Energy Audit Report

St. Lawrence University Canton, NY

72 Park Street - Pink Triangle

Prepared By:

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July 2008

Facility Name:	72 Park St. - Pink Triangle
Facility Location:	St. Lawrence University

Facility Address:	72 Park St.
Facility City:	Canton
Facility State:	NY
Facility Zip:	13617
Facility County:	St. Lawrence

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Size of Facility:	1,680 Sq. Ft.

Total Annual Energy Costs	$3,443.93
Electric	$920.87
Natural Gas	$2,523.06
Water and Sewer	$1,185.76

Type of Facility (included in Abstract):

College Dormitory - Theme House

72 Park St - Pink Triangle

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 May 23, 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 $14,255. The annual cost savings is estimated to be $1,333. The recommended measures are projected to save 36.4% of the buildings current energy use. The energy improvement measures have a combined SIR of 1.60. 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 $50. The water saving measures have a combined SIR of 1.1. The water savings measures are projected to save 4,978 gallons per year.

72 Park St - Pink Triangle

Description of Existing Building Systems

1.1 BUILDING ENVELOPE

72 Park Street, also known as the Pink Triangle, is a two story building with a full basement reportedly built around 1950. The building is used as a student dormitory. It is occupied primarily during school sessions. Occupancy is reduced in the summer and during school breaks. The building contains a common kitchen facility and a common laundry facility.

The first floor of the building contains the common kitchen, a common bath, and some dormitory space. The second floor contains dormitory rooms and another common bath. The basement is entered from the first floor.

Exterior walls are 2 x 4 wood framed with drywall. Walls appear to have no insulation where observable. The basement is unheated and uninsulated.

Windows are double glazed with vinyl frames. Basement windows are single glazed. Exterior doors are all solid wood and insulated steel. The front (East) metal door is particularly leaky.

The unconditioned basement is used for mechanical systems and laundry. The walls are uninsulated masonry. The floor of the basement is concrete slab. The rim joists are uninsulated.

The attic over the second floor of the structure has an average of about 2 inches of rock wool insulation. Much of the attic has a wood floor and is used for storage.

A blower door test performed on the building found moderate air leakage. Major routes for leakage include panned joists in the basement for the furnace cold-air return, the leaky front door, and a major air flow from the wall between the first floor shower and the rest of the first floor.

1.2 HEATING AND COOLING SYSTEMS

The heat for this building is supplied by a Conquest 80 150,000 Btuh natural gas induced draft furnace. The furnace is not original to the building. Annual efficiency is assumed to be 90% based on manufacturer's specifications and the historical energy usage of the building. The ductwork is uninsulated and unsealed. A basement window is used to provide combustion air for the furnace.

A non-programmable thermostat controls the heat. Temperature setting in the winter is assumed to be 70F.

1.3 LIGHTING SYSTEMS

Lighting for the common spaces for this building is provided primarily by a combination of circline fluorescent fixtures and hard wired compact fluorescent (cfl) overhead fixtures. There are a few incandescent bulbs in table and floor lamps. Common bathrooms have a combination of fluorescent lamps and incandescent bulbs. Common bathrooms do not contain occupancy sensors.

1.4 WATER HEATING SYSTEMS

Domestic hot water is provided by a 76,000 Btu natural gas Bradford White 75 gallon natural draft hot water heater. This unit is commonly vented with the furnace. The hot water temperature was measured at 120F in the kitchen, but over 130F in the upstairs bath. Domestic hot water piping in the unconditioned basement is uninsulated.

1.5 WATER USAGE

Water flow rates were measured at 1 gallon per minute maximum (GPM) at all locations, except the kitchen sink which was 2 GPM. Water usage of the two toilets was measured, and found to both be about 3.2 gallons per flush.

1.6 APPLIANCES

The common kitchen on the first floor contains a reasonably efficient ten year old top-freezer refrigerator, and an electric range that is not vented. The freezer was in need of defrosting at the time of the site visit. The basement laundry area contains a front-load washer and an electric dryer. The vent for the electric dryer is metal, twisted, long and had become disconnected at the time of the site visit.

1.7 VENTILATION

The second floor bath contains a working exhaust fan, but the first floor bath does not. The bath fan appears to vent to the exterior. 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) Old knob and tube wiring is present and may still be in use.

2) The freezer was in need of defrosting at the time of the site visit. Frost build-up in freezers can significantly reduce the units efficiency.

3) Exterior paint on this building is peeling at what appears to be a higher rate than adjacent buildings. This may be an indication of moisture entering the walls.

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Description of Improvements

2.1 Increase Attic Insulation

Existing Conditions:
The attic over the second floor of the structure has an average of about 2 inches of rock wool insulation. Much of the attic has a wood floor and is used for storage.

Improvement Specifications:
Increase attic insulation to a minimum of 16 inches by adding blown in cellulose above the existing insulation where possible. If the attic is needed for storage an insulated floor area can be installed consisting of 4 inches of foam board over the existing floor with a plywood surface. Insulate the attic hatch to a minimum of R20. Box the hatchway to prevent cellulose from falling into the hatchway as necessary. Weatherstrip the hatch to prevent infiltration. Conduct air sealing prior to insulating. Correct any electrical wiring issues prior to insulating.

2.2 Replace Furnace and Seal and Improve Ductwork

Existing Conditions:
The heat for this building is supplied by a Conquest 80 150,000 Btu natural gas induced draft furnace. The furnace is not original to the building. Annual efficiency is assumed to be 90% based on manufacturer's specifications and the historical energy usage of the building. The ductwork is uninsulated and unsealed. A basement window is used to provide combustion air for the furnace.

Improvement Specifications:
Replace the existing furnace with a high efficiency sealed combustion unit. Properly size unit for the building. Seal all ductwork with duct mastic. Redesign ductwork as needed to reduce air restrictions and improve air flow. Seal basement window.

2.3 Insulate Exterior Walls

Existing Conditions:
Exterior walls are 2 x 4 wood framed with drywall. Walls appear to have no insulation where observable.

Improvement Specifications:
Increase wall insulation in the wood framed sections of the heated space R12 minimum by installing blown cellulose in wall cavities or its equivalent. Prior to installing insulation confirm the depth of the wall cavity. Installing insulation can reduce infiltration into the building if installed properly. Particular attention should be paid to rim and band joists to insure insulation of these areas is accomplished by the insulation technique. Rim and Band joists can be significant sources of infiltration.

2.4 Insulate Domestic Hot Water Piping

Existing Conditions:
Domestic Hot Water piping in the basement is uninsulated. Heat is lost to the basement unnecessarily.

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 Install Programmable Thermostats

Existing Conditions:
A non-programmable thermostat controls the heat. Temperature setting in the winter is assumed to be 72F.

Improvement Specifications:
Install a programmable thermostat. Savings is based on a three degree set back 8 hours each day.

2.6 Reduce Infiltration

Existing Conditions:
A blower door test performed on the building found moderate air leakage. Major routes for leakage include panned joists in the basement for the furnace cold-air return, the leaky front door, and a major air flow from the wall between the first floor shower and the rest of the first floor.

Improvement Specifications:
Install weatherstripping on doors as needed. Conduct comprehensive air sealing in conjunction with a blower door to identify areas for sealing.

2.7 Replace Basement Windows

Existing Conditions:
Basement windows are single glazed.

Improvement Specifications:
Replace windows with Energy Star units with a maximum Uvalue of 0.32. Specify windows with a thermal break. Window frames must be properly air sealed around frames during installation to maximize energy savings and comfort. Flashing around windows must be installed correctly to prevent water damage to building.

2.8 Replace Incandescent Lighting with Compact Fluorescent Lamps

Existing Conditions:
Lighting for the common spaces for this building is provided primarily by a combination of circline fluorescent fixtures and hardwired compact fluorescent (cfl) overhead fixtures. There are a few incandescent bulbs in table and floor lamps. Common bathrooms have a combination of fluorescent lamps and incandescent bulbs. Common bathrooms do not contain occupancy sensors.

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

2.9 Seal and Improve Ductwork

Existing Conditions:
The ductwork is uninsulated and unsealed.

Improvement Specifications:
Seal ductwork with duct mastic. Redesign and configure ductwork as necessary to improve air flow and system efficiency.

2.10 Install Energy Star Fans on Automatic Controls

Existing Conditions:
The second floor bath contains a working exhaust fan, but the first floor bath does not. The bath fan appears to vent to the exterior. 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.

Improvement Specifications:
Install an Energy Star bath fan on humidistat or automatic timer control in the second floor bathroom to improve ventilation in the building and reduce humidity in the space. Bath fans on automatic controls can be used to provide ventilation throughout the building by insuring fresh air enters the building at a controlled rate.

2.11 Replace Electric Clothes Dryer with Natural Gas fired Unit

Existing Conditions:
The basement laundry area contains a front-load washer and an electric dryer. The vent for the electric dryer is metal, twisted, long and had become disconnected at the time of the site visit.

Improvement Specifications:

Replace the existing electric dryer with natural gas fired dryer. Combustion gases should be vented to the exterior of the building through solid metal duct flue pipe.

2.12 Install Low Flush Toilet

Existing Conditions:
Water flow rates were measured at 1 gallon per minute maximum (GPM) at all locations, except the kitchen sink which was 2 GPM. Water usage of the two toilets was measured, and found to both be about 3.2 gallons per flush.

Improvement Specifications:
Replace the existing high flush toilets with a low flush unit 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

72 Park Pink Triangle

For: St. Lawrence University

By: Scott Shipley

Date: 7/1/2008

Evaluated Packages:

Package Name	Cost $	Annual Savings, MMBtu	Annual Savings, $	Payback years	Cashflow $/year	SIR
Improvement Package 1	14,255	91.33	1,333	10.69	78	1.6

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
Replace Basement Windows	800	0.04	1	N/A	-70	20	0.01
Replace Furnace and Improve Ductwork	4,500	26.60	335	13.4	-61	20	1.12
Insulate Domestic Hot Water Piping	250	2.04	26	9.7	4	20	1.54
Reduce Infiltration	1,000	8.33	105	9.5	17	20	1.57
Insulate and Airseal Attic	1,680	14.00	176	9.5	29	40	2.46
Install Natural Gas Dryer	750	-3.80	89	8.5	23	15	1.42
Insulate Walls	4,640	48.14	607	7.6	198	20	1.96
Replace Incandescents	75	0.48	52	1.4	45	7	4.32
Reduce Water Temperature	10	1.45	18	0.5	17	10	15.68

Install Energy Star Fan on Controls	400	-0.31	-4	N/A	-39	20	N/C
Install Programmable Thermostat	150	-5.64	-71	N/A	-84	15	N/C
Total for Package	14,255	91.33	1,333	10.69	78	N/A	1.60

Non-Energy Benefits:

1. Replace Basement Windows: Improve comfort (reduce drafts), increase value of building.
2. Replace Furnace and Improve Ductwork: Increased equity.
3. Insulate Domestic Hot Water Piping: Reduce risk of scalding, reduce flow noise, protect piping from damage.
4. Reduce Infiltration: Reduce drafts.
5. Insulate and Airseal Attic: Improve comfort, increase value of building.
6. Install Natural Gas Dryer: Increase value of building, reduce environmental risk due to old ozone-depleting refrigerants.
7. Insulate Walls: Improve comfort, increase value of building.
8. Replace Incandescents: Reduce maintenance, reduce replacement cost (fluorescent bulbs last 10,000 hours whereas incandescent bulbs typically last less than 1,000 hours).
9. Reduce Water Temperature: Reduce risk of scalding.
10. Install Energy Star Fan on Controls: Improve indoor air quality, increase value of building.
11. Install Programmable Thermostat: Improve comfort, improve convenience.

Table 1
Annual Emissions Savings

Fuel Type	NOx (LBS)	SO2 (LBS)	CO2 (LBS)
Electricity	3	6	1,847
Natural Gas	8	0	9,840
Oil	0	0	0
Propane	0	0	0
Other: Other Fuel Type Name	0	0	0
Total	**11**	**6**	**11,687**

ENERGY BILLS

72 Park St - Pink Triangle

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
06/02/06	7/5/06	33	521	$59.90	$0.11
07/05/06	8/2/06	28	455	$57.73	$0.13
08/02/06	9/5/06	34	525	$66.72	$0.13
09/05/06	10/2/06	27	961	$119.87	$0.12
10/02/06	11/1/06	30	1,112	$137.98	$0.12
11/01/06	12/4/06	33	1,105	$136.91	$0.12
12/04/06	1/2/07	29	856	$105.52	$0.12
Totals 2006			**5,535**	**$684.63**	**$0.12**
01/02/07	2/1/07	30	754	$100.86	$0.13
02/01/07	3/2/07	29	1,168	$159.47	$0.14
03/02/07	4/3/07	32	987	$128.20	$0.13
04/03/07	5/2/07	29	889	$121.31	$0.14
05/02/07	6/4/07	33	534	$72.60	$0.14
06/04/07	7/3/07	29	393	$52.35	$0.13
07/03/07	8/2/07	30	439	$59.10	$0.13
08/02/07	8/31/07	29	345	$45.50	$0.13
08/31/07	10/1/07	31	1,049	$49.21	$0.05
10/01/07	10/30/07	29	976	$42.40	$0.04
10/30/07	12/3/07	34	1,398	$60.86	$0.04
12/03/07	1/3/08	31	1,113	$29.01	$0.03
Totals 2006-2007			**10,045**	**$920.87**	
Average Cost Per kWh				$0.09	

Constellation Energy began supplying electricity in September of 2007. No cost data for purchases was provided. This accounts for the lower than expected $/kWh in the last four months above.

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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	257	$330.19	$1.28
12/21/05	1/23/06	33	357	$462.05	$1.29
1/23/06	2/21/06	29	244	$291.55	$1.19
2/21/06	3/22/06	29	424	$501.82	$1.18
3/22/06	4/20/06	29	184	$194.70	$1.06
4/20/06	5/22/06	32	151	$154.58	$1.02
5/22/06	6/21/06	30	24	$25.95	$1.08
6/21/06	7/24/06	33	1	$0.89	$0.89
7/24/06	8/22/06	29	6	$6.28	$1.05
8/22/06	9/21/06	30	38	$42.36	$1.11
9/21/06	10/23/06	32	104	$88.12	$0.85
10/23/06	11/21/06	29	208	$216.25	$1.04
Totals for 2006			**1,998**	**$2,314.74**	
11/21/06	12/21/06	30	186	$216.90	$1.17
12/21/06	1/23/07	33	363	$430.83	$1.19
1/23/07	2/21/07	29	340	$410.62	$1.21
2/21/07	3/22/07	29	502	$613.78	$1.22
3/22/07	4/20/07	29	160	$197.66	$1.24
4/20/07	5/22/07	32	215	$274.54	$1.28
5/22/07	6/21/07	30	21	$33.45	$1.59
6/21/07	7/23/07	32	15	$23.80	$1.59
7/23/07	8/22/07	30	15	$21.43	$1.43
8/22/07	9/20/07	29	26	$32.51	$1.25
9/20/07	10/22/07	32	75	$84.37	$1.12
10/22/07	11/21/07	30	143	$183.17	$1.28
Totals for 2007			**2,061**	**$2,523.06**	
Average Cost Per Therm				**$1.22**	

6/21/2005

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Water and Sewer Cost

Begin	End	Gallons	Water $	Sewer $	Total	$Water/ 1000 gal	$Sewer/ 1000 gal
Jul-08	Sep-08	5,000	$22.45	$27.75	$50.20	$4.49	$5.55
Oct-06	Dec-06	36,000	$161.64	$199.80	$361.44	$4.49	$5.55
Jan-07	Mar-07	27,000	$121.23	$149.85	$271.08	$4.49	$5.55
Apr-07	Jun-07	20,000	$93.40	$116.20	$209.60	$4.67	$5.81
Jul-07	Sep-08	14,000	$65.38	$81.34	$146.72	$4.67	$5.81
Oct-08	Dec-08	14,000	$65.38	$81.34	$146.72	$4.67	$5.81
Total		**116,000**	**$529.48**	**$656.28**	**$1,185.76**	**$4.56**	**$5.66**