	0
Propane	0	0	0
Other: Other Fuel Type Name	0	0	0
Total	6	7	5,686

ENERGY BILLS

70 Park St. - Student Residence

Electric Bills					
Utility:		National Grid/ Constellation Energy			
Rate Class:		SC1			
Account Number:		Unknown			
Start Billing Date	End Billing Date	Days in Period	Usage (kWh)	Cost	Cost per kWh
07/24/06	8/23/06	30	359	\$45.79	\$0.13
08/23/06	9/21/06	29	541	\$67.70	\$0.13
09/21/06	10/23/06	32	765	\$93.92	\$0.12
10/23/06	11/21/06	29	1,035	\$126.68	\$0.12
11/21/06	12/20/06	29	1,518	\$185.63	\$0.12
12/20/06	1/23/07	34	1,616	\$197.91	\$0.12
01/23/07	2/21/07	29	2,867	\$385.52	\$0.13
02/21/07	3/21/07	28	2,479	\$333.12	\$0.13
03/21/07	4/20/07	30	1,532	\$194.93	\$0.13
04/20/07	5/22/07	32	924	\$124.06	\$0.13
05/22/07	6/25/07	34	519	\$70.42	\$0.14
Totals 2006-2007			14,155	\$1,825.68	\$0.13
06/25/07	7/23/07	28	453	\$59.89	\$0.13
07/23/07	8/21/07	29	698	\$92.24	\$0.13
08/21/07	9/20/07	30	753	\$96.24	\$0.13
09/20/07	10/22/07	32	898	\$39.23	\$0.04
10/22/07	11/19/07	28	1,383	\$60.94	\$0.04
11/19/07	12/20/07	31	2,504	\$62.10	\$0.02
12/20/07	1/23/08	34	2,280	\$85.26	\$0.04
01/23/08	2/21/08	29	2,567	\$93.01	\$0.04
02/21/08	3/20/08	28	2,455	\$65.98	\$0.03
03/20/08	4/21/08	32	1,955	\$58.65	\$0.03
04/21/08	5/19/08	28	889	\$38.37	\$0.04
05/19/08	6/19/08	31	908	\$21.92	\$0.02
Totals 2007-2008			17,743	\$773.83	
Average Cost Per kWh				\$0.044	

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Natural Gas Bills					
St. Lawrence Gas					
Account Number:			Unknown		
Start Billing Date	End Billing Date	Days in Period	Usage (Therms)	Cost	Cost per Therm
11/21/05	12/21/05	30	267	\$343.53	\$1.29
12/21/05	1/23/06	33	255	\$331.28	\$1.30
1/23/06	2/21/06	29	254	\$303.95	\$1.20
2/21/06	3/22/06	29	306	\$363.46	\$1.19
3/22/06	4/20/06	29	134	\$142.84	\$1.07
4/20/06	5/22/06	32	96	\$99.53	\$1.04
5/22/06	6/21/06	30	34	\$36.40	\$1.07
6/21/06	7/24/06	33	1	\$0.42	\$0.42
7/24/06	8/22/06	29	15	\$17.30	\$1.15
8/22/06	9/21/06	30	22	\$25.28	\$1.15
9/21/06	10/23/06	32	115	\$97.79	\$0.85
10/23/06	11/21/06	29	98	\$103.57	\$1.06
Totals for 2006			1,597	\$1,865.35	
11/21/06	12/21/06	30	196	\$228.64	\$1.17
12/21/06	1/23/07	33	233	\$280.34	\$1.20
1/23/07	2/21/07	29	350	\$422.99	\$0.00
2/21/07	3/22/07	29	321	\$395.88	\$1.23
3/22/07	4/20/07	29	170	\$210.02	\$1.24
4/20/07	5/22/07	32	60	\$83.19	\$1.39
5/22/07	6/21/07	30	25	\$39.63	\$1.59
6/21/07	7/23/07	32	2	\$6.99	\$3.50
7/23/07	8/22/07	30	21	\$29.11	\$1.39
8/22/07	9/20/07	29	27	\$34.05	\$1.26
9/20/07	10/22/07	32	62	\$71.52	\$1.15
10/22/07	11/21/07	30	138	\$177.40	\$1.29
Totals for 2007			1,605	\$1,979.76	
Average Cost Per Therm				\$1.23	

70 Park St. - Student Residence

Water and Sewer Cost

Begin	End	Gallons	Water \$	Sewer \$	Total	\$Water/ 1000 gal	\$Sewer/ 1000 gal
Jul-08	Sep-08	7,000	\$31.43	\$38.85	\$70.28	\$4.49	\$5.55
Oct-06	Dec-06	44,000	\$197.56	\$244.20	\$441.76	\$4.49	\$5.55
Jan-07	Mar-07	42,000	\$188.58	\$233.10	\$421.68	\$4.49	\$5.55
Apr-07	Jun-07	35,000	\$163.45	\$203.35	\$366.80	\$4.67	\$5.81
Jul-07	Sep-08	10,000	\$46.70	\$58.10	\$104.80	\$4.67	\$5.81
Oct-08	Dec-08	10,000	\$46.70	\$58.10	\$104.80	\$4.67	\$5.81
Total		97,000	\$445.43	\$552.65	\$998.08	\$4.59	\$5.70