ASSOCIATION OF MANITOBA MUNICIPALITIES
MANITOBA MUNICIPAL ENERGY AND WATER EFFICIENCY PROJECT
R.M. OF ST. ANDREWS
FINAL REPORT
MAY 2006

KGS GROUP

KONTZAMANIS ▪ GRAUMANN ▪ SMITH ▪ MACMILLAN INC.
CONSULTING ENGINEERS & PROJECT MANAGERS

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May 26, 2006

File No. 05-1285-01-1000.10

Association of Manitoba Municipalities
1910 Saskatchewan Avenue West
Portage la Prairie, Manitoba
R1N 0P1

ATTENTION: Mr. Tyler MacAfee

RE: Municipal Energy and Water
Efficiency Study for the R.M. of St. Andrews – Final Report

Dear Mr. Tyler MacAfee:

Enclosed is the Final Report of the Manitoba Municipal Energy and Water Efficiency Study for the R.M. of St. Andrews with all comments incorporated.

Included with this submission are 10 hard copies (3 in colour, 7 in black and white) of the report and 10 copies on compact disk in PDF format with searchable text functionality, as requested in the "Request for Proposal". The PDF file consists of the entire report, including the Executive Summary, Sections 1 to 12, and Appendix A to G.

We thank you for giving us the opportunity to work on this project and look forward to continuing this work with the other Municipalities.

Yours Truly,

R. B. Bodnar, P.Eng.
Senior Mechanical Engineer/ Department Head

RBB/mg

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EXECUTIVE SUMMARY

The objective of this study was to determine energy and water efficiency opportunities that could enable the Rural Municipality of St. Andrews to reduce operating costs, conserve resources, and reduce greenhouse gas emissions.

An energy and water efficiency audit was conducted on eight buildings in the R.M. of St. Andrews. Throughout the course of this audit, water and energy efficiency opportunities were analyzed to determine each building's potential for energy and water savings. The saving opportunities were separated into the following categories:

- Lighting – Replacing the interior and/or exterior lighting with more energy efficient lights and fixtures.
- Envelope – This involves measures that would reduce the heat loss through the building's windows, doors, walls, and roof.
- Motors- Replacing low efficiency motors with higher efficiency motors.
- HVAC- Improving current heating, ventilating, and air conditioning systems.
- Process Equipment: Potential upgrades to ice plants at arenas and curling rinks.
- Water – Replacing high flow water fixtures with water efficient fixtures.

Table E1 shows the energy and water consumption for each of the buildings for the period October 2004 to October 2005. This year was chosen as it represents a typical year for energy and water consumption. In addition, the most recent year was selected since the conditions of the buildings throughout this time most closely resemble the buildings' current conditions. The buildings included in this audit used natural gas and electricity as their source of energy. The "Energy Density" column in this table is the total energy (electricity and natural gas) consumed in the building divided by the area of the building. This is useful in comparing the energy consumption among the different buildings in St. Andrews. The pie chart displays the percentage of total energy density for each of the buildings. It ranges from a high of 16.9% for the Fire Hall #2 to a low of 9.4% for the St. Andrews Heritage Centre (Old Fire Hall).

Tables E2 (a) and (b) show overall energy and water saving opportunities for all eight buildings in the Rural Municipality of St. Andrews. These tables also include approximate product and installation prices for each measure both with and without incentives (refer to Appendix D for a list of Manitoba Hydro incentives) and simple payback years. The "Simple Payback Years" column is the overall payback period and may vary for individual buildings.

From the energy saving opportunities table (Table E2(a)) it can be seen that the total potential for energy savings in all eight buildings is 715,192 kWh, 30% of the current total energy consumption.

The water saving opportunities table (Table E2(b)) only shows percentages of savings. The reason for this is that none of the buildings audited have water meters and actual water consumption is unknown. Actual water savings in litres/year would therefore be based on rough estimates and would not be accurate. The percentages shown in this table indicate the percent water savings that would result from replacing the current water fixtures in all of the buildings with water efficient fixtures.

In addition to energy, water, and cost savings, other benefits would result from implementing the saving opportunities recommended throughout this report:

- Reduction in CO_2 emissions resulting in reduced contribution to climate change– the percent reduction is shown at the bottom of each of the energy saving opportunity tables.
- Lowered maintenance costs – (e.g. replacing the current lights with longer lasting bulbs).
- Improved physical comfort – (e.g. reducing infiltration into buildings).

Table E1 Energy Consumption for the Period from October 2004 – October 2005

Site	Energy Density (kWh/m^2)	% of Total Energy Density	Area (m^2)	Electricity		Natural Gas		TOTAL ENERGY	
				kWh	Cost	kWh	Cost	kWh	Cost
Heritage Centre (Old Fire Hall)	223	9.4%	141	31,520	$2,333	0	$0	31,520	$2,333
Fire Hall #1	332	14.0%	321	12,000	$760	94,669	$3,853	106,669	$4,613
Municipal Administrative Building	273	11.5%	673	123,640	$7,796	59,718	$2,546	183,358	$10,342
Municipal Repair Shop	348	14.7%	465	23,000	$1,450	138,831	$5,741	161,831	$7,191
Fire Hall #2	402	16.9%	733	52,500	$3,765	242,307	$9,578	294,807	$13,343
Northend Fire Hall #3	265	11.1%	907	58,320	$4,118	181,958	$7,407	240,278	$11,525
St. Andrews Community Club	247	10.4%	3,135	325,140	$18,731	450,595	$16,928	775,735	$35,659
Petersfield Curling Club	286	12.0%	1,737	170,220	$10,445	326,150	$12,633	496,370	$23,078
Totals				796,340	$49,398	1,494,228	$58,685	2,290,568	$108,083

Percentage of Total Energy Density for Buildings in St. Andrews

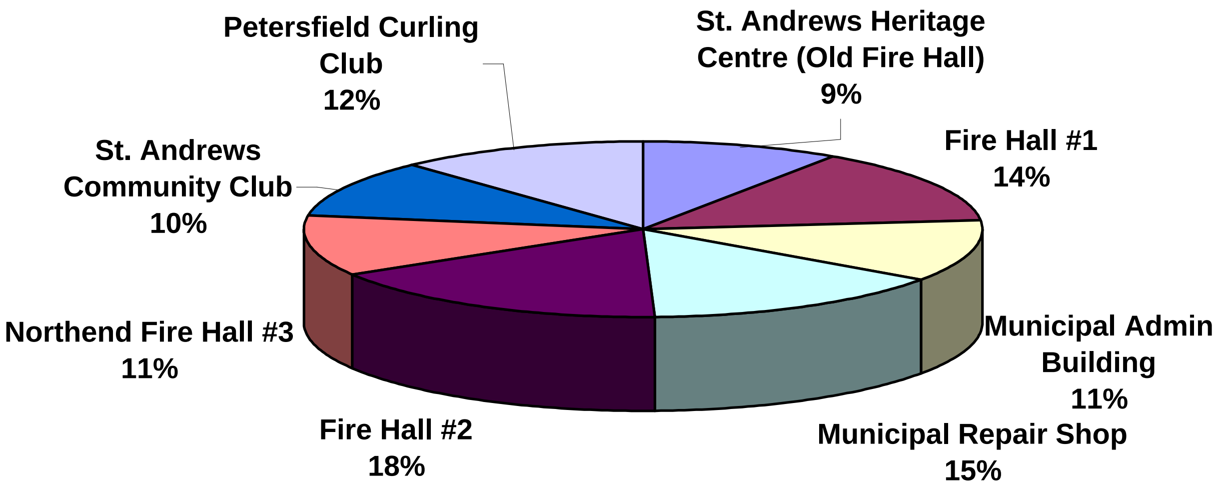

Table E2 (a) Summary of Energy Saving Opportunities for the R.M. of St. Andrews

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years****		Related Buildings
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*	
LIGHTING & PARKING LOT CONTROLLERS											
When 8' x2 T12 ballasts burn out, replace them with T8 ballast and tubes.	160	$47	$12	$0	$8,628	$2,244	20,033	$1,203	7.2	1.9	Heritage Centre, Fire Hall #1, Municipal Repair Shop, Fire Hall #2, Northend Fire Hall #3.
When 4'x2 T12 ballasts burn out, replace them with T8 ballasts and tubes.	120	$41	$21	$0	$5,636	$2,900	4,913	$295	19.1	9.8	Fire Hall #1, Municipal Administration Building, Municipal Repair Shop, Fire Hall #2, Petersfield Curling Club.
When 4' x4 T12 ballasts burn out, replace them with T8 ballasts and tubes.	85	$32	$12	$0	$3,140	$1,202	12,561	$754	4.2	1.6	Municipal Administration Building, Northend Fire Hall #3, St. Andrews Community Club.
Replace interior incandescents with compact fluorescents.	4	$15	$10	$13	$128	$105	433	$26	4.9	4.0	Heritage Centre.
When replacing interior incandescents, replace them with compact fluorescents.	24	$13	$8	$0	$356	$219	1,621	$97	3.7	2.2	Municipal Administration Building, Petersfield Curling Club.
Replace EXIT incandescent lamps with LED modules.	25	$50	$5	$80	$3,705	$2,423	5,913	$355	10.4	6.8	Heritage Centre, Fire Hall #1, Municipal Administration Building, Northend Fire Hall #3, Petersfield Curling Club.
Repair photocell on outdoor lights.	4	$25	$25	$65	$410	$410	1,752	$105	3.9	3.9	St. Andrews Community Club.
Turn indoor lights off throughout the night.	4	$0	$0	$0	$0	$0	1,717	$103	0.0	0.0	Fire Hall #2.
Install parking lot controllers.	3	$100	$75	$150	$855	$770	1,296	$78	11.0	9.9	Municipal Administration Building.
Lighting & Parking Lot Controllers Subtotal					**$7,738**	**$4,358**	**50,239**	**$1,338**			
ENVELOPE											
Replace pedestrian doors.	2	$350	$350	$100	$1,026	$1,026	6,746	$308	3.3	3.3	Northend Fire Hall #3.

Table E2 (a) Summary of Energy Saving Opportunities for the R.M. of St. Andrews

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years****		Related Buildings
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*	
Weatherstrip pedestrian doors.	17	$15	$15	$50	$1,260	$1,260	20,575	$990	1.3	1.3	Heritage Centre, Fire Hall #1, Municipal Repair Shop, Fire Hall #2, St. Andrews Community Club, Petersfield Curling Club.
Weather-strip vehicle doors.	10	$15	$15	$50	$741	$741	29,204	$1,335	0.6	0.6	Fire Hall #1, Fire Hall #2, Northend Fire Hall #3.
Caulk pedestrian/vehicle doors.	44	$5	$5	$25	$1,505	$1,505	32,287	$1,476	1.0	1.0	Fire Hall #1, Municipal Repair Shop, Fire Hall #2, Northend Fire Hall #3, St. Andrews Community Club, Petersfield Curling Club.
Replace windows.	15	$4,880	$3,685	$1,877	$13,429	$11,223	8,436	$395	34.0	28.4	Heritage Centre, Municipal Administration Building, Municipal Repair Shop, Northend Fire Hall #3, Petersfield Curling Rink.
Weather-strip windows.	2	$15	$15	$50	$148	$148	540	$25	6.0	6.0	Fire Hall #2.
Caulk windows.	26	$5	$5	$13	$534	$534	6,572	$313	1.7	1.7	Heritage Centre, Municipal Repair Shop, Fire Hall #2, Northend Fire Hall #3, Petersfield Curling Club.
Upgrade roof insulation.	2	$5,148	$1,848	$3,803	$10,205	$6,443	37,832	$1,780	5.7	3.6	Heritage Centre, Municipal Repair Shop.
Upgrade wall insulation	2	$12,420	$10,990	$12,420	$28,318	$26,687	13,079	$667	42.4	40.0	Heritage Centre, Municipal Administration Building.
Envelope Subtotal					**$57,165**	**$49,566**	**155,272**	**$7,288**			
HVAC											
Replace unit heaters with high efficiency furnaces.	2	$3,600	$3,355	$500	$9,348	$8,789	13,588	$621	15.1	14.2	Fire Hall #2

Table E2 (a) Summary of Energy Saving Opportunities for the R.M. of St. Andrews

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years****		Related Buildings
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*	
When unit heaters require replacement, replace them with high efficiency furnaces.	8	$2,325	$2,080	$0	$21,204	$18,970	38,339	$1,752	12.1	10.8	Fire Hall #1, St. Andrews Community Club & Petersfield Curling Club.
Replace unit heaters with high efficiency furnaces (ducted).	6	$3,133	$2,888	$1,000	$28,272	$26,596	37,704	$1,723	16.4	15.4	Municipal Repair Shop, Fire Hall #2, Northend Fire Hall #3.
Replace RTUs with high efficiency RTUs.	2	$5,800	$5,395	$1,000	$15,504	$14,581	$17,143	$1,029	15.1	14.2	Municipal Administration Building.
When RTUs require replacement, replace them with high efficiency RTUs with CO_2 sensors.	2	$700	$500	$500	$2,736	$2,280	12,013	$549	5.0	4.2	St. Andrews Community Club.
Replace furnace with high efficiency furnace.	4	$3,100	$2,855	$500	$16,416	$15,299	30,838	$1,409	11.6	10.9	Municipal Administration Building, St. Andrews Community Club, Petersfield Curling Club.
Replace condensing unit with high efficiency unit.	2	$5,000	$4,784	$500	$12,540	$12,048	20,765	$949	13.2	12.7	Petersfield Curling Club.
Install HRVs.	4	$3,000	$3,000	$900	$17,784	$17,784	16,588	758	23.5	23.5	Municipal Administration Building, Fire Hall #2.
Replace backdraft dampers with motorized dampers.	11	$300	$300	$300	$7,524	$7,524	117,163	$5,354	1.4	1.4	Municipal Administration Building, Municipal Repair Shop, Fire Hall #2, Northend Fire Hall #3, Petersfield Curling Club.
Install countdown timer for greasehood exhaust fan.	1	$60	$60	$125	$211	$211	3,554	$162	1.3	1.3	St. Andrews Community Club.
Install ceiling fan.	6	$100	$100	$175	$1,881	$1,881	12,709	$581	3.2	3.2	Fire Hall #2, Northend Fire Hall #3.
Install outdoor thermostat wired to rink ventilation.	1	$600	$600	$600	$1,368	$1,368	38,437	$1,757	0.8	0.8	St. Andrews Community Club.

Table E2 (a) Summary of Energy Saving Opportunities for the R.M. of St. Andrews

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years****		Related Buildings
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*	
Install thermostats; setback temp to 15 °C (59 °F)	27	$300	$300	$300	$18,468	$18,468	100,137	$4,623	4.0	4.0	Heritage Centre, Fire Hall #1, Municipal Administration Building, Municipal Repair Shop, Fire Hall #2, Northend Fire Hall #3, St. Andrews Community Club, Petersfield Curling Club.
Install geothermal heating system (not included in totals).	1	$48,000	$48,000	$32,000	$91,200	$91,200	63,112	$2,884	31.6	31.6	Fire Hall #1.
HVAC Subtotal					**$153,256**	**$145,798**	**458,979**	**$21,267**			
MOTORS											
When 50HP compressor motors require replacement, replace them with premium efficiency motors.	2	$800	$800	$0	$1,824	$1,824	5,074	$305	6.0	6.0	St. Andrews Community Club.
When 30HP compressor motor requires replacement, replace it with a premium efficiency motor.	1	$400	$400	$0	$456	$456	1,984	$119	3.8	3.8	Petersfield Curling Club.
When 20HP brine pump motor requires replacement, replace it with a premium efficiency motor.	1	$470	$470	$0	$536	$536	1,804	$108	4.9	4.9	St. Andrews Community Club.
When 8HP brine pump motor requires replacement, replace it with a premium efficiency motor.	1	$226	$226	$0	$258	$258	496	$30	8.6	8.6	Petersfield Curling Club.
Motors Subtotal					**$3,073**	**$3,073**	**9,358**	**$562**			

Table E2 (a) Summary of Energy Saving Opportunities for the R.M. of St. Andrews

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years****		Related Buildings
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*	
HOT WATER											
Install water efficient metering faucets.	7	$309	$309	$150	$3,663	$3,663	1,792	$82	44.7	44.7	St. Andrews Community Club.
Install water efficient showerheads.	8	$21	$21	$50	$648	$648	4,421	$202	3.2	3.2	St. Andrews Community Club.
Insulate hot water piping	3	$50	$50	$50	$342	$342	1,397	$71	4.8	4.8	Heritage Centre, Fire Hall #1, Northend Fire Hall #3.
Install instantaneous water heater (small electric).*****	4	$300	$300	$500	$3,648	$3,648	4,683	$256	14.2	14.2	Heritage Centre, Fire Hall #1, Municipal Administration Building, Municipal Repair Shop.
Install instantaneous water heater (large gas-fired).*****	2	$1,000	$1,000	$600	$3,648	$3,648	4,073	$186	19.6	19.6	Northend Fire Hall #3, Fire Hall #2.
Replace boiler and 2 storage tanks with high efficiency boiler.	1	$8,000	$8,000	$500	$9,690	$9,690	24,979	$1,142	8.5	8.5	St. Andrews Community Club.
Hot Water Subtotal					**$21,638**	**$21,638**	**41,344**	**$1,938**			

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	2,413,235	$115,548	291.97
Estimated Annual Savings	715,192	$32,393	104.23
Percent Savings	30%	28%	36%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is 0.0457 $/kWh (as of November 1, 2005)
**** This is the overall payback period and may vary for individual buildings (refer to tables throughout report for payback years for a specific building).
***** Discounted to include the cost of replacement water tank in 10 years.

Table E2 (b) Summary of Water Saving Opportunities for the R.M. of St. Andrews

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Related Buildings
		Material	Labour			
Install water efficient metering faucets.	28	$309	$150	$14,651	80%	Fire Hall #1, Municipal Administration Building, Fire Hall #2, Northend Fire Hall #3, St. Andrews Community Club, Petersfield Curling Club.
Install water efficient dual flush toilets.	36	$284	$150	$17,811	70%	Heritage Centre, Fire Hall #1, Municipal Repair Shop, Fire Hall #2, Northend Fire Hall #3, St. Andrews Community Club, Petersfield Curling Club.
Install water efficient showerheads.	8	$21	$50	$648	29%	St. Andrews Community Club.
Install water efficient urinals.	14	$344	$200	$8,682	60%	Fire Hall #1, Fire Hall #2, Northend Fire Hall #3, St. Andrews Community Club, Petersfield Curling Club.

* The total cost column includes 14% taxes.

MMEP AUDITORS

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Association of Manitoba Municipalities
Manitoba Hydro
Manitoba Conservation
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Manitoba Culture, Heritage, and Tourism

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ACKNOWLEDGEMENTS

KGS Group and the MMEP partners gratefully acknowledge the valuable contributions the following people have made in providing their time, helpful suggestions, and participation in this energy and water efficiency project:

- Scott Spicer (Municipal Administration Building)
- Elmer Keryluk (Heritage Centre – Old Fire Hall)
- Ray Kelsch (Fire Hall #1)
- Brad Pawluk (Municipal Repair Shop)
- Trent Keryluk (Fire Hall #2)
- Rick Warner (Northend Fire Hall #3)
- Stephanie Foy (St. Andrews Community Club)
- Dora Fedorchuk (Petersfield Community Club)

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1.0 INTRODUCTION

1.1 BACKGROUND

Energy and water conservation is becoming more important as environmental concerns grow and energy costs increase. For this reason it is important to perform energy and water efficiency audits to identify practical efficiency improvement opportunities and determine the capital costs and payback periods associated with these implementations.

An energy and water efficiency audit was conducted on eight buildings in the Rural Municipality of St. Andrews to determine how to reduce both energy and water consumption in each of the buildings.

1.2 OBJECTIVE

The objective of this study was to determine energy and water efficiency opportunities that could enable the R.M. of St. Andrews to reduce operating costs, conserve resources, and reduce greenhouse gas emissions. All eight buildings in St. Andrews were analyzed separately and the results are presented in separate sections throughout this report.

1.3 METHODOLOGY

The buildings were toured on March 7 and 8, 2006 by Mr. Ray Bodnar, P.Eng. of KGS Group Consulting Engineers and Project Managers. These tours involved a walkthrough of each of the buildings to determine the current condition of the building's envelope (walls, roof, windows, and doors), lighting, water fixtures, motors, and heating, ventilation and air conditioning (HVAC) systems.

During the building tours, the auditor met with the R.M. of St. Andrew's Chief Administrative Officer Scott Spicer to discuss the study objectives for identifying energy and water saving opportunities, and to provide information on existing incentive programs. At this time it was determined that there are plans for a new Public Works building in the future. While auditing the buildings, whenever possible, on-site training was done to inform the staff on energy and/or water saving opportunities in specific buildings and to point out maintenance issues where applicable.

Using the information collected during the audit, available drawings of the buildings, historical weather data, and the hydro bills from the past 12 months, calculations were performed to determine how each of the buildings are consuming energy and water. Several assumptions were made throughout these calculations including occupancies, room temperatures, and envelope conditions (see Inventory Sheets in Appendix A). When no drawings were available, wall/roof R-values were assumed based on discussions with site personnel or based on knowledge of other buildings of similar type/age to the building surveyed.

Energy Saving Opportunities (ESOs) were developed for each building and are presented in tables throughout this report showing energy savings, cost savings, installation costs, and simple payback periods. Simple Payback Periods are calculated as the total installation cost divided by the annual cost savings. The installation costs include the material costs, both with and without incentives (see Appendix D for a list of Manitoba Hydro incentives), and the labour costs for the installation using standard contractor rates. The total energy savings, the percent energy savings, and the associated costs are presented at the end of each ESO table. It should be noted that the energy savings and capital cost estimates are preliminary. For complex measures such as geothermal heating/cooling, a more detailed investigation would be required to confirm material and installation costs for this system.

An environmental benefit that results from reducing energy consumption is a reduction in CO_2 emissions. CO_2 is a greenhouse gas and thus contributes to global warming. By reducing natural gas and electrical energy consumption, CO_2 emissions are reduced. At the bottom of each ESO table, the total CO_2 reduction resulting from the energy savings is shown. This was calculated using a CO_2 emissions calculator produced by Natural Resources Canada.

Many of the ESOs have low installed costs and payback periods of less than two years. Once the implementation phase begins, these ESOs are the most attractive measures. However, in order to maximize long-term savings and efficiencies for the buildings, implementation of the more capital-intensive measures with the longer payback periods is necessary. These items will become more attractive as energy costs increase in the future. It is recommended that the savings associated with the short payback ESOs be reinvested annually as a means to help finance the more expensive options.

Water Saving Opportunities (WSOs) are also presented in this report. The WSOs include installing water efficient sink faucets, toilets, urinals, and showerheads. Since none of the buildings have water meters, the savings are shown as percentages of the current fixtures' water consumption. Individual water wells supply water to these buildings and therefore, reducing water consumption will not save in water costs but will reduce pumping costs. Another cost saving is in treating the water. Although the current water supply may not be treated, it is possible that future regulations will require that all water supplies be treated. Once this occurs, reduced water consumption will result in significant savings on water treatment.

2.0 ST. ANDREWS HERITAGE CENTRE (OLD FIRE HALL)

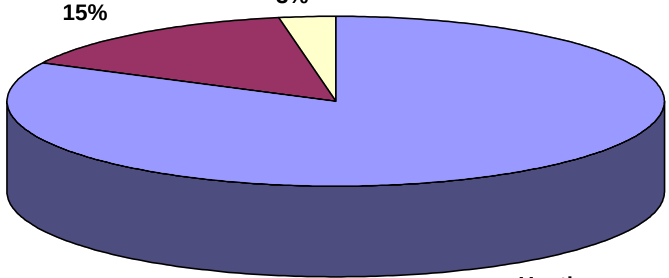
2.1 BACKGROUND

The St. Andrews Heritage Centre was initially built as a fire hall in 1974 but is now used as a museum throughout the summer and for monthly meetings throughout the winter. This building is 1,520 square feet and was constructed of concrete block walls filled with zonolite and 2" of Styrofoam insulation. In 2005, the roof was replaced and re-insulated with 4" of Styrofoam and the previous vehicle doors were filled in and insulated. This building is occupied 12 hours per day throughout the summer and for meetings once a month throughout the winter.

Photo 1 – St. Andrews Heritage Centre (Old Fire Hall)

The Heritage Centre uses electricity exclusively for heating, lighting and water heating. The total electrical energy consumption for the previous year was 31,520 kWh. The pie chart below shows the total energy breakdown for the Heritage Centre.

Energy Breakdown (% of Total kWh) for the St. Andrews Heritage Centre (Old Fire Hall)



The washroom in the St. Andrews Heritage Centre contains a total of 1 toilet and 1 sink. A 115 Litre electric hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to offset the heat losses from the storage tank.

2.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 1 and 2 show a summary of both the energy and water saving opportunities for the Heritage Centre. The following assumptions were made in determining the annual savings:

- The Centre is occupied for 12 hours per day from May to September and for 8 hours per month throughout the winter.
- The temperature of the Heritage Centre is maintained at 21°C (70°F).
- For the purpose of hot water consumption, the typical occupancy is taken as 4.
- The exit lamps are on 24 hours per day year round.

Table 1 Energy Saving Opportunities for the St. Andrews Heritage Centre (Old Fire Hall)

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Replace EXIT incandescent lamps with LED modules.	1	$50	$5	$80	$148	$97	237	$14	10.4	6.8
When 8' x2 T12 ballasts burn out, replace them with T8 ballast and tubes.	12	$47	$12	$0	$647	$168	1,336	$80	8.1	2.1
Replace interior incandescents with compact fluorescents.	4	$15	$10	$13	$128	$105	433	$26	4.9	4.0
Lighting Subtotal					**$923**	**$370**	**2,005**	**$120**		
ENVELOPE										
Weather-strip pedestrian doors.	4	$15	$15	$50	$296	$296	3,441	$207	1.4	1.4
Caulk windows.	4	$5	$5	$13	$82	$82	881	$53	1.6	1.6
Replace windows.	4	$530	$450	$160	$3,146	$2,782	677	$41	77.5	68.5
When replacing the roof, upgrade roof insulation.	1	$1,873	$973	$528	$2,738	$1,712	3,545	$213	12.9	8.0
Upgrade wall insulation.	1	$7,020	$6,290	$7,020	$16,006	$15,173	4,850	$291	55.0	52.1
Envelope Subtotal					**$22,268**	**$20,045**	**13,393**	**$804**		
HVAC										
Install programmable thermostats; Setback temp to 15 °C (59 °F)	3	$300	$300	$300	$2,052	$2,052	3,227	$194	10.6	10.6
HVAC Subtotal					**$2,052**	**$2,052**	**3,227**	**$194**		
HOT WATER										
Install instantaneous water heater.****	1	$300	$300	$500	$912	$912	873	$52	17.4	17.4
Insulate hot water piping.	1	$50	$50	$50	$114	$114	466	$28	4.1	4.1
Water Subtotal					**$1,026**	**$1,026**	**1,339**	**$80**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	31,520	$2,333	0.94
Estimated Annual Savings	19,964	$1,199	0.6
Percent Savings	63%	51%	64%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website).
**** Discounted to include cost of replacement tank in 10 years.

Table 2 Water Saving Opportunities for the St. Andrews Heritage Centre (Old Fire Hall)

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)
		Material	Labour		
Install water efficient dual flush toilets.	1	$284	$150	$495	70%

* The total cost column includes 14% taxes.

2.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis summary for the Heritage Centre is shown in Appendix B, Table B.1.3. The energy consumed by the incandescent exit sign would be reduced by 90% if it were replaced with an LED module. There is a high capital cost associated with replacing the 8' T12s with energy efficient T8s. However, once the T12 ballasts burn out, the extra costs associated with installing T8 ballasts and tubes would result in energy savings with a short payback period. Another reason for upgrading these lights to T8 fluorescents is that the T12s are expected to be obsolete by the year 2010. Another opportunity for energy savings is to replace the incandescent bulbs with compact fluorescents.

Envelope

The walls of this building have approximately R-12 insulation. Upgrading this to R-20 would result in large energy savings; however, the cost of this upgrade is high resulting in a long payback period. When the roof of this building was upgraded, the insulation was upgraded to R-16 as opposed to the recommended R-40. The energy saving opportunity listed in Table 1 is to upgrade the insulation to R-40 once the roof requires replacement.

A large amount of heat is lost due to infiltration through cracks around the windows and doors. Sealing these cracks with weather-stripping and caulking would eliminate the infiltration resulting in large energy savings with a short payback period. As can be seen from Table 1, replacing the windows with triple pane windows does not result in enough energy savings to make this upgrade worthwhile. Table B.1.4 in Appendix B shows details on these calculations.

HVAC

Reducing the temperature in the Heritage Centre to 15°C (59°F) when unoccupied would reduce the heat load during these times. It is recommended to install new thermostats wired to the light switches such that when the lights are turned off the temperature setting automatically drops to 15°C.

Water

The majority of energy consumed for water heating is used to offset the heat losses from the storage tank. Replacing the tank with an instantaneous water heater would eliminate these storage losses and thus save in the energy used for water heating. Instantaneous water heaters also have a much longer life than the hot water tanks and therefore would not have to be replaced as often. Another energy saving opportunity is to insulate the hot water piping. This would cost very little and would reduce the heat losses from the pipes.

Replacing the toilets in the washroom with water efficient dual flush toilets would save 70% of the current water consumption. Exact water savings in litres are not shown in Table 2 above; however, Table B.1.5 in Appendix B shows estimated water consumption results that were calculated based on typical water fixtures and estimations of the occupancy of the Heritage Centre.

Operation and Maintenance

One of the electric unit heaters is defective and should be either replaced or repaired.

3.0 FIRE HALL #1

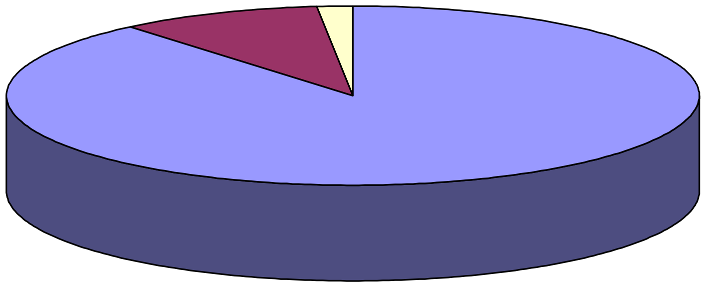
3.1 BACKGROUND

The Fire Hall #1, constructed in 1985, is a 3,456 square foot metal clad building. The Fire Hall is on the main floor and the meeting room and office are on the second floor. This building is occupied for approximately 30 hours/week.

Photo 2 – Fire Hall #1

The Fire Hall #1 is serviced with both electricity and natural gas. The electrical service for this building is shared with the Municipal Repair Shop and the Municipal Administration Building. The annual electricity consumption for this building in the previous year was 12,000 kWh and was used for lighting, water heating, and heating for the second floor. Natural gas unit heaters heat the main floor of this building. The total energy consumption through the use of natural gas for the previous year was 94,669 kWh. The pie chart below shows the portions of the total energy consumption used for lighting, water heating, and building heat.

Energy Breakdown (% of Total kWh) for the Fire Hall #1



The washroom in the Fire Hall #1 contains a total of 1 toilet, 1 urinal, and 1 sink. A 150 Litre electric hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to offset the heat losses from the storage tank.

3.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 3 and 4 show a summary of energy and water saving opportunities for the Fire Hall #1. The following assumptions were made in the analysis:

- The fire hall is occupied for 30 hours per week year round.
- The temperature of the hall is maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy of this building is 6.
- The exit lamps are on 24 hours per day year round.

Table 3 Energy Saving Opportunities for the Fire Hall #1

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
When 8'x2 T12 ballasts burn out, replace them with T8 ballasts and tubes.	30	$47	$12	$0	$1,618	$421	1,835	$110	14.7	3.8
When 4'x2 T12 ballasts burn out, replace them with T8 ballasts and tubes.	4	$41	$21	$0	$188	$97	243	$15	12.9	6.6
Replace EXIT incandescent lamps with LED modules.	6	$50	$5	$80	$889	$581	1,419	$85	10.4	6.8
Lighting Subtotal					**$2,695**	**$1,099**	**3,497**	**$210**		
ENVELOPE										
Weather-strip pedestrian doors.	3	$15	$15	$50	$222	$222	1,853	$85	2.6	2.6
Weather-strip vehicle doors.	3	$15	$15	$50	$222	$222	13,155	$601	0.4	0.4
Caulk pedestrian doors.	3	$5	$5	$25	$103	$103	549	$25	4.1	4.1
Caulk vehicle doors.	3	$5	$5	$25	$103	$103	4,209	$192	0.5	0.5
Envelope Subtotal					**$650**	**$650**	**19,767**	**$903**		
HVAC										
When unit heaters require replacement, replace them with high efficiency furnaces.	3	$2,300	$2,055	$0	$7,866	$7,028	14,200	$649	12.1	10.8
Install new thermostats; setback temperature to 15°C (59°F).	4	$300	$300	$300	$2,736	$2,736	11,664	$533	5.1	5.1
Install geothermal heating system (not included in totals).	1	$48,000	$48,000	$32,000	$91,200	$91,200	63,112	$2,884	31.6	31.6
HVAC Subtototal					**$10,602**	**$10,602**	**25,865**	**$1,182**		
HOT WATER										
Install instantaneous water heater.****	1	$300	$300	$500	$912	$912	1,164	$53	17.1	17.1
Insulate hot water pipes.	1	$50	$50	$50	$114	$114	466	$21	5.4	5.4
Hot Water Subtotal					**$1,026**	**$1,026**	**1,630**	**$74**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	106,641	$4,613	17.35
Estimated Annual Savings	50,758	$2,370	8.05
Percent Savings	48%	51%	46%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is 0.0457 $/kWh (as of November 1, 2005).
**** Discounted to include the cost of a replacement tank in 10 years.

Table 4 Water Saving Opportunities for the Fire Hall #1

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)
		Material	Labour		
Install water efficient metering faucets.	1	$309	$150	$523	80%
Install water efficient dual flush toilets.	1	$284	$150	$495	70%
Install water efficient urinals.	1	$344	$200	$620	60%

* The total cost column includes 14% taxes.

3.3 GENERAL RECOMMENDATIONS

Lighting

One energy saving opportunity is to replace the T12 fluorescent lamps and ballasts with energy efficient T8s. T8s are slim, high efficiency fluorescent lamps with better phosphors that generate more light per watt than conventional lighting. Once the T12 ballasts burn out, consideration should be given to this upgrade. Another opportunity is to replace the exit sign incandescent lamps with LEDs. This would result in savings with a less than 10 year payback period. The lighting analysis summary table is shown in Appendix B as Table B.2.3.

Envelope

The walls and roof of this building have adequate insulation and the doors and windows are in good condition. The most cost-effective opportunities for energy savings for this building include weather-stripping and caulking the vehicle and pedestrian doors. There is significant leakage through the cracks around these doors that could be reduced for very little cost. The results from these energy saving calculations are shown in Appendix B, Table B.2.4.

HVAC

The unit heaters in this building are at most 80% efficient. Replacing these heaters with 95% efficient furnaces would save at least 15% of the annual energy consumption for heating the hall. In addition, the temperature setting should be reduced to 15 ^{o}C (59 ^{o}F) when the building is unoccupied to save in heating costs. This could be done by installing new thermostats wired to the light switch such that when the lights are turned off, the temperature setting is automatically reduced to 15°C (59°F).

A geothermal heating system was investigated for this facility. The existing natural gas unit heaters would be replaced with a water-to-air heat pump connected to a closed loop ground source system. The ground loop is needed as a heat exchanger to pull and return heat from the ground. If desired, this system could also be used for cooling. A geothermal heat pump is one of the most energy efficient and environmentally friendly electric heating and cooling systems available.

Water

An energy saving opportunity shown in Table 3 is to install an instantaneous water heater. With an instantaneous water heater there is no storage tank; therefore, the heat loss that is present with the current water heater's storage tank would be eliminated. Another advantage of an instantaneous water heater is that they have a longer life than the hot water tanks.

Another opportunity with a short payback period is to insulate the hot water piping.

The water analysis summary is shown in Table B.2.5 in Appendix B. Replacing the current high flow water fixtures with water efficient fixtures would reduce the water consumed by these fixtures by 60 to 80%.

4.0 MUNICIPAL ADMINISTRATION BUILDING

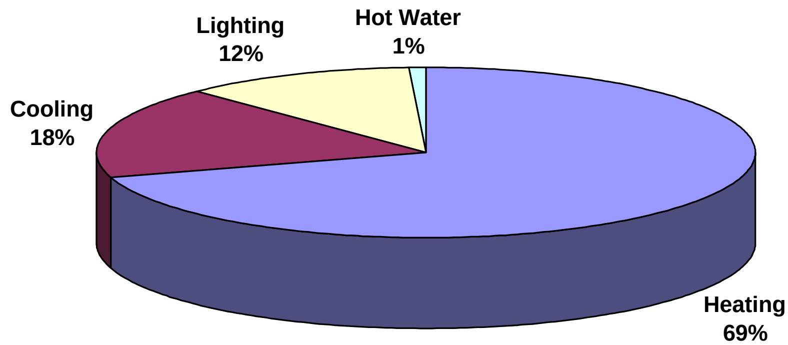
4.1 BACKGROUND

The Municipal Administration Building is a 7,240 square foot building consisting of the Municipal Offices in one half, and the Museum and classrooms in the other half. The Museum was constructed in 1911. In 1988, the Municipal Office was built and the Museum was renovated. The Municipal Office is occupied from Monday to Friday, 9:00 am to 4:30 pm and the Museum is occupied intermittently for approximately 20 hours every week.

Photo 3 – Municipal Administration Building

The Municipal Administration Building uses electricity for lighting, hot water, and air conditioning and natural gas for heating. The total electricity and natural gas consumption for the previous year was 124,000 kWh and 59,718 kWh, respectively. The electrical service for this building was shared with Fire Hall #1 and the Municipal Repair Shop. The total energy breakdown is shown in the following pie chart.

Energy Breakdown (% of Total kWh) for the Municipal Administration Building



The washrooms in the Administration Building contain water efficient toilets and 2 high flow sinks. A 75 Litre electric hot water heater tank heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to offset the heat losses from the storage tank.

4.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 5 and 6 show summaries of the energy and water efficiency improvement opportunities for the Municipal Administration Building. The following assumptions were made in the calculations:

- The Municipal Office is occupied from Monday to Friday for 7 ½ hours per day and the Museum is occupied for 20 hours per week.
- The temperature of both the offices and the museum is maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy of this building is 16.

Table 5 Energy Saving Opportunities for the Municipal Administration Building

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING & PARKING LOT CONTROLLERS										
When 4' x 2 T12 ballasts in museum burn out, replace them with T8 ballast and tubes.	16	$41	$21	$0	$751	$387	649	$39	19.3	9.9
When 4' x 4 T12 ballasts in office burn out, replace them with T8 ballast and tubes.	41	$32	$12	$0	$1,514	$580	6,236	$374	4.0	1.5
When replacing interior incandescents, replace them with compact fluorescents.	14	$13	$8	$0	$207	$128	1,048	$63	3.3	2.0
Replace incandescent EXIT signs with LEDs.	6	$50	$5	$80	$889	$581	1,419	$85	10.4	6.8
Install parking lot controllers.	3	$100	$75	$150	$855	$770	1,296	$78	11.0	9.9
Lighting and Parking Lot Controllers Subtotal					**$4,218**	**$2,445**	**10,649**	**$639**		
ENVELOPE										
Replace 60"x65" windows with triple pane windows.	2	$1,000	$730	$320	$3,010	$2,394	1,684	$77	39.1	31.1
Replace broken 56"x20" window with triple pane window.	1	$500	$420	$240	$844	$752	597	$27	30.9	27.6
Replace broken 60"x65" window with triple pane window.	1	$1,000	$730	$320	$1,505	$1,197	2,080	$95	15.8	12.6
Upgrade wall insulation	1	$5,400	$4,700	$5,400	$12,312	$11,514	8,229	$376	32.7	30.6
Envelope Subtotal					**$17,670**	**$15,857**	**12,590**	**$575**		
HVAC										
Replace RTUs with high efficiency units with CO_2 control.	2	$5,800	$5,395	$1,000	$15,504	$14,581	17,203	$1,033	15.0	14.1
Replace furnace with high efficiency furnace.	1	$3,200	$2,955	$500	$4,218	$3,939	6,269	$286	14.7	13.7
Provide HRVs for RTUs (2).	2	$2,000	$2,000	$800	$6,384	$6,384	5,925	$271	23.6	23.6
Install programmable thermostats for RTUs in Offices; setback temp to 59 F.	2	$300	$300	$300	$1,368	$1,368	3,114	$142	9.6	9.6
Install new thermostats wired to light switch in museum; setback temp to 59 F.	1	$300	$300	$300	$684	$684	4,359	$199	3.4	3.4

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
Replace leaky backdraft dampers with motorized dampers.	3	$300	$300	$300	$2,052	$2,052	14,809	$677	3.0	3.0
HVAC Subtototal					**$30,210**	**$29,007**	**51,619**	**$2,605**		
HOT WATER										
Install instantaneous water heater.****	1	$300	$300	$500	$912	$912	582	$27	34.3	34.3
Water Subtotal					**$912**	**$912**	**582**	**$27**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	282,640	$17,806	14.42
Estimated Annual Savings	75,440	$3,846	6.97
Percent Savings	27%	22%	48%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is 0.0457 $/kWh (as of November 1, 2005).
**** Discounted to include the cost of a replacement water tank in 10 years.

Table 6 Water Saving Opportunities for the Municipal Administration Building

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)
		Material	Labour		
Install water efficient metering faucets.	2	$309	$150	$1,047	80%

* The total cost column includes 14% taxes.

4.3 GENERAL RECOMMENDATIONS

Lighting & Parking Lot Controllers

The lighting analysis results for the Municipal Administration Building can be found in Appendix B, Table B.3.3. A low cost opportunity for energy savings in lighting is to replace the incandescent bulbs with compact fluorescent bulbs; this results in the largest energy savings with the shortest payback period when compared to the other lighting upgrades. Replacing the 4'x4 T12 fluorescent lights in the offices with energy efficient T8s once the T12 ballasts burn out would also save considerably in the electrical energy consumption with a short payback period.

Another opportunity is to replace the incandescent exit signs with LED modules. At the time of inspection, the exit signs were turned off. The exit signs should be left on 24 hours a day and therefore calculations were done based on that assumption. Upgrading the exit signs with LED modules saves 90% of their current energy consumption.

Parking lot controllers save energy by automatically adjusting the power at the car plugs depending on the outdoor temperature. These calculations were done assuming that the plugs were used 60 days per year for 8 hours/day.

Envelope

Table B.3.4 in Appendix B shows energy savings for replacing windows with triple pane windows. The only window upgrades from this table that were included in Table 5 are those with a less than 40 year payback period. The best opportunities for energy savings with upgrading windows is to replace the broken windows with triple pane windows.

The walls of the Municipal Office have adequate insulation but the R-value for the walls of the museum is unknown. For the purpose of these calculations the museum's walls are assumed to have an R-value of 10. With this assumption, energy savings for upgrading the wall insulation to R-20 were calculated and the result is shown in Table 5 above.

HVAC

The Municipal Office is heated and cooled using 2 standard efficiency rooftop units (RTUs). One opportunity is to replace these units with higher efficiency units with CO_2 sensors controlling the ventilation. Although RTUs are not available with high heating efficiency, the cooling efficiency could increase by as much as 35%. Heating recovery ventilators (HRVs) could also be installed to pre-heat the fresh air entering the RTUs with the exhaust air. These HRVs would replace the exhaust fans.

The furnace in the Museum is only 76% efficient. Replacing this with a high efficiency furnace would save almost 20% of the energy used for heating the Museum.

Installing programmable thermostats in the Municipal Office would help reduce the annual energy consumption. The thermostats should be setback to 15°C (59°F) when the offices are unoccupied (evenings and weekends). Similarly, a new thermostat should be installed in the Museum and wired to the light switch such that the temperature is automatically reduced to 15°C (59°F) when the lights are switched off.

There are 3 leaky backdraft dampers in the exhaust ducts that should be replaced with motorized dampers. This would eliminate the cold air leaking into the building through the dampers.

Water

The energy required to offset the heat losses from the hot water tank could be eliminated if an instantaneous water heater were installed to replace the current hot water heater.

Water usage savings of 80% would result from installing new water efficient metering faucets in the washrooms. The water analysis is shown in Appendix B, Table B.3.5.

5.0 MUNICIPAL REPAIR SHOP

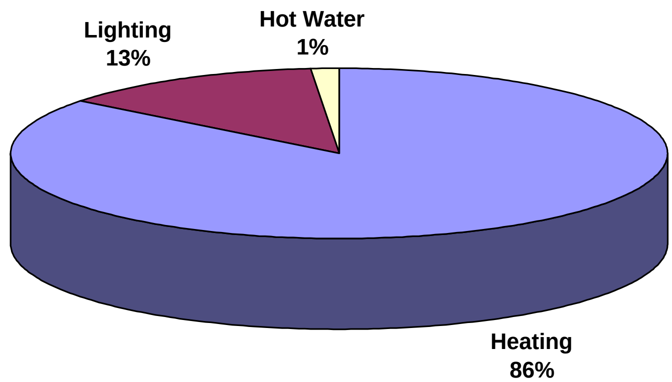
5.1 BACKGROUND

The Municipal Repair Shop is a 5,000 square foot concrete block building. The building was constructed in the 1960s and consists of a small office, a large vehicle shop, and a second floor lunchroom. Renovations to the shop have included adding exterior insulation and metal cladding. The shop is occupied from Monday to Friday, from 7am to 4:30pm.

Photo 4 – Municipal Repair Shop

In the previous year, a total of 138,831 kWh of natural gas energy was consumed for heating the shop, and approximately 23,000 kWh of electricity was used for lighting, water heating, and to heat the washrooms, the office and the second floor lunchroom. The pie chart below shows the breakdown of energy consumption for this building.

Energy Breakdown (% of Total kWh) for the Municipal Repair Shop



The washrooms in the Municipal Repair Shop contain a total of 2 toilets, 1 urinal, and 1 sink. A 175 Litre electric hot water heater tank heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to offset the heat losses from the storage tank.

5.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 7 and 8 show summaries of the energy and water saving opportunities for the Municipal Repair Shop. The following assumptions were made in the calculations:

- The shop is occupied from Monday to Friday from 7am – 4:30pm.
- The temperature of the shop is maintained at 21°C (70°F).
- For the purpose of water consumption, typical occupancy of the shop is assumed to be 5.

Table 7 Energy Saving Opportunities for the Municipal Repair Shop

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
When 8'x2 T12 ballasts burn out, replace them with T8 ballasts and tubes.	31	$47	$12	$0	$1,672	$435	9,495	$570	9.3	7.1
When 4'x2 T12 ballasts burn out, replace them with T8 ballasts and tubes.	8	$41	$21	$0	$376	$193	771	$46	8.1	4.2
Lighting Subtotal					**$2,047**	**$628**	**10,265**	**$616**		
ENVELOPE										
Weather-strip pedestrian doors.	2	$15	$15	$50	$148	$148	3,373	$154	1.0	1.0
Caulk pedestrian doors.	2	$5	$5	$25	$68	$68	1,079	$49	1.4	1.4
Caulk vehicle doors.	3	$5	$5	$25	$103	$103	4,209	$192	0.5	0.5
Caulk windows.	3	$5	$5	$13	$62	$62	1,322	$60	1.0	1.0
Replace windows.	3	$800	$650	$250	$1,197	$1,026	1,456	$67	18.0	15.4
Upgrade roof insulation to R-40.	1	$3,275	$875	$3,275	$7,467	$4,731	34,288	$1,567	4.8	3.0
Envelope Subtotal					**$9,045**	**$9,045**	**45,727**	**$2,090**		
HVAC										
Replace unit heaters in shop with high efficiency furnaces.	3	$3,200	$2,955	$1,000	$14,364	$13,526	18,027	$824	17.4	16.4
Replace leaky backdraft dampers with motorized dampers (2).	1	$300	$300	$300	$684	$684	19,746	$902	0.8	0.8
Replace intake damper with new insulated motorized damper.	1	$300	$300	$300	$684	$684	20,637	$943	0.7	0.7
Install new thermostats wired to lights; setback temperature to 15°C (59°F).	6	$300	$300	$300	$4,104	$4,104	14,944	$683	6.0	6.0
HVAC Subtotal					**$19,836**	**$19,836**	**73,354**	**$3,352**		
HOT WATER										
Install instantaneous water heater.****	1	$300	$300	$500	$912	$912	2,065	$124	7.4	7.4
Water Subtotal					**$912**	**$912**	**2,065**	**$124**		

TOTALS	**Energy (kWh)**	**Cost ($)**	**CO_2 (Tonnes)**
Existing Annual Consumption/Cost/Emissions	185,244	$7,191	25.62
Estimated Annual Savings	131,412	$6,182	18.18
Percent Savings	71%	86%	71%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is 0.0457 $/kWh (as of November 1, 2005).
**** Discounted to include the cost of replacement water tank in 10 years.

Table 8 Water Saving Opportunities for the Municipal Repair Shop

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)
		Material	Labour		
Install water efficient dual flush toilets.	2	$284	$150	$990	70%

* The total cost column includes 14% taxes

5.3 GENERAL RECOMMENDATIONS

Lighting

Replacing the T12 fluorescents with T8 lamps and ballasts once the current ballasts burn out would result in large energy savings with a less than 10-year payback period for both the 4’ and 8’ fluorescents. Table B.4.3 in Appendix B shows the lighting analysis summary for this building.

Envelope

The roof of this building has only R-10 insulation. Upgrading this to R-40 would simply involve adding blow-in insulation in the attic and would result in large energy savings with a short payback period.

The pedestrian doors should be both weather-stripped and caulked to reduce the cold air infiltration through the cracks around the doors. Similarly, the vehicle doors and the windows should be caulked. Heat savings would also result from replacing the windows with triple pane windows; however, the cost associated with replacing these windows is high resulting in a long payback period.

HVAC

The shop is kept warm throughout the night to melt the ice on the snowplows. One option that would allow the temperature to be kept cooler throughout the night while still melting the ice is to replace the unit heaters with high efficiency furnaces that are ducted to the floor. The warm air would then blow directly where it is needed to melt the ice. The high efficiency furnaces would save 15% of the annual energy used for heating and the temperature could now be setback during unoccupied times. Alternatively, radiant gas heaters could be used for ice melting as well.

The backdraft dampers in the exhaust ducts are letting cold air into the building. Replacing these with motorized dampers would eliminate the cold air infiltration and thus save in heating requirements. The intake damper does not close properly and should also be replaced with an insulated, motorized damper to reduce heat losses.

Water

The energy used to make up for heat losses from the hot water tank would be eliminated if the tank were replaced with an instantaneous water heater.

Table 8 shows that replacing the current toilets with water efficient dual flush toilets would save 70% of the current toilets' water consumption.

6.0 FIRE HALL #2

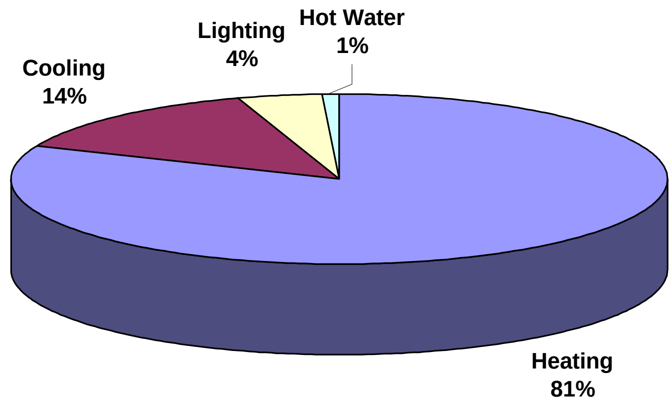
6.1 BACKGROUND

The Fire Hall #2, constructed in 1991, is a 7,888 square foot metal clad building. This building consists of a fire hall, an office, and a lounge on the north side and a public works vehicle repair shop on the south side. The Fire Hall is occupied for 4 hours every Wednesday for practices and for approximately 200 calls per year. Public Works is occupied from Monday to Friday from 7:30am – 4:30pm.

Photo 5 – Fire Hall #2

This building is serviced with both electricity and natural gas. In the previous year a total of 52,500 kWh of electricity was used for lighting and air conditioning and 242,307 kWh of natural gas energy was consumed by the unit heaters, furnaces, and the hot water tank. The following pie chart shows the breakdown of energy consumption for the Fire Hall #2.

Energy Breakdown (% of Total kWh) for the Fire Hall #2



The washrooms in the Fire Hall #2 contain a total of 5 toilets, 1 urinal, and 5 sinks. A 190 Litre hot water heater tank heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to offset the heat losses from the storage tank.

6.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 9 and 10 below show summaries of the energy and water saving opportunities for the Fire Hall #2. The following assumptions were made in the calculations:

- The Fire Hall is occupied 4 hours/week for practices plus 400 hours per year for calls.
- The Public Works is occupied for 45 hours/week.
- The outdoor lights are on 12 hours per day year round.
- The temperature is maintained at an average temperature of 21°C (70°F).

Table 9 Energy Saving Opportunities for the Fire Hall #2

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
When 8'x2 T12 ballasts in Public Works burn out, replace them with T8 lamps and ballasts.	10	$47	$12	$0	$539	$140	2,883	$173	3.1	0.8
When 8'x2 T12 ballasts in Fire Hall burn out, replace them with T8 lamps and ballasts.	22	$47	$12	$0	$1,186	$308	1,648	$99	12.0	3.1
When 4'x2 T12 ballasts in Office and 2nd floor lounge burn out, replace them with T8 lamps and ballasts.	41	$41	$21	$0	$1,926	$991	972	$58	33.0	17.0
Turn indoor lights off throughout the night.	4	$0	$0	$0	$0	$0	1,717	$103	0.0	0.0
Lighting Subtotal					**$3,651**	**$1,440**	**7,220**	**$433**		
ENVELOPE										
Weatherstrip pedestrian doors.	3	$15	$15	$50	$222	$222	5,059	$231	1.0	1.0
Weatherstrip vehicle doors.	6	$30	$30	$100	$889	$889	11,637	$532	1.7	1.7
Weatherstrip windows.	2	$15	$15	$50	$148	$148	540	$25	6.0	6.0
Caulk pedestrian doors.	4	$5	$5	$25	$137	$137	2,159	$99	1.4	1.4
Caulk vehicle doors.	6	$5	$5	$25	$205	$205	8,419	$385	0.5	0.5
Caulk windows.	9	$5	$5	$13	$185	$185	2,375	$109	1.7	1.7
Envelope Subtotal					**$1,786**	**$1,786**	**30,188**	**$1,380**		
HVAC										
Replace unit heater in Public Works with high efficiency furnace.	1	$3,600	$3,355	$1,000	$5,244	$4,965	9,316	$426	12.3	11.7
Replace unit heaters in Fire Hall with high efficiency furnace.	2	$3,600	$3,355	$500	$9,348	$8,789	13,588	$621	15.1	14.2
Install thermostats in Public Works; setback temp to 59°F.	1	$300	$300	$300	$684	$684	6,823	$312	2.2	2.2
Install thermostats in Fire Hall & Office; setback temp to 59°F.	4	$300	$300	$300	$2,736	$2,736	18,737	$856	3.2	3.2
Install ceiling fans in Public Works.	2	$100	$100	$175	$627	$627	4,150	$190	3.3	3.3
Install ceiling fans in Fire Hall.	2	$100	$100	$175	$627	$627	6,003	$274	2.3	2.3

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
Install ceiling fan in hose tower.	1	$100	$100	$175	$314	$314	592	$27	11.6	11.6
Install 1200 cfm HRV for tower ventilation.	1	$4,000	$4,000	$1,000	$5,700	$5,700	5,391	$246	23.1	23.1
Install 1200 cfm HRV for Public Works.	1	$4,000	$4,000	$1,000	$5,700	$5,700	5,272	$241	23.7	23.7
Replace leaky damper with motorized, insulated damper.	1	$300	$300	$300	$684	$684	20,660	$944	0.7	0.7
HVAC Subtotal					**$31,664**	**$30,826**	**90,532**	**$4,137**		
HOT WATER										
Install instantaneous water heater.****	1	$1,000	$1,000	$600	$1,824	$1,824	1,891	$86	21.1	21.1
Hot Water Subtotal					**$1,824**	**$1,824**	**1,891**	**$86**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	294,807	$13,343	45.06
Estimated Annual Savings	129,831	$6,037	22.24
Percent Savings	44%	45%	49%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is 0.0457 $/kWh (as of November 1, 2005).
**** Discounted to include the cost of replacement water tank in 10 years.

Table 10 Water Saving Opportunities for the Fire Hall #2

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)
		Material	Labour		
Install water efficient dual flush toilets.	5	$284	$150	$2,471	70%
Install water efficient metering faucets.	5	$309	$150	$2,616	80%
Install water efficient urinals.	1	$344	$200	$620	60%

* The total cost column includes 14% taxes

6.3 GENERAL RECOMMENDATIONS

Lighting

The lighting in this building consists of 4' and 8' T12 lamps. It is recommended that these lamps and ballasts be replaced with energy efficient T8s. Since Public Works is occupied more frequently than the Fire Hall and thus the lights are turned on for longer periods, the shortest payback period is for replacing the lights in Public Works.

Some lights are left on in the Public Works all night as a security protocol. We recommend turning off all the indoor lights overnight and covering the windows to address security issues. The lighting analysis summary for this building is shown in Appendix B, Table B.5.3.

Envelope

The energy saving opportunities for the building's envelope include sealing the cracks around all the windows and doors. A large amount of heat is lost due to infiltration through these cracks. Weather-stripping the pedestrian and vehicle doors and caulking all the doors and windows would drastically reduce these heat losses. Further details are shown in Appendix B, Table B.5.4.

HVAC

There are several opportunities for energy savings in terms of the buildings heating and ventilation systems.

The gas unit heaters in both the Fire Hall and Public Works could be replaced with high efficiency furnaces; this would save 15% of the current energy used for heating. Currently, the Public Works section of this building is maintained at 24 ^{o}C (75 ^{o}F) throughout the night to melt the ice on the snowplows. By ducting the new furnaces such that the warm air is blown directly at the snowplows, the temperature could be reduced to 15 ^{o}C (59 ^{o}F) throughout the night. Alternatively, radiant gas heaters could be used to heat the snowplows and reduce space temperatures in the building.

Another opportunity is to install 2 ceiling fans in Public Works (and repair the broken one), 2 fans in the Fire Hall, and one in the hose drying tower. Ceiling fans help circulate the air such that the hot air that would otherwise be near the ceiling is circulated throughout the room. The reduced air temperature near the ceiling results in less heat conducted through the top of the walls and through the ceiling.

The Fire Hall has one Plymovent vehicle exhaust system for one of the parking stalls. When the fire truck in this stall is used, the exhaust is vented through a flexible duct to outside. Using this system reduces the amount of ventilation required for the fire hall and saves in energy necessary to heat the ventilation air. It is recommended that two more of these vehicle exhaust systems be installed for the other two parking spots in this Fire Hall.

There is a potential for energy savings in installing new thermostats wired to the light switches such that the temperature is automatically reduced to 15 ^{o}C (59 ^{o}F) when the lights are turned off.

A heating recover ventilator (HRV) is recommended for both the hose-drying tower and Public Works. The HRV for the hose-drying tower will replace the existing ventilation system, and the HRV in Public Works should be connected to the vehicle emissions detector. An HRV will pre-heat the outdoor air entering the room with the exhaust air leaving and save approximately 50% of the energy required to heat this intake air.

The last opportunity recommended in the HVAC section of Table 9 is to replace the leaky backdraft damper for the intake air with an insulated, motorized damper.

Water

The hot water tank is constantly losing heat to the surroundings. Installing a gas instantaneous water heater would eliminate these losses.

Table 10 shows the percent water savings that would result from replacing the current high flow water fixtures with water efficient fixtures.

Ventilation System Operations Training

During the building tour it became evident that no one from the fire hall fully comprehended how the ventilation systems in the building operated. This duty was left to the installing contractor. It is recommended that the building operating staff be trained on the operations of the ventilation system so that they can assess its operation and determine when malfunctions occur that could potentially waste energy in the future.

7.0 NORTHEND FIRE HALL #3

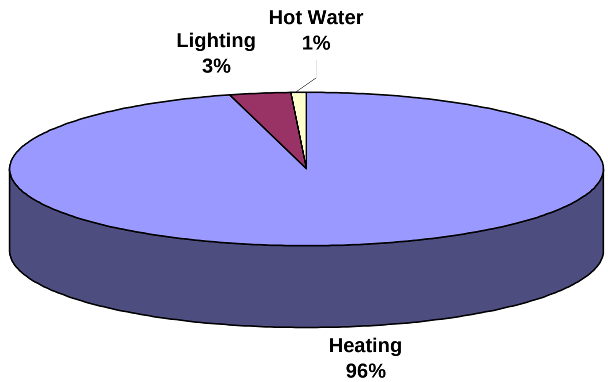
7.1 BACKGROUND

The Northend Fire Hall #3 is a 9,768 square foot metal clad building that consists of an old fire hall, a new fire hall, and a public works shop with a meeting room. The Old Fire Hall was constructed approximately 30 years ago and in 1995, the New Fire Hall and Public Works were added on. This building is only occupied for approximately 8 hours/week.

Photo 6 – Northend Fire Hall #3

The Old Fire Hall is heated electrically while the New Fire Hall and Public Works are heated using natural gas unit heaters and a furnace for the meeting room. The total electrical and natural gas energy consumption for the previous year was 58,320 kWh and 181,958 kWh, respectively. The breakdown of total energy consumption is shown in the following pie chart.

Energy Breakdown (% of Total kWh) for the Northend Fire Hall #3



The washrooms in the Northend Fire Hall #3 contain a total of 3 toilets, 1 urinal, and 3 sinks. A 285 Litre hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to offset the heat losses from the storage tank.

7.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 11 and 12 show the energy and water saving opportunities for the Northend Fire Hall #3. The following assumptions were made in the analysis:

- This building is occupied for 8 hours per month year round.
- The temperature is maintained at 21°C (70°F) at all times.
- For the purpose of water consumption, the typical occupancy of the building is 12.
- The exit signs are on 24 hours per day year round.

Table 11 Energy Saving Opportunities for the Northend Fire Hall #3

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	KWh	$***	NI	WI
LIGHTING										
When 4' x 4 T12 ballasts require replacement, replace them with T8 ballast and tubes.	16	$32	$12	$0	$591	$226	519	$31	19.0	7.3
When 8' x 2 T12 ballasts require replacement, replace them with T8 ballast and tubes.	55	$47	$12	$0	$2,966	$771	2,837	$170	17.4	4.5
Retrofit Exit Signs with LED modules.	4	$50	$5	$80	$593	$388	946	$57	10.4	6.8
Lighting Subtotal					**$4,149**	**$1,385**	**4,302**	**$258**		
ENVELOPE										
Replace pedestrian doors.	2	$350	$350	$100	$513	$513	6,746	$308	1.7	1.7
Weather-strip vehicle door.	1	$30	$30	$100	$148	$148	4,413	$202	0.7	0.7
Caulk pedestrian and vehicle doors.	14	$5	$5	$25	$479	$479	7,231	$330	1.4	1.4
Replace windows.	3	$550	$435	$267	$2,793	$2,400	1,083	$49	56.4	48.5
Caulk windows.	3	$5	$5	$13	$62	$62	1,106	$51	1.2	1.2
Envelope Subtotal					**$3,995**	**$3,601**	**20,579**	**$940**		
HVAC										
Replace unit heaters in Public Works with high efficiency furnaces.	2	$2,800	$2,555	$1,000	$8,664	$8,664	10,361	$473	18.3	18.3
Replace bdd with motorized damper.	1	$300	$300	$300	$684	$684	9,873	$451	1.5	1.5
Install thermostats wired to light switch.	2	$300	$300	$300	$1,368	$1,368	15,985	$730	1.9	1.9
Install ceiling fan in hose hanging tower.	1	$100	$100	$175	$314	$314	1,964	$90	3.5	3.5
HVAC Subtotal					**$11,030**	**$10,471**	**38,182**	**$1,745**		
HOT WATER										
Install instantaneous water heater.	1	$1,000	$1,000	$600	$1,824	$1,824	2,182	$100	18.3	18.3
Insulate hot water piping.	1	$50	$50	$50	$114	$114	465	$21	5.4	5.4
Water Subtotal					**$1,938**	**$1,938**	**2,647**	**$121**		

TOTALS	**Energy (kWh)**	**Cost ($)**	**CO_2 (Tonnes)**
Existing Annual Consumption/Cost/Emissions	240,278	$11,525	34.40
Estimated Annual Savings	65,711	$3,065	11.15
Percent Savings	27%	27%	32%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro’s website).
**** Discounted to include the cost of replacement water tank in 10 years.

Table 12 Water Saving Opportunities for the Northend Fire Hall #3

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)
		Material	Labour		
Install water efficient dual flush toilets.	3	$284	$150	$1,483	70%
Install water efficient metering faucets.	3	$309	$150	$1,570	80%
Install water efficient urinals.	1	$344	$200	$620	60%

* The total cost column includes 14% taxes

7.3 GENERAL RECOMMENDATIONS

Lighting

Since the T12 lights are only on for 8 hours every week, the payback periods for replacing these with T8s are long. However, since T12s are expected to become obsolete within 5 years, this upgrade should be done once the T12 ballasts burn out.

Another opportunity is to replace the incandescent exit signs with LED modules. At the time of inspection, the exit signs were turned off. The exit signs should be left on 24 hours a day and therefore calculations were done based on that assumption. Upgrading the exit signs with LED modules saves 90% of their current energy consumption. The lighting analysis summary can be found in Table B.6.3.

Envelope

One of the pedestrian doors to the Old Fire Hall and one of the doors to Public Works are not closing properly and should be replaced and weather-stripped to reduce the cold air infiltrating through the cracks. The vehicle door to the Old Fire Hall should also be weather-stripped to reduce heat losses due to infiltration and all the doorframes should be caulked.

The energy savings for replacing the double pane windows with triple pane windows are not sufficient to make-up for the high installation cost. At the very least, the perimeter of these windows should be caulked to seal the cracks.

HVAC

Public works is maintained at 21 ^{o}C (70 ^{o}F) overnight to melt the ice on the snowplows. One option is to replace the unit heaters with high efficiency furnaces ducted to the floor level. The high efficiency furnaces would save 15% of the energy used to heat this area and with the heat blowing directly where needed, the room temperature could therefore be reduced throughout the night.

Another opportunity is to install new thermostats wired to the light switches in Public Works. The temperature setting should be automatically reduced to 15 ^{o}C (59 ^{o}F) when the lights are turned off.

Table 11 shows energy savings for installing a ceiling fan in the hose-drying tower. The ceiling in the hose-drying tower is 30 ft high and since hot air rises, the temperature of the air is much hotter near the ceiling. A ceiling fan would help circulate this hot air resulting in a cooler air temperature near the ceiling and thus reduced heat loss through the top half of the walls and the ceiling.

Finally, the backdraft damper in Public Works should be replaced with a motorized damper to reduce air leakage.

Water

Insulating the hot water piping would reduce the heat loss from the piping and reduce the annual energy consumption for water heating. Consideration should also be given to replacing the hot water tank with a natural gas fired instantaneous water heater and thus eliminate the energy required to offset the heat losses from the storage tank.

From Table 12 it can be seen that water savings from 60% to 80% would result from installing water efficient fixtures in the washrooms.

8.0 ST. ANDREWS COMMUNITY CLUB

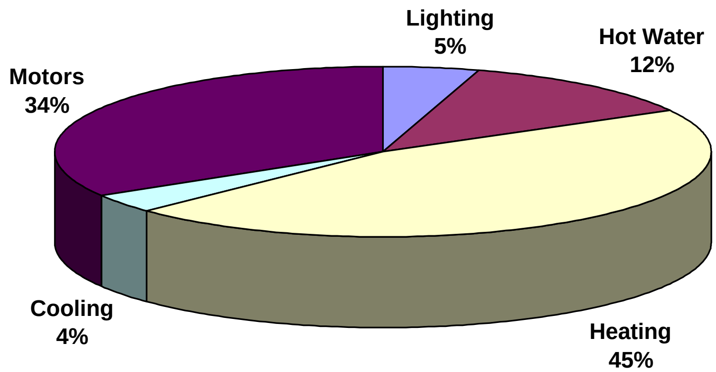
8.1 BACKGROUND

The St. Andrews Community Club is a 33,750 square foot building that was built in 1954 of concrete block walls. The Community Club contains a hockey rink, a lounge and concession with windows overlooking the rink, an office, change rooms, and mechanical rooms.

Photo 7 – St. Andrews Community Club

Natural gas is used for both heating and hot water, and electricity is used for lighting, cooling, and to run the ice plant motors. The total natural gas and electrical energy consumption in the previous year was 325,140 kWh and 450,595 kWh, respectively. The breakdown of total energy consumption is shown in the pie chart below.

Energy Breakdown (% of Total kWh) for the St. Andrews Community Club



The washrooms in the St. Andrews Community Club contain a total of 16 toilets, 7 urinals, 7 sinks, and 8 showers. A 285 Litre hot water heater heats the water for this facility. A large amount of hot water is also used for flooding the rink. This water is heated with a 250MBH boiler and then stored in one of three hot water tanks. The energy used for hot water heating was calculated based on estimates of the current hot water consumed by both the water fixtures and the rink and includes the energy required to offset the heat losses from the storage tanks.

8.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 13 and 14 show the energy and water saving opportunities for the St. Andrews Community Club. The following assumptions were made in the analysis:

- The Community Club is occupied for approximately 1660 hours per year.
- The outdoor lights are assumed to be on 24 hours per day year round.
- For the purpose of water consumption, the typical occupancy is 50.
- The temperature of the lounge is maintained at 21°C (70°F) and the rink area is maintained at 0°C (32°F).

Table 13 Energy Saving Opportunities for the St. Andrews Community Club

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
When 4' x4 T12 ballasts burn out, replace them with T8 ballast and tubes.	28	$32	$12	$0	$1,034	$396	5,806	$349	3.0	1.1
Repair photocell on outdoor lights.	4	$25	$25	$65	$410	$410	1,752	$105	3.9	3.9
Lighting Subtotal					**$1,445**	**$806**	**7,558**	**$454**		
ENVELOPE										
Caulk pedestrian doors to outside.	4	$5	$5	$25	$137	$137	2,159	$99	1.4	1.4
Weather-strip pedestrian doors to rink.	2	$15	$15	$50	$148	$148	2,558	$118	1.3	1.3
Envelope Subtotal					**$285**	**$285**	**4,747**	**$217**		
HVAC										
Install countdown timer for greasehood exhaust fan.	1	$60	$60	$125	$211	$211	3,554	$162	1.3	1.3
When RTUs require replacement, replace them with high efficiency RTUs with CO_2 sensors.	2	$700	$500	$500	$2,736	$2,280	12,013	$579	5.0	4.2
Replace 150 MBH furnace with high efficiency furnace.	1	$3,600	$3,355	$500	$4,674	$4,395	6,615	$302	15.5	14.5
When unit heater in zamboni room requires replacement, replace it with a high efficiency furnace.	1	$2,100	$1,855	$0	$2,394	$2,115	2,594	$119	20.2	17.8
Install outdoor thermostat wired to rink ventilation.	1	$600	$600	$600	$1,368	$1,368	38,437	$1,757	0.8	0.8
Install thermostats wired to light switches in lounge and concession.	3	$300	$300	$300	$2,052	$2,052	5,358	$245	8.4	8.4
HVAC Subtotal					**$13,435**	**$12,420**	**68,571**	**$3,134**		
MOTORS										
When compressor motors require replacement, replace them with premium efficiency motors.	2	$800	$800	$0	$1,824	$1,824	5,074	$305	6.0	6.0
When brine pump motor requires replacement, replace it with a premium efficiency motor.	1	$470	$470	$0	$536	$536	1,804	$108	4.9	4.9
Motors Subtotal					**$2,360**	**$2,360**	**6,878**	**$413**		
HOT WATER										
Install water efficient metering faucets.	7	$309	$309	$150	$3,663	$3,663	1,792	$82	44.7	44.7

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
Install water efficient showerheads.	8	$21	$21	$50	$648	$648	4,421	$202	3.2	3.2
Replace boiler and 2 storage tanks with high efficiency water heater.	1	$8,000	$8,000	$500	$9,690	$9,690	24,979	$1,142	8.5	8.5
Hot Water Subtotal					**$14,000**	**$14,000**	**31,191**	**$1,425**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	775,735	$35,659	90.57
Estimated Annual Savings	118,945	$5,643	18.79
Percent Savings	15%	16%	21%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is 0.0457 $/kWh (as of November 1, 2005).

Table 14 Water Saving Opportunities for the St. Andrews Community Club

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)
		Material	Labour		
Install water efficient metering faucets.	7	$309	$150	$3,663	80%
Install water efficient toilets.	16	$284	$150	$7,916	70%
Install water efficient showerheads.	8	$21	$50	$648	29%
Install water efficient urinals.	7	$344	$200	$4,341	60%

* The total cost column includes 14% taxes

8.3 GENERAL RECOMMENDATIONS

Lighting

Several of the fluorescent T12s have already been upgraded to T8s. The recommendation is to upgrade the remaining T12s as well. The energy savings for replacing 28 of these fixtures with T8s are significant. Since the metal halides in the rink area are energy efficient and the exit signs are LEDs, there are no energy saving opportunities for these lights.

During the building tour, the photocells on the exterior lights were malfunctioning. It is recommended that these photocells be either repaired or replaced. Repairing the photocells would ensure that the lights are turned off during the day. The lighting analysis summary table is shown in Appendix B, Table B.7.3.

Envelope

The most cost-effective energy saving opportunities for the building's envelope are to weather-strip the pedestrian doors to the rink and caulk the pedestrian doors to outside. Energy savings associated with replacing the double pane windows with triple pane windows were also determined. However, the savings are not sufficient to make-up for the high installation cost for this upgrade and therefore this opportunity is not recommended.

HVAC

Replacing the rooftop units (RTUs) with higher efficiency units would save 35% of the energy used for cooling the lounge. In addition, installing RTUs with CO_2 sensors would ensure that the lounge is only ventilated when necessary. The costs shown in Table 13 for this upgrade is the cost difference in installing a high efficiency versus a standard efficiency RTU.

The 150MBH furnace for the dressing rooms and concession is a mid-efficiency furnace. Replacing this with a high efficiency furnace would save 15% of the current energy consumed by this furnace. Similarly, when the unit heater in the zamboni room needs to be replaced, a high efficiency furnace should be considered.

Another opportunity is to install new thermostats in the lounge and concession that are wired to the light switches. This should be set up such that when the lights are turned off, the temperature is automatically reduced to 15°C (59°F).

Installing an outdoor thermostat to control the ventilation in the arena could help reduce the load on the compressors and condensers in the ice plant. When the outdoor temperature is between –5°C and –15°C, the ventilation fan in the rink will turn on and the outdoor air will help to maintain the ice temperature. With the outdoor air cooling the ice, the load on the refrigeration system will be reduced resulting in significant energy savings in running the ice plant.

During the site visit, the greasehood exhaust fan was left on for no reason. Consideration should be given to installing a countdown timer on this exhaust fan to ensure that the fan is never accidentally left on resulting in unnecessary heat losses. The energy savings shown in Table 13 for this opportunity were calculated based on the assumption that with a countdown timer, the exhaust fan will run for 3 hours less every week.

Motors

The energy savings shown in the Motors section of Table 13 represent the savings that would result from replacing the ice plant motors with premium efficiency as opposed to standard efficiency motors once the current ones require replacement.

Water

The two bare steel storage tanks lose a large amount of heat to the surroundings. Both these tanks and the boiler could be replaced with a 380 Litre, A.O. Smith, BTH-250 high efficiency water heater. This heater is 12% more efficient than the current boiler and has a large storage capacity to make-up for the two storage tanks that are to be removed. By removing the two bare steel storage tanks there is that much less heat lost from the tanks.

Energy savings would also result from replacing the faucets and showerheads with water efficient fixtures.

From Table 14 it can be seen that installing water efficient fixtures in the washroom would reduce the water consumed by these fixtures by 29 to 80%. The water usage table for the Community Club is Table B.7.5 in Appendix B.

Other Opportunities

The following is a list of energy saving opportunities for the ice plant that would help reduce annual costs associated with ice production:

- Natural ventilation of the rink in the winter saves energy by reducing the run time of the refrigeration equipment.

- Ensure that the water used for flooding is pure – salts lower the freezing point of water and air in water acts like an insulation, making it harder for the brine in the slab to freeze the top layer of the ice.

- Keep the ice thin (1 inch thick) because excessive ice thickness increases the load on the compressor. Shaving ice helps to reduce the ice thickness and removes concentrations of impurities. When shaving ice, take the ice shavings outside to be melted as opposed to melting the shavings in a heated area of the building.
- Maintain the brine at a specific gravity of 1.2 to 1.22 for optimum energy use and maintain the brine temperature as high as possible.

- Significant amounts of energy can be saved by recovering heat from the refrigeration equipment and using it for flood water heating, space heating, domestic water heating, or ice melting.

For additional information, refer to the Manitoba Hydro "Guidelines for Operators of Manitoba's Rinks and Arenas", available for downloading from the following website:

http://www.hydro.mb.ca/power_smart_for_business/recreation_manitoba_rinks.pdf

9.0 PETERSFIELD CURLING CLUB

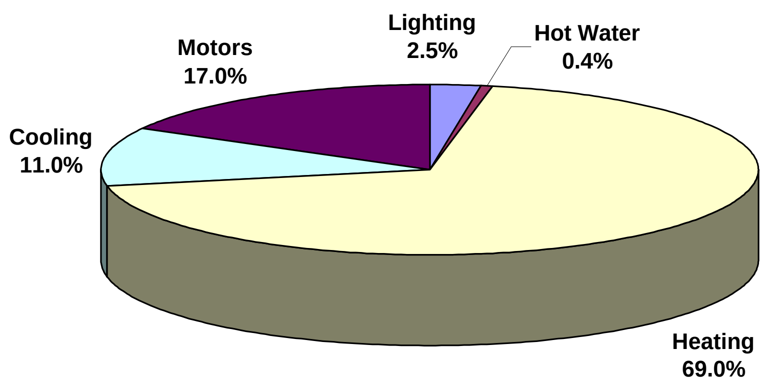
9.1 BACKGROUND

The Petersfield Curling Club is an 18,700 square foot building constructed in 1991 of 2x6" studs with exterior and interior metal cladding. The Curling Club contains a curling rink with 4 sheets of ice, and a two-story lounge with windows overlooking the rink.

Photo 8 – Petersfield Curling Club

The total natural gas and electrical energy consumption in the previous year was 170,220 kWh and 326,150 kWh, respectively. The natural gas is used for heating and water heating and the electricity is used for lighting, air conditioning, and for the ice plant motors. The total energy breakdown is shown in the pie chart below.

Energy Breakdown (% of Total kWh) for the Petersfield Curling Club



The washrooms in the Petersfield Curling Club contain a total of 8 toilets, 4 urinals, and 10 sinks. A 136 Litre hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumed by the water fixtures and includes the energy required to offset the heat losses from the storage tank.

9.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 15 and 16 show a summary of the energy and water saving opportunities for the Petersfield Curling Club. The following assumptions were made in the analysis:

- The Curling Club is occupied from October to April for 40 hours a week and for 7 – 15 hour bonspiels per year.
- The temperature of the lounge is maintained at 21°C (70°F) and the rink area is maintained at 3.3°C (38°F).
- For the purpose of water consumption, the typical occupancy is 50.
- The exit signs are assumed to be on 24 hours per day, 7 days a week.

Table 15 Energy Saving Opportunities for the Petersfield Curling Club

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
When 4' x2 T12 ballasts burn out, replace them with T8 ballast and tubes.	51	$41	$21	$0	$2,395	$1,233	2,277	$137	17.5	9.0
When replacing the indoor incandescents, replace them with compact fluorescents.	10	$13	$8	$0	$148	$91	573	$34	4.3	2.7
Replace incandescent exit signs with LED signs.	8	$50	$5	$80	$1,186	$775	1,892	$114	10.4	6.8
Lighting Subtotal					**$3,729**	**$2,099**	**4,742**	**$285**		
ENVELOPE										
Replace broken window with triple pane window.	1	$500	$270	$320	$935	$673	860	$39	23.8	17.1
Weatherstrip pedestrian doors.	3	$15	$15	$50	$222	$222	4,260	$195	1.1	1.1
Caulk pedestrian doors.	5	$5	$5	$25	$171	$171	2,272	$104	1.6	1.6
Caulk windows.	7	$5	$5	$13	$144	$144	888	$41	3.5	3.5
Envelope Subtotal					**$1,472**	**$1,210**	**8,280**	**$378**		
HVAC										
When unit heaters in rink area require replacement, replace them with high efficiency furnaces.	4	$2,400	$2,155	$0	$10,994	$9,827	21,545	$985	11.1	10.0
Replace furnaces on second floor with high efficiency furnaces.	2	$2,800	$2,555	$500	$7,524	$6,965	17,954	$821	9.2	8.5
Replace condensing units with high efficiency units.	2	$5,000	$4,784	$500	$12,540	$12,048	20,765	$949	13.2	12.7
Replace BDDs with motorized damper	3	$300	$300	$300	$2,052	$2,052	14,809	$677	3.0	3.0
Install motorized damper on greasehood intake duct and wire to greasehood fan.	1	$300	$300	$300	$684	$684	16,628	$760	0.9	0.9
Install thermostat on second floor and wire to light switch.	1	$300	$300	$300	$684	$684	15,926	$728	0.9	0.9
HVAC Subtotal					**$34,428**	**$32,260**	**107,628**	**$4,919**		
MOTORS										
When compressor motor requires replacement, replace it with a premium efficiency motor.	1	$400	$400	$0	$456	$456	1,984	$119	3.8	3.8
When brine pump motor requires replacement, replace it with a premium efficiency motor.	1	$226	$226	$0	$258	$258	496	$30	8.6	8.6
Motors Subtotal					**$714**	**$714**	**2,480**	**$149**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	496,370	$23,078	63.61
Estimated Annual Savings	123,131	$5,731	18.25
Percent Savings	25%	25%	29%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is 0.0457 $/kWh (as of November 1, 2005).

Table 16 Water Saving Opportunities for the Petersfield Curling Club

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)
		Material	Labour		
Install water efficient metering faucets.	10	$309	$150	$5,233	80%
Install water efficient toilets.	8	$284	$150	$3,958	70%
Install water efficient urinals.	4	$344	$200	$2,481	60%

* The total cost column includes 14% taxes

9.3 GENERAL RECOMMENDATIONS

Lighting

The energy saving opportunities in terms of lighting include replacing the 4'x2 T12 fluorescents with T8s, replacing the indoor incandescents with compact fluorescents, and replacing the incandescent exit signs with LED modules.

Envelope

The exterior windows are all double pane windows with poor caulking. The energy savings for replacing these windows with triple panes and sealing the cracks around the frames are shown in Table B.8.4 in Appendix B.

Another opportunity is to weather-strip three of the pedestrian doors to reduce the cold air infiltration and caulk all the pedestrian doors.

HVAC

Replacing the unit heaters in the rink with high efficiency furnaces would save 15% of the energy required to heat the rink. Similarly, the furnaces and condensing units for the second floor could be replaced with high efficiency units to reduce heating and cooling costs.

A saving in heating costs would also result from installing new thermostats on the second floor wired to the light switches. When the lights are turned off, the thermostats should automatically setback the temperature to 15 ^{o}C (59 ^{o}F).

Another HVAC opportunity is to replace the leaky backdraft dampers with motorized dampers to reduce the cold air infiltration into the building. For the greasehood intake duct, a motorized damper should be wired to the greasehood fan such that the fan cannot run when the damper is not fully open.

Motors

Once the compressor and brine pump motors in the ice plant require replacement, these motors should be replaced with premium efficiency motors. The energy saving and costs shown in Table 15 represent the difference between the standard and the high efficiency motors.

Water

From Table 16 it can be seen that replacing the water fixtures in the washrooms with water efficient fixtures would save from 60 to 80% of the current fixtures annual water consumption.

10.0 GENERAL UPGRADES AND MAINTENANCE RECOMMENDATIONS FOR REDUCING ENERGY AND WATER CONSUMPTION

The following energy and water saving opportunities exist in many buildings including those toured in this study. The saving opportunities are generic in nature and include both capital upgrades (Sections 10.1 – 10.4) and maintenance activities (Section 10.5) that will result in energy/water savings for all the buildings.

10.1 LIGHTING AND ELECTRICAL

Light Switches – Place signs or stickers adjacent to switches to remind occupants to shut off switches when leaving rooms unoccupied. Occupancy sensors can be provided to shut off lights automatically when not in use. Timers can also be used in a similar fashion.

Fluorescent Lighting Systems – T12 lights should be upgraded to premium T8 or T5 electronic ballasts and lamps. This may be done when current T12 ballasts need replacement or in a planned retrofit program. Use cold-weather rated ballasts for retrofits in areas where the temperature is below 15°C (59°F). When selecting T8 electronic ballasts, please refer to Manitoba Hydro's Power Smart Lighting program for current listings of eligible ballasts. Contact Manitoba Hydro for details.

EXIT Signs – Replace all incandescent exit signs with 3W LED signs.

Incandescent Bulbs – All incandescent bulbs should be converted to compact fluorescents. Compact fluorescent bulbs last approximately 10 times longer than incandescents and save up to 75% of the energy costs.

Exterior Lights – Compact fluorescent bulbs do not function at low temperatures, therefore, the exterior lights should be replaced with high-pressure sodium lighting. High-pressure sodium lights are the most energy efficient type of lighting available today. Savings of approximately 50% would result from replacing exterior incandescent fixtures with these high-pressure sodium lights. Photos cells should be considered for automatically shutting off outdoor lights during day light conditions.

Parking Lot Controllers – Parking lot controllers save energy by automatically adjusting the power at the car plugs depending on the outside temperature.

Other Recommendations - Dispose of all fluorescent lamps and ballasts through a recycling company to reduce toxins entering the landfills.

Refer to Appendix D for a list of Manitoba Hydro's Power Smart incentives and listings of other incentive programs.

10.2 BUILDING ENVELOPE

Window/Door Infiltration – Seal drafts on windows and doors. This can be done by installing or upgrading weather-stripping, or with removable silicone caulking such as “Draft Stop” or “Peel and Seal”. This should be maintained annually.

Window/Door Replacement – Windows and doors with low R-values should be considered for replacement. Manitoba Hydro offers incentives for new windows.

Wall / Roof Insulation – The wall insulation on older buildings typically has a resistance of R-12 or less. Large energy savings would result from upgrading this insulation to R-20. Similarly, roof insulation should be upgraded to R40. In addition to the energy savings, upgrading insulation also extends the life of a building by avoiding the rotting of wood framing from the development of mould and mildew in the walls.

Electrical Outlets – Install draft-reducing foam pads in all electrical receptacles

10.3 HEATING, VENTILATION, AND AIR CONDITIONING

Temperature Control – Use programmable electronic thermostats where appropriate. Use the recommended “set-back” and “set forward” temperatures during unoccupied periods. A 3°C “set-back” over a 12 hour period can reduce heating costs by 4%. Terminate ventilation during un-occupied periods.

Air Conditioning – Reduce the cooling load on the air conditioner by keeping the facility a few degrees warmer and using fans at workstations to augment cooling of personnel. Provide an economizer to supply “free cooling” when it is cool outside and air conditioning is required.

Remove or insulate wall or window-mounted air conditioners for the winter season.

HVAC Ductwork – Seal duct joints with duct tape to reduce losses of heated or cooled air where the ducts traverse cold or hot areas respectively. Insulate duct work passing through unconditioned spaces.

Thermostat Equipped Electric Baseboard Heaters – Mark the thermostat “normal” setting to provide a visual cue as to when they are on or set too high.

10.4 WATER CONSUMPTION

Excessive water usage wastes energy, increases water / sewage treatment costs and further risks damage to the environment.

Toilet Tanks – Install flush volume reduction devices in existing toilet tanks to reduce the quantity of water used per flush by about 25%. “Early closing flapper valves” are inexpensive and are easily installed**.**

Toilets – When replacing older toilets or installing new ones, use high efficiency, dual-flush volume models that use either 6 L (1.6 Imp. gal.) or 3 L (0.8 Imp. gal.) per flush. These toilets reduce water usage by over 70% compared with the traditional 13 L, and by 40% over a “low flush” 6 L toilet. Refer to the toilet and drainline reports on the Canadian Water and Wastewater Association (CWWA) website for advice in selecting a toilet that will perform well.

Urinals – Waterless urinals function on gravity flow and use absolutely no water. These urinals resemble conventional wall-hung urinals but do not require a water supply or a flush valve.

Hot Water – In facilities where large volumes of hot water are not required, set the hot water tank thermostat to 55°C (131°F). A reduction from 60°C to the recommended value of 55°C saves approximately 3% of the energy related to hot water generation. Insulate the first 2 meters (6 ft) of the cold water line and as much of the hot water distribution lines as practical, particularly where hot water lines traverse cold spaces.

Shower Controls – In facilities where large amounts of water are used, consider retrofitting single actuator, short cycle (adjustable), self-closing control valves, with pressure-balancing temperature controls to reduce water consumption. These controls limit flow and allow for a preset water temperature (recommended 40°C) for the showers in order to reduce water heating costs and wastage of water.

Auto-Shut Off Fixtures - Consider using spring loaded fixtures that automatically shut off water flow in public areas.

Tankless Water Heaters – Consider replacing the hot water storage tanks with instantaneous water heaters to avoid storage tank losses and save energy.

10.5 MAINTENANCE

Maintenance activities are important to ensure that the equipment in a building is operating efficiently and to reduce the potential for future equipment breakdown. One option is to hire a maintenance contractor to perform inspections four times annually to clean, lubricate, test, and adjust the building’s HVAC.

The following is a list of HVAC maintenance procedures that should be performed two to four times annually:

Heating/Ventilation Systems

- Change filters
- Inspect belts
- Inspect and clean heating coils
- Inspect operation of blower
- Inspect and lubricate motor and fan bearings
- Inspect and lubricate fresh air, exhaust air, and return air dampers

Air Conditioning/Ice Plant Systems

- Clean outdoor condensers
- Clean filters
- Check refrigerant and oil levels
- Inspect ice plant and refrigerant piping for leaks
- Inspect and lubricate brine pumps
- Inspect and lubricate motorized and back draft dampers
- Inspect A/C operation and adjust as required

Building Envelope

- Caulk window and door frames
- Check and replace weather-stripping annually

11.0 IMPLEMENTATION OF ENERGY AND WATER SAVING OPPORTUNITIES

11.1 IMPLEMENTATION

The energy and water saving opportunities suggested in this report range from simply changing a light bulb to installing a geothermal heating system. Some of the simpler recommended upgrades can be completed in-house while others would require hiring a contractor to complete the work. Major renovation projects will require a consulting engineer to design and help implement the upgrade. The various energy/water saving opportunities discussed throughout this report are separated into three levels of implementation: (1) in-house implementations, (2) contractor implementations, and (3) consulting engineer implementations. The following sections discuss which upgrades fall into each of these three categories.

In-House Implementations

Some of the energy saving opportunities can be completed in-house. Replacing the incandescent light bulbs with compact fluorescent bulbs involves simply replacing the bulb and could easily be done by one of the building's janitors. Installing weather-stripping around the doors and sealing the windows could also be done in-house. For the saving opportunities that involve replacing the doors, some could be done in-house while for others, such as the vehicle doors, it is best to hire a contractor.

Contractor Implementations

The majority of the energy saving opportunities will require a contractor. In terms of lighting, replacing the T12s with T8s requires replacing the ballast as well as the bulbs. An electrician should be hired to complete this function. Replacing the exterior incandescent lights with high-pressure sodium lights and replacing the exit incandescent lamps with LED modules involve replacing the fixture and will therefore require an electrician.

Upgrades on a building's envelope not mentioned in the "In-House Implementations" section should be done by a contractor. This includes replacing windows and vehicle doors, and upgrading the wall and/or roof insulation.

In terms of HVAC, a contractor should be hired to install programmable thermostats, motorized dampers, heating recovery ventilators (HRVs), new furnaces, and new air conditioner units.

Electricians should be hired to replace motors with high-efficiency motors.

For the water saving opportunities involving installing low-flow water fixtures, a contractor will likely be required. Insulating the hot water tank, and installing an instantaneous water heater will also require a contractor.

Consulting Engineer Implementations

The energy saving opportunity for the R.M. of St. Andrews that requires a consultant to implement is the geothermal heating system in Fire Hall #1. The geothermal heating system will require a detailed site investigation, bore hole testing, and energy modeling of the building to properly size the geothermal system.

Consulting services should be considered for any major upgrades to buildings and services.

11.2 FINANCING

There are several incentive programs listed in Appendix D of this report that will help finance the implementation of the energy and water saving opportunities. In the "Energy Saving Opportunity" tables throughout this report, the capital costs are listed both with and without incentives. The incentives in these tables are from Manitoba Hydro's Power Smart Incentives and apply to energy efficient lighting and windows, wall insulation upgrades, and geothermal heating systems. For more information on these incentives, contact your local Manitoba Hydro Energy Services Coordinator or the contact listed in Table D.1.

Table D.2 lists other incentive programs that are available for energy saving upgrades. These programs are:

- Energy Innovators Initiative: Energy Retrofit Assistance (ERA)
- Municipal Rural Infrastructure Fund (MRIF)
- Renewable Energy Development Initiative (REDI)
- Community Places Program

- Sustainable Development Innovations Fund (SDIF)

For further information on these programs refer to the website listed in the table.

Members of the Association of Manitoba Municipalities also have the option of purchasing products and services in bulk at reduced prices through the Municipalities Trading Company of Manitoba Ltd. (MTCML). Details on this can be found in Appendix G of this report.

11.3 POLITICAL FRAMEWORK

General Municipal Environment in Manitoba

In Manitoba, municipal elections are set every 4 years. The next municipal election will be in October 2006, which may mean that some councils will see a change in members. However, we do not expect this to have a major impact on the plans to implement the recommendations of this report.

There are currently no Provincial or Federal targets or goals set that municipalities must achieve. ‘Green Projects’ have become common in Manitoba and often programs like the Municipal Rural Infrastructure Fund (MRIF) targets such projects. Details of this program are included in Appendix D of this report. Manitoba has been a leader in energy efficiency and many municipalities have partnered with other levels of government and companies like Manitoba Hydro on innovative projects. We believe the MMEP project is an excellent example of an innovative project and believe all of the participating communities are receptive to innovative ideas because they have agreed to participate.

A recent trend in municipal government has been toward longer-term planning. This is seen with the recent changes to the provincial Planning Act and the requirements for community sustainability plans in the New Deal agreement. The recommendations in this report certainly complement this direction.

Political Environment in St. Andrews

The Municipality of St. Andrews has shown some interest in the past in both energy and water efficiency. In terms of water efficiency, the toilets in the Municipal Office Building have been replaced with water efficient, dual flush toilets and in terms of energy efficiency, the lighting in the St. Andrews Community Club has been upgraded to energy efficient T8s.

A new public works shop is being considered with possible implementation by 2009. There are also plans for renovations to current buildings including an addition to the Municipal Office Building sometime in the future. The knowledge gained from this study and from observing the energy savings that result from implementing the recommended upgrades will be valuable in these renovations and in the future when new buildings are developed.

A potential barrier that could affect the implementation of the energy and water saving opportunities discussed throughout this report is a change in council members. It is important that the information gained here be passed on as new members enter the council and current members leave.

12.0 PERFORMANCE VERIFICATION

Following the implementation of the recommended energy and water saving opportunities, it is important to continuously monitor the annual energy consumption to keep a record of the resulting energy savings.

Appendix F contains a spreadsheet and graph for each of the buildings audited. These spreadsheets should be used as a tool to monitor the energy consumption on a monthly basis. The first five columns in each spreadsheet are for year 2004-2005 and have already been completed.

Following the implementation of the measures discussed in this report, the energy consumption should be recorded. The year headings may need to be re-entered, depending on when the implementations are completed. The monthly electrical energy consumption in kWh taken from the building's electricity bill should be recorded in the "Billed Elec. Energy" column and the monthly gas consumption in m^3 should be recorded in the "Billed Natural Gas" column. The monthly energy consumption for heating depends on the outdoor temperatures for that month. The "Billed Energy Consumption" is therefore normalized to the year 2004-2005 such that a fair comparison can be made.

The normalized energy consumption is determined as follows:

$$NEC = TEC \times (\%\, Energy\, Used\;\; for\; Heating) \times \left(\frac{HDD(present)}{HDD(2004-2005)} \right)$$
$$+ TEC \times (1 - \%\, Energy\, Used\;\; for\; Heating)$$

Where *NEC* is the Energy Normalized to year 2004-2005, *TEC* is the total energy consumption and *HDD* is the heating degree-days.

The heating degree-days (HDD) for a given day are the number of Celsius degrees that the mean temperature is below 18°C. This data can be found for Winnipeg on the following website:

http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=11&Day=18

Once the “Billed Elec Energy”, the “Billed Natural Gas”, and “HDD” columns are filled in, the “Energy Normalized to 2004-2005” column is automatically calculated and the graph is updated. From this graph, the energy consumption can be monitored on a monthly basis to ensure that the upgrades are resulting in a reduction in energy consumption.

APPENDIX A

INVENTORY SHEETS

TABLE OF CONTENTS – APPENDIX A

BUILDING INSPECTION INVENTORY

Revision 2

Municipality: St. Andrews	**Date: March 8, 2006**
Toured By: Ray Bodnar, Elmer Keryluk	**Construction Date: 1974**
Building: St. Andrews Heritage Centre (Old Fire Hall)	**Renovations: Renovated in 2005. Doors filled in and insulated, roof redone and insulated.**
Address: 6 Riverview, St Andrews	
L x W x H: 40' x 38' x 15' — **Area: 1,520 ft^2**	
Building Capacity:	
Building Floor Plan: Building is now a museum with kitchen, washroom, and upstairs storage.	**Occupied Times: Summer May 15 – Sep 15 open 12 hours/day, 7 days/week. Winter: 8 hours/month, meetings once a month.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Concrete block filled with zonolite and 2" styrofoam. Approx R-12 in walls (should have been R-20).
Roof Type/R-value: New roof and insulation. 4" styrofoam approx R-16 (should have been R-40).
Door Type/weather stripping: 3 new, pedestrian doors, caulking good, poor stripping on one door, no stripping on 2 doors – carpet stuck under door to fill gap.
Window type/caulking: 4 – 4'x2' double pane aluminum sliders with poor caulking.
Other:
MECHANICAL
Heating System: Heating left on in the winter – cool inside. 2 electric unit heaters, 1 not working, baseboards in washroom, kitchen and upstairs c/w wall stats (3).
Cooling System: None
Ventilation System: None, Ceiling fans.
HVAC Controls: 5 wall standard stats heating only.
HVAC Maintenance/Training:
Water Supply System: Well
Domestic Hot Water System: 30 gallon electric tank, no piping insulation.
Water Fixtures: 1 low flow sink, 1 toilet.

ELECTRICAL
Indoor Lighting: 12 – 8'x2 T12 fluorescents, 4 100W incandescents.
Outdoor Lighting:
Exit Signs: 1 incandescent exit signs.
Motors:
Parking Lot Plugs: None
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: St. Andrews	**Date: March 7, 2006**
Toured By: Ray Bodnar, Ray Kelsch	**Construction Date: 1985**
Building: Fire Hall #1	**Renovations: Mezzanine office added later.**
Address: 500 Railway Avenue, Clandeboye	
L x W x H: 72' x 48' x 16' **Area: 3,456 ft^2**	
Building Capacity: 12 in meeting room	
Building Floor Plan: Fire Trucks on main floor. Meeting room and office on second level.	**Occupied Times: 30 hrs/week.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: 6" thick walls, metal clad. R-20.
Roof Type/R-value: Metal Clad. R-20.
Door Type/weather stripping: Good ped doors, no caulking, poor stripping (3). Good vehicle doors need caulking, very poor stripping (3).
Window type/caulking: 3 pane, 2004 – good condition.
Other:
MECHANICAL
Heating System: Gas unit heaters, 100MBH (3). Electric baseboards in meeting room and office.
Cooling System: None
Ventilation System: Ceiling fans
HVAC Controls: Standard stats kept at 21 C.
HVAC Maintenance/Training:
Water Supply System: Well
Domestic Hot Water System: 40 gallon electric water tank, 3000W, no insulation.
Water Fixtures: 1 toilet, 1 sink, 1 urinal – high flow.

ELECTRICAL
Indoor Lighting: 6 – 8'x2 T12s (60W) in mezzanine, 24 – 8'x2 T12s on main floor. 4 – 4'x2 T12s (40W).
Outdoor Lighting: 6 outdoor lights
Exit Signs: 2 old incandescents**.**
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: St. Andrews	**Date: March 7, 2006**
Toured By: Ray Bodnar, Scott Spicer	**Construction Date: A – 1988,** **B – 1911.**
Building: Municipal Administration Building	**Renovations: In 1988 the Office was built and the Museum was renovated. The museum's exterior was redone and likely re-insulated.**
Address: 500 Railway Avenue, Clandeboye	
L x W x H: A: 60' x 54' **B: 50' x 40' (2 story)** — **Area: 7,240 ft^2**	
Building Capacity: Office: 15 Museum: 15	
Building Floor Plan: **Part A – Office.** **Part B - Museum on main floor, classroom on second floor.**	**Occupied Times: A – Mon-Fri, 9am-4:30pm. B is occupied intermittently – 20 hours/week.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Masonry, stucco and metal clad exterior, drywall interior. A is R-28 perimeter insulation. B insulation is unknown.
Roof Type/R-value: A is R-30 flat roof. B is unknown.
Door Type/weather stripping: Doors are good.
Window type/caulking: A – 3 pane windows with good caulking. B – old 2 pane, Museum: 3 – 60" x 65", Classroom: 4 – 56" x 20" , 2 – 24" x 36". *Note in B: 1 broken 2 pane 56" x 20" and 1 broken 60" x 65" window included above.
Other:
MECHANICAL
Heating System: A: 2 RTUs (1988) 5 ton heat/cool with economizer zone control in office, none in council chambers, several electric baseboards. B: Carrier heat pump removed, replaced with standard gas furnace 150/114 MBH.
Cooling System: A/C in A, No A/C in B.
Ventilation System: 3 exhaust fans c/w BDD on manual switch (left on too much).
HVAC Controls: Standard heat/cool stats. 4 zone stats for office, no setback.
HVAC Maintenance/Training:
Water Supply System: Well
Domestic Hot Water System: 20 gallon electric water heater.
Water Fixtures: Low flow toilets, 2 high flow sinks.

ELECTRICAL
Indoor Lighting: A: 41 - 4'x4 T12s (34W). B: 14 - 100W incandescents, 16 – 4'x2 T12s (40W).
Outdoor Lighting:
Exit Signs: 6 Incandescents but are turned off.
Motors:
Parking Lot Plugs: 3 plugs.
OTHER BUILDING SYSTEMS
Note in B: Carrier air-to-air heat pump being replaced.
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Hydro and Gas.
NOTES
Note Part B may be demolished but should be reviewed for upgrade as if it won't happen.

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: St. Andrews	**Date: March 7, 2006**
Toured By: Brad Pawluk, Ray Bodnar	**Construction Date: 1960s**
Building: Municipal Repair Shop	**Renovations: Exterior insulation added – approx 2 – 3" styrofoam insulation with metal cladding on walls.**
Address: 500 Railway Avenue – Clandeboye	
L x W x H: 100' x 50' x 15' / **Area: 5,000 ft^2**	
Building Capacity: 5	
Building Floor Plan: Small office, large vehicle shop, and second floor lunchroom.	**Occupied Times: Mon-Fri, 7am-4:30pm.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Concrete block filled with insulation plus 2-3" styrofoam – R-14.
Roof Type/R-value: 2x4 attic with 4" blown in fiberglass R-10 – easy to access.
Door Type/weather stripping: Older insulated steel door, no caulking, good stripping. 2 ped doors 8/10 stripping.
Window type/caulking: 2 pane, 1996 1 – 60" x 38" no caulking. 2 - 62" x 36" on second floor.
Other:
MECHANICAL
Heating System: 3 gas unit heaters in shop approx. 100MBH. Electric baseboards in washroom, office, 2 in second floor lunchroom with integral stats.
Cooling System: None
Ventilation System: Ceiling fans, wall exhaust fan c/w 2 backdraft dampers (24"x24"). Motorized intake Damper, exhaust for vehicle emissions and welding hood (on).
HVAC Controls: Standard stats.
HVAC Maintenance/Training: Intake damper does not close.
Water Supply System: Well
Domestic Hot Water System: 175 Litre electric tank, 3000W. No pipe insulation.
Water Fixtures: 2 high flow toilets, 1 3.8 lpf urinal.

ELECTRICAL
Indoor Lighting: 31 – 8’x2 T12s (96W). 8 – 4’x2 T12s (40W).
Outdoor Lighting: On photocell.
Exit Signs: None
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: St. Andrews	**Date: March 8, 2006**
Toured By: Ray Bodnar, Trent Keryluk	**Construction Date: 1991**
Building: Fire Hall #2	**Renovations: None except a wall was built to separate fire hall from public works.**
Address: 5610 Main Street (Hwy 9)	
L x W x H: 116' x 68' x 23' — **Area: 7,888 ft^2**	
Building Capacity: 10 in Office, 2 in Public Works	
Building Floor Plan: North Side: Fire Hall + office + lounge (2nd floor). South Side: Public Works Vehicle Repair.	**Occupied Times: Fire Hall: Practice every Wednesday for 4 hours. 200 calls/yr and 2 hours per call.** **Public Works: 7:30am-4:30pm Mon-Fri.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: 8" walls – R-24 Metal Clad inside and outside.
Roof Type/R-value: Metal Clad
Door Type/weather stripping: Doors have poor stripping, caulking 5/10. 6 vehicle doors, 5 pedestrian doors.
Window type/caulking: 3 pane windows are caulked but could be repaired. 5 – 1'x1', 2 – 2'x3' and 2 – 3'x4'. Repair stripping on 3 opening windows 30" x 18".
Other:
MECHANICAL
Heating System: Public Works: 1 – 120MBH gas unit heater. Fire Hall: 2 – 120MBH gas unit heaters. Meeting room and lounge: 2 high efficiency furnaces – 80MBH. PW and FH both need ceiling fans (2).
Cooling System: 2 ton A/C with furnace for lounge – high efficiency.
Ventilation System: Air transfer fan from ceiling in PW. Ventilation not blocked by wall openings. QEL system for Fire hall – large exhaust on dehumidistat for hose drying. Emissions detector for both buildings.
HVAC Controls: Standard stats
HVAC Maintenance/Training:
Water Supply System:
Domestic Hot Water System: 50 gallon, 65 MBH input tank – gas, no pipe insulation.
Water Fixtures: 5 toilets, 5 high flow sinks, 1 urinal

ELECTRICAL

Indoor Lighting: PW: 10-8'x2 T12 fluorescents. FH: 22-8'x2 T12 fluorescents. Main Office: 17-4'x2 T12s (40W) Second lounge: 24-4'x2 T12s (40W).

Outdoor Lighting: Minimal lights on all night.

Exit Signs: None

Motors:

Parking Lot Plugs:

OTHER BUILDING SYSTEMS

PROCESS SYSTEMS

BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)

NOTES

Public Works is heated to 24 C to melt ice on equipment.

Fresh Air Intake in Public Works with BDD.

Wall built with opening on top.

Existing ceiling fan doesn't work.

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: St. Andrews		**Date: March 7, 2006**
Toured By: Ray Bodnar, Rick Warner		**Construction Date: New Fire Hall & Public Works – 1995, Old Fire Hall – approx 30 yrs old.**
Building: Northend Fire Hall #3		**Renovations:**
Address: 108 Grant Street, Matlock		
L x W x H: **Public Works – 50'x58'x21'** **Meeting Rm. – 30'x58'x21'** **New Fire Hall – 58'x60'x19'** **Old Fire Hall – 28'x48'x13'.**	**Area: 9,768 SF**	
Building Capacity: 12 in meeting room		
Building Floor Plan: New fire hall, old fire hall, and new public works shop and meeting room.		**Occupied Times: Minimal occupancy. 8 hrs per week for both areas.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Metal clad, 6" thick walls for both new and old sections.
Roof Type/R-value:
Door Type/weather stripping: Ped door in old hall doesn't close properly and has poor stripping – repair. 170x144" door in old hall – re-strip. All doors have poor caulking.
Window type/caulking: Poor caulking on all windows. 3 – 44" x 38" double pane windows – good stripping.
Other:
MECHANICAL
Heating System: Electric units in old hall – 2 standard stats. 2 Reznor unit heaters in new hall, 80 MBH. 2 Reznor unit heaters in Public Works. 92% efficient gas furnace in meeting room.
Cooling System: None
Ventilation System: Exhaust fan and air intake on CO system in new fire hall. Ceiling fans. 2 leaky BDD in Public Works.
HVAC Controls: Standard stats.
HVAC Maintenance/Training: Replace pedestrian door in old fire hall.
Water Supply System: Well
Domestic Hot Water System: 75 gallon, 75 MBH gas hot water tank. Piping not insulated.
Water Fixtures: 3 sinks, 3 toilets (13.2 LPF), 1 high flow urinal.

ELECTRICAL
Indoor Lighting: 16 – 4’x4 T12s (40W). 24 – 8’x2 T12s (75W) in new fire hall. 14 – 8’x2 (75W) in old fire hall. 17 – 8’x2 (75W) in Public Works.
Outdoor Lighting: On photocell?
Exit Signs: 4 Incandescents signs turned off.
Motors:
Parking Lot Plugs: None
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES
Must keep vehicles at 60F to reduce freezing on road. Look at putting radiant heaters on the side. Temperature kept at minimum in the halls but at 70 F in Public Works to melt ice – radiant heaters. Is there a motorized damper on intake in new fire hall? No wall opening?

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: St. Andrews		**Date: March 8, 2006**
Toured By: Stephanie Foy, Ray Bodnar		**Construction Date: approx. 1954**
Building: St. Andrews Community Club		**Renovations: New furnace added in 2005. New Entrance and doors for arena. Occupancy sensors for washroom lights.**
Address: 28 St. Andrews Road		
L x W x H: 200' x 125' + 70' x 125'.	**Area: 33,750 ft^2**	
Building Capacity: 117		
Building Floor Plan: Rink, lounge, concession, 2 story office, mechanical room, change rooms, ice plant and zamboni room.		**Occupied Times: Sep – March approx. 980 hrs. April – Aug approx. 680 hours. Total ave hours of use per year = 1660.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Block walls plus 6" studs inside, wood paneling in lounge.
Roof Type/R-value: Flat roof, metal exposed deck underneath.
Door Type/weather stripping: No caulking in doors, stripping 5/10 (4 doors to outside). 2 old doors to rink, no stripping, large gaps. Water heater room – strip vehicle door.
Window type/caulking: 8 – 32 x 34 (well protected) double pane windows to rink, none to outside.
Other:
MECHANICAL
Heating System: Radiant heaters in rink. Lounge has 2 RTUs c/w economizers for heating and cooling – 4 yrs old. 150 MBH gas furnace for dressing rooms and concessions – 80% efficient.
Cooling System: 2 RTUs
Ventilation System: Grease exhaust fan in concessions, MUA was removed – running for nothing. No exhaust in lounge.
HVAC Controls: Standard stats for heating/cooling.
HVAC Maintenance/Training:
Water Supply System: Well
Domestic Hot Water System: Gas tank, 75 gallons, 125 MBH
Water Fixtures: 16 high flow toilets, 8 high flow showers, 7 high flow urinals, 7 sinks (3 hf) – most are auto shut off.

ELECTRICAL
Indoor Lighting: 70 – 4'x4 T12 fluorescents (34W), 32 metal halides in rink. Some T8s in new washroom with occupancy sensors. Lounge and concession lights were upgraded.
Outdoor Lighting: On during the day. There is a photocell but it's malfunctioning.
Exit Signs: 11 LED.
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
Zamboni room – 2 – 5' high x 20" dia bare steel storage tanks at 170 F, 300/247 MBH AO Smith water heater + 1 Insulated tank. Piping not insulated.
PROCESS SYSTEMS
Ice Plant: 2 – 50HP Compressors – old – 1 always on, 1 intermittent. 1 – 20HP Brine Pump – old – continuous.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Gas and Hydro
NOTES
- Ice plant dumps outside. - Hot water usage for rink – 100 gal/flood, 6 per day Mon-Fri, 15 on Sat, 15 on Sun. - NH2 plant controlled by ice temperature. - CO detector manual control of fans (safety issue) – can use for ice making. - MUA for concession was removed when RTUs were installed.

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: St. Andrews		**Date: March 7, 2006**
Toured By: Ray Bodnar, Dora Fedorchuk		**Construction Date: 1991**
Building: Petersfield Community Club		**Renovations: In floor heating system abandoned.**
Address: P.O. Box 455 Petersfield		
L x W x H: 4 sheets of ice = 156' x 70' x 20' high. Main floor lounge = 70' x 52'. Second floor lounge = 70' x 52'.	**Area: 18,700 ft^2**	
Building Capacity: 50 upstairs, 50 downstairs, 100 total		
Building Floor Plan: Curling Rink, Main Floor Concession		**Occupied Times: Oct 20 – April 1: 40 hrs/week (22 weeks), includes Saturdays. 7 x 15 hours for bonspiels. Occasional use in the summer.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Metal clad exterior and interior with 6" thick walls R-20 perimeter insulation = 3" styrofoam.
Roof Type/R-value: Metal sloped roof
Door Type/weather stripping: Insulated metal doors with weather-stripping – good condition. 2 doors with poor stripping. Poor caulking on all doors.
Window type/caulking: 2 pane windows on exterior have poor caulking. Main floor: 2 – 33" x 58". Rink: 12 – 50" x 48" double pane (same on second floor). Second floor: 5 – 20" x 30" 2 pane windows to outside. 1 Broken window at entrance – 33" x 58"
Other:
MECHANICAL
Heating System: Weil-Maclain high efficiency nat gas boiler for in-floor heating for main floor only. 4 – 125 MBH unit Heaters in rink (kept at 38 F all the time). 2 propane furnaces for second floor.
Cooling System: 2 propane furnaces with A/C – 80MBH complete with 3 ton condenser – st. eff. = 80%.
Ventilation System: 4 Rink fans c/w dampers – not used. Wall fan c/w bdd in ice room. 2 washroom exhaust fans.
HVAC Controls: Standard stats.
HVAC Maintenance/Training: 1 Broken window at entrance – 33" x 58"
Water Supply System:
Domestic Hot Water System: 36 gallon gas water heater.
Water Fixtures: 10 Sinks, 8 toilets, and 4 urinals.

ELECTRICAL
Indoor Lighting: Metal halides in rink. 35 – 4'x2 T12 fluorescents (40W) on main floor, 16 – 4'x2 T12 fluorescents on second floor. 10 Incandescents.
Outdoor Lighting:
Exit Signs: 8 Incandescents
Motors:
Parking Lot Plugs: None
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Ice Plant 30HP, 87.5% efficient compressor and 7.5HP brine pump with ice temperature sensor controls.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Well pump with meter.
NOTES
1. Large duct by wall exhaust is intake for grease hood connected to hood, no damper. 2. Rink fans are not run to maintain humidity of 40-50% in curling rink – this prevents ice loss.

APPENDIX B

TABLES TO CALCULATE ENERGY SAVINGS

TABLE OF CONTENTS – APPENDIX B

Table B.1.1 - Energy Breakdown for the St. Andrews Heritage Centre (Old Fire Hall)

	Energy Consumption (kWh)	% of Total Energy Consumption
Heating	25,992	82%
Lighting	4,623	15%
Hot Water	904	3%
Total	**31,520**	

Table B.1.2 (a) Electricity Usage for St. Andrews Heritage Centre (Old Fire Hall)

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	0	0	70	$0	$4	$23
November	0	0	2,100	$0	$123	$158
December	0	0	5,180	$0	$304	$364
January	0	0	5,120	$0	$300	$360
February	0	0	6,060	$0	$355	$423
March	0	0	3,450	$0	$202	$248
April	0	0	5,040	$0	$295	$359
May	0	0	1,630	$0	$96	$130
June	0	0	1,160	$0	$68	$97
July	0	0	200	$0	$12	$32
August	0	0	1,270	$0	$74	$105
September	0	0	240	$0	$14	$35
TOTAL		**0**	**31,520**	**$0**	**$1,847**	**$2,333**

Notes

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.1.3 - Lighting Analysis Summary for St. Andrews Heritage Centre (Old Fire Hall)

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
Fluorescents - Convert ' T12s to 8' T8s (12x2)	24	3,321	$199	1,985	$119
100W Incandescents - convert to compact fluorescents	4	602	$36	168	$10
Outdoor lighting	1	438	$26	438	$26
Exit Signs - Convert Incandescents to LEDs	1	263	$16	26	$2
TOTALS		**4,623**	**$278**	**2,618**	**$157**

Annual Energy Savings (kWh)	**2,005**
Annual Cost Savings	**$120**
Percent Annual Energy Savings	**43%**

These calculations are assuming that the museum is occupied from May 15 - Sep 15 for 12 hrs/day, 7 days/week and for 8 hrs/month throughout the winter.

The Exit signs are assumed to be on 24 hours a day, 365 days per year

One outdoor light is assumed to be on 12 hours per day, 365 days per year.

Table B.1.4 (a) Window and Door Replacement Calculations for the St. Andrews Heritage Centre (Old Fire Hall)

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace double pane aluminum sliders with triple pane windows (4 - 4'x2').	32	2.000	995	$45	6.25	318	$15	677	$31
TOTALS			**995**	**$45**		**318**	**$15**	**677**	**$31**

Table B.1.4 (b) Window and Door Infiltration Calculations for the St. Andrews Heritage Centre (Old Fire Hall)

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Weatherstrip single pedestrian doors (3).	15	0.05	125	51	11,740,618	3,441	$157
Caulk windows (4)	48	0.005	10	13	3,005,598	881	$40
TOTALS						**4,322**	**$157**

Table B.1.4 (c) Wall/Roof Insulation Upgrade for the St. Andrews Heritage Centre (Old Fire Hall)

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Upgrade roof insulation	1520	16.000	5,908	$270	40	2,363	$108	3,545	$162
Upgrade wall insulation	2340	12.000	12,126	$554	20	7,276	$332	4,850	$222
TOTALS			**5,908**	**$270**		**2,363**	**$108**	**3,545**	**$162**

The crack length around the pedestrian doors is taken as a quarter of the perimeter.
The cracks around the windows are taken as the entire length of the perimeter.
The Heritage Centre is assumed to be maintained at 59 F throughout the winter.

Table B.1.5 - Water Usage for the St. Andrews Heritage Centre (Old Fire Hall)

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	1	1.8	2,632	0.32	842	0.32	842	0	0	$0
Toilets	1	1.8	2,632	13.25	34,874	3.98	10,462	24,412	NA	NA
Total					**35,716**		**11,304**	**24,412**	**0**	**$0**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	2	2	
Number of Toilet Uses/day	3	4	
Number of Toilets	1	1	
Toilet Uses/hour/fixture	0.75	1	1.75
Number of Sinks	1	1	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.75	1	1.75

Current Hot Water Usage (kWh)		
Fixture	L/Yr	kWh
Sinks	842	32
Total	**842**	**32**

The current sinks are assumed to consume 0.5 gpm

The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 / 0.8 gallons per flush

Table B.1.6 Energy Savings with Heating, Ventilating, and Air Conditioning for the St. Andrews Heritage Centre (Old Fire Hall)

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat	Heat Savings (kWh)
Setback thermostats to 59 F	82.83%	10,400	8,841	25,992	3,227

Table B.2.1 - Energy Breakdown for Fire Hall #1

	Energy Consumption (kWh)	% of Total Energy Consumption
Heating	94,669	89%
Lighting	10,051	9%
Hot Water	1,921	2%
Total	**106,641**	

Table B.2.2 - Natural Gas Consumption for Fire Hall #1

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
October	193	1,997	$95
November	196	2,029	$96
December	873	9,035	$378
January	2,300	23,804	$977
February	1,567	16,218	$668
March	1,850	19,147	$766
April	1,237	12,803	$516
May	576	5,961	$251
June	232	2,401	$17
July	36	373	$28
August	76	787	$46
September	11	114	$17
TOTAL	**9,147**	**94,669**	**$3,853**

Notes

The Total Charge column includes 14% taxes.

This building shares electrical service with Repair Shop & Administrative Building

The total electrical energy consumption is approximately 12,000 kWh.

Table B.2.3 - Lighting Analysis Summary for Fire Hall #1

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
Fluorescents - Convert 8' T12s to 8' T8s (30x2).	60	6,926	$416	5,092	$306
Fluorescents - Convert 4' T12s to 4' T8s (4x2).	8	612	$37	368	$22
Outdoor lighting	6	936	$56	936	$56
Exit Signs - Convert Incandescents to LEDs	6	1,577	$95	158	$9
TOTALS		**10,051**	**$603**	**6,554**	**$393**

Annual Energy Savings (KWH)	**3,497**
Annual Cost Savings	**$210**
Percent Annual Energy Savings	**35%**

These calculations are assuming that the fire hall is occupied for 30 hours/week.

The Exit signs are assumed to be on 24 hours a day, 365 days per year.

Table B.2.4 - Window and Door Infiltration Calculations for Fire Hall #1

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Weather-strip pedestrian doors (3).	15	0.05	125	19	6,322,738	1,853	$85
Caulk pedestrian doors (3).	60	0.005	10	6	1,874,701	549	$25
Weather-strip vehicle doors (3).	39	0.05	125	133	44,885,522	13,155	$601
Caulk vehicle doors (3)	156	0.005	10	43	14,363,367	4,209	$192
TOTALS						**19,767**	**$903**

The fire hall is assumed to be kept at 70 F.

The crack lengths for weather-stripping are taken as a quarter of the perimeter of the doors and the width is 0.05 inches.

The crack lengths for caulking are taken as the entire perimeter of the door and the width is 0.005 inches.

Table B.2.5 - Water Usage for Fire Hall #1

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	1	2.8	4,290	1.60	6,864	0.32	1,373	5,491	206	$9
Toilets	1	1.3	1,950	13.25	25,838	3.98	7,761	18,077	NA	NA
Urinal	1	1.5	2,340	9.50	22,230	3.80	8,892	13,338	NA	NA
Total					**54,932**		**18,026**	**36,906**	**206**	**$9**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	2	4	
Number of Toilet Uses/day	3	1	
Number of Toilets	1	1	
Toilet Uses/hour/fixture	0.75	0.50	1.25
Number of urinal uses/day	0	3	
Number of urinals	0	1	
urinal uses/hour/fixture	0	1.5	1.5
Number of Sinks	1	1	
Number of SInk Uses/day	3	4	
Sink Uses/hr/fixture	0.75	2.00	2.75

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	6,864	257
Total		**257**

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm

The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 / 0.8 gallons per flush

The current urinals consume 2.5 gallons per flush and the new urinals consume 1 gpf

Table B.2.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Fire Hall #1

Description	Current Efficiency	New Efficiency	Energy Used for Heating (kWh)	Energy Savings (kWh)
Replace unit heaters with high efficiency furnaces.	80%	95%	94,669	14,200

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Energy Used for Heating (kWh)	Energy Savings (kWh)
Setback thermostats to 59 F.	82.19%	10,400	8,841	94,669	11,664

Description	Annual Energy Savings (kWh)	Annual Cost Savings ($)	Installation Cost	Simple Payback Years
Install geothermal heating system.	63,112	$2,884	$91,200	31.62

Table B.3.1 - Energy Breakdown for Municipal Administration Building

	Energy Consumption (kWh)	% of Total Energy Consumption
Heating	128,205	70%
Cooling	32,051	17%
Lighting	22,062	12%
Hot Water	1,400	1%
Total	**183,718**	

Table B.3.2 (a) - Electricity Usage for Municipal Administration Building

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	31	0	7,980	$0	$468	$551
November	35	0	12,240	$0	$694	$809
December	39	0	14,820	$0	$793	$923
January	48	0	20,400	$0	$996	$1,167
February	48	0	19,200	$0	$962	$1,115
March	47	0	18,360	$0	$930	$1,078
April	42	0	17,460	$0	$895	$1,039
May	39	0	13,800	$0	$754	$899
June	31	0	9,060	$0	$544	$638
July	31	0	9,240	$0	$555	$651
August	31	0	8,400	$0	$504	$593
September	32	0	7,680	$0	$461	$544
TOTAL		**0**	**158,640**	**$0**	**$8,557**	**$10,006**

Table B.3.2 (b) - Natural Gas Consumption for Municipal Administration Building

Month (2004-2005)	**Gas (m^3)**	**Gas (kWh)**	**Total Charge**
October	204	2,111	$99
November	588	6,086	$264
December	834	8,632	$361
January	0	0	$0
February	1,416	14,655	$604
March	912	9,439	$384
April	1,066	11,033	$446
May	322	3,333	$145
June	257	2,660	$129
July	140	1,449	$75
August	20	207	$20
September	11	114	$17
TOTAL	**5,770**	**59,718**	**$2,546**

Notes

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

The electricity is shared with the Municipal Repair Shop and Fire Hall #1.

The electrical energy consumption for this building is approximately 124,000 kWh.

Table B.3.3 - Lighting Analysis Summary for Municipal Administration Building

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
A: Indoor Fluorescents - Convert 4' T12s to 4' T8s (41x4)	164	15,670	$941	9,434	$566
B: Indoor Fluorescents - Convert 4' T12s to 4' T8s (16x2)	32	1,631	$98	982	$59
Indoor 100 W Incandescents - Convert to Compact Fluorescents	14	1,456	$87	408	$24
Exit Signs - Convert Incandescents to LEDs	6	1,577	$95	158	$9
Parking lot plug-ins	6	1,728	$104	432	$26
TOTALS		**22,062**	**$1,325**	**11,413**	**$685**

Annual Energy Savings (kWh)	**10,649**
Annual Cost Savings	**$639**
Percent Annual Energy Savings	**48%**

The Offices are occupied Monday to Friday, 7.5 hours a day year round.

The Museum is occupied intermittently for approximately 20 hours/week.

Table B.3.4 (a) Window and Door Replacement Calculations for Municipal Administration Building

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace 2 - 60"x65" 2 pane windows with triple pane windows.	54	2.000	2,476	$113	6.25	792	$36	1,684	$77
Replace 3 - 56"x20" 2 pane windows with triple pane windows.	23	2.000	1,067	$49	6.25	341	$16	725	$33
Replace 2 - 24"x36" 2 pane windows with triple pane windows.	12	2.000	549	$25	6.25	176	$8	373	$17
Replace broken 56" x 20" 2 pane window with triple pane window.	8	1.000	711	$32	6.25	114	$5	597	$27
Replace broken 60"x65" 2 pane window with triple pane window.	27	1.000	2,476	$113	6.25	396	$18	2,080	$95
TOTALS			**7,279**	**$333**		**1,819**	**$83**	**5,460**	**$250**

Table B.3.4 (b) Wall/Roof Insulation Upgrade for Municipal Administration Building

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Upgrade wall insulation	1,800	10.000	16,458	$752	20	8,229	$376	8,229	$376
TOTALS			**16,458**	**$752**		**8,229**	**$376**	**8,229**	**$376**

The office is assumed to be kept at 70 F

Table B.3.5 - Water Usage for Municipal Administration Building

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	2	3.5	13,650	1.60	21,840	0.32	4,368	17,472	655	$39
Toilets	2	3.5	13,650	3.98	54,327	3.98	54,259	68	NA	NA
Total					**76,167**		**58,627**	**17,540**	**655**	**$39**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	8	8	
Number of Toilet Uses/day	3	4	
Number of Toilets	2	2	
Toilet Uses/hour/fixture	1.5	2	3.5
Number of Sinks	2	2	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	1.5	2	3.5

Current Hot Water Usage (kWh)		
Fixture	L/Yr	kWh
Sinks	21,840	818
Total		**818**

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm

The current toilets are assumed to use 1.5 / 0.8 gallons per flush

Table B.3.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Municipal Administration Building

Description	Current Efficiency	New Efficiency	Current Energy Used to Heat/Cool	Heat Savings
Replace RTUs with high efficiency.	8	13	32,051	11,218
Replace furnace with high efficiency furnace.	76%	95%	32,993	6,269

Description	Leakage (cfm)	HDD below 70 F	Heating Efficiency	Annual Heat Loss (BTU)	Annual Heat Savings for 1 (kWh)	Annual Heat Savings for 2 (kWh)
Provide HRVs for RTUs (2).	400	10,400	80%	5,925	2,962	5,925
Install CO_2 sensors on RTUs.	400	10,400	80%	5,925	2,962	5,925

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat	Heat Savings
Setback Thermostats in A to 59 F	77.74%	10,400	8,841	26,725	3,114
Setback Thermostats in B to 59 F	88.13%	10,400	8,841	32,993	4,359

Description	Heating Efficiency	HDD below 70 F	Flow Rate (cfm)	Heat Loss (kWh)	Energy Savings
Replace leaky backdraft dampers with motorized dampers (3).	80%	10,400	150	14,809	14,809

Table B.4.1 - Energy Breakdown for Municipal Repair Shop

	Energy Consumption (kWh)	% of Total Energy Consumption
Heating	138,831	86%
Lighting	21,015	13%
Hot Water	2,398	1%
Total	**162,244**	

Table B.4.2 - Natural Gas Consumption for Municipal Repair Shop

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
October	0	0	$0
November	246	2,546	$130
December	1,531	15,845	$654
January	3,285	33,999	$1,390
February	2,725	28,203	$1,153
March	2,653	27,458	$1,094
April	2,073	21,455	$857
May	162	1,677	$79
June	288	2,981	$143
July	207	2,142	$106
August	115	1,190	$64
September	129	1,335	$72
TOTAL	**13,414**	**138,831**	**$5,741**

Notes

The Total Charge column includes 14% taxes.

This building shares electrical services with Fire Hall #1 and Municipal Administrative Building.
Total annual electricity consumption is approximately 23,000 kWh and $1,450.

Table B.4.3 - Lighting Analysis Summary for Municipal Repair Shop

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
Fluorescent Lamps- Convert 8' T12s to 8' T8s (31x2)	62	17,764	$1,067	8,270	$497
Fluorescent Lamps- Convert 4' T12s to 4' T8s (8x2)	16	1,936	$116	1,166	$70
Outdoor lights on photocell.	3	1,314	$79	1,314	$79
TOTALS		**21,015**	**$1,262**	**10,749**	**$645**

Annual Energy Savings (kWh)	**10,265**
Annual Cost Savings	**$616**
Percent Annual Energy Savings	**49%**

The Municipal Repair Shop is occupied from Mon-Fri, 7am-4:30pm.

The outdoor lights are on 12 hours per day year round.

Table B.4.4 (a) Window and Door Replacement Calculations for Municipal Repair Shop

Description	Existing				New			Savings	
	Area (ft^2)	R-Value (^oF ft^2hr/BTU)	Annual Heat Loss (kWh)	Cost	R-Value (^oF ft^2hr/BTU)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace 2 pane 60"x38" window with a new, insulated 3 pane window (1).	16	2.000	724	$33	6.25	232	$11	492	$22
Replace 2 pane 62"x36" windows with new, insulated 3 pane windows (2).	31	2.000	1,417	$65	6.25	454	$21	964	$44
TOTALS			**2,141**	**$98**		**685**	**$31**	**1,456**	**$67**

Table B.4.4 (b) Window and Door Infiltration Calculations for Municipal Repair Shop

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Weatherstrip pedestrian doors (2).	10	0.05	125	34	11,508,555	3,373	$154
Caulk pedestrian doors (2).	40	0.005	10	11	3,682,738	1,079	$49
Caulk vehicle doors (3).	156	0.005	10	43	14,362,677	4,209	$192
Caulk windows (3).	49	0.005	10	13	4,511,354	1,322	$60
TOTALS						**9,984**	**$456**

Table B.4.4 (c) Wall/Roof Upgrade Calculations for Municipal Repair Shop

Description	Existing				New			Savings	
	Area (ft^2)	R-Value (^oF ft^2hr/BTU)	Annual Heat Loss (kWh)	Cost	R-Value (^oF ft^2hr/BTU)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Upgrade roof insulation.	5000	10.00	45,717	$2,089	40.00	11,429	$522	34,288	$1,567
TOTALS			**45,717**	**$2,089**		**11,429**	**$522**	**34,288**	**$1,567**

Table B.4.5 - Water Usage for Municipal Repair Shop

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	1	2.3	5,558	1.60	8,892	1.60	8,892	0	0	$0
Toilets	2	0.6	2,779	13.25	36,818	3.98	11,046	25,773	NA	NA
Urinals	1	1.1	2,779	3.80	10,559	3.80	10,559	0	NA	NA
Total					**56,270**		**30,497**	**25,773**	**0**	**$0**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	2	3	
Number of Toilet Uses/day	3	1	
Number of Toilets	2	2	
Toilet Uses/hour/fixture	0.4	0.2	0.6
Number of Urinal Uses/day	0	3	
Number of Urinals	0	1	
Urinal Uses/hour/fixture	0	1.13	1.13
Number of Sinks	1	1	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.75	1.50	2.25

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	8,892	333
Total		**333**

The current sinks are assumed to consume 2.5 gpm.

The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 / 0.8 gallons per flush

The current urinals consume 1 gallon per flush.

Table B.4.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Municipal Repair Shop

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat	Heat Savings
Setback Thermostats to 59 F	71.80%	10,400	8,841	138,831	14,944

Description	Current Efficiency	New Efficiency	Energy Used for Heating	Energy Savings
Replace unit heaters in shop with high efficiency furnaces.	80%	95%	120,182	18,027

Description	Heating Efficiency	HDD below 70 F	Flow Rate (cfm)	Heat Loss (kWh)	Energy Savings
Replace leaky backdraft dampers with motorized dampers (2).	80%	10,400	100	9,873	19,746
Replace leaky intake damper with new motorized damper (1).	80%	10,400	200	19,746	19,746
Insulate damper.	80%	10,400	NA	914	892

Table B.5.1 - Energy Breakdown for Fire Hall #2

	Energy Consumption (kWh)	% of Total Energy Consumption
Heating	240,153	81%
Cooling	39,808	14%
Lighting	12,692	4%
Hot Water	2,154	1%
Total	**294,807**	

Table B.5.2 (a) - Electricity Usage for Fire Hall #2

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
October	0	0	4,080	$0	$239	$291
November	0	0	3,420	$0	$200	$246
December	0	0	4,080	$0	$239	$291
January	0	0	4,440	$0	$260	$315
February	0	0	4,800	$0	$281	$339
March	0	0	3,300	$0	$193	$238
April	0	0	4,860	$0	$285	$346
May	0	0	3,420	$0	$200	$252
June	0	0	7,080	$0	$425	$503
July	0	0	3,120	$0	$187	$232
August	0	0	6,660	$0	$400	$474
September	0	0	3,240	$0	$195	$240
TOTAL		**0**	**52,500**	**$0**	**$3,105**	**$3,765**

Table B.5.2 (b) - Natural Gas Consumption for Fire Hall #2

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
October	84	869	$111
November	1,790	18,526	$751
December	2,488	25,750	$1,003
January	5,798	60,008	$2,231
February	4,046	41,875	$1,554
March	3,624	37,507	$1,362
April	2,636	27,282	$1,013
May	1,298	13,434	$565
June	582	6,024	$314
July	417	4,316	$248
August	453	4,688	$265
September	196	2,029	$161
TOTAL	**23,412**	**242,307**	**$9,578**

Notes

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.5.3 - Lighting Analysis Summary for Fire Hall #2

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
Public Works: 8' T12 Fluorescents - Convert to T8s (10x2).	20	5,429	$326	2,546	$153
Fire Hall: 8' T12 Fluorescents - Convert to T8s (22x2).	44	3,103	$186	1,455	$87
Main Office: 4' T12 Fluorescents - Convert to T8s (17x2).	34	1,013	$61	610	$37
Second Fl. Lounge: 4' T12 Fluorescents - Convert to T8s (24x2).	48	1,430	$86	861	$52
Turn indoor lights off throughout the night.	8	1,717	$103	0	$0
TOTALS		**12,692**	**$762**	**5,472**	**$329**

Annual Energy Savings (kWh)	**7,220**
Annual Cost Savings	**$433**
Percent Annual Energy Savings	**57%**

These calculations were done assuming that the Fire Hall is occupied every Wednesday for 4 hrs plus for 200 2 hour calls per year.

The Public works is occupied from Mon-Fri, 7:30am - 4:30pm.

Table B.5.4 - Window and Door Infiltration Calculations for Fire Hall #2

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Weather-strip pedestrian doors (3).	15	0.05	125	51	17,263,662	5,059	$231
Weather-strip vehicle doors (6).	34.5	0.05	125	118	39,706,424	11,637	$532
Caulk pedestrian doors (4).	80	0.005	10	22	7,365,829	2,159	$99
Caulk vehicle doors (6).	312	0.005	10	85	28,726,734	8,419	$385
Caulk windows (9).	88	0.005	10	24	8,102,412	2,375	$109
Weather-strip windows (2).	4	0.025	50	5	1,841,457	540	$25
TOTALS						**30,188**	**$1,380**

The temperature of the building is maintained at an average of 70 F.

The crack length around the pedestrian doors is taken as a quarter of the perimeter of the doors.

The crack length around the vehicle doors is taken as an eighth of the perimeter of the doors.

The crack length around the windows is taken as a quarter of the perimeter

Table B.5.5 - Water Usage for Fire Hall #2

Fixtures	Qty	Est. # of Uses/Hr/Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	5	0.38	4,388	1.60	7,020	0.32	1,404	5,616	210	$13
Toilets	5	0.15	1,755	13.25	23,254	3.98	6,976	16,278	NA	NA
Urinals	1	1.13	2,633	9.50	25,009	3.80	10,004	15,005		
Total					**55,283**		**18,384**	**36,899**	**210**	**$13**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	1	3	
Number of Toilet Uses/day	3	1	
Number of Toilets	5	5	
Toilet Uses/hour/fixture	0.08	0.08	0.15
Number of Urinal Uses/day	0	3	
Number of Urinals	0	1	
Urinal Uses/hour/fixture	0	1.13	1.13
Number of Sinks	5	5	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.08	0.30	0.38

Current Hot Water Usage (kWh)		
Fixture	L/Yr	kWh
Sinks	7,020	263
Total		**263**

The high flow toilets consume 3.5 gallons per flush and the water efficient toilets consume 1.5 / 0.8 gpf
The high flow sinks consume 2.5 gallons per minute and the water efficient sinks consume 0.5 gpm
The urinals consume 2.5 gallons per flush and the water efficient urinals consume 1 gallon per flush

Table B.5.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Fire Hall #2

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat (kWh)	Heat Savings (kWh)
Setback thermostats in Public Works to 59 F.	73.29%	10,400	8,841	62,109	6,823
Setback thermostats in Office and Fire Hall to 59 F.	93.06%	10,400	8,841	134,314	18,737

Description	Current Efficiency	New Efficiency	Energy Used for Heating (kWh)	Energy Savings (kWh)
Replace unit heater in Public Works with high efficiency furnace.	80%	95%	62,109	9,316
Replace unit heaters in Fire Hall with high efficiency furnaces.	80%	95%	90,584	13,588

Description	Area of Ceiling (ft^2)	Area of Top Half of Walls (ft^2)	Roof R-value	Wall R-value	Heat Savings (kWh)
Repair and install 2 ceiling fans in public works.	2,040	1,472	30	24	4,150
Install 2 ceiling fans in fire hall.	3,944	1,334	30	24	6,003
Install ceiling fan in hose tower.	144	180	30	24	592

Description	Heating Efficiency	HDD below 70 F	Flow Rate (cfm)	Heat Loss (kWh)	Energy Savings (kWh)
Install 1200 cfm HRV for tower ventilation.	80%	10,400	1,200	10,781	5,391
Install 1200 cfm HRV for Public Works.	80%	10,400	1,200	10,544	5,272
Replace leaky damper with motorized damper	80%	10,400	200	19,746	3
Insulate damper.	80%	10,400	NA	914	892

Table B.6.1 - Energy Breakdown for Northend Fire Hall #3

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	230,274	96%
Lighting	7,682	3%
Hot Water	2,322	1%
Total	**240,278**	

Table B.6.2 (a) - Electricity Usage for Northend Fire Hall #3

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
October	0	0	3,720	$0	$218	$266
November	0	0	3,440	$0	$202	$248
December	0	0	8,440	$0	$495	$582
January	0	0	11,840	$0	$679	$792
February	0	0	6,800	$0	$398	$472
March	0	0	10,040	$0	$588	$689
April	0	0	3,720	$0	$218	$272
May	0	0	3,440	$0	$207	$254
June	0	0	1,800	$0	$108	$141
July	0	0	1,640	$0	$98	$130
August	0	0	2,000	$0	$120	$155
September	0	0	1,440	$0	$86	$117
TOTAL		**0**	**58,320**	**$0**	**$3,417**	**$4,118**

Table B.6.2 (b) - Natural Gas Consumption for Northend Fire Hall #3

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
October	1,005	10,401	$458
November	1,455	15,059	$621
December	3,456	35,769	$1,362
January	4,474	46,305	$1,740
February	2,862	29,621	$1,098
March	2,485	25,719	$959
April	949	9,822	$416
May	686	7,100	$350
June	78	807	$111
July	36	373	$94
August	0	0	$0
September	95	983	$199
TOTAL	**17,581**	**181,958**	**$7,407**

Notes

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.6.3 - Lighting Analysis Summary for the Northend Fire Hall #3

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
4' T12 Fluorescents - Convert to T8s (16x4).	64	1,305	$78	785	$47
8' T12 Fluorescents - Convert to T8s (55x2)	110	5,326	$320	2,489	$149
Convert incandescent Exit signs to LEDs	4	1,051	$63	105	$6
TOTALS		**7,682**	**$461**	**3,380**	**$203**

Annual Energy Savings (kWh)	**4,302**
Annual Cost Savings	**$258**
Percent Annual Energy Savings	**56%**

These calculations are based on the assumptions that the building is occupied for 8 hours/week.

Table B.6.4 (a) Window and Door Replacement Calculations for Northend Fire Hall #3

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace double pane windows with triple pane windows (3-44"x38")	34.83	2.000	1,592	$73	6.25	510	$23	1,083	$49
TOTALS			**1,592**	**$73**		**510**	**$23**	**1,083**	**$49**

Table B.6.4 (b) Window and Door Infiltration Calculations for Northend Fire Hall #3

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Pedestrian door to old fire hall and Public Works (don't close properly).	20	0.05	125	68	23,017,110	6,746	$308
Vehicle door to old fire hall.	13.08	0.05	125	45	15,057,026	4,413	$202
Caulk windows.	41.00	0.005	10	11	3,774,806	1,106	$51
Caulk doors (6 pd, 8 vd).	268.00	0.005	10	73	24,674,342	7,231	$330
TOTALS						**11,158**	**$308**

The crack lengths around the two pedestrian doors that don't close properly is taken as half of the perimeter

The temperature is maintained at an average of 18 ^oC (64 ^oF)

Table B.6.5 - Water Usage for Northend Fire Hall #3

Fixtures	Qty	Est. # of Uses/Hr/Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	3	1.9	2,340	1.60	3,744	0.32	749	2,995	112	$7
Toilets	3	0.8	936	13.25	12,402	3.98	3,721	8,681	NA	NA
Urinals	1	3.4	1,404	9.50	13,338	3.80	5,335	8,003		
Total					**29,484**		**9,805**	**19,679**	**112**	**$7**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	3	9	
Number of Toilet Uses/day	3	1	
Number of Toilets	3	3	
Toilet Uses/hour/fixture	0.38	0.38	0.75
Number of Urinal Uses/day	0	3	
Number of Urinals	0	1	
Urinal Uses/hour/fixture	0	3.38	3.38
Number of Sinks	3	3	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.38	1.50	1.88

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	3,744	140
Total		**140**

The high flow toilets consume 3.5 gallons per flush and the water efficient toilets consume 1.5 / 0.8 gpf
The high flow sinks consume 2.5 gallons per minute and the water efficient sinks consume 0.5 gpm
The urinals consume 2.5 gallons per flush and the water efficient urinals consume 1 gallon per flush

Table B.6.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Northend Fire Hall #3

Description	Quantity	Heating Efficiency	HDD below 70 F	Flow Rate (cfm)	Heat Loss (kWh)
Replace BDD with motorized damper	2	80%	10,400	100	9,873

Description	Current Efficiency	New Efficiency	Energy Used for Heating	Energy Savings
Replace unit heaters in Public Works with high efficiency furnace.	80%	95%	69,073	10,361

Description	Area of Ceiling (ft^2)	Area of Top Half of Walls (ft^2)	Roof R-value	Wall R-value	Heat Savings
Install ceiling fan in hose hanging tower.	144	720	30	20	1,964

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat	Heat Savings (kWh)
Setback Thermostats in Public Works to 59 F.	95.25%	10,400	8,841	69,073	9,863
Setback Thermostats in Meeting Room to 59 F.	95.25%	10,400	8,841	42,873	6,122

Table B.7.1 - Energy Breakdown for the St. Andrews Community Club

	Energy Consumption (kWh)	% of Total Energy Consumption
Lighting	37,066	5%
Hot Water	94,817	12%
Heating	355,778	46%
Cooling	27,553	4%
Motors	260,520	34%
Total	**775,735**	

Table B.7.2 (a) - Electricity Usage for St. Andrews Community Club

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
October	127	77	50,700	$641	$1,705	$2,699
November	118	68	53,640	$566	$1,774	$2,692
December	114	64	42,480	$532	$1,513	$2,356
January	117	67	38,640	$557	$1,423	$2,282
February	114	64	34,380	$532	$1,323	$2,140
March	114	64	36,840	$532	$1,381	$2,206
April	121	71	38,940	$591	$1,430	$2,351
May	17	0	3,300	$0	$198	$251
June	8	0	1,140	$0	$68	$103
July	23	0	3,420	$0	$205	$259
August	26	0	3,840	$0	$231	$288
September	138	88	17,820	$732	$931	$1,104
TOTAL		**563**	**325,140**	**$4,684**	**$12,180**	**$18,731**

Table B.7.2 (b) - Natural Gas Consumption for St. Andrews Community Club

Month	Gas (m^3)	Gas	Total
October	1,245	12,885	$549
November	4,662	48,250	$1,823
December	5,554	57,482	$2,140
January	10,619	109,903	$4,019
February	5,851	60,556	$2,199
March	7,961	82,394	$2,897
April	4,010	41,502	$1,499
May	2,351	24,332	$961
June	0	0	$0
July	767	7,938	$468
August	344	3,560	$221
September	173	1,790	$152
TOTAL	**43,537**	**450,595**	**$16,928**

Notes

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.7.3 - Lighting Analysis Summary for the St. Andrews Community Club

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (KWH)	Annual Cost
Indoor T12 fluorescents - convert 4' T12s to 4' T8s (28x4).	112	9,110	$547	3,304	$198
Indoor T8 fluorescents - no upgrade recommended (42x4).	168	8,227	$494	8,227	$494
Metal halides in rink - no upgrade recommended (32).	32	15,936	$957	15,936	$957
Outdoor Lights - repair photocell.	4	3,504	$210	1,752	$105
LED Exit signs - no upgrade recommended.	11	289	$17	289	$17
TOTALS		**37,066**	**$2,225**	**29,508**	**$1,772**

Annual Energy Savings (kWh)	**7,558**
Annual Cost Savings	**$454**
Percent Annual Energy Savings	**20%**

The Community Club is occupied from Sep-Mar for 980 hrs and from Apr-Aug for 680 hrs.

Table B.7.4 (a) Window and Door Replacement Calculations for St. Andrews Community Club

Description	Existing				New			Savings	
	Area (ft^2)	R-Value (^oF ft^2hr/BTU)	Annual Heat Loss (kWh)	Cost	R-Value (^oF ft^2hr/BTU)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace rink windows with triple pane windows (8 - 32"x34")	60.44	2.000	2,120	$97	6.25	679	$31	1,442	$66
TOTALS			**2,120**	**$97**		**679**	**$31**	**1,442**	**$66**

Table B.7.4 (b) Window and Door Infiltration Calculations for St. Andrews Community Club

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors/ windows (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Caulk pedestrian doors to outside (4).	80	0.005	10	22	7,365,475	2,159	$99
Weatherstrip pedestrian doors to rink (2).	10	0.05	125	34	8,831,027	2,588	$118
TOTALS						**4,747**	**$217**

The rink is assumed to be kept at 32 F, the indoor areas are assumed to be kept at 64 F at all times.

Table B.7.5 - Water Usage for the St. Andrews Community Club

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	7	3.2	37,350	1.60	59,760	0.32	11,952	47,808	1,792	$82
Toilets	16	0.7	18,675	13.25	247,444	3.98	74,233	173,211	NA	NA
Urinals	7	1.6	18,675	9.50	177,413	3.80	70,965	106,448	NA	NA
Showers	8	0.5	6,225	66.25	412,406	47.30	294,443	117,964	4,421	$202
Total					**897,023**		**451,593**	**445,430**	**6,212**	**$284**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	20	30	
Number of Toilet Uses/day	3	1	
Number of Toilets	16	16	
Toilet Uses/hour/fixture	0.47	0.23	0.70
Number of Urinal Uses/day	0.0	3.0	
Number of Urinals	0.0	7.0	
Urinal Uses/hour/fixture	0.00	1.61	1.61
Number of Sinks	7	7	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	1.07	2.14	3.21
Number of Showers	8	8	
Total Number of Shower Uses/day	15	15	
Shower Uses/hr/fixture	0.23	0.23	0.47

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	59,760	2,239
Showers	412,406	15,455
Zamboni	635,880	52,588
Total		**70,282**

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm

The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 / 0.8 gallons per flush

The current urinals are assumed to consume 2.5 gallons per flush and the new urinals consume 1 gpf

Table B.7.6 Energy Savings with Heating, Ventilating, and Air Conditioning for St. Andrews Community Club

Description	Quantity	Heating Efficiency	HDD below 70 F	Flow Rate (cfm)	Heat Savings (kWh)
Install countdown timer for greasehood exhaust fan.	1	80%	10,400	2000	3,554
Install CO2 sensors on RTUs.	2	80%	10,400	1000	2,370

Description	Current Efficiency	New Efficiency	Energy Used for Heating/Cooling	Energy Savings
Replace RTUs with high efficiency RTUs.	8.00	13.50	27,553	9,644
Replace 150 MBH furnace with high efficiency furnace.	80%	95%	44,097	6,615
Replace unit heater with high efficiency furnace.	75%	95%	12,970	2,594
Replace boiler with high efficiency boiler.	82%	94%	52,588	6,135

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat	Heat Savings (kWh)
Setback thermostats in lounge and concession to 15 C (59 F)	81.05%	10,400	8,841	44,097	5,358

Description	Current Energy Used by Ice Plant (kWh)	% of Operating Time Savings	Energy Savings (kWh)
Install outdoor thermostat to run exhaust fans in rink when outdoor temp is between -5 ^{o}C and -15 ^{o}C.	192,187	20%	38,437

Table B.7.7 Energy Consumption and Savings Calculations for Motors in the St. Andrews Community Club

Description	Rated HP	Required HP	# of hours	Current Motors				Energy Savings of Premium Efficiency Versus Standard Efficiency Motor		
				Eff.	Actual HP	kW	kWh	Actual HP	kW	kWh
Compressor 1	50	40	5,040	88%	45.5	33.90	170,833	1.20	0.89	4,510
Compressor 2	50	40	630	88%	45.5	33.90	21,354	1.20	0.89	564
Brine Pump	20	16	5,040	88%	18.2	13.56	68,333	0.48	0.36	1,804
TOTALS							**260,520**			**6,878**

Table B.8.1 - Energy Breakdown for the Petersfield Curling Club

	Energy Consumption (kWh)	% of Total Energy Consumption
Lighting	15,840	3.2%
Hot Water	2,456	0.5%
Heating	383,023	77.2%
Air Conditioning	59,329	12.0%
Motors	95,051	19.1%
Total	**496,370**	

Table B.8.2 (a) - Electricity Usage for Petersfield Curling Club

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
October	16	0	1,620	$0	$95	$133
November	71	21	27,300	$175	$1,157	$1,544
December	73	23	27,300	$191	$1,157	$1,563
January	74	24	24,060	$200	$1,082	$1,486
February	72	22	33,660	$183	$1,306	$1,723
March	74	24	18,720	$200	$957	$1,328
April	73	23	24,720	$191	$1,097	$1,494
May	68	18	5,100	$150	$306	$545
June	11	0	1,680	$0	$101	$140
July	24	0	2,700	$0	$162	$210
August	16	0	1,740	$0	$104	$144
September	0	0	1,620	$0	$97	$136
TOTAL		**155**	**170,220**	**$1,290**	**$7,623**	**$10,445**

Table B.8.2 (b) - Natural Gas Consumption for Petersfield Curling Club

Month	Gas (m^3)	Gas	Total
October	8	83	$157
November	1,595	16,508	$681
December	6,498	67,252	$2,492
January	6,111	63,247	$2,347
February	8,801	91,088	$3,339
March	3,377	34,951	$1,275
April	4,169	43,148	$1,555
May	0	0	$0
June	867	8,973	$485
July	0	0	$0
August	62	642	$184
September	25	259	$117
TOTAL	**31,513**	**326,150**	**$12,633**

Notes

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

Table B.8.3 - Lighting Analysis Summary for Petersfield Curling Club

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (KWH)	Annual Cost
Metal Halides in Rink - No upgrade recommended.	20	6,870	$412	6,870	$412
4' T12 Fluorescents - Convert to T8s (51x2).	102	5,723	$344	3,445	$207
Indoor incandescents - convert to compact fluorescents.	10	1,145	$69	573	$34
Incandescent exit signs - convert to LEDs.	8	2,102	$126	210	$13
TOTALS		**15,840**	**$951**	**11,098**	**$666**

Annual Energy Savings (kWh)	**4,742**
Annual Cost Savings	**$285**
Percent Annual Energy Savings	**30%**

The Curling Club is assumed to be occupied from Oct to Apr for 40 hrs/week plus 7 bonspiels per year.

Table B.8.4 (a) Window and Door Replacement Calculations for Petersfield Curling Club

Description	Existing				New			Savings	
	Area (ft^2)	R-Value (^oF ft^2hr/BTU)	Annual Heat Loss (kWh)	Cost	R-Value (^oF ft^2hr/BTU)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace main floor exterior windows with triple pane windows (1 - 33"x58").	13.29	2.000	512	$23	6.25	164	$7	348	$16
Replace second floor exterior windows with triple pane windows (5 - 20"x30").	20.83	2.000	952	$44	6.25	305	$14	648	$30
Replace rink windows with triple pane windows (24 - 50"x48")	466.67	2.000	7,510	$343	6.25	2,403	$110	5,107	$233
Replace broken window at entrance (1-33"x58").	13.29	1.000	1,023	$47	6.25	164	$7	860	$39
TOTALS			**9,998**	**$457**		**3,036**	**$139**	**6,962**	**$318**

Table B.8.4 (b) Window and Door Infiltration Calculations for Petersfield Curling Club

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors/ windows (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Weather-strip pedestrian doors (3).	15	0.05	125	51	14,537,122	4,260	$195
Caulk all windows (7).	36	0.005	10	10	3,030,367	888	$41
Caulk pedestrian doors (5).	100	0.005	10	27	7,753,132	2,272	$104
TOTALS						**7,421**	**$339**

The rink is assumed to be kept at 38 F when occupied, the indoor areas are assumed to be kept at 64 F at all times.

Table B.8.5 - Water Usage for the Petersfield Curling Club

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	10	2.2	21,547	1.60	34,475	0.32	6,895	27,580	1,034	$47
Toilets	8	1.6	12,313	13.25	163,141	3.98	48,942	114,198	NA	NA
Urinals	4	2.3	9,234	9.50	87,727	3.80	35,091	52,636	NA	NA
Total					**197,616**		**55,837**	**141,778**	**1,034**	**$47**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	25	25	
Number of Toilet Uses/day	3	1	
Number of Toilets	8	8	
Toilet Uses/hour/fixture	1.2	0.4	1.6
Number of Urinal Uses/day	0.0	3.0	
Number of Urinals	0.0	4.0	
Urinal Uses/hour/fixture	0.0	2.3	2.3
Number of Sinks	10	10	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.9375	1.25	2.1875

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	34,475	1,292
Total		**1,292**

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm

The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 / 0.8 gallons per flush

The current urinals are assumed to consume 2.5 gallons per flush and the new urinals consume 1 gallon per flush

Table B.8.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Petersfield Curling Club

Description	Quantity	Heating Efficiency	HDD below 70 F	Flow Rate (cfm)	Heat Loss (kWh)
Replace BDDs with motorized damper.	3	80%	10,400	50	14,809
Install motorized damper on greasehood intake duct and wire to greasehood fan.	1	95%	10,400	200	16,628

Description	Current Efficiency	New Efficiency	Energy Used for Heating/Cooling	Energy Savings
Replace unit heaters in rink area with high efficiency furnaces.	80%	95%	143,634	21,545
Replace furnaces on second floor with high efficiency furnaces.	80%	95%	119,695	17,954
Replace condensing units with high efficiency units.	8.0	13.0	59,329	20,765

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat	Heat Savings (kWh)
Setback Thermostats on second floor.	88.76%	10,400	8,841	119,695	15,926

Table B.8.7 Energy Consumption and Savings Calculations for Motors in the Petersfield Community Club

Description	Rated HP	Required HP	# of hours	Current Motors				Energy Savings of Premium Efficiency Versus Standard Efficiency Motor		
				Eff.	Actual HP	kW	kWh	Actual HP	kW	kWh
Compressor	30	24	3,696	88%	27.4	20.45	75,596	0.72	0.54	1,984
Brine Pump	8	6	3,696	85%	7.06	5.26	19,455	0.18	0.13	496
TOTALS							**95,051**			**2,480**

APPENDIX C

WATER EFFICIENCY

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Leaks

- A leak of one drop per second wastes 10,000 litres of water per year. A toilet that runs after a flush can waste 200,000 litres of water per year. Fixing a hot water leak will save energy as well as water.

- Check for differing water meter readings at bedtime and in the morning. If no water has been intentionally used, a difference in meter readings indicates a leak.

- If a few drops of food colouring put in your toilet tank seep into the toilet bowl (without flushing), check the flapper valve, valve seat and flapper lift chain for the source of the leak.

- Conduct a periodic "leak check" a minimum of twice a year on water using fixtures and appliances, including outside hose connections. Replace worn washers, O-rings and faulty fixtures.

On-Site Wastewater Systems

- Wise water management is necessary. All septic systems have limitations and water conservation should be practiced.

- Do not use substitutes for toilet paper. These products may not decompose in the tank and could clog the system.

- Perform regular maintenance checks on your entire system, including regular pump outs of the septic tank and inspection of the disposal field for signs of saturation or leakage.

For More Information, Please Contact:

Water Efficiency Coordinator
Pollution Prevention
Manitoba Conservation
123 Main Street, Suite 160
Winnipeg MB R3C 1A5

Phone: (204) 945-8980 or
1-800-282-8069 ext. 8980
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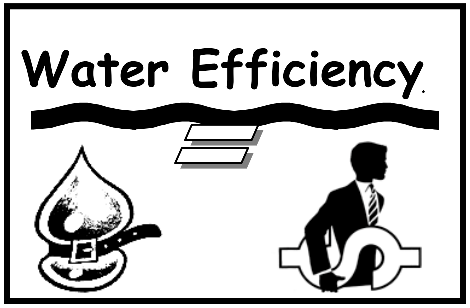
E-mail: lliebgott@gov.mb.ca

Publication Number: 98-06E

Pollution Prevention
Manitoba Conservation



Water Use

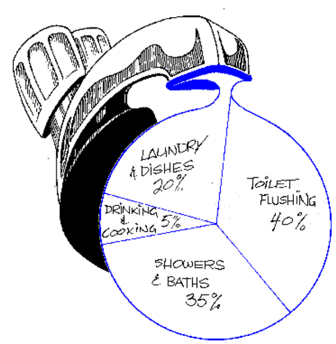
How you can reduce yours!

- Save money.

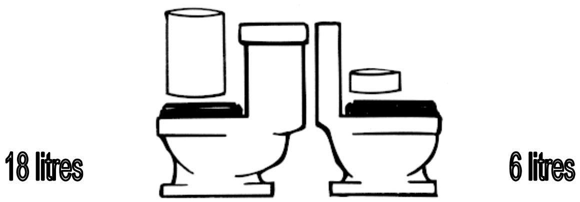
- Delay the need to expand our water and wastewater treatment plants.

- Prolong the life of in-ground sewage disposal systems, i.e., septic fields.

- Protect our water sources.



Bathroom



- Replace toilets that flush 13 to 26 litres of water with 6 litre or dual flush toilets, cutting water used by toilets by half or more. See www.cwwa.ca for toilet performance ratings. In the mean time, reduce water per flush in toilets by up to 35% by installing early closure devices (don't use bricks – as they break down, pieces interfere with the flapper seal).

- Refrain from using the toilet to dispose of trash.

- A partially filled tub uses less water than a long shower; a short shower uses less than a full tub.

- Replace your 20 litre per minute showerhead with a low-flow 9.5 litre per minute showerhead. You'll use less than half the water.

- Make it a habit to be finished your shower in less than 5 minutes.

- Install a water conserving 3.5 litre per minute aerator on your bathroom tap.

- When shaving, rinse the razor in a cup or a partially filled sink instead of letting the tap run.

- Brush teeth using a glass of water to rinse.

Kitchen & Laundry

- Install a water saving 9 litre per minute aerator on the kitchen tap.

- Rinse dishes in a stoppered sink or basin, not with running water.

- Wash vegetables in a basin or stoppered sink, then quickly rinse using running water.

- Keep drinking water in the fridge. Wash the container and change the water every few days.

- Thaw food in the fridge rather than under a running tap. This conserves both energy and water.

- Compost organic wastes instead of using a sink garbage disposal.

- Buy a low water use dishwasher to save on energy, water and detergent costs.

- Wash only full loads of laundry and dishes.

- Front loading washing machines use less water than top-loading washers do. If unavailable, choose a clothes washer with a suds saver, and water saving cycle.

General Water Use

- Only use water treatment or softening systems, if required. If possible, only use softened water for bathing and cleaning – use unsoftened water for cooking, drinking and watering plants.

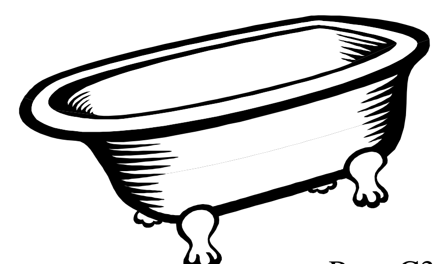
- Ensure a water softener regenerates only when the resin is exhausted.

- Turn the system off if you will be away for more than a few days.

- Insulate hot water tank and pipes to reduce the need to run water until it is hot. Install a heat trap on the pipe above your water heater to save energy and water.

- Know location of sink, toilet and main shut off valves in case a pipe or water heater blows, or so you can turn off your water when you are away.

- If your water pipes tend to freeze, do not let the tap run continuously. This wastes water, and overloads sewer systems. Instead, install heat tape or connect a pump-back reservoir system (discuss options with your plumber, electrician or call Manitoba Conservation).



APPENDIX D

INCENTIVE PROGRAMS

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Table D.1 Manitoba Hydro Power Smart Incentives

Item	Incentives	Contacts
Compact Fluorescents	$5 - Non-reflectorized screw in lamp, $10 - Reflectorized screw-in lamp, $45 - New hard wired fixture	Kelly Epp at kepp@hydro.mb.ca or 204-474-3615
T8 Electronic Fluorescents	T8 Premium Ballast - $20, T8 Standard Ballast - $15, T8 Dimmable Ballast - $60, 8 Foot T8 Ballast - $35	Kelly Epp at kepp@hydro.mb.ca or 204-474-3615
LED Exit Signs	$45 per new sign	Kelly Epp at kepp@hydro.mb.ca or 204-474-3615
High Pressure Sodium Lighting	The lesser of $500 per kilowatt saved or $100 of lighting fixture cost	Kelly Epp at kepp@hydro.mb.ca or 204-474-3615
Parking Lot Controllers	$25 for each controlled circuit	May Arason-Li at marasonli@hydro.mb.ca or 204-474-7813
Air Barrier System	$0.46 per square foot or $5 per square meter of net wall area	May Arason-Li at marasonli@hydro.mb.ca or 204-474-7813
Windows	Depends on replacement window's U-Value and net window area	May Arason-Li at marasonli@hydro.mb.ca or 204-474-7813
Geothermal Heat Pump	Manitoba Hydro will pay up to half the cost of a feasabillity study to help decide whether a geothermal heat pump is the right choice for you building. Manitoba Hydro also offers a custom incentive towards the capital cost of your heat pump system, based on the energy savings calculated in the feasability study.	Domenic Marinelli at dmarinelli@hydro.mb.ca or 204-474-4273
High Efficiency Furnaces	$245 for each furnace installed.	Jamie Hopkins at jhopkins@hydro.mb.ca or 204-474-4018
Condensing Boilers	Boilers < 300MBH, Manitoba Hydro will pay $500 + $5/MBH input. Boilers > 300MBH, Manitoba Hydro will pay $2000 + $8/MBH input (retrofits) and $2000 + $5/MBH input (new construction).	Jamie Hopkins at jhopkins@hydro.mb.ca or 204-474-4018
Air Conditioners	Depends on the EER, the cooling capacity, and the incentive factor.	Jamie Hopkins at jhopkins@hydro.mb.ca or 204-474-4018

Notes
For general information and information kits contact:
Power Smart for Business
Phone: 474-3676
Email Address: powersmartforbusiness@hydro.mb.ca

Table D.2. Other Incentive Programs

Program Name	Eligibility	What Type of Projects are Available	Ref. Page	Available Funding	Funding Maximums	Deadline For Applications	Prospect of Funding	Project Sponsor	Contact	Email	Website
EnerGuide for Existing Buildings (EEB)	Comm. & Institutional Bldgs. Aboriginal, northern, rural or remote communities may receive special consideration.	Projects that reduce energy consumption. Includes costs for project planning and development, materials and labour, monitoring and tracking and staffing training and awareness.	13	$7.50/GJ (277.8 kW H)	up to 25% of costs based on energy savings ($250,000 max)	On-going	Good	NRCan	MarieLynn Tremblay	Marie_Lyne.Tremblay@nrcan-rncan.gc.ca	http://oee.nrcan.gc.ca/commercial/existing.cfm?attr=20
Municipal Rural Infrastructure Fund (MRIF)	All MB local governments	Projects that construct, restore or improve infrastructure that ensures sustainable use and management of water and wastewater resources. Projects that construct, restore or improve public arts and heritage infrastructure, such as museums, heritage sites, sites for performings arts, and cultural or community centres. - See detailed program info for more info. Program has many requirements and caveats.	23, 46, 54		2/3 of the approved costs	On-going	Good	Canada-Manitoba Infrastructure Programs		infra@gov.mb.ca	http://www.infrastructure.mb.ca/e/index.html
Renewable Energy Development Initiative (REDI)	…Municipalities…, solar air/water heating, biomass	Projects involving solar air or water heating and clean burning biomass combustion projects.	25	25% of purchase and install of qualifying system	$80,000	31-Mar-07		NRCan		redi.penser@nrcan.gc.ca	http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=455
Community Places Program	Non-profit community organizations in MB, except public schools, universities, hospitals, nursing homes, monnercial coops, federal, provincial and city of Winnipeg departments.	Projects involving the upgrading, construction or acquisition of community facilities available to the general community. Priority given to proposals for critical repairs to extend the life of existing well-used facilities. Projects must provide lasting, long-term benefits to the community.		Up to 50% of first $15,000 and 1/3 of the rest of project	$50,000			Manitoba Culture, Heritage and Tourism	Varies by region	www.gov.mb.ca/chc/grants	http://www.gov.mb.ca/chc/grants
Sustainable Development Innovations Fund (SDIF)	Municipal corporations, local governments, private and non-profit organizations and businesses	Sustainable community development, Eco-efficiency initiatives, environmental stewardship. Emphasis on youth involvement, first nations and northern communities.	55		$50,000 (usually $25,000 or less)		fair	Manitoba Conservation		sdif@gov.mb.ca	http://www.gov.mb.ca/conservation/pollutionprevention/sdif/index.html

APPENDIX E

TRANSPORTATION AND EQUIPMENT EFFICIENCY

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Transportation and Equipment Efficiency for Small Municipalities (< 10,000 population).

Municipal governments may wish to:

- Assess Regulatory, Standards & Industry “Best Practices” to ensure compliance and demonstrated “Due Diligence”. Includes Provincial, Federal, Society of Automotive Engineers (SAE), Canadian Standards Association (CSA), American National Standards Institute (ANSI), Workplace Safety & Health audits, Safety inspections, Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods regulation (TDG), etc.

- Review current fuelling habits & education on “economical operation” (Driver training, minimal idling, proper lubricants for seasonal operation etc.)

- Review “Alternative Fuel” options, e.g., Diesel and Biodiesel, Propane, Compressed Natural Gas (CNG). Note: Electric Vehicles are not an option yet due to initial cost and the prevailing ambient temperatures experienced in Manitoba

- Consider recycling initiatives for disposal of Fleet Waste Stream products, eg. tires, lubricating oil, anti-freeze, aerosol cans, paints, controlled products, ferrous & non-ferrous scrap metal, plastics etc.

Other Opportunities:

Transportation Demand Management

- Education & awareness programs on ride-sharing, telecommuting & teleconferencing

Encouragement of Alternative Modes of Transportation

- Possibility of van based transit or “pool” operations for commuting within towns & outlying areas. May be viable for transporting groups of employees to & from work locations

- Provision of bike racks, lockable bike containers or small fenced compounds at key locations

- Education & awareness programs on vehicle emissions, “fuel saving” driving habits etc.

Traffic & Parking Management

- Possibility of synchronizing traffic lights (if installed) and implementing parking fees etc. to manage parking

CHOOSING A VEHICLE

Vehicle Construction

The following points are important when considering fuel efficiency.

- A five speed manual transmission is about 5% more efficient than an automatic.
- Smaller engines use less fuel.
- Front wheel drive vehicles are lighter and therefore more fuel efficient than rear wheel drive vehicles
- SUV's tend to have low fuel efficiency
- Front wheel drive vehicles provide better traction than rear wheel drive in most cases.
- Small engines with a turbocharger can help make up the power difference between large and small engines by using energy from hot exhaust.

Vehicle Ratings

The Office of Energy Efficiency of Natural Resources Canada, issues a list of the most fuel efficient vehicles in each of a number of categories. See their website for the latest list.

Extra Features

Air conditioning, power steering, and roof racks are some of the big energy using extras. Air conditioning can increase your fuel consumption by 10 to 20 percent in city driving. A fully loaded roof rack can add 25% to your fuel costs. Even empty, it will add about 1% due to wind resistance

DRIVING ECONOMICALLY

Driving technique is critical to fuel economy.

- Maintain recommended tire pressure to maximize fuel efficiency and tire life.
- Keep your engine well tuned and maintained.
- One minute of idling uses more fuel than restarting the engine.
- Avoid jack-rabbit starts.
- An open sun roof and open windows increase air resistance, especially on the highway. Use the car's ventilation system instead.
- Most cars use 10% less fuel when driven at 55 miles per hour as opposed to 62, or 90 kilometers as opposed to 100.
- Adjust your speed in advance of changes in traffic flow. Take your foot off the accelerator and progressively gear down rather than accelerating up to a stop sign and breaking hard.

ENGINE BLOCK HEATERS - IS THERE A SAVINGS?

- In sub-freezing temperatures, the first 15 to 20 minutes of driving, after a cold start cause the engine to use about 30% more fuel than a warm engine.
- A timer can be installed for your vehicle's block heater to start warming the engine a couple hours before you head out.
-

- With the cost of electricity accounted for, you should still come out ahead, over the course of a winter.

FUEL OPTIONS

- Diesel engines are more fuel efficient than gasoline engines, as Diesel contains 10% more energy per unit volume than gasoline. Higher diesel engine costs are offset by increased fuel economy and engine life.
- Many fleet operators are converting their vehicles to biodiesel for cost advantages and a cleaner burn.
- There are many advantages to a dual-fuel system, which allows you to switch between gasoline and propane or natural gas with the flick of a switch.
- Hybrid vehicles…

From the Office of Energy Efficiency, Natural Resources Canada:

Buying a Fuel-Efficient Vehicle

- Fuel consumption can vary widely from one vehicle to the next. Whether you're buying new or used, the choices you make today will either save you money (through reduced fuel consumption) or cost you money for years to come.

- How big is big enough? It's always a good idea to avoid buying more vehicle than you need. Larger vehicles tend to be heavier and have bigger and more powerful engines, so consider buying the most fuel-efficient vehicle that meets your everyday needs.

- If you're buying a new vehicle, check the EnerGuide label for its fuel consumption rating. EnerGuide labels are now affixed to all new light-duty vehicles sold in Canada.

- Fuel consumption ratings for all new cars, light-duty trucks and vans sold in Canada are also available in the free Fuel Consumption Guide. You can download a PDF version of the Guide, or call 1 800 387-2000 to order your free copy. Past editions are available, so you can also check fuel consumption ratings for used vehicles.

- Have a look at the list of the most recent winners of the EnerGuide Awards, presented each model year to the manufacturers of the most fuel-efficient vehicles in different classes – two-seater, subcompact, compact, mid-sized and large cars, as well as station wagons, vans, pickup trucks and special purpose vehicles.

- Your choice of transmission will directly affect the cost of the vehicle and its fuel consumption. As a general rule, a manual transmission is more fuel efficient than an automatic, assuming you shift properly. If you buy an automatic, the more gears, the better.

- Four-wheel drive and all-wheel drive offer superior traction and braking under slippery conditions, but the weight and friction of additional drivetrain parts can increase fuel consumption by 5 to 10 percent compared with two-wheel drive vehicles. How often would you need to use this option, and is it worth the extra fuel cost for as long as you own the vehicle?

- Under normal driving conditions, smaller engines deliver better fuel economy than larger engines. Choose the smallest engine that meets your everyday needs.

- Are you willing to pay a fuel penalty for as long as you own your vehicle just to have the convenience of options such as power windows, seats and mirrors? Many options increase fuel consumption by adding weight, increasing aerodynamic drag, or drawing extra power from the engine.

- Do you really need an air conditioner? Operating an air conditioner in hot weather can increase fuel consumption by more than 20 percent in city driving. Consider using the car's ventilation system and options such as a sunroof and tinted glass.

- For most drivers, cruise control saves fuel on the highway by keeping your speed constant and avoiding inadvertent speeding.

- Explore your fuel options. Will a fuel-efficient diesel vehicle meet your needs? What about propane or natural gas, which produce fewer greenhouse gas emissions and are cheaper to use than gasoline or diesel fuel? Ethanol fuel blends are also widely used by Canadian motorists. And hybrid vehicles, which use a combination of high-power batteries and an internal combustion engine, are beginning to appear on the North American market.

Please note – this list of websites is not comprehensive. They have not been reviewed for accuracy, but may provide ideas and options appropriate for some municipalities.

Other vehicle and equipment information can be found on the Internet at:
http://oee.nrcan.gc.ca/publications/infosource/home/index.cfm?act=category&PrintView=N&Text=N

http://www.betterroads.com/articles/NewProds/oct05bid.htm

http://www.edmunds.com/advice/specialreports/articles/102946/article.html

http://www.betterroads.com/articles/NewProds/oct05bid.htm

http://snow.grounds-mag.com/ar/grounds_maintenance_september_2/

http://www.missoulian.com/articles/2003/11/15/news/local/news03.txt

http://rocktoroad.com/grader.html

http://news.thomasnet.com/fullstory/29180/3281

http://www.forester.net/gx_0501_graders.html

http://www.epa.gov/greenkit/quick_start.htm#greenfleet

Self Audit

Municipal Operations -Efficiency Survey

(Transportation, Road Repair, Snow Clearance, Waste Disposal, etc.)

Name of Organisation: ____________________________
Address: ____________________________
____
____
Contact Name: ____________________________
Phone No. ______________
Name of person completing form: ______________________________
Date: ______________________

Vehicles and Construction Equipment						
	Gasoline	**Diesel**	**CNG**	**Propane**	**Other**	**Total**
Total Fuel Usage L/Year						
Greenhouse Gas Emissions (tonnes)						

Fuel Use Minimization Considerations

 What type of vehicles/equipment, if any, are you planning to replace in the next few years?___________________________________
____
____

 Can you downsize these vehicles/equipment?
Comments:____
____
____

 Can you make process or other changes to minimize use of, or eliminate these vehicles/equipment? Comments:_________________
____
____

 Do you have a policy in place to make fuel efficiency one of the vehicle/equipment purchase requirements? Yes ___ No ___

 Have you made operational changes such as reducing idling time of vehicles and equipment, and using block heaters and timers to reduce warm up time?
Yes ___ No ___

 Have you encouraged more energy efficient driving behaviour through training, policies, and ongoing reminders? Yes ___ No ___

 Do you have procedures in place to detect and rectify leakage of above-ground and under-ground fuel storage tanks? Yes __ No ___

 Do you use automatic shut-off fill nozzles at pumps? Yes ___ No ___

Comments

APPENDIX F

**ENERGY CONSUMPTION MONITORING
SPREADSHEETS AND GRAPHS**

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Table F.1 - Energy Consumption Monitoring Data for the Heritage Centre (Old Fire Hall)

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	70	0	70	340.7	70			0		#DIV/0!			0		#DIV/0!
November	2,100	0	2,100	525.4	2,100			0		#DIV/0!			0		#DIV/0!
December	5,180	0	5,180	970.3	5,180			0		#DIV/0!			0		#DIV/0!
January	5,120	0	5,120	1116	5,120			0		#DIV/0!			0		#DIV/0!
February	6,060	0	6,060	816.7	6,060			0		#DIV/0!			0		#DIV/0!
March	3,450	0	3,450	735.1	3,450			0		#DIV/0!			0		#DIV/0!
April	5,040	0	5,040	293.2	5,040			0		#DIV/0!			0		#DIV/0!
May	1,630	0	1,630	214.9	1,630			0		#DIV/0!			0		#DIV/0!
June	1,160	0	1,160	41.3	1,160			0		#DIV/0!			0		#DIV/0!
July	200	0	200	12	200			0		#DIV/0!			0		#DIV/0!
August	1,270	0	1,270	20.5	1,270			0		#DIV/0!			0		#DIV/0!
September	240	0	240	89.5	240			0		#DIV/0!			0		#DIV/0!
TOTAL	31,520	0	31,520	5175	31,520	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F18) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.1 - Energy Consumption Monitoring Graph for the Heritage Centre (Old Fire Hall)

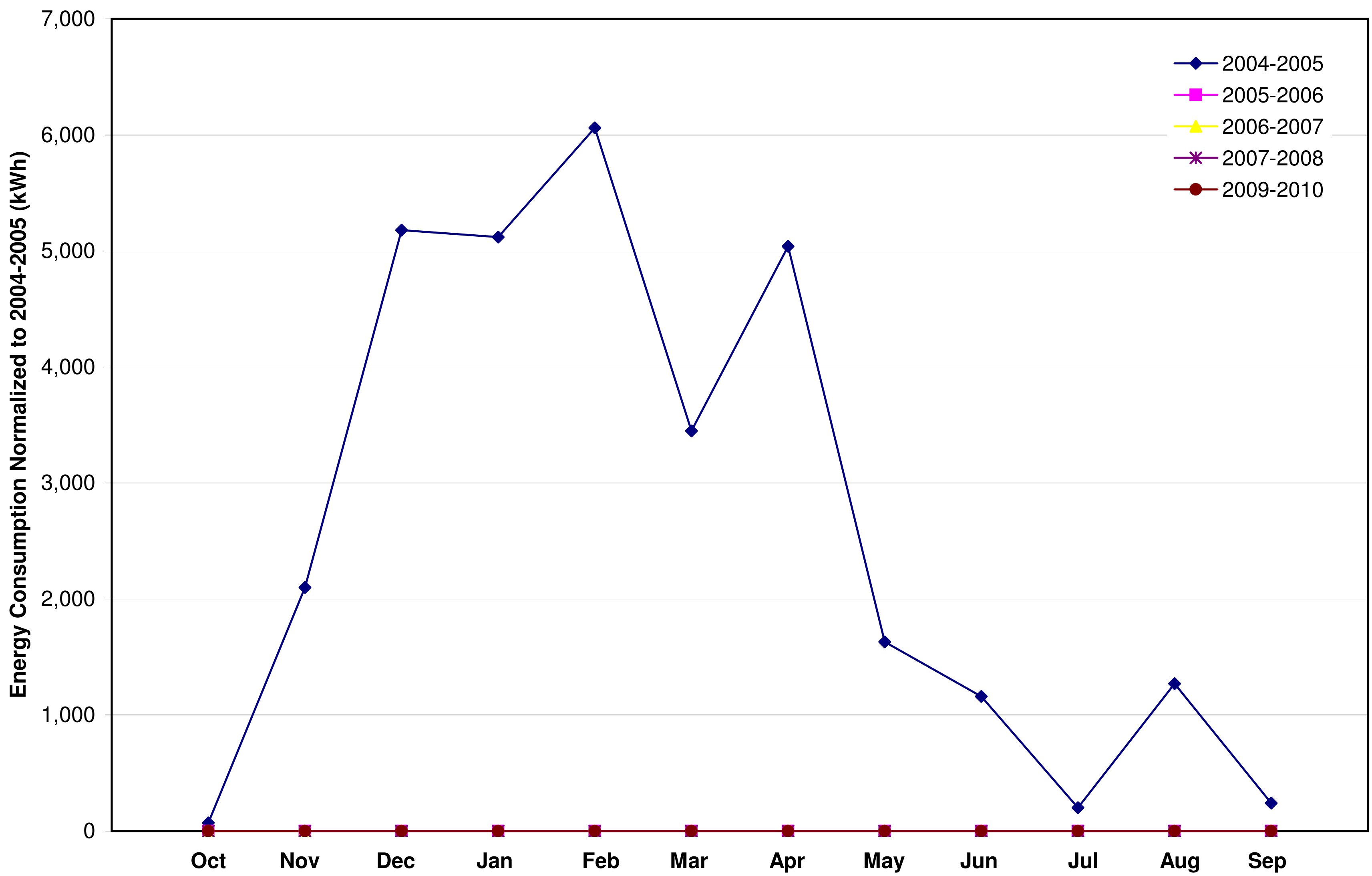


Table F.2 - Energy Consumption Monitoring Data for the Fire Hall #1

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	606	193	2,604	340.7	2,604			0		#DIV/0!			0		#DIV/0!
November	930	196	2,959	525.4	2,959			0		#DIV/0!			0		#DIV/0!
December	1,126	873	10,162	970.3	10,162			0		#DIV/0!			0		#DIV/0!
January	1,550	2,300	25,355	1116	25,355			0		#DIV/0!			0		#DIV/0!
February	1,459	1,567	17,677	816.7	17,677			0		#DIV/0!			0		#DIV/0!
March	1,395	1,850	20,542	735.1	20,542			0		#DIV/0!			0		#DIV/0!
April	1,327	1,237	14,130	293.2	14,130			0		#DIV/0!			0		#DIV/0!
May	1,049	576	7,010	214.9	7,010			0		#DIV/0!			0		#DIV/0!
June	689	232	3,090	41.3	3,090			0		#DIV/0!			0		#DIV/0!
July	702	36	1,075	12	1,075			0		#DIV/0!			0		#DIV/0!
August	638	76	1,425	20.5	1,425			0		#DIV/0!			0		#DIV/0!
September	584	11	698	89.5	698			0		#DIV/0!			0		#DIV/0!
TOTAL	12,057	9,147	106,725	5175	106,725	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

* The billed electrical energy consumption is 7.6% of the combined electricity bill for this building, the Municipal Admin Building, and the Municipal Repair Shop.

Notes

Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F18) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.2 - Energy Consumption Monitoring Graph for the Fire Hall #1

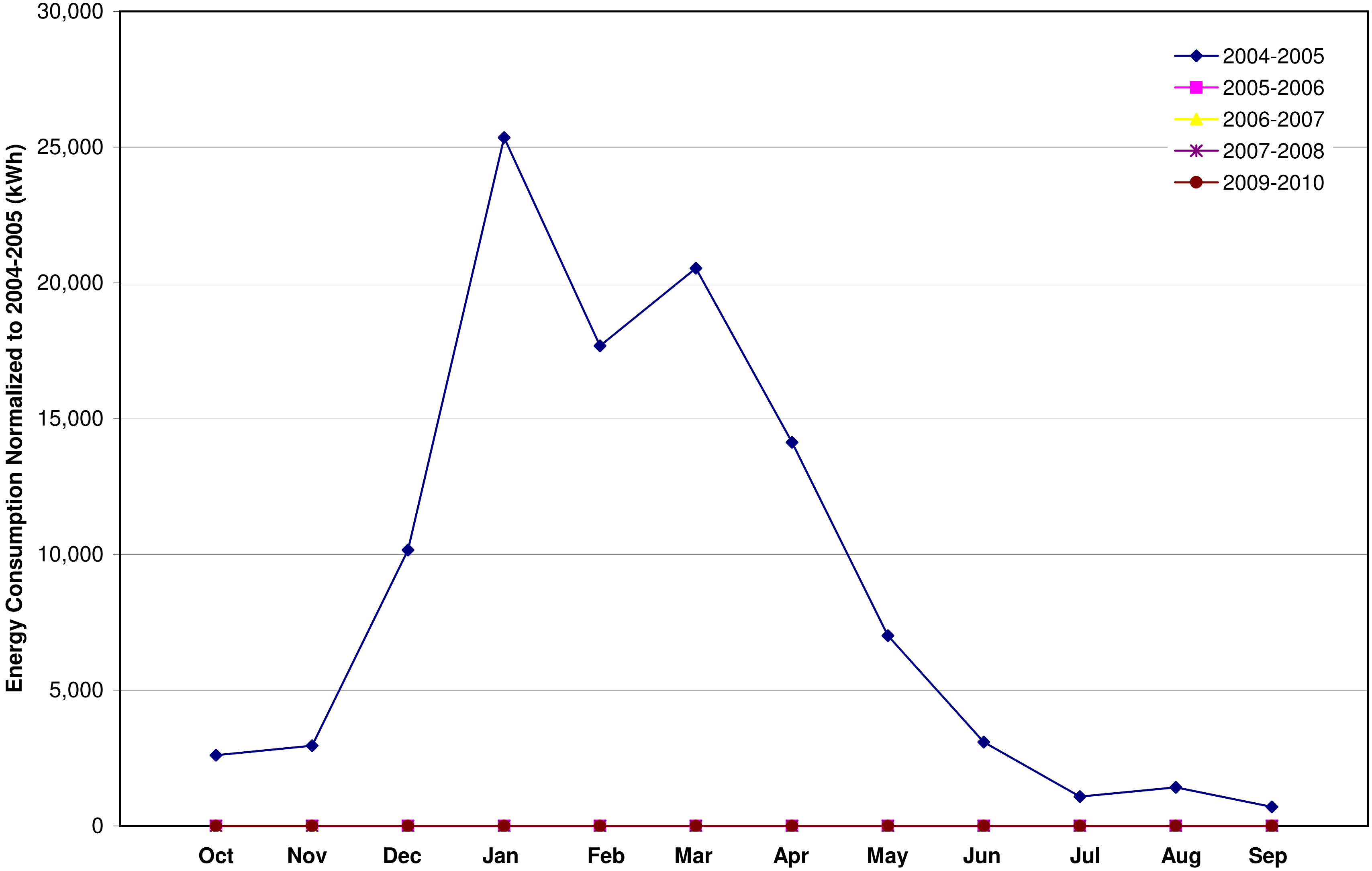


Table F.3 - Energy Consumption Monitoring Data for the Municipal Administration Building

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	6,224	204	8,336	340.7	8,336			0		#DIV/0!			0		#DIV/0!
November	9,547	588	15,633	525.4	15,633			0		#DIV/0!			0		#DIV/0!
December	11,560	834	20,191	970.3	20,191			0		#DIV/0!			0		#DIV/0!
January	15,912	0	15,912	1116	15,912			0		#DIV/0!			0		#DIV/0!
February	14,976	1,416	29,631	816.7	29,631			0		#DIV/0!			0		#DIV/0!
March	14,321	912	23,760	735.1	23,760			0		#DIV/0!			0		#DIV/0!
April	13,619	1,066	24,652	293.2	24,652			0		#DIV/0!			0		#DIV/0!
May	10,764	322	14,097	214.9	14,097			0		#DIV/0!			0		#DIV/0!
June	7,067	257	9,727	41.3	9,727			0		#DIV/0!			0		#DIV/0!
July	7,207	140	8,656	12	8,656			0		#DIV/0!			0		#DIV/0!
August	6,552	20	6,759	20.5	6,759			0		#DIV/0!			0		#DIV/0!
September	5,990	11	6,104	89.5	6,104			0		#DIV/0!			0		#DIV/0!
TOTAL	123,739	5,770	183,457	5175	183,457	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

* The billed electrical energy consumption is 78% of the combined electricity bill for this building, the Fire Hall #1, and the Municipal Repair Shop.

Notes

Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F18) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.3 - Energy Consumption Monitoring Graph for the Municipal Administration Building

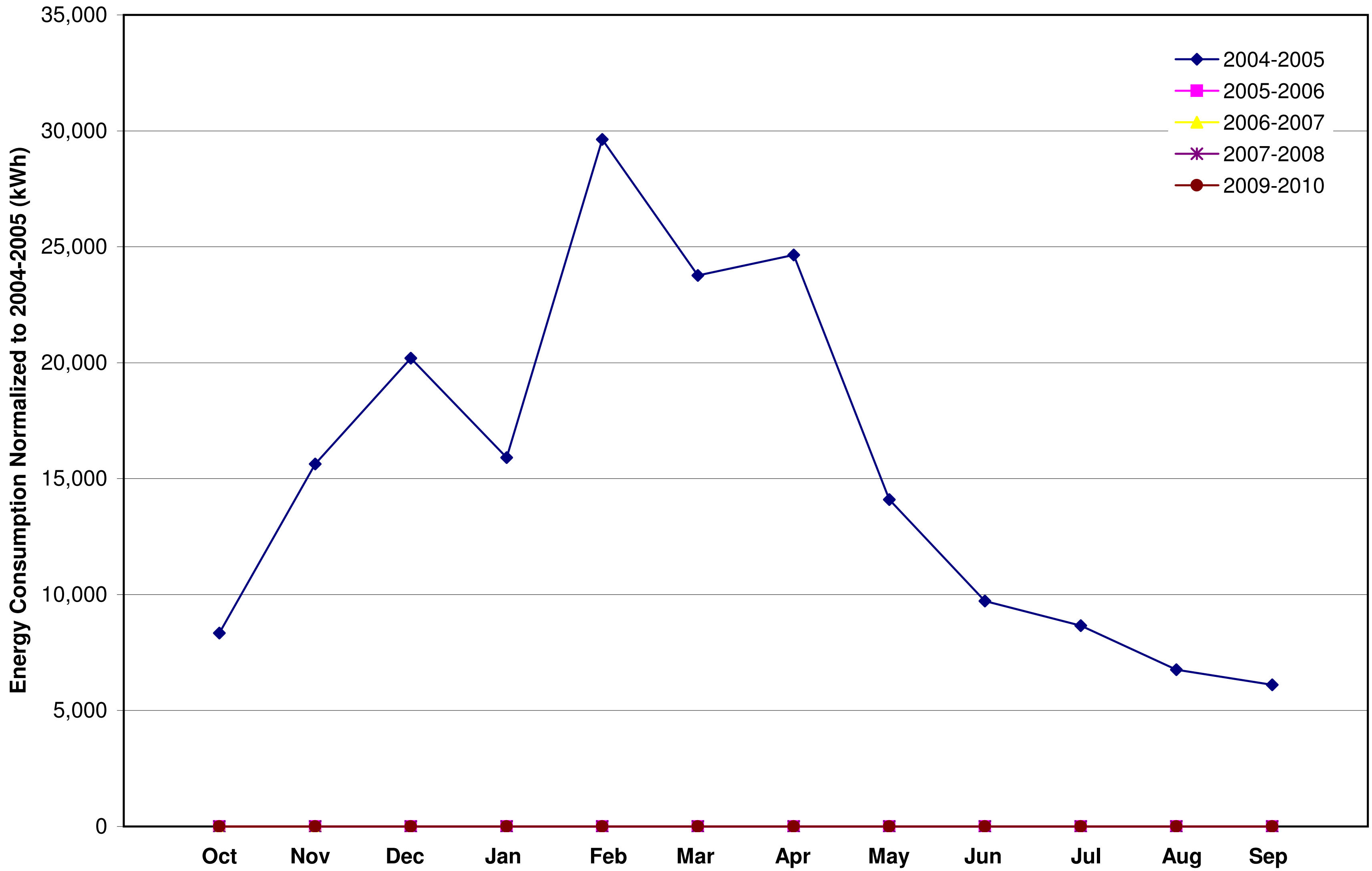


Table F.4 - Energy Consumption Monitoring Data for the Municipal Repair Shop

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	1,149	0	1,149	340.7	1,149			0		#DIV/0!			0		#DIV/0!
November	1,763	246	4,309	525.4	4,309			0		#DIV/0!			0		#DIV/0!
December	2,134	1,531	17,979	970.3	17,979			0		#DIV/0!			0		#DIV/0!
January	2,938	3,285	36,936	1116	36,936			0		#DIV/0!			0		#DIV/0!
February	2,765	2,725	30,968	816.7	30,968			0		#DIV/0!			0		#DIV/0!
March	2,644	2,653	30,102	735.1	30,102			0		#DIV/0!			0		#DIV/0!
April	2,514	2,073	23,969	293.2	23,969			0		#DIV/0!			0		#DIV/0!
May	1,987	162	3,664	214.9	3,664			0		#DIV/0!			0		#DIV/0!
June	1,305	288	4,285	41.3	4,285			0		#DIV/0!			0		#DIV/0!
July	1,331	207	3,473	12	3,473			0		#DIV/0!			0		#DIV/0!
August	1,210	115	2,400	20.5	2,400			0		#DIV/0!			0		#DIV/0!
September	1,106	129	2,441	89.5	2,441			0		#DIV/0!			0		#DIV/0!
TOTAL	22,844	13,414	161,675	5175	161,675	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy* (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

* The billed electrical energy consumption is 14.4% of the combined electricity bill for this building, the Fire Hall #1, and the Municipal Administration Building.

Notes

Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F18) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.4 - Energy Consumption Monitoring Graph for the Municipal Repair Shop

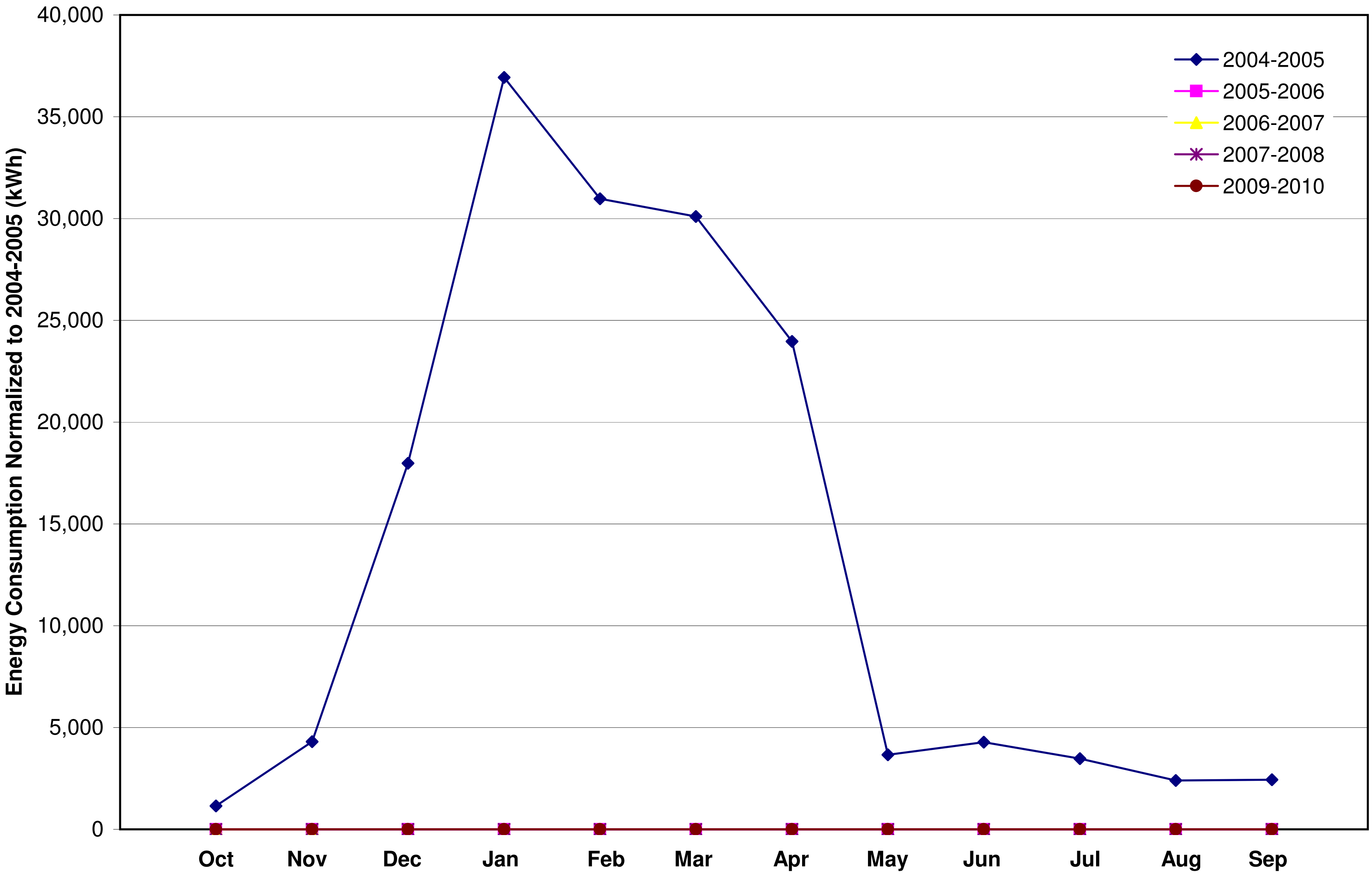


Table F.5 - Energy Consumption Monitoring Data for the Fire Hall #2

	2004-2005					2005-2006					2006-2007				
Month	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
October	4,080	84	4,949	340.7	4,949			0		#DIV/0!			0		#DIV/0!
November	3,420	1,790	21,946	525.4	21,946			0		#DIV/0!			0		#DIV/0!
December	4,080	2,488	29,830	970.3	29,830			0		#DIV/0!			0		#DIV/0!
January	4,440	5,798	64,448	1116	64,448			0		#DIV/0!			0		#DIV/0!
February	4,800	4,046	46,675	816.7	46,675			0		#DIV/0!			0		#DIV/0!
March	3,300	3,624	40,807	735.1	40,807			0		#DIV/0!			0		#DIV/0!
April	4,860	2,636	32,142	293.2	32,142			0		#DIV/0!			0		#DIV/0!
May	3,420	1,298	16,854	214.9	16,854			0		#DIV/0!			0		#DIV/0!
June	7,080	582	13,104	41.3	13,104			0		#DIV/0!			0		#DIV/0!
July	3,120	417	7,436	12	7,436			0		#DIV/0!			0		#DIV/0!
August	6,660	453	11,348	20.5	11,348			0		#DIV/0!			0		#DIV/0!
September	3,240	196	5,269	89.5	5,269			0		#DIV/0!			0		#DIV/0!
TOTAL	52,500	23,412	294,807	5175	294,807	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F18) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.5 - Energy Consumption Monitoring Graph for the Fire Hall #2

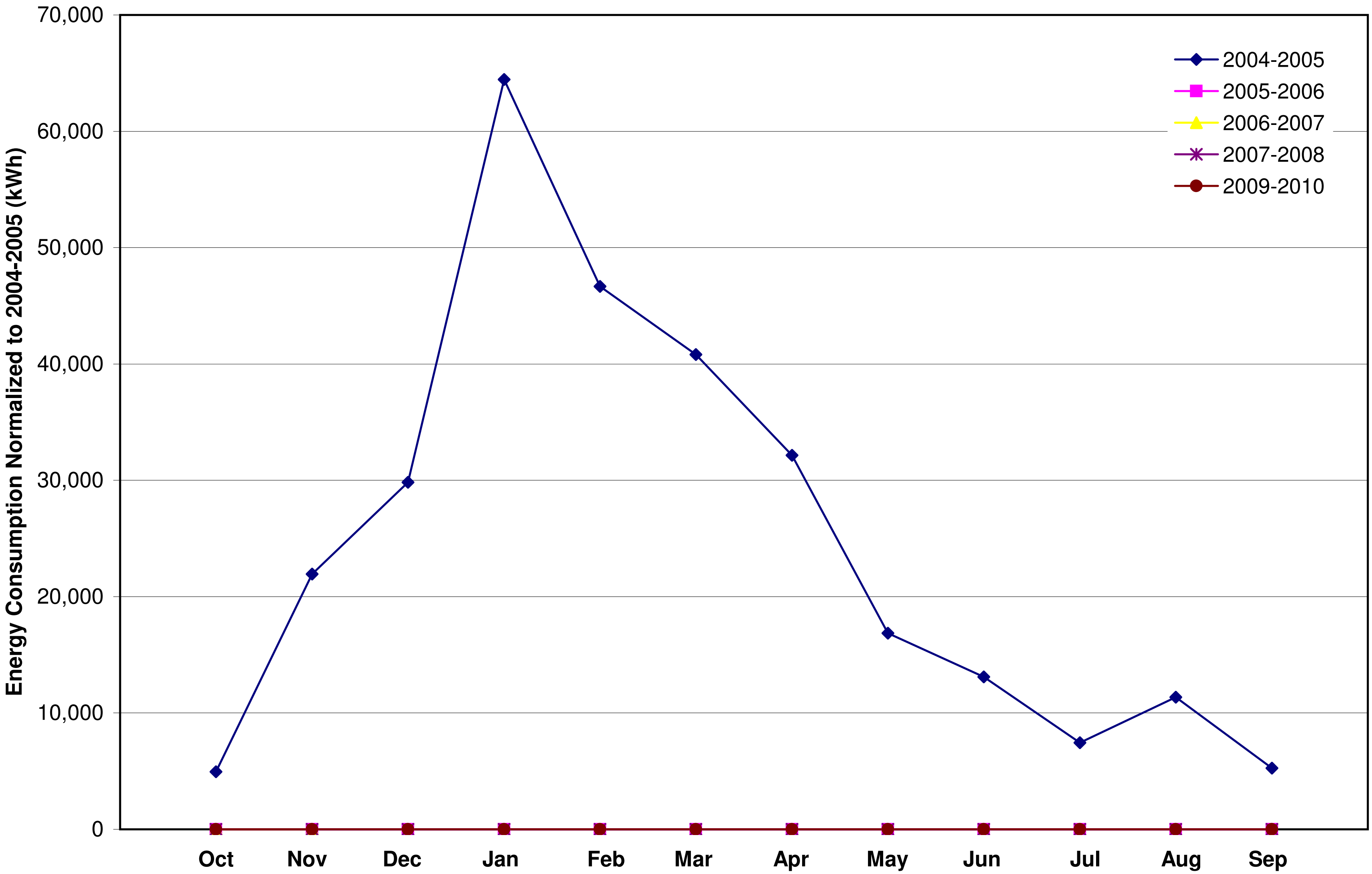


Table F.6 - Energy Consumption Monitoring Data for the Northend Fire Hall #3

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	3,720	1,005	14,121	340.7	14,121			0		#DIV/0!			0		#DIV/0!
November	3,440	1,455	18,499	525.4	18,499			0		#DIV/0!			0		#DIV/0!
December	8,440	3,456	44,209	970.3	44,209			0		#DIV/0!			0		#DIV/0!
January	11,840	4,474	58,145	1116	58,145			0		#DIV/0!			0		#DIV/0!
February	6,800	2,862	36,421	816.7	36,421			0		#DIV/0!			0		#DIV/0!
March	10,040	2,485	35,759	735.1	35,759			0		#DIV/0!			0		#DIV/0!
April	3,720	949	13,542	293.2	13,542			0		#DIV/0!			0		#DIV/0!
May	3,440	686	10,540	214.9	10,540			0		#DIV/0!			0		#DIV/0!
June	1,800	78	2,607	41.3	2,607			0		#DIV/0!			0		#DIV/0!
July	1,640	36	2,013	12	2,013			0		#DIV/0!			0		#DIV/0!
August	2,000	0	2,000	20.5	2,000			0		#DIV/0!			0		#DIV/0!
September	1,440	95	2,423	89.5	2,423			0		#DIV/0!			0		#DIV/0!
TOTAL	58,320	17,581	240,278	5175	240,278	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F18) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.6 - Energy Consumption Monitoring Graph for the Northend Fire Hall #3

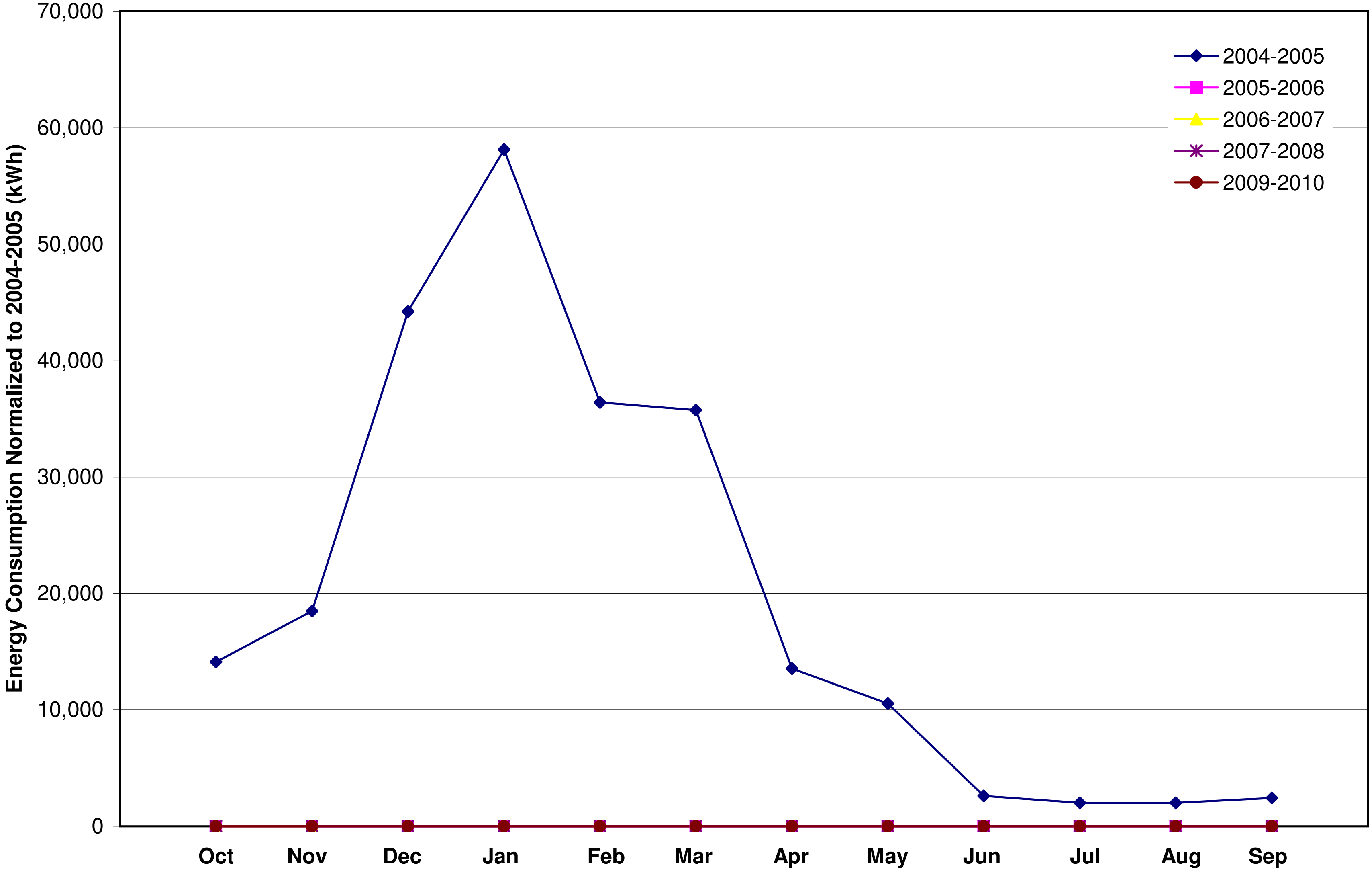


Table F.7 - Energy Consumption Monitoring Data for the St. Andrews Community Club

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	50,700	1,245	63,585	340.7	63,585			0		#DIV/0!			0		#DIV/0!
November	53,640	4,662	101,890	525.4	101,890			0		#DIV/0!			0		#DIV/0!
December	42,480	5,554	99,962	970.3	99,962			0		#DIV/0!			0		#DIV/0!
January	38,640	10,619	148,543	1116	148,543			0		#DIV/0!			0		#DIV/0!
February	34,380	5,851	94,936	816.7	94,936			0		#DIV/0!			0		#DIV/0!
March	36,840	7,961	119,234	735.1	119,234			0		#DIV/0!			0		#DIV/0!
April	38,940	4,010	80,442	293.2	80,442			0		#DIV/0!			0		#DIV/0!
May	3,300	2,351	27,632	214.9	27,632			0		#DIV/0!			0		#DIV/0!
June	1,140	0	1,140	41.3	1,140			0		#DIV/0!			0		#DIV/0!
July	3,420	767	11,358	12	11,358			0		#DIV/0!			0		#DIV/0!
August	3,840	344	7,400	20.5	7,400			0		#DIV/0!			0		#DIV/0!
September	17,820	173	19,610	89.5	19,610			0		#DIV/0!			0		#DIV/0!
TOTAL	325,140	43,537	775,735	5175	775,735	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F18) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.7 - Energy Consumption Monitoring Graph for the St. Andrews Community Club

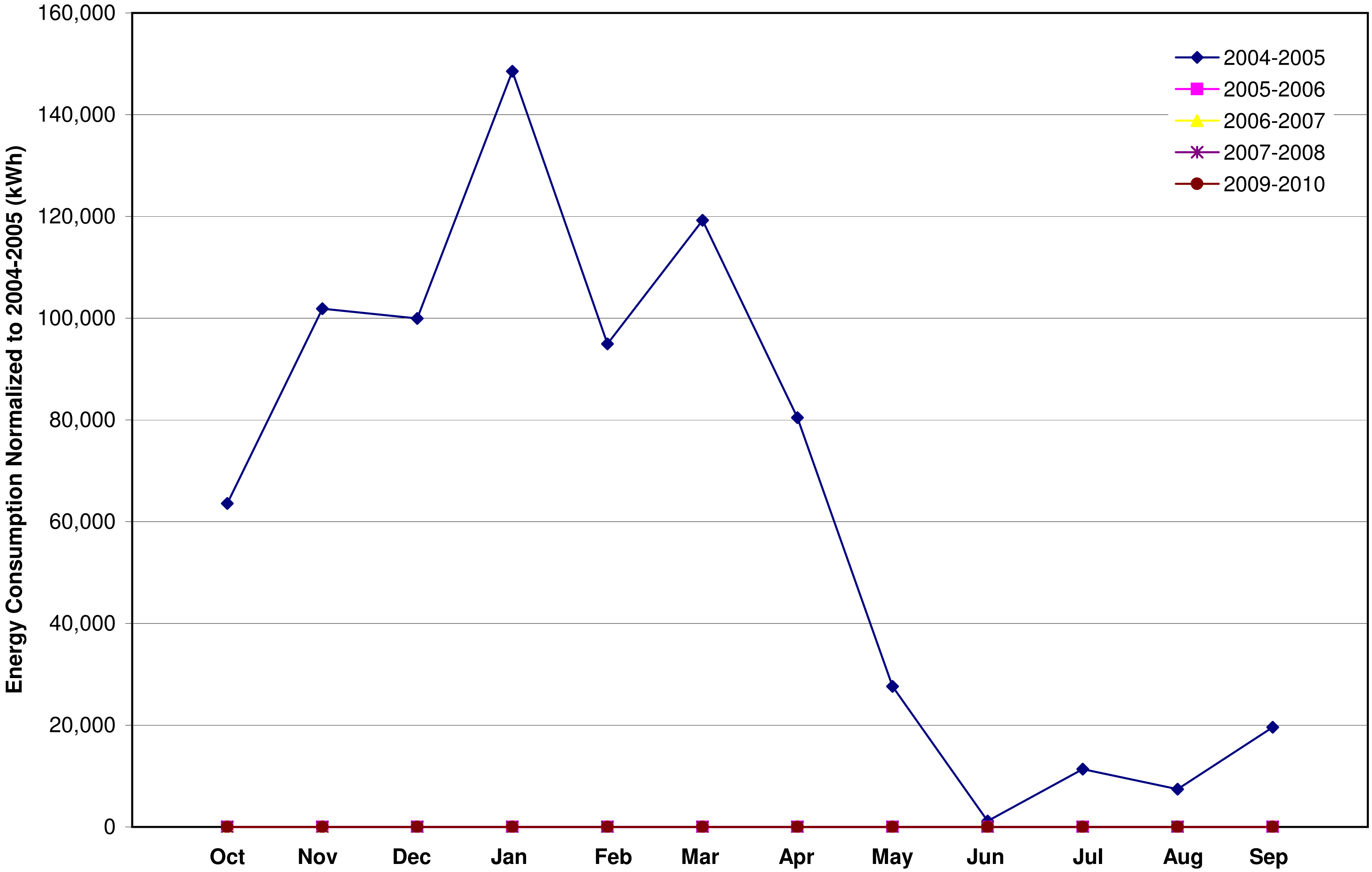


Table F.8 - Energy Consumption Monitoring Data for the Petersfield Curling Club

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	1,620	8	1,703	340.7	1,703			0		#DIV/0!			0		#DIV/0!
November	27,300	1,595	43,808	525.4	43,808			0		#DIV/0!			0		#DIV/0!
December	27,300	6,498	94,552	970.3	94,552			0		#DIV/0!			0		#DIV/0!
January	24,060	6,111	87,307	1116	87,307			0		#DIV/0!			0		#DIV/0!
February	33,660	8,801	124,748	816.7	124,748			0		#DIV/0!			0		#DIV/0!
March	18,720	3,377	53,671	735.1	53,671			0		#DIV/0!			0		#DIV/0!
April	24,720	4,169	67,868	293.2	67,868			0		#DIV/0!			0		#DIV/0!
May	5,100	0	5,100	214.9	5,100			0		#DIV/0!			0		#DIV/0!
June	1,680	867	10,653	41.3	10,653			0		#DIV/0!			0		#DIV/0!
July	2,700	0	2,700	12	2,700			0		#DIV/0!			0		#DIV/0!
August	1,740	62	2,382	20.5	2,382			0		#DIV/0!			0		#DIV/0!
September	1,620	25	1,879	89.5	1,879			0		#DIV/0!			0		#DIV/0!
TOTAL	170,220	31,513	496,370	5175	496,370	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

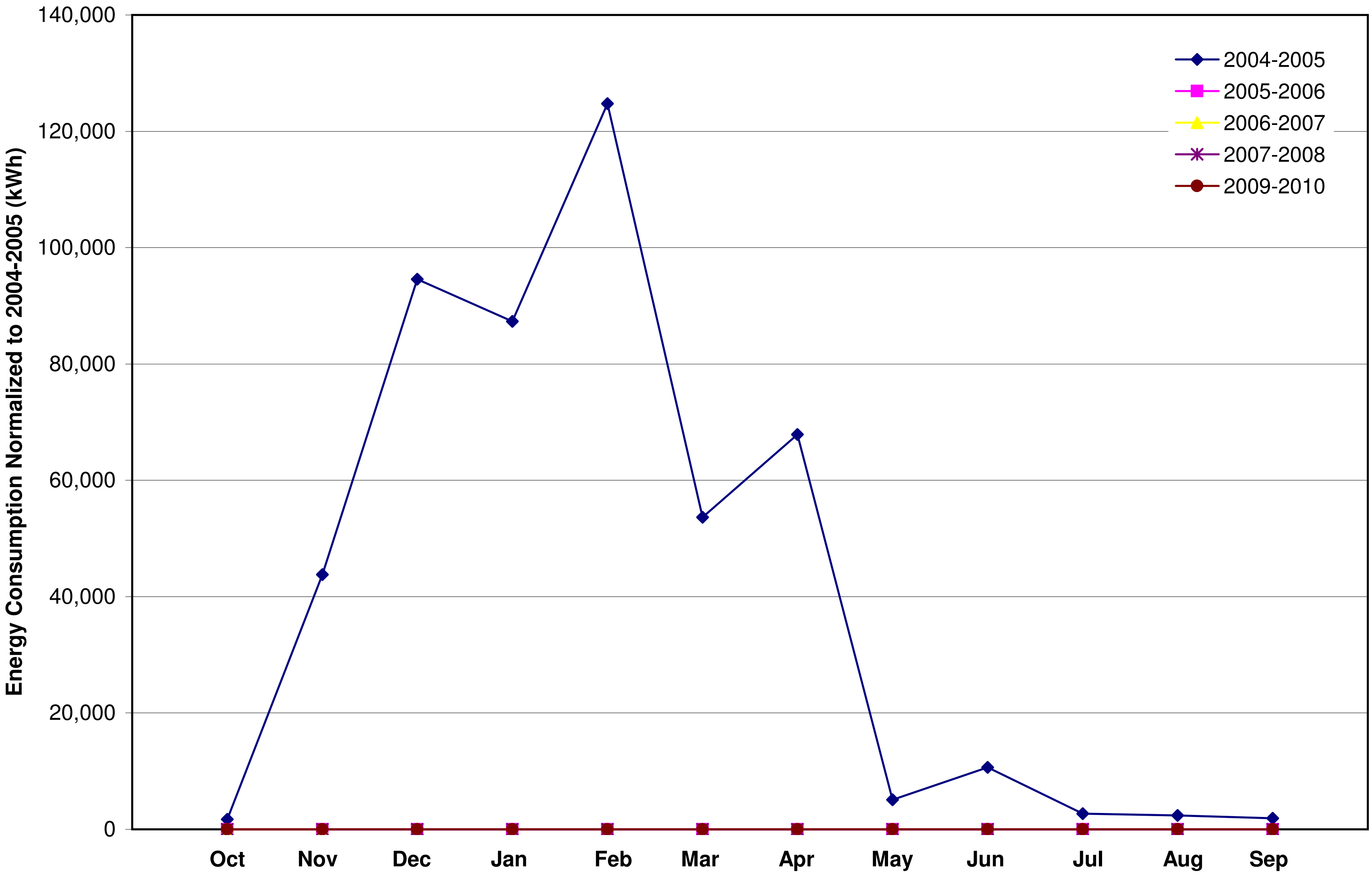
	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
October			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
November			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
December			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
January			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
February			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
March			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
April			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
May			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
June			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
July			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
August			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Notes

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in (m^3) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=1
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F18) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

Figure F.8 - Energy Consumption Monitoring Graph for the Petersfield Curling Club



Environment Canada Environnement Canada

[français] [Back]

Daily Data Report for November 2005

Notes on Data Quality.

WINNIPEG THE FORKS
MANITOBA

Latitude: 49° 52' N **Longitude:** 97° 7' W **Elevation:** 230.00 m
Climate ID: 5023262 **WMO ID:** 71579 **TC ID:** XWN

Daily Data Report for November 2005

Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days C	Cool Deg Days C	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
01	8.8	2.8	5.8	12.2	0.0	0.0	0.0	0.0			
02	10.5	1.1	5.8	12.2	0.0	0.4	0.0	0.4			
03	3.8	2.3	3.1	14.9	0.0	0.2	0.0	0.2			
04	3.2	1.2	2.2	15.8	0.0	1.0	0.0	1.0			
05	4.7	1.9	3.3	14.7	0.0	0.4	0.0	0.4			
06	9.0	-1.5	3.8	14.2	0.0	0.2	0.0	0.2			
07	6.2	0.5	3.4	14.6	0.0	0.0	0.0	0.0			
08	4.0	-0.8	1.6	16.4	0.0	7.4	7.3	14.7			
09	2.6	-0.3	1.2	16.8	0.0	0.4	0.0	0.4			
10	8.9	-0.2	4.4	13.6	0.0	0.0	0.0	0.0			
11	12.1	3.4	7.8	10.2	0.0	0.0	0.0	0.0			
12	6.6	-0.2	3.2	14.8	0.0	0.2	0.0	0.2			
13	2.9	-4.2	-0.7	18.7	0.0	0.2	0.0	0.2			
14	0.9	-5.5	-2.3	20.3	0.0	0.0	1.8	1.8			
15	0.2	-9.5	-4.7	22.7	0.0	0.0	13.8	13.8			
16	-9.5	-17.1	-13.3	31.3	0.0	0.0	0.0	0.0			
17	-5.6	-20.3	-13.0	31.0	0.0	0.0	0.0	0.0			
18	3.5	-7.4	-2.0	20.0	0.0	11.0	1.6	12.6			
19	3.4	-2.9	0.3	17.7	0.0	0.0	0.7	0.7			
20	9.3	-1.3	4.0	14.0	0.0	0.0	0.0	0.0			
21	5.5	-2.4	1.6	16.4	0.0	0.0	0.0	0.0			
22	4.1	-3.2	0.5	17.5	0.0	0.0	0.0	0.0			
23	4.1	-13.4	-4.7	22.7	0.0	0.0	0.0	0.0			
24	-7.8	-13.5	-10.7	28.7	0.0	0.0	0.0	0.0			
25	-5.9	-10.6	-8.3	26.3	0.0	0.0	0.0	0.0			
26	-4.0	-10.3	-7.2	25.2	0.0	0.0	0.0	0.0			
27	-3.5	-10.0	-6.8	24.8	0.0	0.0	0.0	0.0			
28	-4.2	-11.4	-7.8	25.8	0.0	0.0	0.0	0.0			
29	-7.3	-11.3	-9.3	27.3	0.0	0.0	0.0	0.0			
30	-9.1	-12.6	-10.9	28.9	0.0	0.0	0.0	0.0			
Sum				589.7	**0.0**	**21.4**	**25.2**	**46.6**			
Avg	**1.9**	**-5.2**	**-1.7**								
Xtrm	**12.1**	**-20.3**									

Legend

[empty] = No data available
M = Missing

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APPENDIX G

THE MUNICIPALITIES TRADING COMPANY OF MANITOBA LTD. REPORT

TABLE OF CONTENTS - APPENDIX G

Member Services

The Municipalities Trading Company of Manitoba Ltd. (MTCML) allows AMM members to purchase products and services at lower prices through the power of bulk buying. This year was another great success. Sales remained consistent and the stable pool of official suppliers continued to change and grow. The products sales have consistently remained between 6.5 and 7.4 million dollars for the last 4 years.

The MTCML provides a major source of revenue for the AMM and allows the AMM membership dues to remain one of the lowest in Canada. This past year, the MTCML was able to rebate another $350,000 to our members based on their MTCML sales, bringing the cumulative rebate over the past four years to $1,250,000.

MTCML Official Suppliers

Official Suppliers are very important to the success of the MTCML. These suppliers offer hundreds of products and services that municipalities use. The Trading Company has individual contracts with each of these suppliers that ensure the best possible pricing for the purchasing members. In return, suppliers have direct contact with Manitoba's municipal market and can be a part of regular marketing opportunities through the AMM (mailings, Convention, trade shows, etc.) Each of our suppliers has shown long term commitment to the MTCML, creating a stable purchasing environment for the members of the AMM.

Corporate Members

At present fourteen companies make up the Corporate Members list of the AMM, five of these new for 2004/2005. These members assist the buying group in providing many services and hosting various events throughout the year.

*Last year, the MTCML was able to rebate **$350,000** to our members based on their MTCML sales, bringing the total rebate over the past four years to **$1,250,000**.*

Major Programs

There are also two major buying programs offered by the Trading Company. These programs are owned by the AMM membership, managed by the AMM and each administered by a company that has expertise in the program area.

Petroleum Products Buying Group (PPBG)

AMM has entered into contracts with both Imperial Oil and Petro Canada, on behalf of all of our participating Members, for the supply of gasoline, diesel and lubricants. Our objective is to combat one-sided pricing advantages enjoyed by petroleum suppliers and to assist our Members to purchase fuel at a lower cost while still supporting the local fuel dealers. Currently there are 77 AMM Members who purchase over 6,000,000 litres of fuel each year and about 130 other municipalities in Saskatchewan and Alberta who purchase an additional 29,000,000 litres of fuel annually.

The concept of AMM purchasing large volumes of fuel on behalf of our Members and the careful analysis of industry pricing means fuel savings for member municipalities in all three provinces. At the same time, local fuel dealers are supported. The program is administered by Prairie Fuel Advisors Inc., who also act as our purchasing agent.

The only cost for joining the PPBG is 1.2¢ per litre for the fuel purchased and 10¢ per litre for lubricants. A municipality may withdraw from the PPBG at any time, and there is no cost to withdraw.

Member Services

Insurance

All AMM members outside of Winnipeg participate in the insurance program, administered by Hayhurst Elias Dudek on behalf of the AMM. Coverage includes property/road machinery and equipment; crime (loss of money); comprehensive general liability; errors and omissions liability; environmental impairment (pollution) liability; fire vehicle insurance; plus accident insurance for Councils, fire departments, ambulance services, and other 'volunteers'.

A major part of the program is the $3,500,000 annual self-insurance loss pool that keeps premiums much lower than if individual municipalities purchased their own coverage. Insurance is purchased from various providers for coverage in excess of the $3,500,000 annual loss pool amount, to provide complete protection. This allows the opportunity for significant refunds in low-claims years.

Last year, the AMM was able to offer an average 5% reduction in our insurance rates. As well, as a result of excellent risk management by municipalities, the AMM was able to refund $918,000 to municipalities out of the insurance loss pool.

Official Suppliers have shown long-term commitment to the MTCML.

MTCML Official Suppliers

Acklands Grainger Inc.
Airmaster Sales
Armtec
Bridgestone Canada Inc.
CD Awards
Darwen Road Technologies Ltd.
Denray Tire
Dust Free Road Maintenance
Fort Distributors Ltd.
Grand & Toy
Guardian Traffic Services Manitoba Ltd.
Hayhurst Elias Dudek Inc.
Kal Tire
MTS
Michelin
Norquay Printers Ltd.
PCO Orkin Swat Team
Prairie Fuel Advisors Inc.
Shippam & Associates Inc.
Souris Rock Shop
Tirecraft
Westcon Equipment & Rentals
Westman Steel Industries

AMM Corporate Members

Borland Construction
Cochrane Engineering
Guertin Equipment
Hayhurst Elias Dudek
Innovative Municipal Products Inc.
Manitoba Aboriginal and Northern Affairs
Manitoba Heavy Construction Association
Manitoba Hydro
Manitoba Mixed Concrete Association
Manitoba Pork Council
Mazer Group Construction Equipment
Robert Watson, Attorney
Strong-Coley & Associates
Westcon Equipment & Rentals Ltd.