Final Technical Report

Award Recipient: Sault Sainte Marie Tribe of Chippewa Indians

Project Title: Sault Tribe Building Efficiency Energy Audits of Tribally-Owned Governmental Buildings and Residential Tribal Housing

Project Locations:
Tribal Social Services Offices, 2218 Shunk Road, Sault Ste. Marie, MI
Barbeau Hatchery, 15464 S. Shunk Road, Dafter, MI
Building Trades Rental, 2293 Shunk Road, Sault Ste. Marie, MI
Child Advocacy Center, 2163 Migisa Court, Sault Ste. Marie, MI
Child Care Center, 2218 Shunk Road, Sault Ste. Marie, MI
Chippewa Cleaning Service, 916 Ashmun Street, Sault Ste. Marie, MI
Culture Camp, 266 Homestead Road, Sugar Island, MI
Elderly Center, 2076 Shunk Road, Sault Ste. Marie, MI
Enrollment Building, 2428 Shunk Road, Sault Ste. Marie, MI
Environmental Building, 206 Greenough, Sault Ste. Marie, MI
Tribal Health Clinic, 4935 Zee-ba-Tik Lane, Newberry, MI
Community Center/Health & Human Services, 3355 N. 3 Mile Road, Hessel, MI
Sault Tribe Housing Fleet Building, 154 Parkside, Kincheloe, MI
Housing Office, 154 Parkside, Kincheloe, MI
Sault Tribe Housing Warehouse, 154 Parkside, Kincheloe, MI
George K. Nolan Judicial Building, 2175 Shunk Road, Sault Ste. Marie, MI
Lambert Center, 225 WaSeh, St. Ignace, MI
McCann Elderly Center, 399 McCann, St. Ignace, MI
Niigaanagiizhik Ceremonial Building, 11 Ice Circle, Sault Ste. Marie, MI
Northern Hospitality, 827 Ashmun Street, Sault Ste. Marie, MI
Nunns Creek Fishery, E3346 East M134, Hessel, MI
Rental House, 1857 E. 16th Street, Sault Ste. Marie, MI
Shedawin Building, 2154 Shunk Road, Sault Ste. Marie, MI
Somes Office Building, 1022 E. Portage, Sault Ste. Marie, MI
Sault Tribe Construction, 3375 South M-129, Sault Ste. Marie, MI
Stallman Building, 302 Watertower Drive, Kincheloe, MI
USDA Food Distribution, 3601 Mackinaw Trail, Sault Ste. Marie, MI
USDA Vehicle Garage, 3601 Mackinaw Trail, Sault Ste. Marie, MI
Wetmore Office, M-28, Munising, MI
Youth Education & Activities Building, 2428 Shunk Road, Sault Ste. Marie, MI

DOE Award/Contract Number: DE-EE0005177

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Technical Report Date: 03/25/2015
Project Reporting Period: 09/01/2011 – 12/31/2014

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Executive Summary

Federally recognized in 1972, the Sault Ste. Marie Tribe of Chippewa Indians is centered in the eastern Upper Peninsula and northern Lower Peninsula of Michigan. The Tribe currently has a membership of approximately 40,000, with approximately 13,000 members residing in the Upper Peninsula of Michigan and with over 2,000 members residing on trust land in the Tribe's low income housing.

The Tribe's land holdings are primarily in the Eastern Upper Peninsula of Michigan, of which 1,600 acres are held in trust. The Tribe's governmental offices are located in Sault Ste. Marie, with its furthest tribal communities located 180 miles northwest and 120 miles southwest of Sault Ste. Marie. Tribal communities located outside of the Sault Ste. Marie home base are located in remote areas of their county on approximately 10-20 acres. Housing development sites range between 10-150 homes. Most of the service areas have small community centers although the centers are located within 1-2 miles from each housing site. Public transportation is non-existent with the exception of limited taxi service and limited county transportation authority busing that is not available in all areas.

The Tribe administers several membership programs such as health, education, social service, housing, law enforcement, judicial, fisheries, legal, eldercare, and internal administrative services. Funding for a majority of membership services is received through self-governance BIA funding, grants, and profits from casinos and other enterprise businesses owned and operated by the Tribe.

As part of the Tribe's long-standing interest in energy conservation and the feasibility of renewable energy options, the Tribe is working to reduce energy consumption and expenses in Tribally-owned, governmental buildings and low income housing sites. Conducting energy audits of Tribally-owned facilities helps to define the extent and types of energy efficiency improvements needed, establish a basis for energy priorities, strategies and action plans, and provide a benchmark for measuring improvements from energy efficiency implementations.

Implementation of prioritized energy efficiency improvements and renewable energy options will integrate with the cultural, social, and long-term goals of the Tribe by protecting the environment and natural resources, improving the economic well-being of Tribal members and families through reducing housing expenses and by reallocating resources to providing additional support for direct services for Tribal members.

In 2002, the Tribe demonstrated its commitment to researching energy options by applying for and receiving a DOE grant to conduct a feasibility study of wind energy as a renewable source of electricity for Tribal buildings and housing sites. While the grant findings, based on the lower power costs and higher technological investment requirements of that time, did not support further development, interest continued at the Tribal Board of Directors' level to pursue options for improving building efficiencies, consider renewable energy sources for building heating and cooling, and re-visit the feasibility of wind energy and other renewable energy sources to generate electric power for Tribal governmental buildings and housing sites.

In 2009, the Tribe applied to the DOE for funding to conduct energy audits of Tribally-owned governmental buildings and was awarded a grant in 2010 in the amount of $95,238 to fund the energy audits of seven governmental buildings and cover travel expenses for attending required DOE annual program reviews. Competitive pricing during the procurement process for an energy auditor resulted in lower energy audit costs, allowing the Tribe to request two additional governmental building energy audits. The DOE approved the request, increasing the project sites to nine governmental buildings. This grant was completed June 30, 2013.

In 2011, the Tribe applied for and was awarded a DOE grant in the amount of $75,509 to conduct energy audits of the remaining 30 Tribally-owned governmental buildings. Again, competitive pricing during the procurement of an energy auditor resulted in lower costs, allowing the Tribe to request and receive DOE approval to additionally purchase energy audit equipment and contract for residential energy audits of low-income Tribal Housing units.

Energy audit equipment classroom instruction was provided to Tribal personnel through a companion grant from the DOE, <u>Training in Building Audit Technologies</u>, which was also awarded to the Tribe in 2011.

The equipment purchased through the second DOE energy audits grant was used to conduct residential energy audits of 25 low-income Tribal Housing units. The residential energy audits, which were conducted by Building Science Academy, provided field experience for Tribal personnel to supplement the DOE funded classroom instruction.

Throughout the project period, the Tribe conducted regular progress meetings with the Tribal energy team and energy auditor, processed providers payment requests, submitted required grant reporting, attended and presented project updates at the DOE annual program reviews and reviewed completed energy audit reports. The second DOE energy audits grant was completed December 31, 2014.

The Tribe has recognized a general need for energy retrofitting of its governmental buildings. Reviewing the energy audit reports by building clarifies the extent and types of specific energy efficiency improvements needed to either prioritize for funding acquisition or to schedule for implementation utilizing existing resources.

To gain full value from this energy audits project, the Tribe's Facilities Management Department and the Sault Tribe Housing Authority will utilize the energy audit report findings to establish energy priorities and scheduling. As each building is retrofitted, the utilities usage diagrams in the applicable energy audit report can serve as a benchmark for measuring the energy usage reduction resulting from implementing recommended energy improvements.

The thirty energy audit reports prepared by U. P. Engineers and Architects, Inc. are included in the section titled Energy Audit Reports with Thermal-Imaging Photographs. Due to electronic file size constraints, the reports are accompanied by selected thermal images to illustrate the value of infrared technology in displaying energy loss and for use as a visual aid in presentations.

There have been a couple of surprising lessons learned during the course of completing this energy audit project. Access to computerized utility usage data may be limited due to the type of metering equipment still in use by rural utility companies. Utilities may be periodically estimating meter readings, have seasonal gaps in data and may not have the capacity to provide computerized usage reporting. The Tribe experienced these utility data collection challenges. Considerable time was spent gathering and inputting monthly usage and cost data from paper invoicing. A recommendation to any organization considering conducting energy audits would be to contact their local utility companies to verify whether computerized reporting is available or whether additional time should be planned for utility data compilation.

Another lesson learned is that energy audits may reveal unexpected findings, such as unknown window openings buried in a wall causing heat loss. Thermal imaging is particularly helpful for uncovering hidden energy inefficiencies. The Tribe would recommend requiring thermal imaging to be part of the energy audit process not only to bring forward invisible causes of energy loss, but as a visual aid for executive presentations.

The Tribe would like to acknowledge the U. S. Department of Energy for providing the funding and technical assistance that has made this project possible, and the Tribal Board of Directors for their ongoing support of improving energy efficiencies in Tribal governmental buildings and housing sites.

Project Overview

The Tribe is working to reduce energy consumption and expense in Tribally-owned governmental buildings and low income housing sites. In 2009, the Tribe applied to the U. S. Department of Energy for funding to conduct energy audits of Tribally-owned governmental buildings. Findings from the energy audits would define the extent and types of energy efficiency improvements needed, establish a basis for energy priorities, strategies and action plans, and provide a benchmark for measuring improvements from energy efficiency implementations.

In 2010, the DOE awarded a grant in the amount of $95,238 to the Tribe to fund the energy audits of nine governmental buildings and to pay for travel expenses associated with attendance and participation at the DOE annual program reviews. In 2011, the Tribe applied for and was awarded a DOE grant in the amount of $75,509 to conduct energy audits of the remaining 30 Tribally-owned governmental buildings listed below:

1. Tribal Social Services Offices, 2218 Shunk Road, Sault Ste. Marie, MI
2. Barbeau Hatchery, 15464 S. Shunk Road, Dafter, MI
3. Building Trades Rental, 2293 Shunk Road, Sault Ste. Marie, MI
4. Child Advocacy Center, 2163 Migisa Court, Sault Ste. Marie, MI
5. Child Care Center, 2218 Shunk Road, Sault Ste. Marie, MI
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19. Niigaanagiizhik Ceremonial Building, 11 Ice Circle, Sault Ste. Marie, MI
20. Northern Hospitality, 827 Ashmun Street, Sault Ste. Marie, MI
21. Nunns Creek Fishery, E3346 East M134, Hessel, MI
22. Rental House, 1857 E. 16th Street, Sault Ste. Marie, MI
23. Shedawin Building, 2154 Shunk Road, Sault Ste. Marie, MI
24. Somes Office Building, 1022 E. Portage, Sault Ste. Marie, MI
25. Sault Tribe Construction, 3375 South M-129, Sault Ste. Marie, MI
26. Stallman Building, 302 Watertower Drive, Kincheloe, MI
27. USDA Food Distribution, 3601 Mackinaw Trail, Sault Ste. Marie, MI
28. USDA Vehicle Garage, 3601 Mackinaw Trail, Sault Ste. Marie, MI
29. Wetmore Office, M-28, Munising, MI
30. Youth Education & Activities Building, 2428 Shunk Road, Sault Ste. Marie, MI

Competitive procurement of an energy auditor resulted in lower costs, allowing the Tribe to request and receive DOE approval to additionally purchase energy audit equipment and contract for residential energy audits of 25 low-income Tribal Housing units.

Repeating mobilization steps performed during the first DOE energy audits grant, the Tribe initiated the second round of governmental building energy audits by completing energy auditor procurement. The selected energy auditor successfully passed DOE debarment and Sault Tribe background clearances. The energy audits contract was awarded to U. P. Engineers and Architects, Inc. of Sault Ste. Marie, Michigan. The Tribe continued mobilizing for the energy audits by providing the energy auditor with one year of electric, gas and water utility invoice copies per building, as well as supplemental building information, such as operating hours. The Tribe also contacted building occupants to coordinate scheduling for the on-site energy audit inspections and arranged for facilities management personnel to guide the energy auditor through the buildings and answer questions regarding building systems.

The Tribe purchased the DOE approved energy audit equipment, including two Minneapolis blower door systems with cases, four FLIR infrared cameras, cases and software, three Testo 317-3 CO monitors, two Bacharach Leakator™ 10 combustible gas leak detectors, two Regin HVAC smoke pens with wicks, and 7 sets of energy audit training materials, for use by the Sault Tribe Environmental Department and Tribal Facilities Management personnel.

Sault Tribe personnel received training on proper use of this energy audit equipment through classroom instruction and field experience. The classroom instruction was provided through a companion grant from the DOE, Training in Building Audit Technologies, which was awarded to the Tribe in 2011. The field experience was provided through the second DOE energy audits grant to supplement the classroom instruction. Sault Tribe personnel joined the contractor, Building Science Academy of Sparta, Michigan, in conducting the 25 residential energy audits of low-income Tribal Housing units.

Throughout the duration of the second DOE energy audits grant, the Tribe conducted regular meetings with the Tribal energy team and providers to monitor project progress and approve provider payment requests. The energy team also prepared and submitted required quarterly performance progress and financial reporting and presented project updates at the 2011, 2012 and 2014 DOE annual program reviews in Denver, Colorado. As the energy auditor completed reports for each building, the Tribe’s energy team reviewed the findings and the thermal imaging photographs with Tribal Facilities Management Department. The energy audit findings have provided valuable data and recommendations for establishing efficiency priorities and work order scheduling, as well as benchmarking utility usage to compare to after energy efficiency improvements are implemented.

Objectives

Conducting energy audits of the governmental buildings helps define the extent of need for energy efficiency improvements, providing a basis for long-term energy plan strategies and a benchmark for measuring the success of future energy improvements implementation.

The thirty Tribally-owned governmental buildings designated for energy audits include a diverse mix of governmental use, such as health and human services, elders and child care centers, cultural, ceremonial and community gathering centers, Tribal Court and Law Enforcement, food distribution programs, youth education and activities, natural resources, governmental offices, retail stores and services, rental units, construction, warehouse and fleet maintenance buildings. Building locations span four counties in the Upper Peninsula of Michigan – Alger, Chippewa, Luce and Mackinac counties.

In preparation for the energy audits, a project team was assembled, consisting of a Project Director, serving as the Technical Contact for this grant, the Chief Financial Officer, who serves as the Business Contact for this grant and oversees the Facilities Management Department, and assigned project staff. During preliminary work sessions, the project team, with support from the Sault Tribe Board of Directors, identified 30 Tribally-owned governmental buildings, as listed on the cover page of this report. Designating these buildings and compiling supplemental building data, such as location, size and energy-related information, were completed in preparation for developing a Request for Proposal (RFP) to procure a qualified energy auditor to conduct the specified energy audits.

Additional objectives performed during the Energy Audit project included:

As per established Tribal procurement policies and procedures, preparing and advertising the Request for Proposal for a qualified energy auditor to conduct the specified energy audits; scheduling and conducting pre-bid building inspections; working with the Tribal Purchasing Department during the public bid opening, analyzing submittals, and recommending award to Tribal Board of Directors for approval; working with the Tribal Legal Department for contract preparation and acceptance; conducting a pre-project start-up meeting with selected energy auditor to sign contract, review administrative requirements, accounting procedures and finalize project schedule; working with the contracted energy auditor to perform site inspections, provide building and pertinent energy data, supply contact information, and assist with energy audits as needed; purchasing approved energy audit equipment and training materials; scheduling and coordinating residential Tribal housing unit energy audits with contractor, Tribal personnel, Tribal Housing Authority and housing residents; conducting scheduled progress meetings with energy auditor and project team to review project details, findings and analysis reports, develop strategies for addressing energy audit findings, process billings, monitor budget compliance, and prepare project communications, including written monthly updates to the Executive Office and Tribal Board of Directors, required quarterly grant progress reports and annual attendance at the DOE Program Reviews in Denver, Colorado; working with energy auditor and project team to complete project close-out checklists, finalize strategies for addressing energy audit findings, process final billing, close-out and prepare report on budget compliance, and prepare final project communications, including presentation of energy audit project to the Executive Office and Tribal Board of Directors, required final comprehensive grant report and attendance at the 2011, 2012 and 2014 DOE Program Reviews in Denver, CO.

Description of Activities Performed

During the first phase of the project, the project team procured a qualified energy auditor to conduct energy audits of the thirty designated Tribally-owned governmental buildings in four counties across the Upper Peninsula of Michigan. To maximize travel economy, scheduling was based on buildings usage and availability in conjunction with geographic clustering.

The Tribe followed established Tribal procurement policies and procedures to secure the services of a qualified energy auditor to conduct the energy audits, perform related analysis, and to produce and submit written findings per building as completed. Procurement activities included advertising a Request for Proposal for an energy auditor to conduct specified energy audits; scheduling and conducting pre-bid building inspections; working with Tribal Purchasing Department to conduct the public bid opening, analyzing submittals, recommending award to Tribal Board of Directors for approval; and working with the Tribal Legal Department for contract preparation and acceptance. To mobilize for the energy audits, the project team conducted a pre-project start-up meeting with the selected energy auditor, U. P. Engineers and Architects, Inc., to sign the contract, review administrative requirements, accounting procedures and finalize the energy audits schedule.

The energy auditor performed site inspections and conducted thirty energy audits with assistance from the project team. The Project Director and project team coordinated arrangements for personnel interviews and site inspections, supplied copies of supplemental building data, records, etc., and prepared administrative reporting and communications with the Tribal membership. Energy audits included collection of pertinent data through interviews with Facility Management and on-site operations personnel, by site inspections, and utility records analysis, evaluation of the technical and economic viability of building efficiency improvement options, and determination and selection of feasible conservation options. The Project Director, project team and qualified energy auditor worked closely to review findings and energy improvement options throughout the project. The energy audit findings were reviewed as a basis for prioritizing and addressing building efficiency improvements and as a foundation for the Tribe's long-term comprehensive energy plan.

The Project Director, project team, Sault Tribe Environmental Department, Tribal Facilities Management and Sault Tribe Purchasing Department purchased the DOE approved energy audit equipment and training materials.

The Project Director, project team, Sault Tribe Environmental Department, Tribal Facilities Management and Sault Tribe Housing Authority scheduled and coordinated energy audits of 25 Tribal Housing units with the residential energy audits contractor, Tribal personnel, Tribal Housing Authority and housing residents to ensure the availability of housing units and to provide the opportunity for hands-on field experience for Tribal personnel.

The project team conducted progress meetings with the energy auditors to review project status and resolve project issues, review energy audit findings and analysis reports, develop strategies for addressing energy audit findings, and process billings. The project team also met to monitor budget compliance and prepare project communications, including updates to the Executive Office and Tribal Board of Directors, other project communications, required reporting and presentations. Project progress and financial status were documented in quarterly reports submitted electronically to DOE. Project status was also presented at the 2011, 2012 and 2014 Annual Tribal Energy Program Reviews held in Denver, Colorado.

Energy Audit Reports & Thermal-Imaging Photographs

The thirty energy audit reports prepared by U. P. Engineers and Architects, Inc. are included in this section, as listed below.

NOTE: Due to electronic file size constraints, reports are accompanied by selected thermal images to illustrate the value of infrared technology in displaying energy loss and for use as a visual aid in presentations.

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Energy Audit
Tribal Social Services
2218 Shunk Road
Sault Ste. Marie, MI

February 2013

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Summary

This one story building was originally built in 1984 and is currently shared with the Child Care Center. The building consists of approximately 5,025 square feet of office space. Improvements and upgrades have been made to the facility since original construction.

Existing Building Envelope Profile

Wall Construction: Exterior walls are wood framed with drywall interior.

Roof Construction: The roof is a sloped, wood framed, with wood sheathing and traditional shingles. There is ice damming, indicating a lack of ventilation and insulation in the attic space.

Floor Construction: Floors are concrete slab on grade. Floor coverings are a mixture of carpet and tile.

Window and Door Construction: Exterior doors and windows are commercial type in good condition.

Existing Mechanical Systems Profile

HVAC

The heating system is served by a single natural gas fired boiler, Weil Mclain Ultra model, installed in 2011. The boiler and accessories are in excellent condition. The hot water system serves perimeter baseboard radiation in the offices and cabinet unit heaters in the lobby.

The ventilation and cooling system is served by four natural gas fired forced air furnaces, Rheem, models RBHA. The furnaces are in excellent condition. Each furnace has an electric reheat duct coil located in the supply air ductwork. The duct distribution is supplied above the ceiling and returned below the slab. Both duct systems are insulated, insulation is in excellent condition.

Plumbing

The domestic hot water system is served by a single electric wall mounted storage tank type water heater located in the mechanical room. Water piping is copper and insulated. The insulation is in good condition. There is not a hot water return system.

The plumbing fixtures are floor mounted tank type water closets and wall mounted lavatories with single manual faucets.

The average hot water delivery time to the plumbing fixtures is 60 seconds.

The exhaust fans are switched with the lights.

Temperature Control Systems

The thermostats are wall mounted non-programmable type.

Existing Electrical Systems Profile

Lighting Systems: Interior lighting is primarily older T12 linear fluorescent. Most fixtures have 4 lamps. The interior lighting should be upgraded to energy efficient T8 lamps and electronic ballasts. Several HID floodlights are mounted outside on poles to illuminate the parking and sidewalks.

Power Systems: The building has (2) main electrical panels plus (1) sub-panel. One of the main panels has a 200-amp main breaker and the second main is 150-amp.

Special Systems: The building has a fire alarm system.

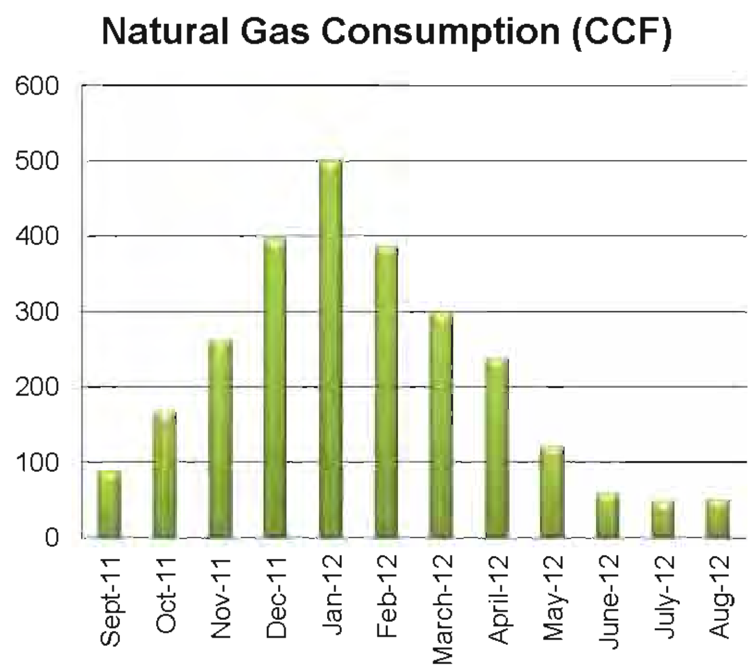
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$58	88
Oct-11	$106	168
Nov-11	$162	261
Dec-11	$241	395
Jan-12	$298	499
Feb-12	$228	387
March-12	$185	298
April-12	$146	237
May-12	$111	120
June-12	$22	59
July-12	$19	48
Aug-12	$21	50
Totals	$1,594	2,608

Natural Gas ECI:	$0.32	per sq ft/yr
Natural Gas ECU:	51,900	BTU/sq ft
Average Cost per CCF:	$0.61	$/CCF

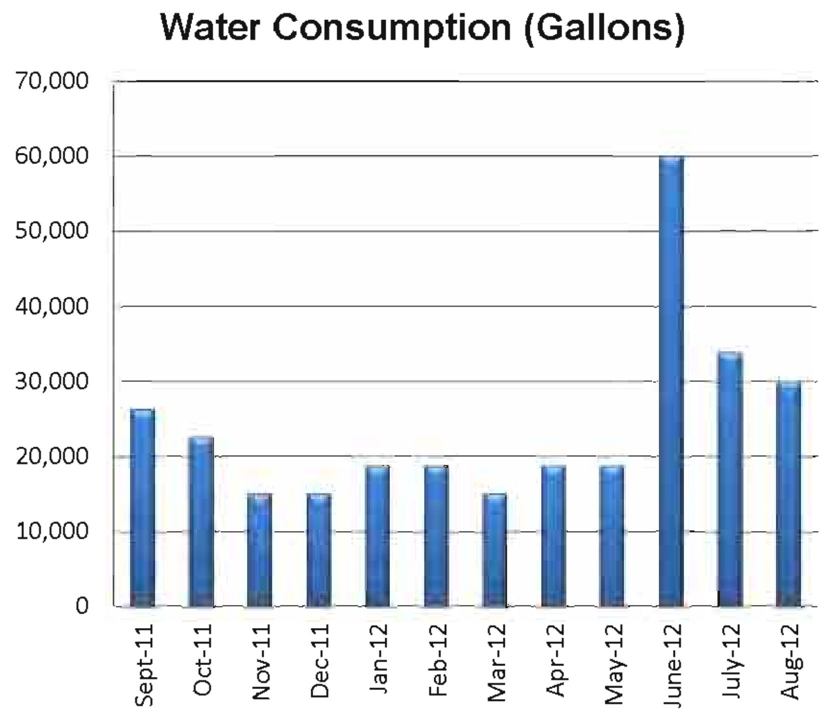


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$215	26,250
Oct-11	$184	22,500
Nov-11	$126	15,000
Dec-11	$126	15,000
Jan-12	$154	18,750
Feb-12	$154	18,750
Mar-12	$126	15,000
Apr-12	$154	18,750
May-12	$154	18,750
June-12	$475	60,000
July-12	$269	33,750
Aug-12	$240	30,000
Totals	$2,377	292,500

Cost per sq ft:	$0.47	per sq ft/yr
Average Usage per Fixture:	48,750	gallons/fix
Average Usage Cost per Fixture:	$0.008	$/gallon

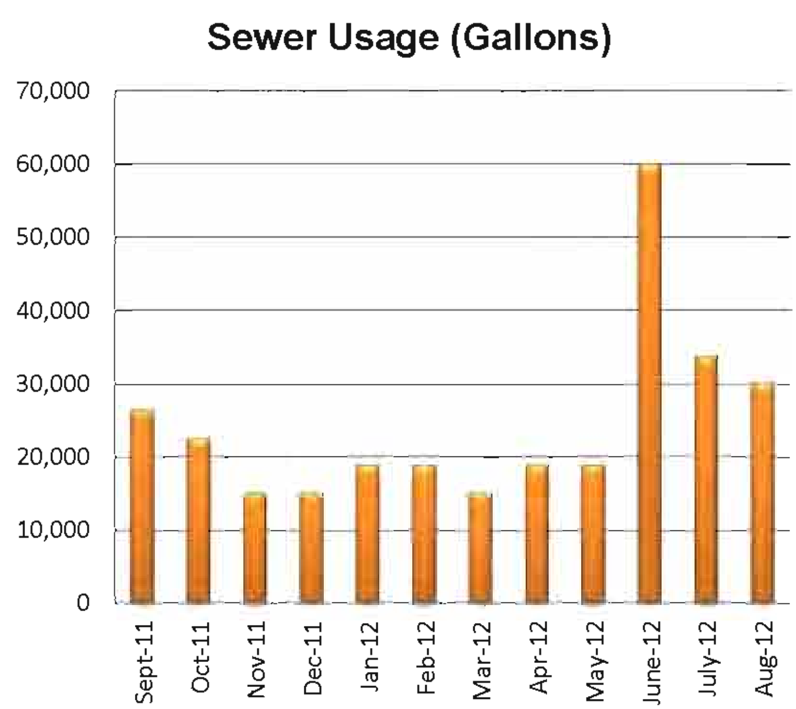


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$225	26,250
Oct-11	$196	22,500
Nov-11	$133	15,000
Dec-11	$133	15,000
Jan-12	$165	18,750
Feb-12	$165	18,750
Mar-12	$133	15,000
Apr-12	$165	18,750
May-12	$165	18,750
June-12	$509	60,000
July-12	$302	33,750
Aug-12	$269	30,000
Totals	$2,560	292,500

Cost per sq ft:	$0.50	per sq ft/yr
Average Usage per	48,750	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon

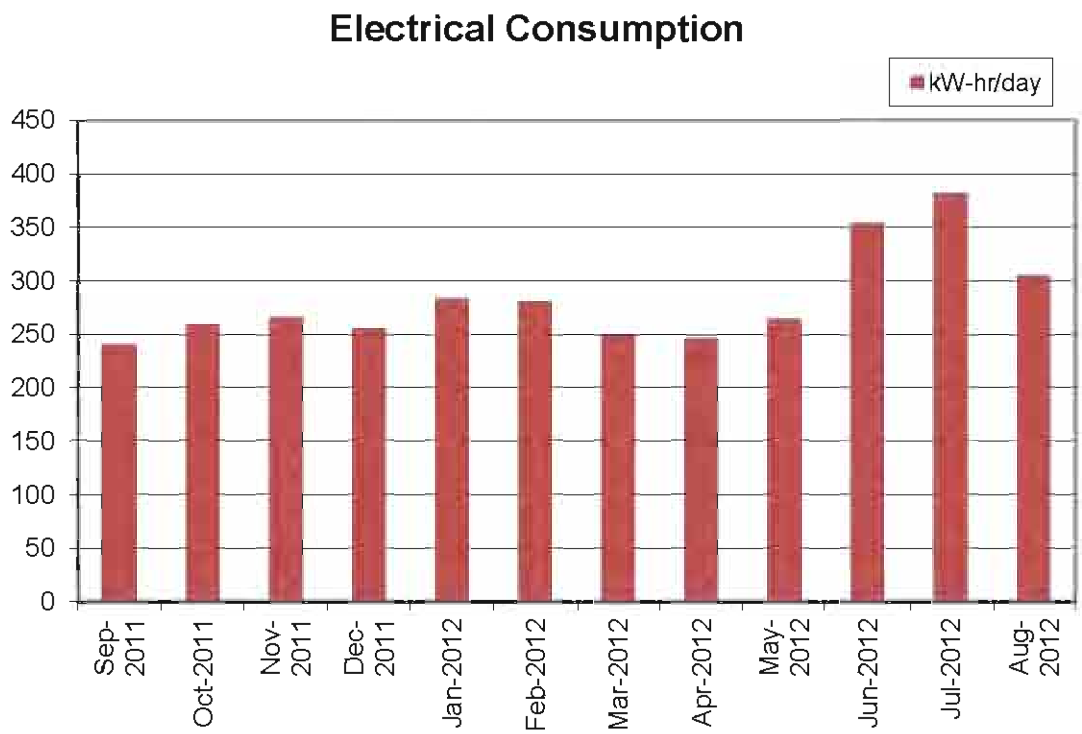


Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period: Month	Cost: Cost	Usage: kWh	cost/day	
29	240	Sep-2011	$735	6,960	$25	
28	259	Oct-2011	$795	7,240	$28	
30	265	Nov-2011	$852	7,960	$28	
34	255	Dec-2011	$967	8,680	$28	
29	283	Jan-2012	$914	8,200	$32	
32	280	Feb-2012	$998	8,960	$31	
28	249	Mar-2012	$777	6,960	$28	
30	245	Apr-2012	$821	7,360	$27	
33	263	May-2012	$967	8,680	$29	
30	353	Jun-2012	$1,166	10,600	$39	
33	382	Jul-2012	$1,384	12,600	$42	
29	305	Aug-2012	$949	8,840	$33	
average:	282	Totals	$11,323	103,040	$31	average

Square Footage	5025
kW-hr per sq ft per year =	20.5

Electrical ECI:	$2.25	per sq ft/yr
Electrical ECU:	70,498	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	5,025	sq ft
Annual Energy Costs	$12,916	dollars
Total Energy Cost Index (ECI):	$2.57	per sq ft/yr
Total Energy Utilization Index (EUI):	122,398	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	87.66%	percentage
Percentage of Annual Energy Costs for Gas	12.34%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Add continuous insulation above ceiling and at energy heels.	Reduce heat loss through ceiling, reduce gas usage, reduce ice damming.
B2	Replace doors and windows with high efficiency type doors and windows.	Reduce infiltration, reduce energy usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Implement comprehensive preventative maintenance program for all mechanical equipment.	Extend life of equipment, improve efficiency of equipment.
M2	Future: Replace furnaces in 5-10 years with gas fired high efficiency condensing type furnaces. Remove electric reheat coils.	Reduce electrical usage, reduce gas usage.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce gas usage during unoccupied hours.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install low flow aerators on faucets.	Reduce water usage.
P2	Install sensor or timed controls on lavatory faucets and water closets.	Reduce water usage.
P3	Replace water heater with instantaneous or point of use type water heater.	Eliminate stand-by losses from storage tank type water heater, reduce energy usage.
P4	Install hot water return system.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace interior lighting with 28-watt premium T8 lamps and low ballast factor program start electronic ballasts. Also recommend dual-level switching	Reduce electrical energy costs and extend life of bulbs.
E2	Replace exterior lights with LED type fixtures	Reduce electrical energy costs.
E3	Install motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.

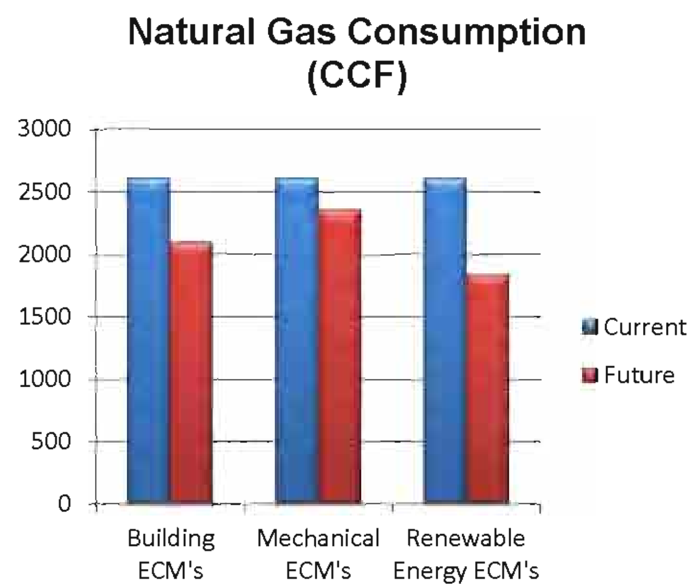
Renewable Energy Opportunities

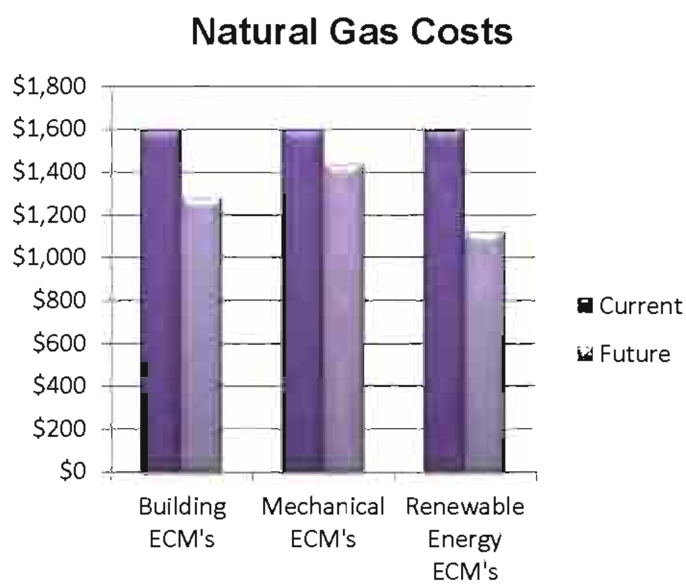
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and electrical utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:

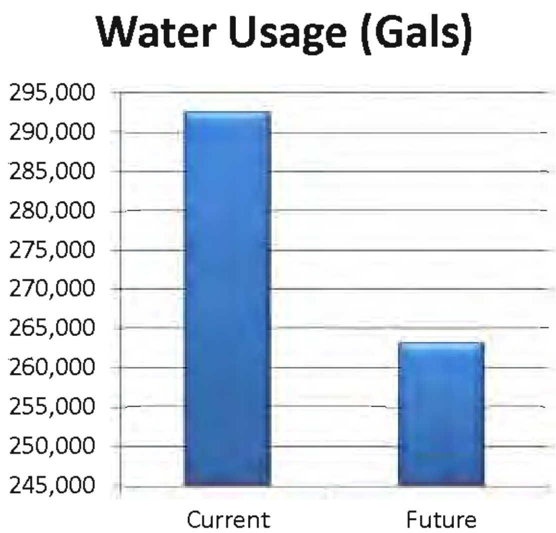


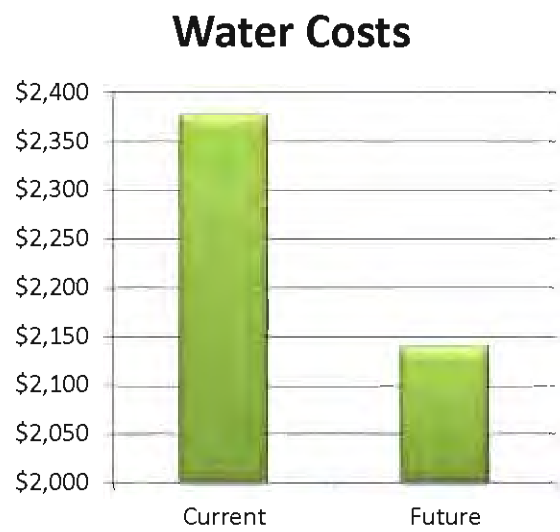


Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.32	51,900	$0.25	41,520
Mechanical	$0.32	51,900	$0.29	46,710
Renewable Energy	$0.32	51,900	$0.22	36,330

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:





Electrical Systems

The installation of program start fluorescent ballasts and premium 28-watt T8 lamps could provide about $1500 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $400 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $150 per year.

The installation of approximately 6kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $1,500

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.70 Btu/hr/sq ft/deg F
Existing ACH: 0.6

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #23 Social Services

Project Name: S10-12262 #23 Social Services 02/15/2013
Prepared by: UPEA 09:45AM

Air System Information

Air System Name	#23 Social Services	Number of zones	1
Equipment Class	UNDEF	Floor Area	5041.0 ft²
Air System Type	SZCAV	Location	Sault Ste Marie, Michigan

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	9.9	Tons	Load occurs at	Jul 1500	
Total coil load	118.4	MBH	OA DB / WB	83.0 / 69.0	°F
Sensible coil load	110.3	MBH	Entering DB / WB	76.9 / 64.1	°F
Coil CFM at Jul 1500	5641	CFM	Leaving DB / WB	58.3 / 57.1	°F
Max block CFM	5641	CFM	Coil ADP	56.2	°F
Sum of peak zone CFM	5641	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.932		Resulting RH	51	%
ft²/Ton	511.1		Design supply temp.	58.0	°F
BTU/(hr-ft²)	23.5		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	23.69	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	131.3	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	5641	CFM	BTU/(hr-ft²)	26.0	
Max coil CFM	5641	CFM	Ent. DB / Lvg DB	63.4 / 85.5	°F
Water flow @ 20.0 °F drop	13.13	gpm			

Supply Fan Sizing Data

Actual max CFM	5641	CFM	Fan motor BHP	3.09	BHP
Standard CFM	5495	CFM	Fan motor kW	2.45	kW
Actual max CFM/ft²	1.12	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	394	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	24.9

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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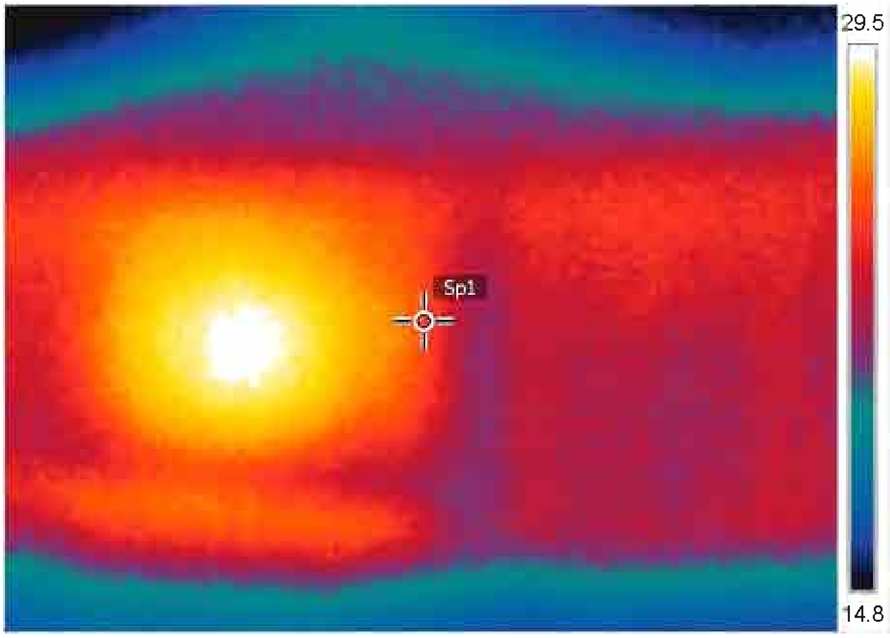

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Energy Audit
Barbeau Hatchery
15464 S. Shunk Road
Dafter, MI

February 2013

Table of Contents

Attachments:

Summary

This facility is a 2 story 3,200 square foot building used to house fish tanks. The building is located in Dafter and has several fish release ponds on the site. The structure is wood frame construction with metal siding and a pitched metal roof. The second floor is unfinished and is to be converted into offices and additional storage space in the future. The building was constructed in 2006.

Existing Building Envelope Profile

Wall Construction: Exterior walls are vertical wood poles with horizontal wood perlins. The building has spray-foam insulation on walls and vertical metal siding on exterior. A similar vertical metal is used for walls and ceiling finish on the main floor.

Roof Construction: Roof is constructed of "A" frame wood trusses with metal roofing.

Floor Construction: Main floor is concrete slab on grade. Upper floor is wood.

Window and Door Construction: The main floor has solid metal exterior doors. The upper level has several vinyl windows. Visible gaps were observed at the doors.

Existing Mechanical Systems Profile

HVAC

The heating system is served by a single propane fired unit heater, Enerco Maxx, ceiling hung. There is no heating on the second floor. The unit heater is in fair condition.

Plumbing

The domestic hot water system is served by a single electric storage tank type water heater, Bradford White model M240, 40 gallon storage capacity, located under the stairs. The water heater is in excellent condition. The water piping is copper and PEX and is not insulated.

The plumbing fixtures are floor mounted tank type water closets and countertop lavatory with a manual dual control faucet.

Temperature Control Systems

The unit heater is controlled with a wall mounted non-programmable thermostat.

Existing Electrical Systems Profile

Lighting Systems: Interior lighting is a mixture of T8 fluorescent fixtures, a few incandescent lamps, and some compact fluorescent lamps. There is (1) exterior HID "barn-light" on front of building.

Power Systems: Electrical power is 240/120-volt, single-phase from Cloverland Electric.

Special Systems: The building has hook-up for a portable generator. The well pump and a few other critical loads are powered from the generator panel.

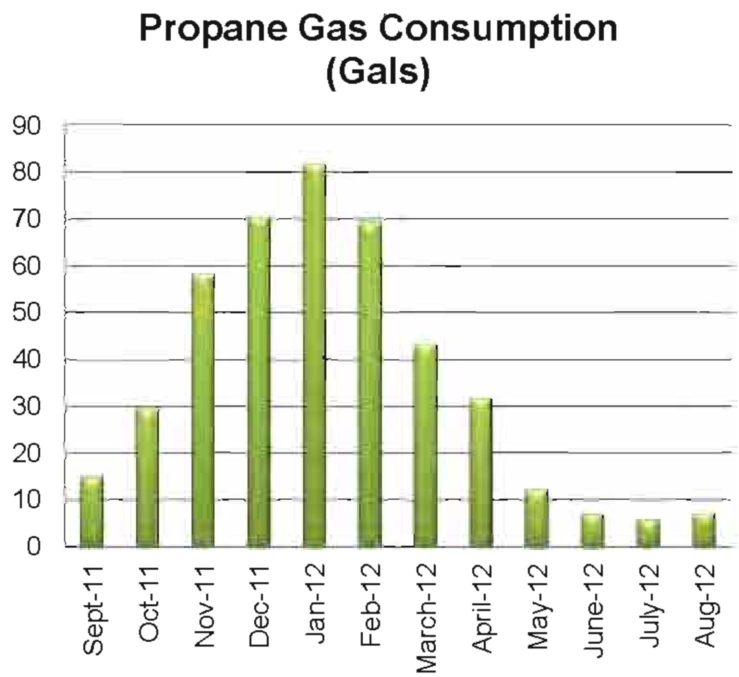
Existing Energy Consumption and Energy Cost Analysis

Propane Usage (Estimate)

The following graphical data represents a monthly weighted average of usage and costs for a building of this construction type and use group for the September 2011 to August 2012 heating season:

Month	Cost	Gals
Sept-11	$38	15
Oct-11	$72	29
Nov-11	$136	58
Dec-11	$161	70
Jan-12	$174	81
Feb-12	$149	69
March-12	$98	43
April-12	$72	32
May-12	$29	12
June-12	$21	7
July-12	$19	6
Aug-12	$22	7
Totals	$992	430

Propane Gas ECI:	$0.31	per sq ft/yr
Propane Gas ECU:	13,430	BTU/sq ft
Average Cost per Gal:	$2.31	$/Gal



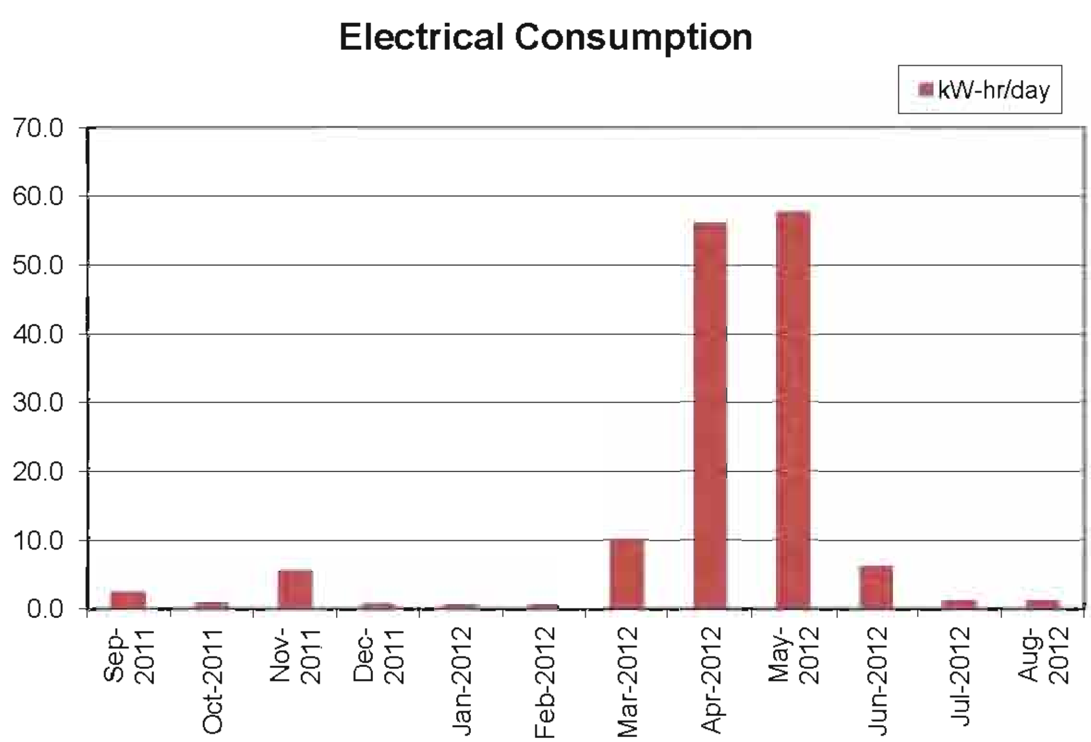
Water and Sewer Usage

The water is served by a well and septic system.

Electrical Usage: The following is a summary of electric use for the past year:

		Period	Cost	Usage		
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**	
30	2.5	Sep-2011	$21.72	74	$0.72	
31	0.9	Oct-2011	$15.94	29	$0.51	
30	5.5	Nov-2011	$31.59	165	$1.05	
31	0.7	Dec-2011	$14.81	22	$0.48	
31	0.6	Jan-2012	$16.40	19	$0.53	
29	0.6	Feb-2012	$16.28	16	$0.56	
31	10.1	Mar-2012	$55.53	313	$1.79	
30	56.2	Apr-2012	$236.83	1,685	$7.89	
31	57.7	May-2012	$250.44	1,788	$8.08	
30	6.3	Jun-2012	$39.01	188	$1.30	
31	1.2	Jul-2012	$19.20	38	$0.62	
31	1.2	Aug-2012	$19.07	37	$0.62	
average:	12.0	Totals	$737	4,374	$2.01	average
		Square Footage		3200		
		kW-hr per sq ft per year =		1.4		

Electrical ECI:	$0.23	per sq ft/yr
Electrical ECU:	4,699	BTU/sq ft
Average Cost per kWh:	$0.17	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	3,200	sq ft
Annual Energy Costs	$1,729	dollars
Total Energy Cost Index (ECI):	$0.54	per sq ft/yr
Total Energy Utilization Index (EUI):	18,129	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	42.61%	percentage
Percentage of Annual Energy Costs for Gas	57.39%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Reinstall doors to seal completely.	Reduce infiltration, reduce gas usage and cost.
B2	Add insulation to second floor ceiling.	Reduce heat loss through ceiling, reduce gas usage and costs.
B3	Add interior walls to second floor.	Reduce heat loss through walls, reduce gas usage and costs.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace unit heater with high efficiency type unit heater.	Reduce gas usage and costs.
M2	Add heat to second floor.	Improve comfort level, improve overall building heating controllability.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostat.	Reduce energy usage during unoccupied hours.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install sensor or timed control on faucets and water closets.	Reduce water usage.
P2	Install low flow aerator on faucet.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace incandescent lamps with compact fluorescent or LED.	Reduce electrical energy costs.
E2	Replace exterior HID "barn-lights" with LED type.	Reduce electrical energy costs.

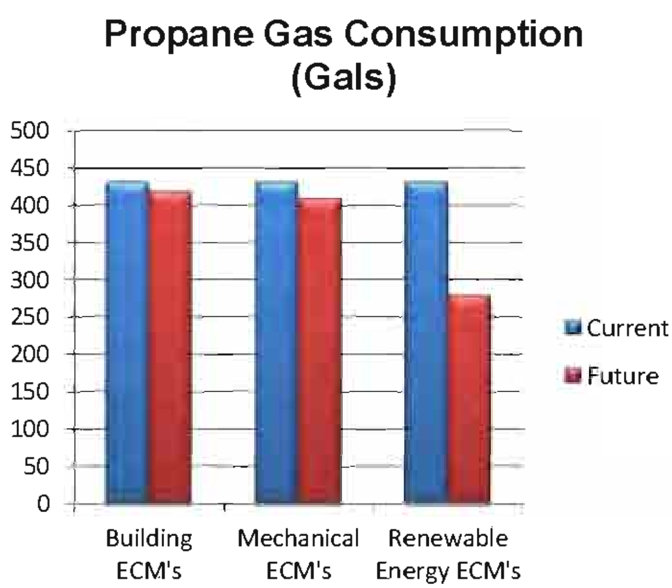
Renewable Energy Opportunities

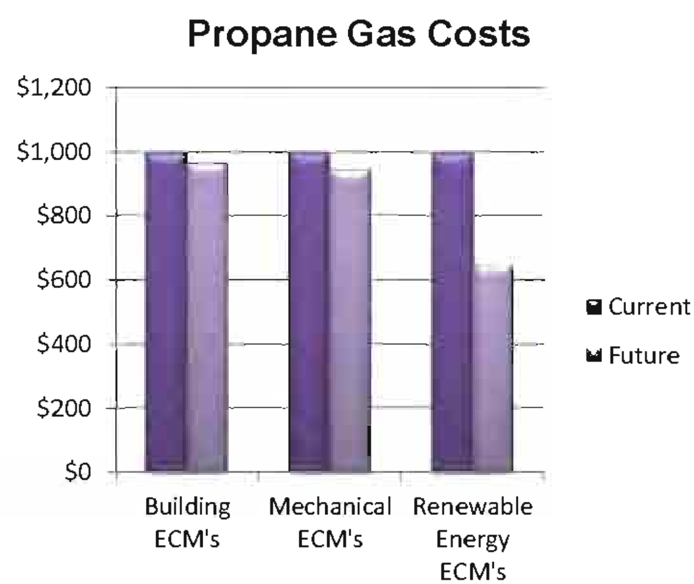
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.
R2	Install a wind energy system for electrical usage.	Reduce electrical energy costs.
R3	Install a closed loop geothermal system for heating and cooling.	Reduce gas energy costs.

Potential Energy Cost Savings

Propane Gas (Estimate)

The following propane gas energy usage and cost savings is an estimate based on the building, mechanical and renewable energy conservation measures:





Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.31	13,430	$0.30	13,027
Mechanical	$0.31	13,430	$0.29	12,758
Renewable Energy	$0.31	13,430	$0.20	8,729

Water and Sewer

The recommended plumbing ECM's will result in an electrical energy savings by limiting usage of well pump.

Electrical Systems

The installation of compact fluorescent lamps could provide about $50 per year of electrical savings.

Upgrading the exterior "barn" light fixtures to LED type would save $100 per year.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. Since the building has very little or no heat, the infrared photos do very little to detect areas of heat loss. It is recommended to do further evaluation at a later time when the heat is turned back on.

References

Existing wall U-value: 0.046 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 0.8

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #27 Barbeau Hatch

Project Name: S10-12262 #27 Barbeau Hatchery 02/15/2013
Prepared by: UPEA 10:00AM

Air System Information

Air System Name	#27 Barbeau Hatch	Number of zones	1	
Equipment Class	UNDEF	Floor Area	3192.0	ft²
Air System Type	SZCAV	Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	5.5	Tons	Load occurs at	Jul 1400	
Total coil load	66.3	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	61.2	MBH	Entering DB / WB	76.7 / 64.1	°F
Coil CFM at Jul 1400	3140	CFM	Leaving DB / WB	58.2 / 57.0	°F
Max block CFM	3140	CFM	Coil ADP	56.1	°F
Sum of peak zone CFM	3140	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.924		Resulting RH	51	%
ft²/Ton	578.1		Design supply temp.	58.0	°F
BTU/(hr-ft²)	20.8		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	13.26	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	73.7	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	3140	CFM	BTU/(hr-ft²)	23.1	
Max coil CFM	3140	CFM	Ent. DB / Lvg DB	62.5 / 84.8	°F
Water flow @ 20.0 °F drop	7.37	gpm			

Supply Fan Sizing Data

Actual max CFM	3140	CFM	Fan motor BHP	1.72	BHP
Standard CFM	3059	CFM	Fan motor kW	1.36	kW
Actual max CFM/ft²	0.98	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	250	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	28.3

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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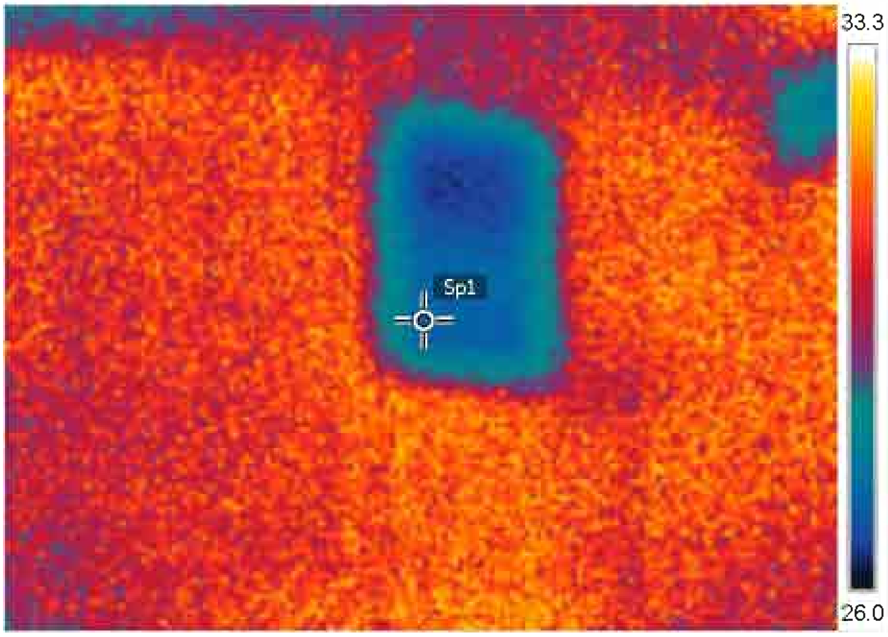

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Energy Audit
Building Trades Rental
2293 Shunk Road
Sault Ste. Marie, MI

February 2013

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Attachments:

Summary

The Building Trades Rental House is a 1,200 square foot, 1 story ranch style house on a crawl space. The building was constructed in 1994 and is located at 2293 Shunk Road, Sault Ste. Marie, MI. The home is currently vacant.

Existing Building Envelope Profile

Wall Construction: Exterior walls are wood frame with vertical T-111 exterior siding and interior drywall. The house has a crawl space with block foundation walls (un-insulated).

Roof Construction: Roof construction is wood trusses, wood sheathing, and shingle roofing.

Floor Construction: The floor is wood framed, wood sheathing, and tile floors.

Window and Door Construction: Exterior windows and doors are residential grade.

Existing Mechanical Systems Profile

HVAC

The heating system is served by a single natural gas fired atmospheric boiler, Burnham, model P-203A, and baseboard radiation. The boiler is in poor condition and is outdated. The heating piping is not insulated and is distributed to baseboard zones in the crawl space. The heating piping is copper.

Plumbing

The domestic hot water heating system is served by a single natural gas fired storage tank type water heater, Bradford White Defender model, 40 gallon capacity. The water heater is in excellent condition. The domestic water piping is copper and is not insulated.

The plumbing fixtures are floor mount tank type water closets, countertop type lavatories with single manual faucets and stainless steel kitchen sink with single handle manual faucet.

The exhaust fan for the bathroom is controlled by a separate fan switch.

Temperature Control Systems

The building is controlled by a single wall mounted non-programmable thermostat.

Existing Electrical Systems Profile

Lighting Systems: The building has very few light fixtures. Most lamps were fluorescent. The bedrooms have ceiling fans with light kits.

Power Systems: Electrical service is 100-amp, 240/120-volt, single-phase from Cloverland Electric (formerly Edison Sault).

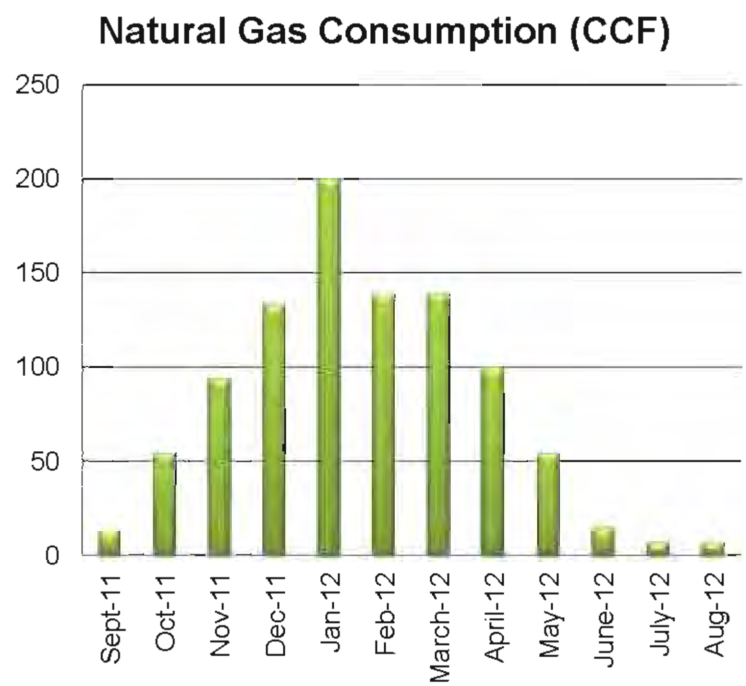
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through Jan 2012 billing period (Feb thru Aug 2012 bills not available, estimates for usage and costs based on type of building and use group for Feb thru Aug):

Month	Cost	CCF
Sept-11	$14	13
Oct-11	$68	54
Nov-11	$89	94
Dec-11	$121	133
Jan-12	$190	200
Feb-12	$136	138
March-12	$137	139
April-12	$98	100
May-12	$50	54
June-12	$14	15
July-12	$6	7
Aug-12	$6	7
Totals	$929	954

Natural Gas ECI:	$0.77	per sq ft/yr
Natural Gas ECU:	79,500	BTU/sq ft
Average Cost per CCF:	$0.97	$/CCF

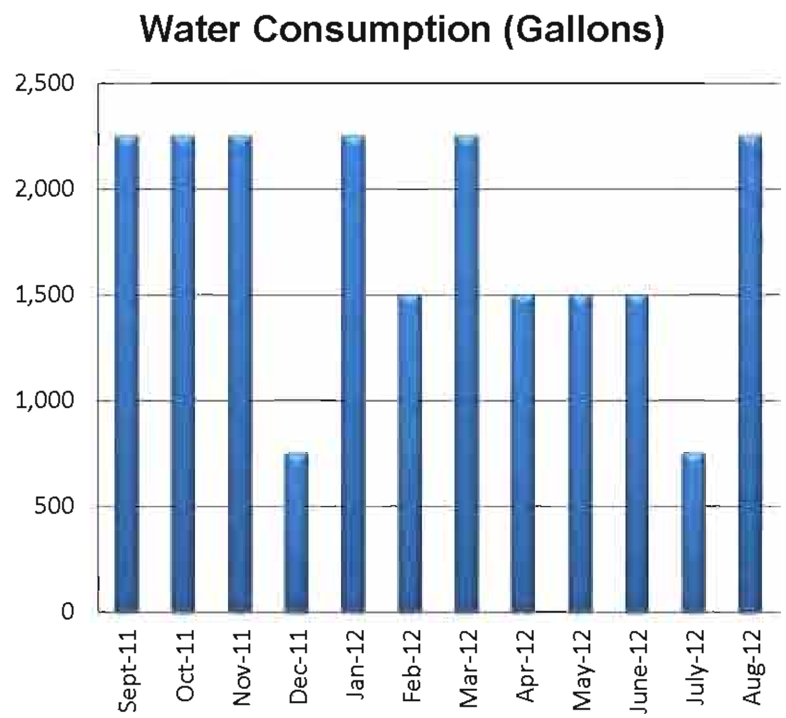


Water Usage

The building is unoccupied, the following graphical data represents the monthly water usage and costs for the month of Dec 2011, the remaining months are estimates based on the type of building, size of building, number and type of plumbing fixtures and use group:

Month	Cost	Gallons
Sept-11	$19	2,250
Oct-11	$19	2,250
Nov-11	$19	2,250
Dec-11	$7	750
Jan-12	$19	2,250
Feb-12	$13	1,500
Mar-12	$19	2,250
Apr-12	$13	1,500
May-12	$13	1,500
June-12	$13	1,500
July-12	$7	750
Aug-12	$19	2,250
Totals	$180	21,000

Cost per sq ft:	$0.15	per sq ft/yr
Average Usage per Fixture:	7,000	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon

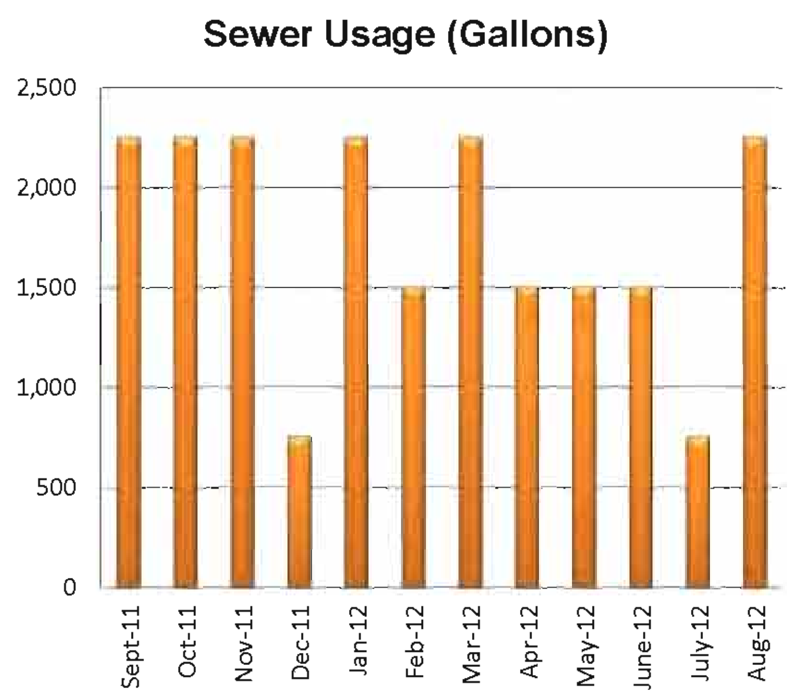


Sewer Usage

The building is unoccupied, the following graphical data represents the monthly sewer usage and costs for the month of Dec 2011, the remaining months are estimates based on the type of building, size of building, number and type of plumbing fixtures and use group:

Month	Cost	Gallons
Sept-11	$22	2,250
Oct-11	$22	2,250
Nov-11	$22	2,250
Dec-11	$9	750
Jan-12	$22	2,250
Feb-12	$16	1,500
Mar-12	$22	2,250
Apr-12	$16	1,500
May-12	$16	1,500
June-12	$16	1,500
July-12	$9	750
Aug-12	$22	2,250
Totals	$214	21,000

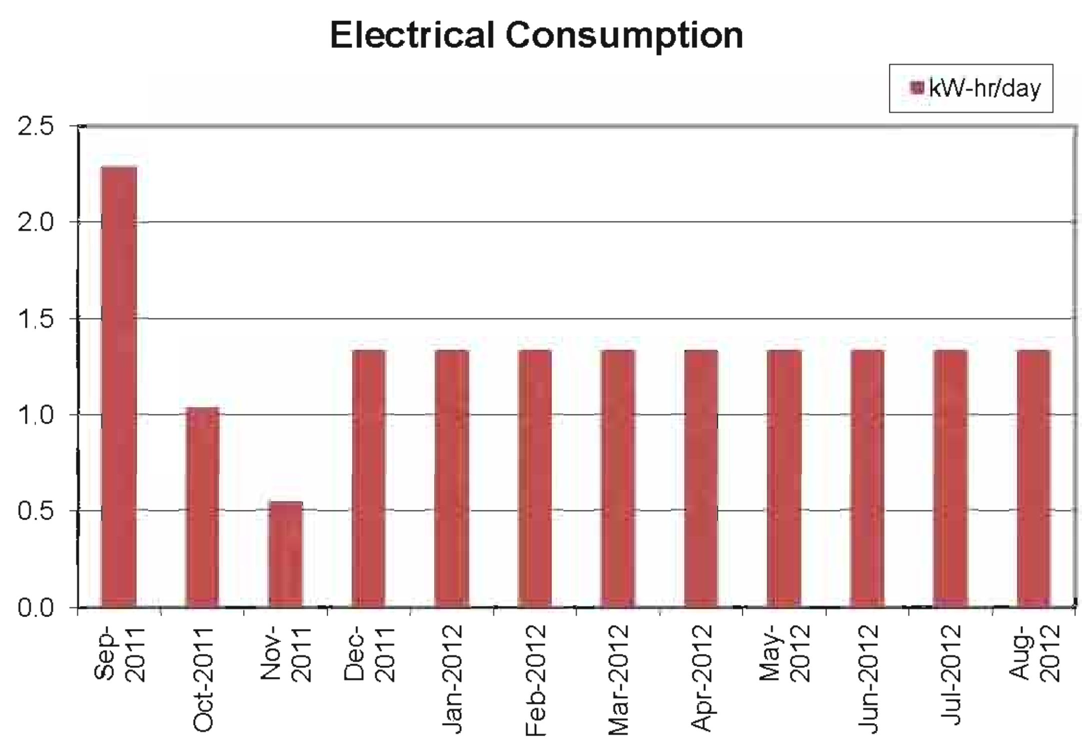
Cost per sq ft:	$0.18	per sq ft/yr
Average Usage per	7,000	gallons/fix
Average Usage Cost per Fixture:	$0.010	$/gallon



Electrical Usage: The following is a summary of electric use for the past year:
(bills were only provided for September to November of 2011 – the other values are estimate). Since the building is currently vacant; these values do not reflect normal expected usage amounts.

		Period	Cost	Usage		
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**	
28	2.3	Sep-2011	$19	64	$0.68	
27	1.0	Oct-2011	$6	28	$0.22	
31	0.5	Nov-2011	$5	17	$0.16	
30	1.3	Dec-2011	$10	40	$0.33	
30	1.3	Jan-2012	$10	40	$0.33	
30	1.3	Feb-2012	$10	40	$0.33	
30	1.3	Mar-2012	$10	40	$0.33	
30	1.3	Apr-2012	$10	40	$0.33	
30	1.3	May-2012	$10	40	$0.33	
30	1.3	Jun-2012	$10	40	$0.33	
30	1.3	Jul-2012	$10	40	$0.33	
30	1.3	Aug-2012	$10	40	$0.33	
average:	1.3	Totals	$120	469	$0.34	average
		Square Footage		1200		
		kW-hr per sq ft per year =		0.4		

Electrical ECI:	$0.10	per sq ft/yr
Electrical ECU:	1,344	BTU/sq ft
Average Cost per kWh:	$0.26	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	1,200	sq ft
Annual Energy Costs	$1,049	dollars
Total Energy Cost Index (ECI):	$0.87	per sq ft/yr
Total Energy Utilization Index (EUI):	80,844	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	11.41%	percentage
Percentage of Annual Energy Costs for Gas	88.59%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace windows and doors with high efficiency type windows and doors.	Reduce infiltration, reduce gas usage.
B2	Replace window and door seals and weather stripping.	Reduce infiltration, reduce heat loss through windows and doors.
B3	Add insulation above ceiling space.	Reduce heat loss through ceiling.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace boiler with sealed combustion, condensing, high efficiency type boiler.	Reduce gas usage.
M2	Insulate heating piping in crawl space.	Reduce heat loss through piping, improve boiler efficiency.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostat.	Reduce energy usage during unoccupied hours.

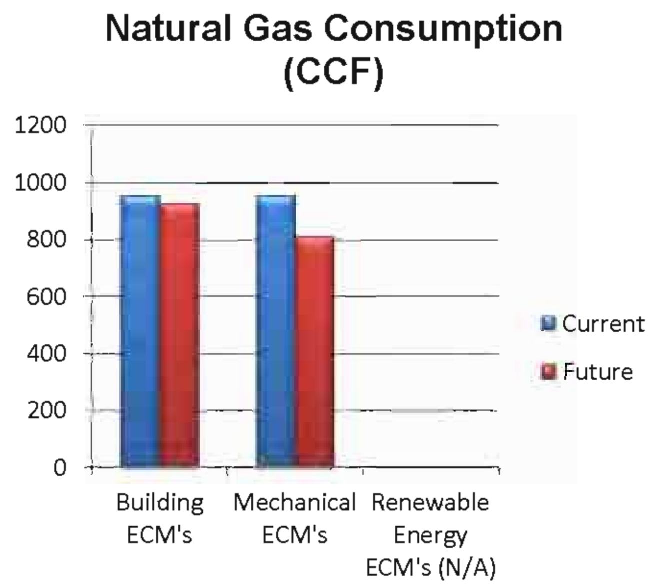
Plumbing

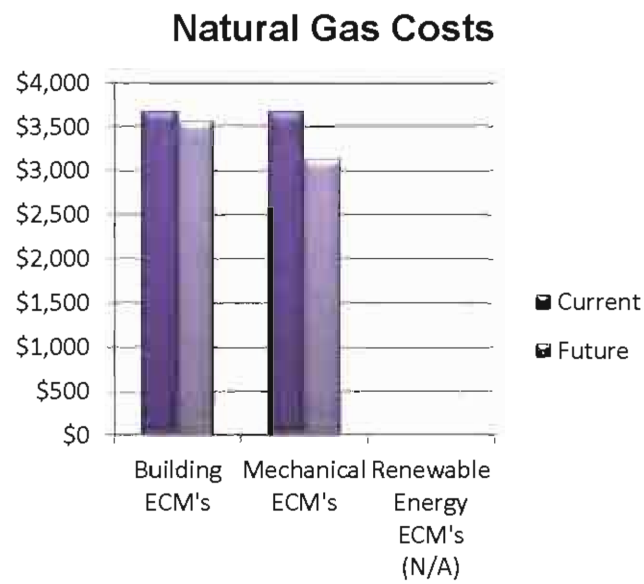
ECM #	Energy Conservation Measure	Benefit
P1	Install sensor or timed operators on faucets and water closets.	Reduce water usage.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical and temperature control energy conservation measures and the estimated annual gas usage:

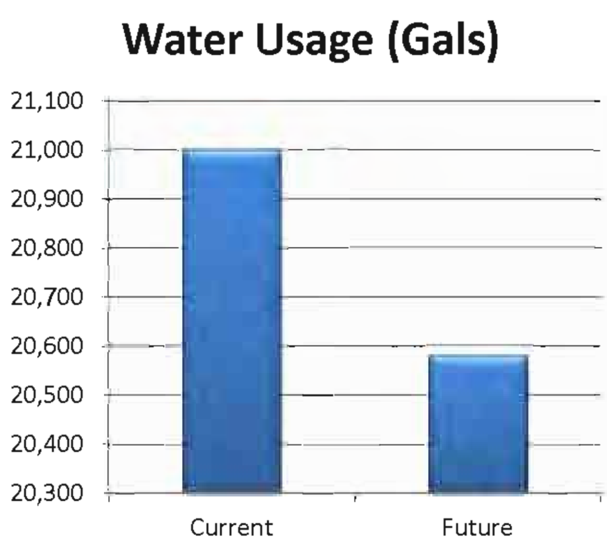




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$3.06	79,500	$2.97	77,115
Mechanical	$3.06	79,500	$2.60	67,575
Renewable Energy (N/A)	$0.00	0	$0.00	0

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

No recommendations at this time.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected, except for the un-insulated crawl space. It is recommended that rigid insulation be at least installed on the inside of the foundation walls all the way up to bottom of the floor sheathing. Insulation would be beneficial on exterior of foundation walls, but would also need a treatment (EIFS or other) to protect from damage and sunlight.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found. The back exterior door had a visible gap between bottom sweep and threshold and should be addressed.

References

Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 0.99

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #33 Building Trades

Project Name: S10-12262 #33 Building Trades — 02/15/2013
Prepared by: UPEA — 11:04AM

Air System Information

Air System Name	#33 Building Trades		Number of zones	1	
Equipment Class	UNDEF		Floor Area	1225.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates		Calculation Months	Jan to Dec
Space CFM	Individual peak space loads		Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	3.0	Tons	Load occurs at	Jul 1600	
Total coil load	35.8	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	33.8	MBH	Entering DB / WB	76.6 / 63.7	°F
Coil CFM at Jul 1600	1717	CFM	Leaving DB / WB	57.9 / 56.7	°F
Max block CFM	1717	CFM	Coil ADP	55.8	°F
Sum of peak zone CFM	1717	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.944		Resulting RH	50	%
ft²/Ton	410.8		Design supply temp.	58.0	°F
BTU/(hr-ft²)	29.2		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	7.16	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	44.1	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	1717	CFM	BTU/(hr-ft²)	36.0	
Max coil CFM	1717	CFM	Ent. DB / Lvg DB	64.4 / 88.9	°F
Water flow @ 20.0 °F drop	4.42	gpm			

Supply Fan Sizing Data

Actual max CFM	1717	CFM	Fan motor BHP	0.94	BHP
Standard CFM	1673	CFM	Fan motor kW	0.75	kW
Actual max CFM/ft²	1.40	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	96	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	29.7

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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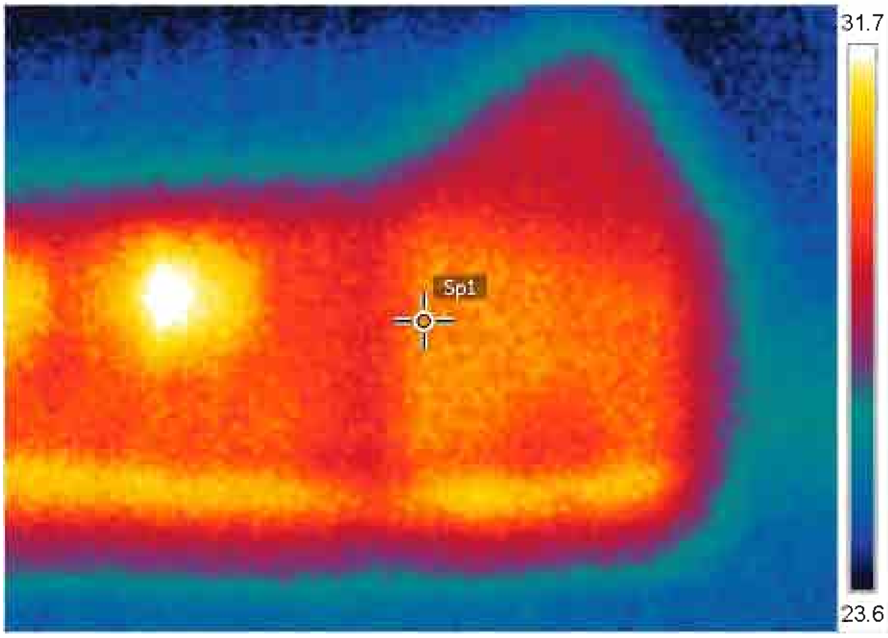

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Energy Audit
Child Advocacy Center
2163 Migisa Ct.
Sault Ste. Marie, MI

February 2013

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Attachments:

Thermal Images

Floor Plans

Summary

The Child Advocacy Center is a 2-story wood frame structure on a crawl space. This facility consists of approximately 2464 square feet of space, and was constructed in 1984. The structure has office spaces, meeting spaces, kitchen, bathrooms, and child care areas.

Existing Building Envelope Profile

Wall Construction: Exterior walls are wood framed with vinyl exterior siding. The building has a concrete block foundation and a crawl space.

Roof Construction: The roof is "stick-framed" wood rafters with wood roof sheathing and shingle roofing. Excessive ice damming was observed.

Floor Construction: Floors are wood framed with wood decking. Floor coverings are a mixture of carpet and tile.

Window and Door Construction: Exterior windows and doors are residential grade. Plastic weatherizing was placed over windows. Moisture was visible on several windows.

Existing Mechanical Systems Profile

HVAC

The heating system is served by a natural gas fired atmospheric boiler, Hydrotherm model, located in the 2nd floor mechanical room. The boiler is in poor condition. Open flames from the burner section of the boiler are very dangerous and should be addressed immediately. The size of mechanical does not allow for proper combustion air for the boiler, boiler runs very inefficiently. The heating piping is copper and is not insulated. Boiler is installed on combustible floor, also a very dangerous situation. The hot water system serves perimeter baseboard radiation.

Plumbing

The domestic hot water system is served by a single natural gas fired storage tank type water heater, Ruud, model P150, 50 gallon capacity. The water heater is in good condition. The water piping is copper and is not insulated.

The average hot water delivery time to the plumbing fixtures is 10 seconds.

The plumbing fixtures are floor mounted tank type water closets and lavatories with single handle manual faucets. Low flow aerators are not installed on the faucets.

The bathroom exhaust fan is switched with the lights.

Temperature Control Systems

The thermostats are wall mounted non-programmable type.

Existing Electrical Systems Profile

Lighting Systems: Most of the existing interior lighting is incandescent lamps (100 watts) with a few old linear fluorescent fixtures and a few small compact fluorescent lights. Lighting control is via standard manual wall box switches.

Power Systems: Electric power is single-phase, 240/120-volt from Cloverland Electric (formerly Edison Sault).

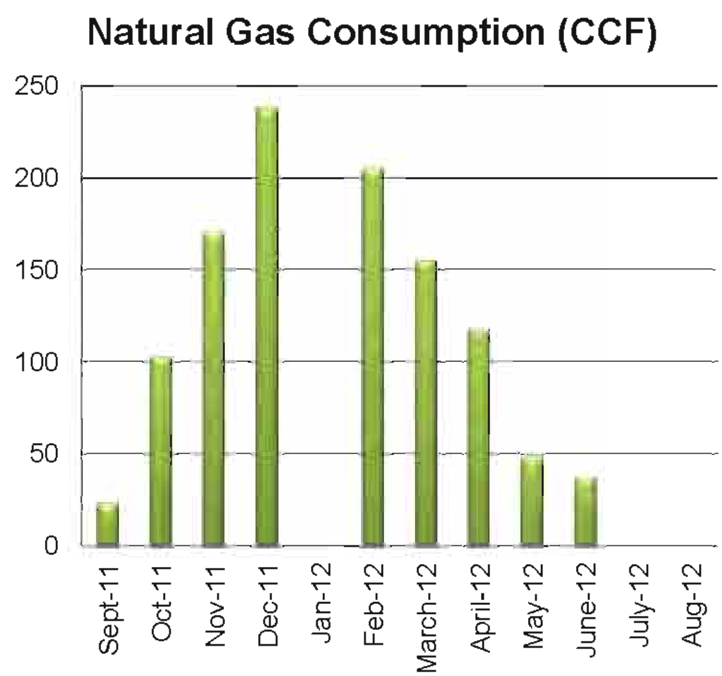
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period (Jan, July, Aug 2012 bills not available):

Month	Cost	CCF
Sept-11	$30	23
Oct-11	$121	103
Nov-11	$160	170
Dec-11	$210	238
Jan-12	$0	0
Feb-12	$170	205
March-12	$131	155
April-12	$104	118
May-12	$49	48
June-12	$49	37
July-12	$0	0
Aug-12	$0	0
Totals	$1,024	1,097

Natural Gas ECI:	$0.41	per sq ft/yr
Natural Gas ECU:	43,880	BTU/sq ft
Average Cost per CCF:	$0.93	$/CCF

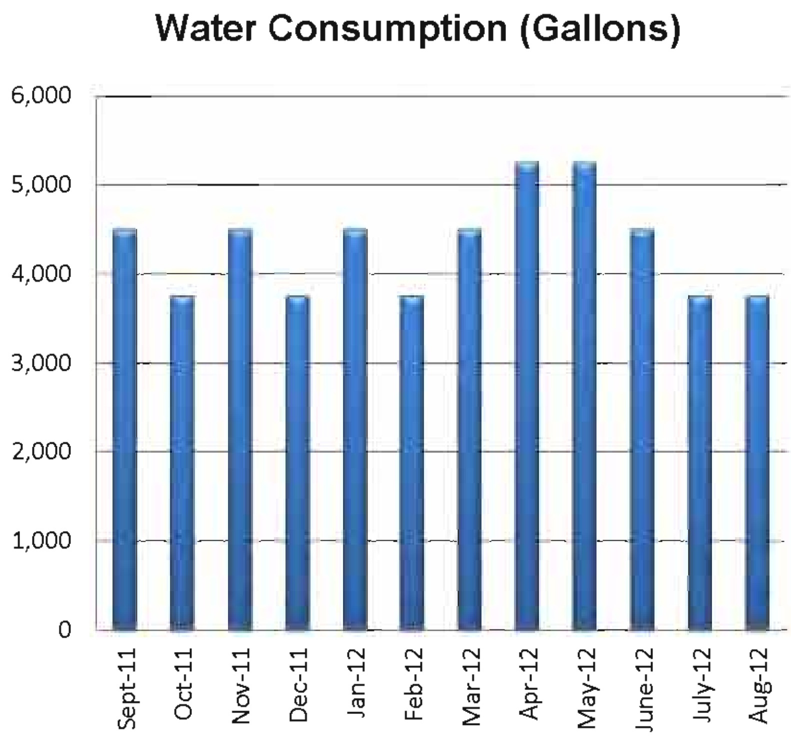


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$36	4,500
Oct-11	$31	3,750
Nov-11	$36	4,500
Dec-11	$31	3,750
Jan-12	$36	4,500
Feb-12	$31	3,750
Mar-12	$36	4,500
Apr-12	$42	5,250
May-12	$42	5,250
June-12	$36	4,500
July-12	$30	3,750
Aug-12	$30	3,750
Totals	$417	51,750

Cost per sq ft:	$0.22	per sq ft/yr
Average Usage per Fixture:	8,625	gallons/fix
Average Usage Cost per Fixture:	$0.008	$/gallon

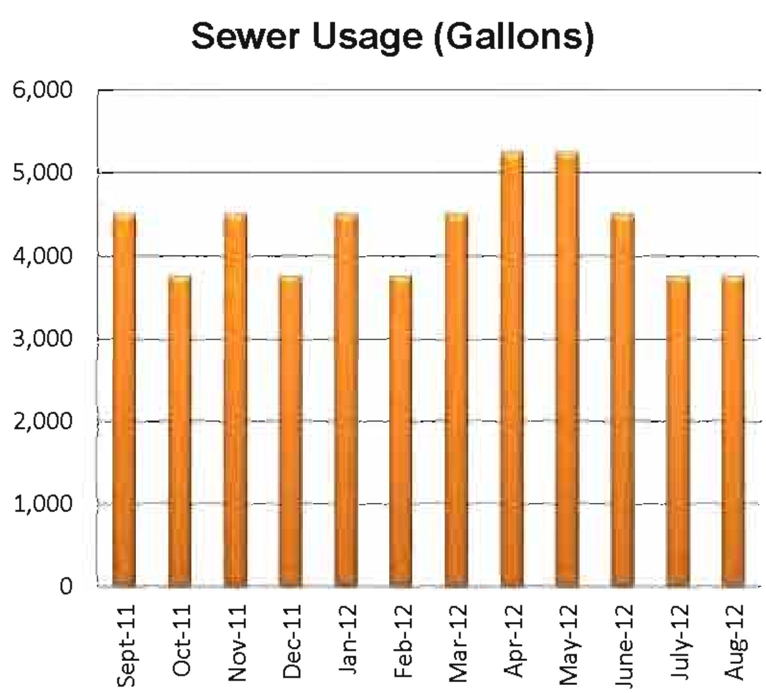


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$40	4,500
Oct-11	$34	3,750
Nov-11	$40	4,500
Dec-11	$34	3,750
Jan-12	$40	4,500
Feb-12	$34	3,750
Mar-12	$40	4,500
Apr-12	$46	5,250
May-12	$46	5,250
June-12	$42	4,500
July-12	$35	3,750
Aug-12	$35	3,750
Totals	$466	51,750

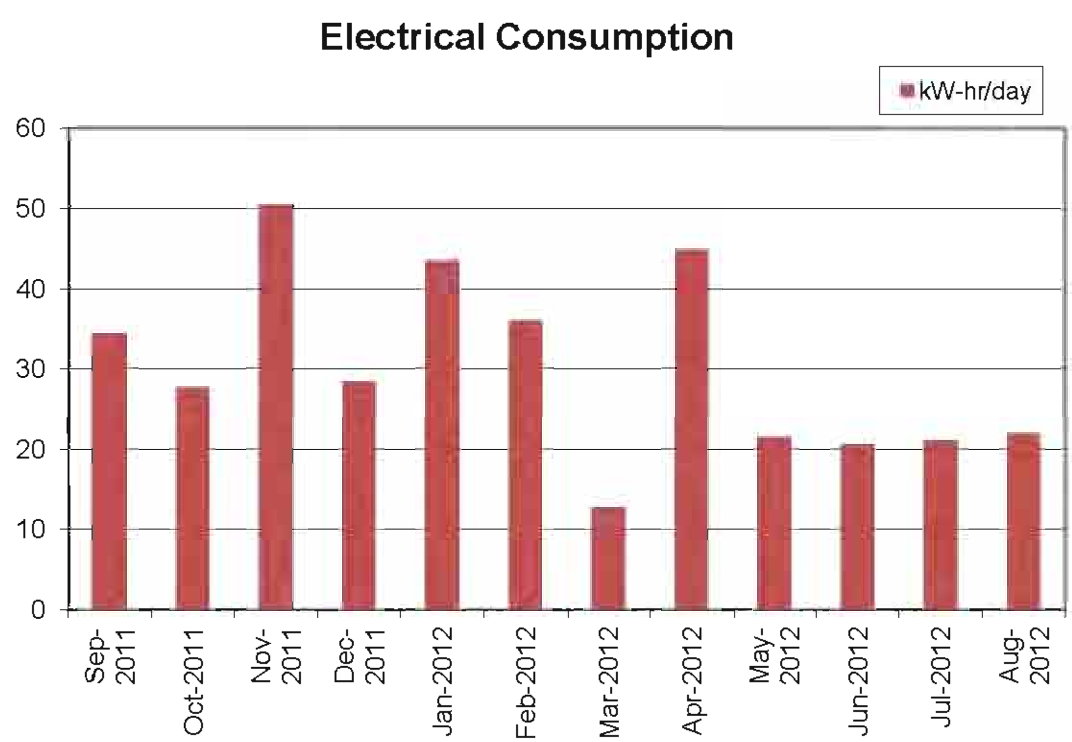
Cost per sq ft:	$0.25	per sq ft/yr
Average Usage per	8,625	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon



Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Month (Period)	Cost (Cost)	kWh (Usage)	cost/day	
30	35	Sep-2011	$103	1,035	S3	
29	28	Oct-2011	$81	802	S3	
30	50	Nov-2011	$147	1,514	S5	
34	28	Dec-2011	$99	968	S3	
31	43	Jan-2012	$137	1,347	S4	
28	36	Feb-2012	$103	1,010	S4	
31	13	Mar-2012	$42	392	S1	
35	45	Apr-2012	$159	1,569	S5	
30	21	May-2012	$67	642	S2	
30	21	Jun-2012	$64	616	S2	
33	21	Jul-2012	$71	694	S2	
29	22	Aug-2012	$64	634	S2	
average:	30	Totals	$1,138	11,223	S3	average
		Square Footage		2464		
		kW-hr per sq ft per year =		4.6		

Electrical ECI:	$0.46	per sq ft/yr
Electrical ECU:	15,659	BTU/sq ft
Average Cost per kWh:	$0.10	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	2,464	sq ft
Annual Energy Costs	$2,162	dollars
Total Energy Cost Index (ECI):	$0.87	per sq ft/yr
Total Energy Utilization Index (EUI):	59,539	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	52.64%	percentage
Percentage of Annual Energy Costs for Gas	47.36%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Install new windows and doors with high efficiency type windows and doors.	Reduce infiltration, reduce gas usage.
B2	Add insulation to attic space.	Reduce heat loss through ceiling, reduce ice damming, reduce gas usage.
B3	Install Energy Star rated appliances.	Reduce electrical usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace boiler with sealed combustible, condensing type, high efficiency boiler. Move boiler to non-combustible surface location.	Reduce gas usage, decrease chance of fire.
M2	Insulate all hot water piping.	Reduce heat loss through pipe, improve performance of heating system.
M3	Implement a comprehensive preventative maintenance program for all mechanical equipment.	Extend life of equipment, improve efficiency of equipment.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce energy usage during unoccupied times.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install low flow aerators.	Reduce water usage.
P2	Install sensor or timed operators on faucets and water closets.	Reduce water usage.
P3	Insulate hot water piping.	Reduce heat loss through piping, improve equipment efficiency.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace incandescent lamps with compact fluorescent type.	Reduce electrical energy costs
E2	Replace older linear fluorescent lights with newer energy efficient T8 fixtures	Reduce electrical energy costs

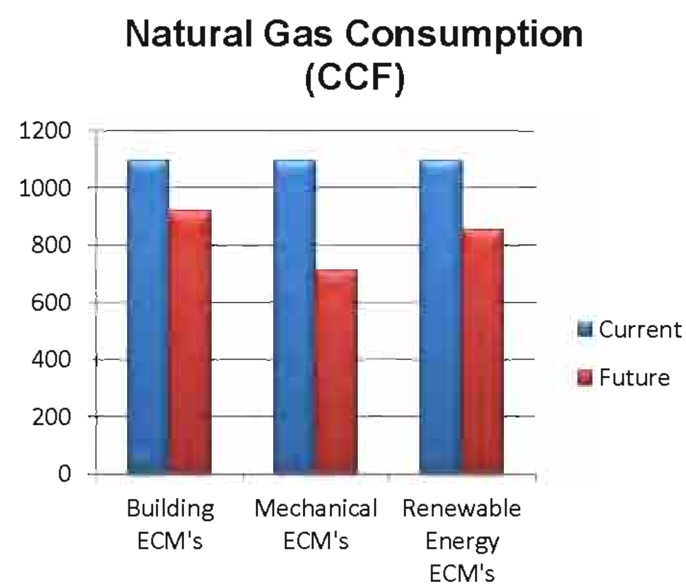
Renewable Energy Opportunities

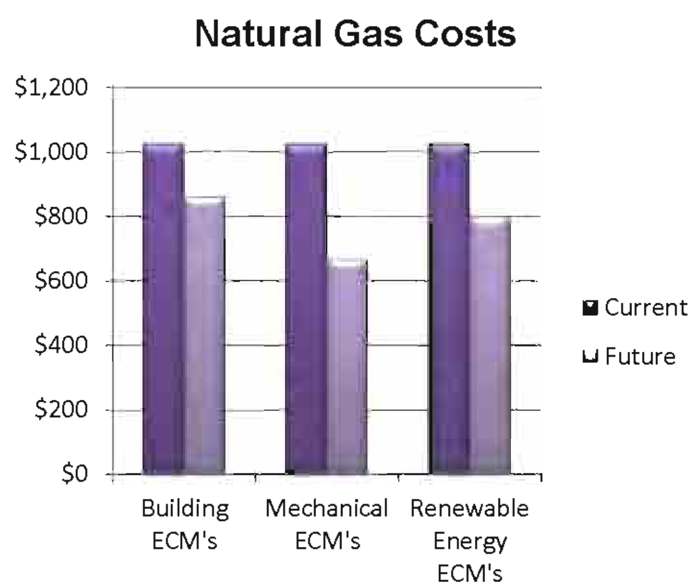
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:

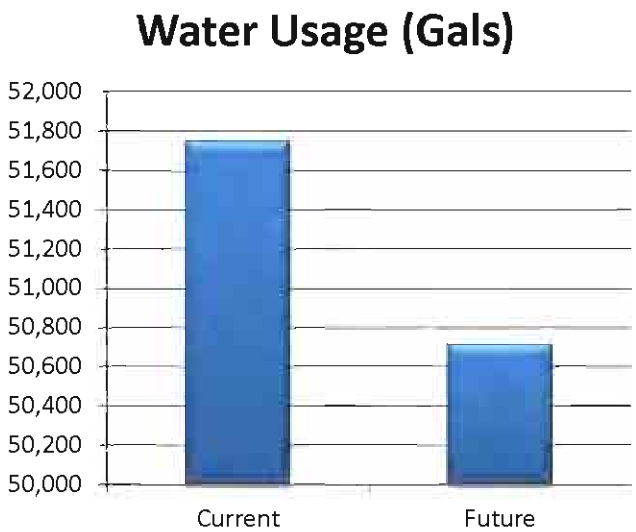




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.41	43,880	$0.34	36,859
Mechanical	$0.41	43,880	$0.27	28,522
Renewable Energy	$0.41	43,880	$0.32	34,226

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

Replacement of incandescent lamps with compact fluorescent type will provide about $150 in annual electrical energy savings.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.06 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 1.0

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #29 Child Adv Cntr

Project Name: S10-12262 #29 Child Adv Cntr 02/15/2013
Prepared by: UPEA 10:52AM

Air System Information

Air System Name	#29 Child Adv Cntr		Number of zones	1	
Equipment Class	UNDEF		Floor Area	2500.0	ft^2
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	4.5	Tons	Load occurs at	Aug 1600	
Total coil load	54.4	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	50.1	MBH	Entering DB / WB	76.6 / 63.6	°F
Coil CFM at Aug 1600	2456	CFM	Leaving DB / WB	57.2 / 56.0	°F
Max block CFM	2456	CFM	Coil ADP	55.1	°F
Sum of peak zone CFM	2456	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.921		Resulting RH	49	%
ft^2/Ton	551.6		Design supply temp.	58.0	°F
BTU/(hr-ft^2)	21.8		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	10.88	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	52.9	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	2456	CFM	BTU/(hr-ft^2)	21.1	
Max coil CFM	2456	CFM	Ent. DB / Lvg DB	62.8 / 83.3	°F
Water flow @ 20.0 °F drop	5.29	gpm			

Supply Fan Sizing Data

Actual max CFM	2456	CFM	Fan motor BHP	1.35	BHP
Standard CFM	2392	CFM	Fan motor kW	1.07	kW
Actual max CFM/ft^2	0.98	CFM/ft^2	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	195	CFM	CFM/person	21.50	CFM/person
CFM/ft^2	0.08	CFM/ft^2			

Measurements	°F
Sp1	27.2

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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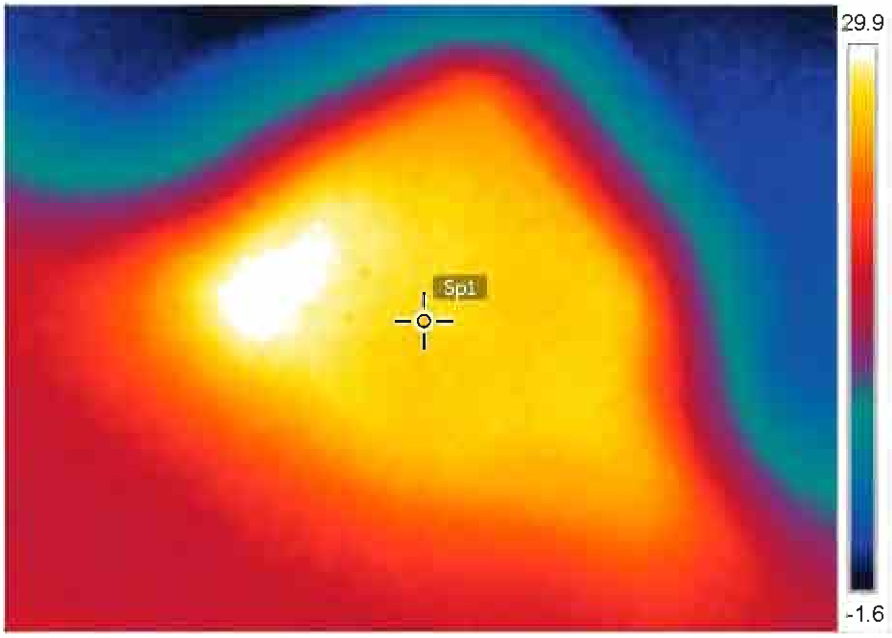

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Energy Audit
Child Care Center
2218 Shunk Road
Sault Ste. Marie, MI

February 2013

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Summary

This 1 story building located at 2218 Shunk Road in Sault Ste. Marie, Michigan, is approximately 7,190 square feet in size. This facility was built in 1983 and has been renovated for the Child Care Center. The building is attached to Tribal Social Services.

Existing Building Envelope Profile

Wall Construction: Exterior walls are wood framed with drywall interior.

Roof Construction: The roof is sloped, wood framed, with wood sheathing and traditional shingles.

Floor Construction: Floors are concrete slab on grade. Floor coverings are a mixture of carpet and tile.

Window and Door Construction: Exterior doors and windows are commercial type in good condition.

Existing Mechanical Systems Profile

HVAC

The heating system is comprised of six natural gas fired forced air furnaces. Two of the furnaces that serve the office areas and infant rooms are newer models, Byrant Plus 90 with air conditioning and outdoor air connected to the return air ductwork. These units have air distribution above the ceiling. The remaining furnaces are older units, Carrier models without air conditioning or outdoor air intakes. These units have supply air distribution below the slab, terminal air devices are floor grilles and central return air grilles located high on the interior walls. The floor grilles are in poor condition. The ductwork is not insulated. Several of the grille locations are not located on outside walls.

Plumbing

The domestic hot water system is served by two natural gas storage type water heaters in the same mechanical room. One unit is an AO Smith ProMax, model FCG50248, 50 gallon capacity and is in good condition. The other unit is a State, Model SBT75, 75 gallon capacity and also in good condition. Both units have hot water return systems. The water piping is copper and is partially insulated.

The average hot water delivery time for the plumbing fixtures is 12 seconds.

The plumbing fixtures are tank type water closets and countertop lavatories with single and double faucets. The faucets do not have low flow aerators installed.

The exhaust fans for the bathrooms are switched with the lights.

Temperature Control Systems

The thermostats are wall mounted non-programmable dial type.

Special Systems

The building has an interior camera system.

Existing Electrical Systems Profile

Lighting Systems: The majority of interior lighting is 4' fluorescent, with 4-lamp fixtures and a few 2-lamp fixtures. Lights are primarily of the recessed lensed "troffer" type with some surface mount "wrap-around" style. Lamps and ballasts were upgraded in the past year to energy efficient T8 (32-watt lamps and instant start electronic ballasts.) Interior lighting controls are primarily manual wall switches for each space. Several of the spaces with 4-lamp fixtures have dual-level switching (alternate rows of lights, not dual-ballast). Exterior lighting consists of a few recessed incandescent "can" lights near exterior doors.

Power Systems: Electrical service is provided from Cloverland Electric (formerly Edison Sault). The main service is 400-amp, with (2) 100-amp subpanels. Power is 208Y/120-volt, 3-phase, 4-wire.

Special Systems: The building has an operational fire alarm system, maintained by Alert Electronics.

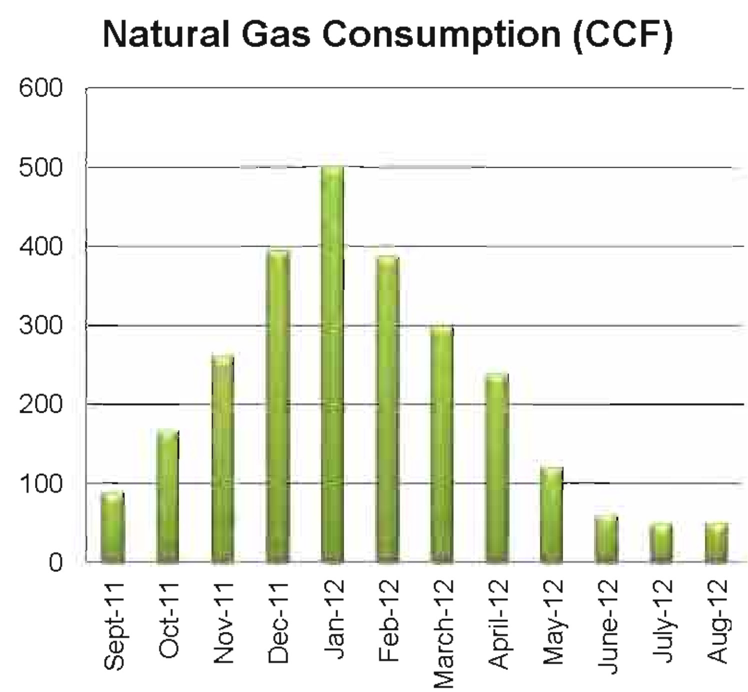
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$58	88
Oct-11	$106	168
Nov-11	$162	261
Dec-11	$241	395
Jan-12	$298	499
Feb-12	$228	387
March-12	$185	298
April-12	$146	237
May-12	$111	120
June-12	$22	59
July-12	$19	48
Aug-12	$21	50
Totals	$1,594	2,608

Natural Gas ECI:	$0.22	per sq ft/yr
Natural Gas ECU:	36,222	BTU/sq ft
Average Cost per CCF:	$0.61	$/CCF

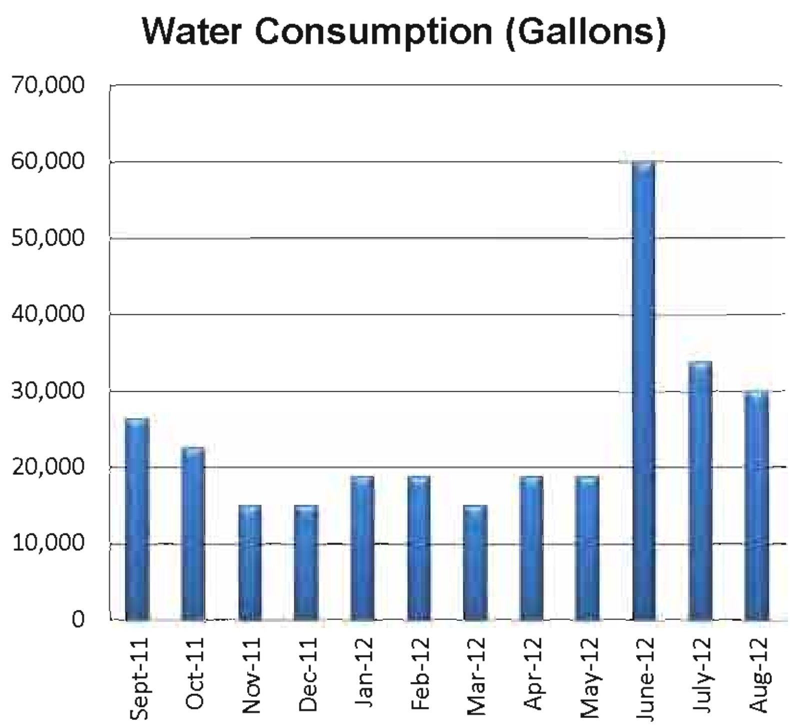


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period.

Month	Cost	Gallons
Sept-11	$213	26,250
Oct-11	$184	22,500
Nov-11	$152	15,000
Dec-11	$126	15,000
Jan-12	$154	18,750
Feb-12	$154	18,750
Mar-12	$126	15,000
Apr-12	$154	18,750
May-12	$154	18,750
June-12	$475	60,000
July-12	$269	33,750
Aug-12	$240	30,000
Totals	$2,401	292,500

Cost per sq ft:	$0.33	per sq ft/yr
Average Usage per Fixture:	29,250	gallons/fix
Average Usage Cost per Fixture:	$0.008	$/gallon

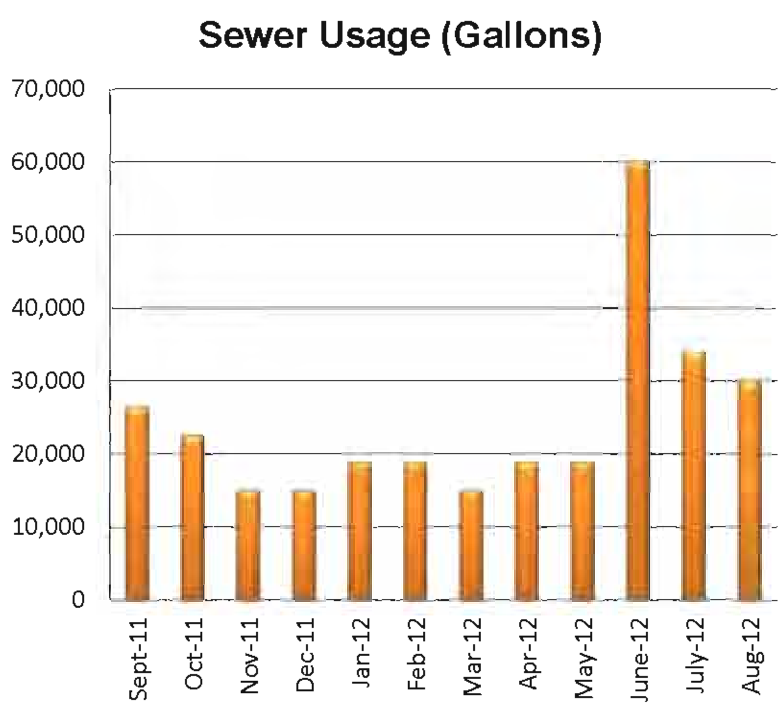


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period.

Month	Cost	Gallons
Sept-11	$227	26,250
Oct-11	$196	22,500
Nov-11	$108	15,000
Dec-11	$134	15,000
Jan-12	$165	18,750
Feb-12	$165	18,750
Mar-12	$134	15,000
Apr-12	$165	18,750
May-12	$165	18,750
June-12	$509	60,000
July-12	$302	33,750
Aug-12	$269	30,000
Totals	$2,539	292,500

Cost per sq ft:	$0.35	per sq ft/yr
Average Usage per	29,250	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon

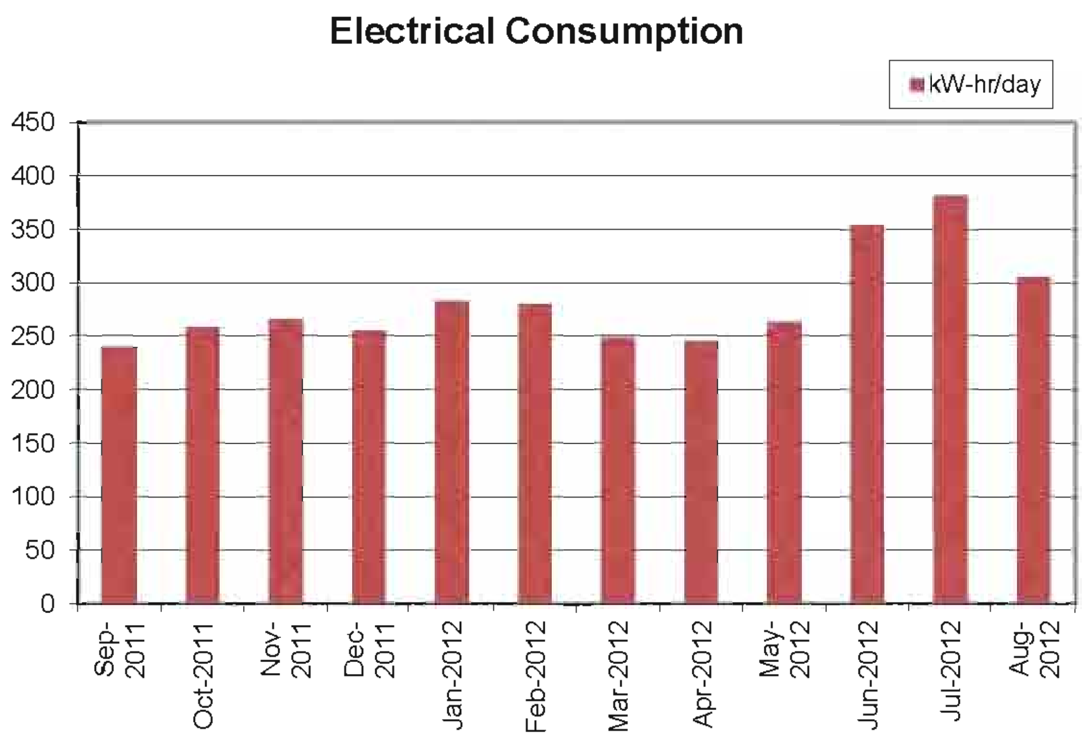


Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day	
29	240	Sep-2011	$735	6,960	$25	
28	259	Oct-2011	$795	7,240	$28	
30	265	Nov-2011	$852	7,960	$28	
34	255	Dec-2011	$967	8,680	$28	
29	283	Jan-2012	$914	8,200	$32	
32	280	Feb-2012	$998	8,960	$31	
28	249	Mar-2012	$777	6,960	$28	
30	245	Apr-2012	$821	7,360	$27	
33	263	May-2012	$967	8,680	$29	
30	353	Jun-2012	$1,166	10,600	$39	
33	382	Jul-2012	$1,384	12,600	$42	
29	305	Aug-2012	$949	8,840	$33	
average:	282	Totals	$11,323	103,040	$31	average

Square Footage	7190
kW-hr per sq ft per year =	14.3

Electrical ECI:	$1.57	per sq ft/yr
Electrical ECU:	49,270	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	7,190	sq ft
Annual Energy Costs	$12,916	dollars
Total Energy Cost Index (ECI):	$1.80	per sq ft/yr
Total Energy Utilization Index (EUI):	85,492	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	87.66%	percentage
Percentage of Annual Energy Costs for Gas	12.34%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Repair or replace door and window weather stripping and seals.	Reduce infiltration.
B2	Add insulation to attic space, seal energy heals with insulation.	Reduce heat loss through ceiling to attic space.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace older furnaces with high efficiency condensing type furnaces.	Reduce gas usage and utility costs.
M2	Install supply air grilles near outside walls.	Reduce heat loss through exterior walls due to natural convection.
M3	Implement a comprehensive maintenance program to include monthly and annual maintenance to equipment, such as filter changes, in accordance with manufacturer's recommendations.	Extend life of equipment, improve efficiency of equipment.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce gas usage during unoccupied hours of operation, greater space temperature control.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install low flow aerators on faucets.	Reduce water usage.
P2	Insulate all of the domestic hot water piping.	Reduce heat losses through pipe.
P3	Install sensor operated or push button activated faucets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install low ballast factor program start ballasts.	Extend life of bulb..
E2	Replace exterior lights with LED type fixtures	Reduce electrical energy costs.
E3	Install motion sensors to automatically turn off lights in interior spaces.	Reduce electrical energy costs.

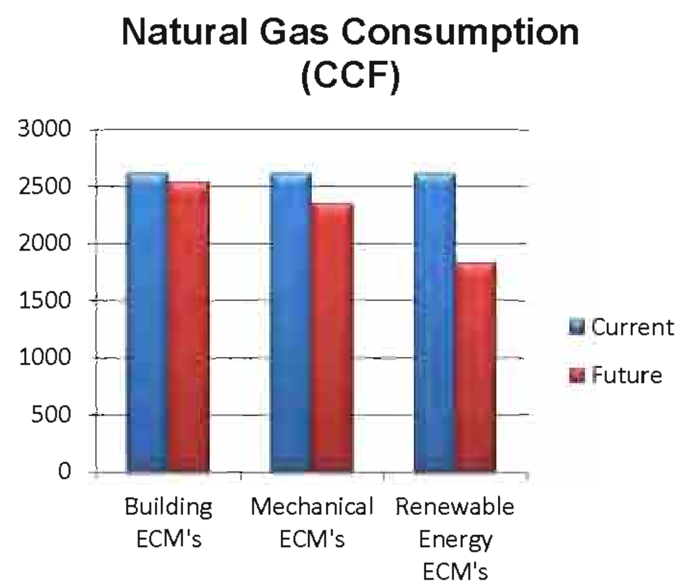
Renewable Energy Opportunities

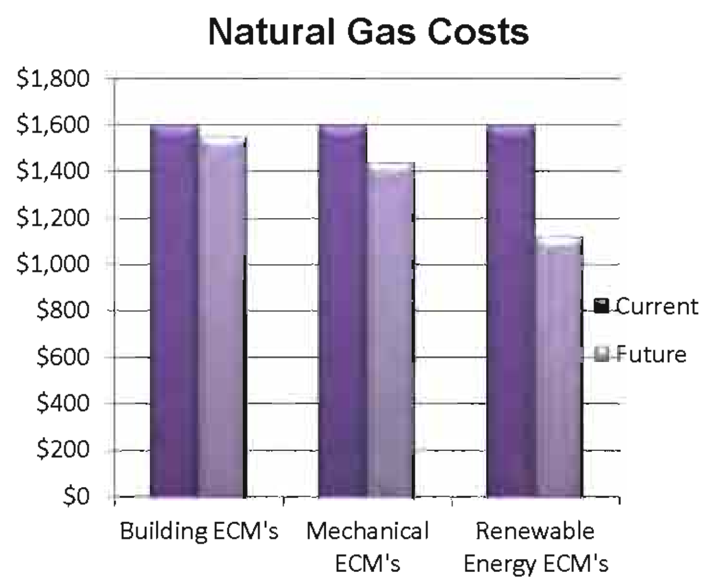
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:

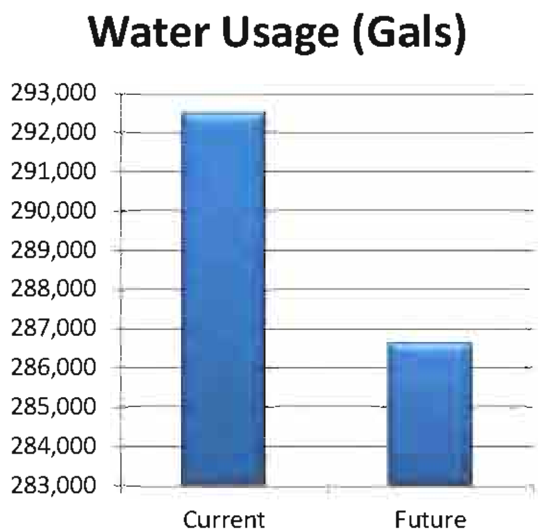




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.22	36,222	$0.21	35,136
Mechanical	$0.22	36,222	$0.20	32,600
Renewable Energy	$0.22	36,222	$0.15	25,356

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

The installation of low ballast factor fluorescent ballasts and 28-watt premium T8 lamps could provide about $500 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $1000 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $400 per year.

The installation of approximately 5kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $1,000.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected.

Exterior windows and doors have typical heat loss, particularly areas with double doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value: 0.072 Btu/hr/sq ft/deg F
Existing roof U-value: 0.066 Btu/hr/sq ft/deg F
Existing window U-value: 0.59 Btu/hr/sq ft/deg F
Existing ACH: 0.70

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #15 Child Care

Project Name. S10-12262 #15 Child Care — 02/15/2013
Prepared by. UPEA — 08.54AM

Air System Information

Air System Name	#15 Child Care	Number of zones	1
Equipment Class	UNDEF	Floor Area	7225.0 ft²
Air System Type	SZCAV	Location	Sault Ste Marie, Michigan

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	13.8	Tons	Load occurs at	Jul 1500	
Total coil load	165.7	MBH	OA DB / WB	83.0 / 69.0	°F
Sensible coil load	154.2	MBH	Entering DB / WB	76.8 / 64.1	°F
Coil CFM at Jul 1500	7888	CFM	Leaving DB / WB	58.3 / 57.1	°F
Max block CFM	7888	CFM	Coil ADP	56.2	°F
Sum of peak zone CFM	7888	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.931		Resulting RH	51	%
ft²/Ton	523.3		Design supply temp.	58.0	°F
BTU/(hr-ft²)	22.9		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	33.15	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	176.0	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	7888	CFM	BTU/(hr-ft²)	24.4	
Max coil CFM	7888	CFM	Ent. DB / Lvg DB	63.1 / 84.3	°F
Water flow @ 20.0 °F drop	17.61	gpm			

Supply Fan Sizing Data

Actual max CFM	7888	CFM	Fan motor BHP	4.32	BHP
Standard CFM	7684	CFM	Fan motor kW	3.43	kW
Actual max CFM/ft²	1.09	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	565	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	50.8

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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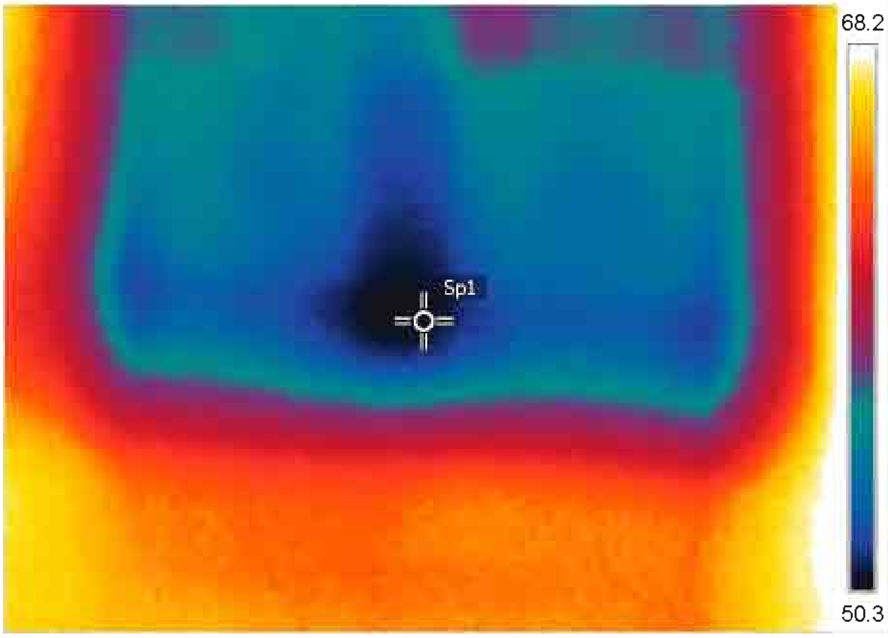

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Energy Audit
Chippewa Cleaning Service
916 Ashmun Street
Sault Ste. Marie, MI

February 2013

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Summary

The Chippewa Service building located at 916 Ashmun Street is a 2 story building with a basement. This facility was built in 1955 and consists of approximately 11,246 square feet. The space currently houses Facility management equipment and supplies including vehicles, supplies, offices etc. The upper level is used for storage.

Existing Building Envelope Profile

Wall Construction: Most exterior walls are masonry block construction. The front side also has brick veneer.

Roof Construction: The roof framing is metal bar joist with corrugated metal deck and membrane above.

Floor Construction: Floors are concrete construction, with carpet and tile in the office areas. The shop space is unpainted concrete.

Window and Door Construction: Exterior windows and doors in the office area are typical commercial aluminum frame and insulated glass and appear to be in good condition. The shop area has (2) large overhead doors in good condition. There are (2) hollow metal frame and steel commercial personnel doors also. The one on road side near shop is somewhat rusty. Several insulation panels are missing on the overheads doors and visible gaps were observed.

The basement is very damp, with areas of standing water. Water damage was observed at door frames, walls and floors. Basement walls are not insulated.

Existing Mechanical Systems Profile

HVAC

The office area is heated by hot water baseboard radiation served by a single natural gas fired hot water boiler, Weil Mclain model CGM-5-P1, installed in 1987. At the time of inspection, boiler was misfiring. Office spaces have four zones. Baseboard radiation is missing on some exterior walls. The condition of existing baseboard is fair. The hot water supply and return piping is not insulated.

The garage area is heated by two gas fired ceiling hung unit heaters. One unit heater, Reznor model, is in poor condition. The unit heater located near the overhead doors, Reznor model UDAS, is in excellent condition.

Plumbing

The domestic water heating system is comprised of a single natural gas fired hot water heater, storage tank type, Ruud model PT50, 50 gallon capacity installed in 1990. The unit is located in the basement. The domestic water piping is copper and is not insulated.

The plumbing fixtures are wall hung urinals with flush valves, tank type water closets and counter type lavatories with single handle faucets. Low flow aerators are not installed on faucets.

Temperature Control Systems

The office areas have a programmable thermostat for the front area and dial type wall mounted thermostats for the remaining areas.

The garage area has wall mounted non-programmable dial type thermostats for the unit heater control.

Existing Electrical Systems Profile

Lighting Systems: Interior lighting is energy efficient 25-watt, 48" T8 lamps and electronic ballasts. The main level office area has 4-lamp recessed lensed "troffer" lights controlled by standard wall box manual switches. The shop area has 6-lamp fluorescent "high-bay" lights controlled by wall switches. The upper & lower floors have a few screw-in self ballasted compact fluorescent lamps in porcelain bases. The stockroom, janitor closet, bathrooms, and stairs have 2-lamp fluorescent "wrap" fixtures. The exterior has a few "wall-pad" HID lights that should be replaced with LED type.

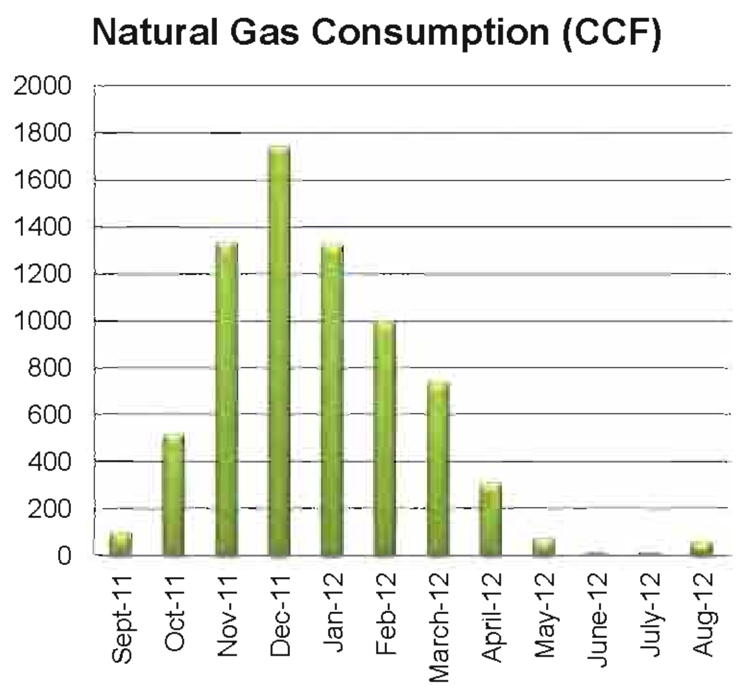
Power Systems: Electrical service is 200-amp, 240/120-volt, 1-phase, 3-wire and is provided by Cloverland Electric (formerly Edison Sault). The electric meter is located at back of building along the alley. There is (1) main panel in back of office area and (1) 100-amp sub-panel in the shop area.

Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

Month	Cost	CCF
Sept-11	$107	95
Oct-11	$473	515
Nov-11	$1,132	1,333
Dec-11	$1,411	1,741
Jan-12	$1,049	1,320
Feb-12	$801	1,001
March-12	$608	737
April-12	$268	308
May-12	$72	72
June-12	$36	14
July-12	$34	12
Aug-12	$71	58
Totals	$6,062	7,206

Natural Gas ECI:	$0.54	per sq ft/yr
Natural Gas ECU:	64,053	BTU/sq ft
Average Cost per CCF:	$0.84	$/CCF

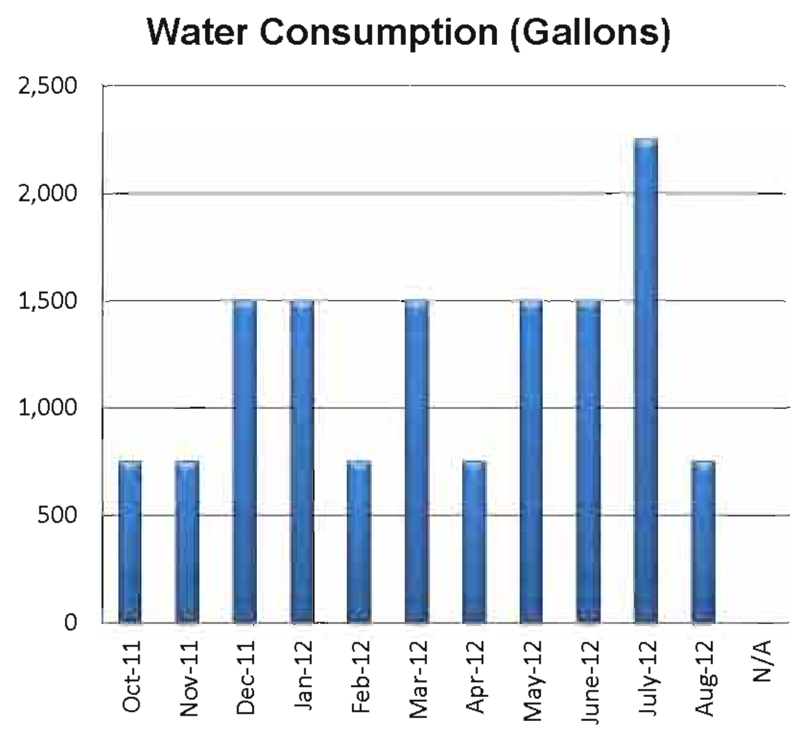


Water Usage

The following graphical data represents the monthly water usage and costs for the October 2011 through August 2012 billing period.

Month	Cost	Gallons
Oct-11	$12	750
Nov-11	$12	750
Dec-11	$18	1,500
Jan-12	$18	1,500
Feb-12	$12	750
Mar-12	$18	1,500
Apr-12	$12	750
May-12	$18	1,500
June-12	$18	1,500
July-12	$24	2,250
Aug-12	$12	750
N/A	$0	0
Totals	$174	13,500

Cost per sq ft:	$0.02	per sq ft/yr
Average Usage per Fixture:	1,929	gallons/fix
Average Usage Cost per Fixture:	$0.013	$/gallon

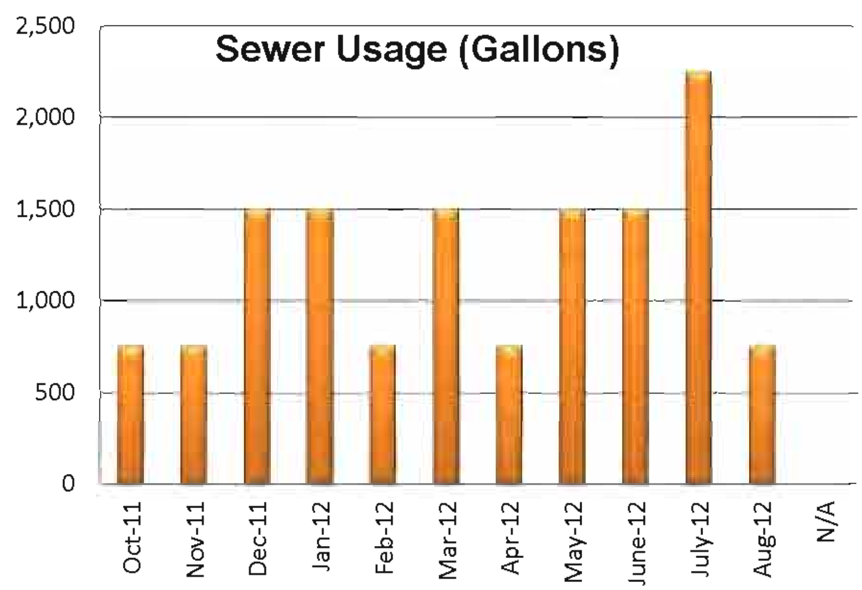


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the October 2011 to August 2012 billing period.

Month	Cost	Gallons
Oct-11	$13	750
Nov-11	$13	750
Dec-11	$19	1,500
Jan-12	$19	1,500
Feb-12	$13	750
Mar-12	$19	1,500
Apr-12	$13	750
May-12	$19	1,500
June-12	$19	1,500
July-12	$26	2,250
Aug-12	$13	750
N/A	$0	0
Totals	$186	13,500

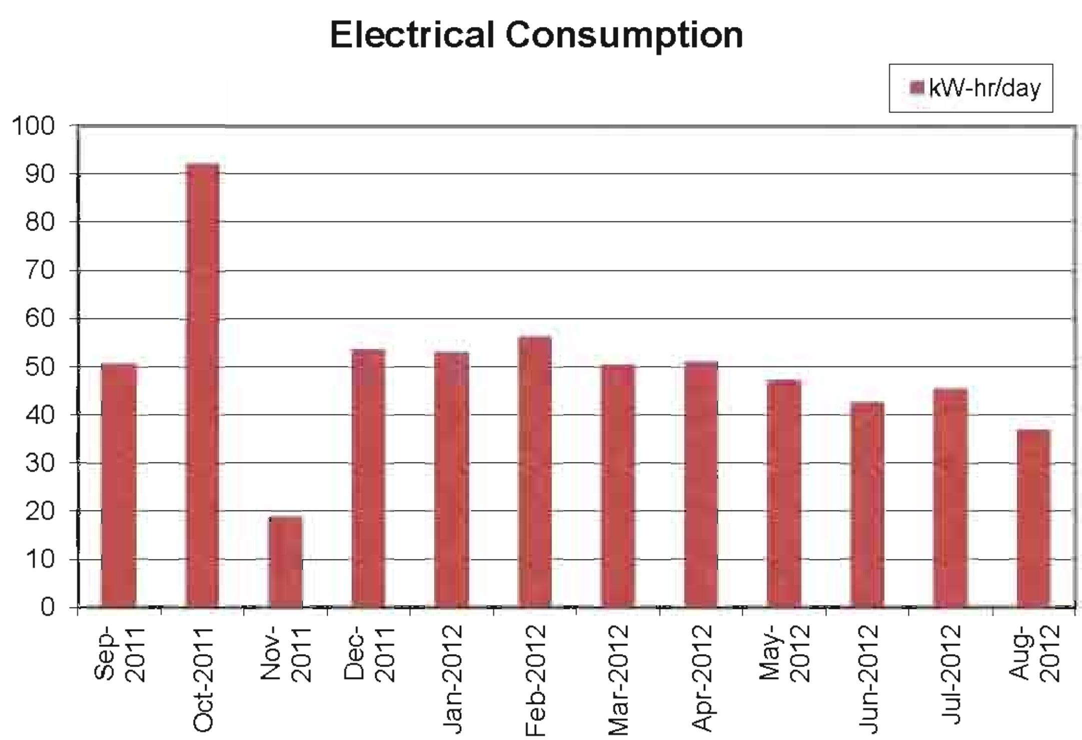
Cost per sq ft:	$0.02	per sq ft/yr
Average Usage per	1,929	gallons/fix
Average Usage Cost per Fixture:	$0.014	$/gallon



Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day
30	51	Sep-2011	$185	1,515	S6
29	92	Oct-2011	$318	2,668	$11
28	19	Nov-2011	$72	524	S3
28	54	Dec-2011	$257	1,500	S9
36	53	Jan-2012	$234	1,909	S7
31	56	Feb-2012	$215	1,743	S7
30	50	Mar-2012	$188	1,511	S6
29	51	Apr-2012	$184	1,481	S6
29	47	May-2012	$171	1,369	S6
34	43	Jun-2012	$181	1,449	S5
29	45	Jul-2012	$154	1,318	S5
34	37	Aug-2012	$147	1,254	S4
average:	50	Totals	$2,306	18,241	S6
		Square Footage		11,246	
		kW-hr per sq ft per year =		1.6	

Electrical ECI:	$0.21	per sq ft/yr
Electrical ECU:	5,576	BTU/sq ft
Average Cost per kWh:	$0.13	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	11,246	sq ft
Annual Energy Costs	$8,368	dollars
Total Energy Cost Index (ECI):	$0.74	per sq ft/yr
Total Energy Utilization Index (EUI):	69,630	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	27.56%	percentage
Percentage of Annual Energy Costs for Gas	72.44%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace exterior metal wall construction with brick and rigid insulation.	Increase R-value of exterior walls, decrease heat loss through walls, decrease gas utility costs.
B2	Replace overhead doors, repair door sweeps, weather stripping.	Decrease heat loss through doors, decrease gas utility costs.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace boiler with high efficiency boiler. Replace pump and accessories.	Decrease electrical and gas usage, decrease gas utility costs.
M2	Replace older unit heater in garage.	Decrease gas usage and gas utility costs.
M3	Install outdoor reset controls on boiler.	Decrease gas usage and utility costs by running boiler at lower water temperatures during mild season.
M4	Insulate all hot water supply and return piping.	Reduce heat loss through piping, improve heat transmission to terminal devices.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Replace hot water heater with high efficiency water heater.	Reduce gas usage and utility costs.
P2	Replace hot water heater with instantaneous type or point of use water heater(s).	Eliminate stand-by losses in tank type storage water heater.
P3	Insulate hot water piping.	Reduce heat loss through piping, improve hot water delivery performance.
P4	Replace urinal with waterless urinal.	Eliminate water usage for urinal.
P5	Install low flow aerators on lavatory faucet.	Reduce water usage.

Electrical Systems

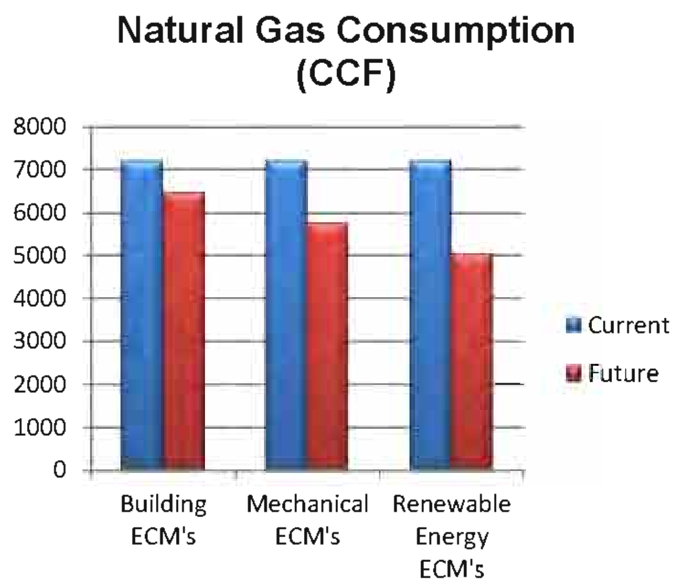
ECM #	Energy Conservation Measure	Benefit
E1	Install low ballast factor program start ballasts.	Extend life of bulb.
E2	Replace exterior lights with LED type fixtures	Reduce electrical energy costs.
E3	Install wall-box motion sensors to automatically turn off lights in individual offices and other small rooms.	Reduce electrical energy costs.

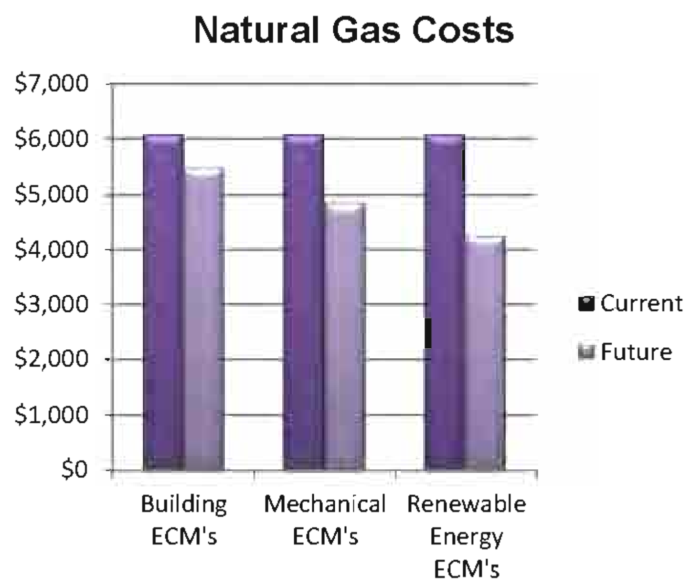
Renewable Energy Opportunities

ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and electrical utility costs.

Potential Energy Cost Savings

Natural Gas

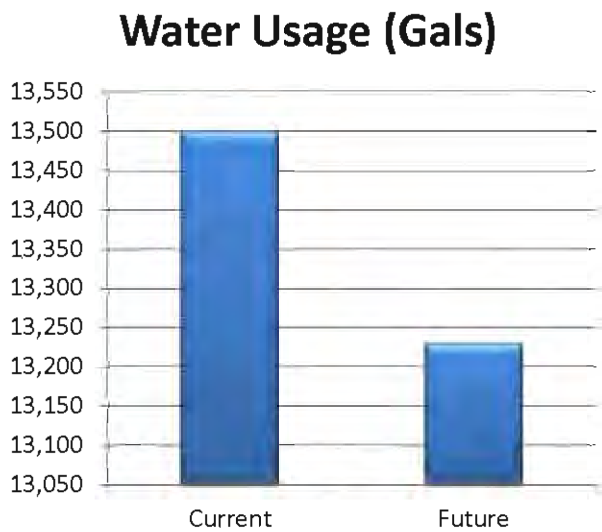




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.54	64,053	$0.49	57,669
Mechanical	$0.54	64,053	$0.43	51,251
Renewable Energy	$0.54	64,053	$0.38	44,853

Water and Sewer

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures related to water usage:



Electrical Systems

The installation of low ballast factor fluorescent ballasts could provide about $150 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $150 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $150 per year.

The installation of approximately 3kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $500

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in exterior walls, particularly in the NE wall where old windows were filled in.

Exterior windows and doors have typical heat loss, particularly areas with double doors and at edges of shop area overhead doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value (office): 0.11 Btu/hr/sq ft/deg F
Existing wall U-value (garage): 0.47 Btu/hr/sq ft/deg F
Existing roof U-value: 0.12 Btu/hr/sq ft/deg F
Existing window U-value: 0.58 Btu/hr/sq ft/deg F
Existing ACH: 0.80

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #10 Chippewa Cleaning

Project Name: S10-12262 #10 Chippewa Cleaning 02/15/2013
Prepared by: UPEA 08:40AM

Air System Information

Air System Name	#10 Chippewa Cleaning		Number of zones	1	
Equipment Class	UNDEF		Floor Area	11236.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	20.4	Tons	Load occurs at	Jul 1600	
Total coil load	244.7	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	226.4	MBH	Entering DB / WB	76.7 / 63.9	°F
Coil CFM at Jul 1600	11428	CFM	Leaving DB / WB	57.8 / 56.6	°F
Max block CFM	11428	CFM	Coil ADP	55.7	°F
Sum of peak zone CFM	11428	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.925		Resulting RH	50	%
ft²/Ton	550.9		Design supply temp.	58.0	°F
BTU/(hr-ft²)	21.8		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	48.97	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	312.3	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	11428	CFM	BTU/(hr-ft²)	27.8	
Max coil CFM	11428	CFM	Ent. DB / Lvg DB	62.6 / 88.6	°F
Water flow @ 20.0 °F drop	31.25	gpm			

Supply Fan Sizing Data

Actual max CFM	11428	CFM	Fan motor BHP	6.26	BHP
Standard CFM	11132	CFM	Fan motor kW	4.97	kW
Actual max CFM/ft²	1.02	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	878	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	37.8

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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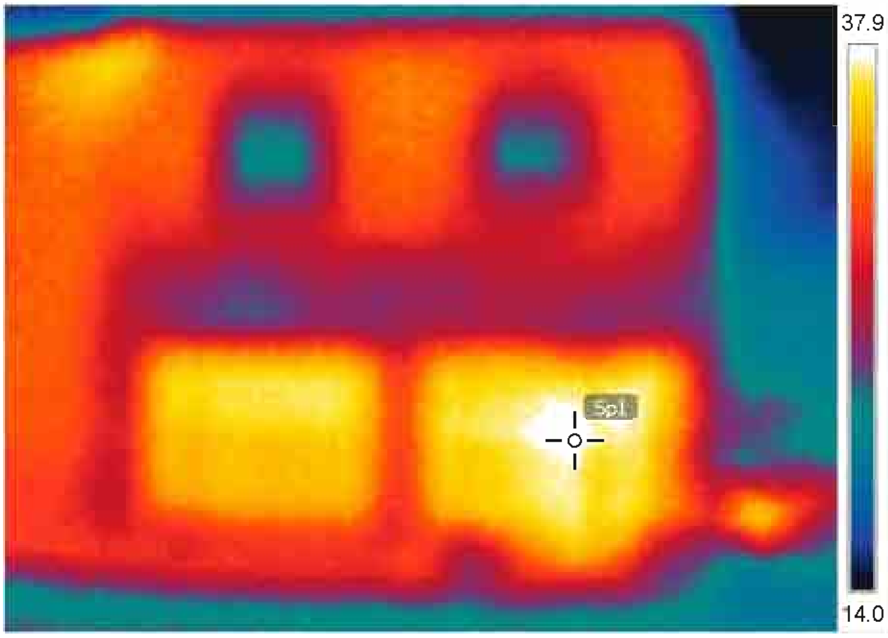

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Energy Audit
Culture Camp
266 Homestead Road, Sugar Island
Sault Ste. Marie, MI

February 2013

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Summary

This 4,480 square foot structure located on Sugar Island was built for the Culture Camp in 1994. It is a 2 story building with 2 separate men and women's bedrooms on the second floor for use during camps and gatherings.

Existing Building Envelope Profile

Wall Construction: Exterior walls are wood frame, with painted drywall interior and log "car-siding" exterior. The building is on a crawl space. Perimeter foundation walls have rigid insulation on the inside.

Roof Construction: The roof is wood trusses with traditional shingle roofing.

Floor Construction: Floors are wood framed, un-insulated. Floor coverings are a mixture of carpet and tile.

Window and Door Construction: Exterior doors are metal. Windows are wood frame with mini blinds.

Existing Mechanical Systems Profile

HVAC

The building heating system is served by a single LP forced air furnace located on the first floor, Carrier, model 58MCA. The furnace is in good condition. The duct distribution system serving the first floor has supply air run in the crawl space, not insulated, with common sidewall return grilles in the walls. The second floor supply air duct distribution system is through sidewall grilles mounted on exterior walls and floor grilles.

The system does not have air conditioning.

Plumbing

The domestic hot system is served by single LP fired storage type water heater, power vented, Ruud, model PVP50, 40 gallon storage capacity. Water piping is copper, not insulated. The water heater is in excellent condition.

The building domestic water and sewer is served by a well and septic system.

The average hot water delivery time to plumbing fixtures is 2.5 seconds.

The plumbing fixtures are tank type water floor mounted water closets, countertop single bowl lavatories with single handle manual faucets, walk-in showers with thermostatic mixing valves and a stainless steel kitchen sink with single handle manual faucets. Low flow aerators are not installed on the faucets.

The exhaust fans for the bathrooms are switched with the light.

Temperature Control Systems

The heating system is controlled by wall mounted Honeywell programmable thermostat.

Special Systems

The building has a full commercial kitchen including an exhaust hood and fan with fire suppression. The exhaust fan is sidewall installed, Greenheck, model CU-150. There is not a make-up air system for the kitchen exhaust hood.

Existing Electrical Systems Profile

Lighting Systems: The majority of interior lighting is 4' fluorescent, 2-lamp surface mount "wrap-around" style. Lamps and ballasts were upgraded in the past year to energy efficient T8 (25-watt lamps and instant start electronic ballasts.) A few spaces also have compact fluorescent and/or incandescent fixtures. Interior lighting controls are primarily manual wall switches for each space. Exterior lighting consists of a couple decorative lights at the front and 2 "wall-pack" lights at the back.

Power Systems: Electrical service is overhead from utility transformer. The main panel is located in mechanical closet under the stairs. Panel is 200-amp, 240/120-volt, single phase, 3-wire.

Special Systems: The building has an operational fire alarm system.

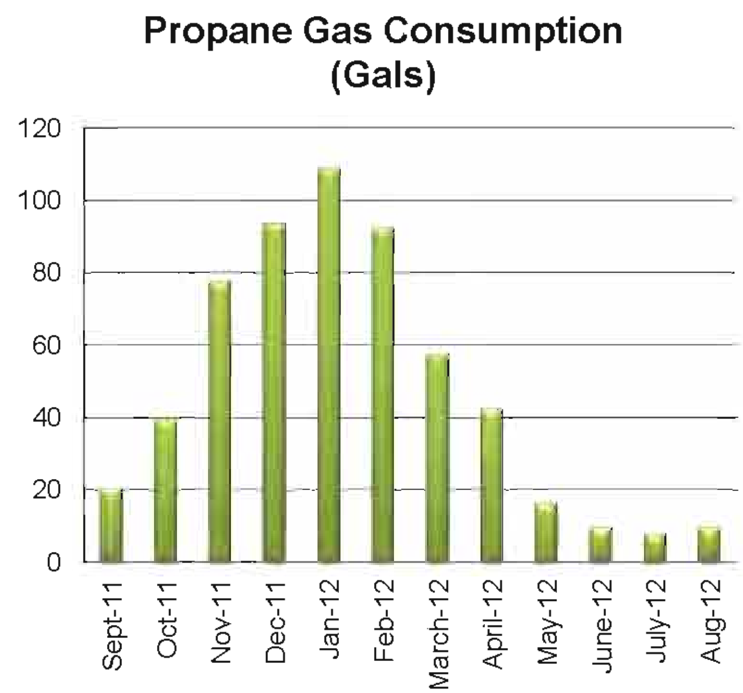
Existing Energy Consumption and Energy Cost Analysis

Propane Usage (Estimate)

The following graphical data represents a monthly weighted average of usage and costs for a building of this construction type and use group for the September 2011 to August 2012 heating season:

Month	Cost	Gals
Sept-11	$51	20
Oct-11	$97	39
Nov-11	$182	77
Dec-11	$214	94
Jan-12	$232	109
Feb-12	$199	92
March-12	$131	57
April-12	$96	42
May-12	$39	16
June-12	$28	9
July-12	$26	8
Aug-12	$29	9
Totals	$1,323	573

Propane Gas ECI:	$0.29	per sq ft/yr
Propane Gas ECU:	12,733	BTU/sq ft
Average Cost per Gal:	$2.31	$/Gal



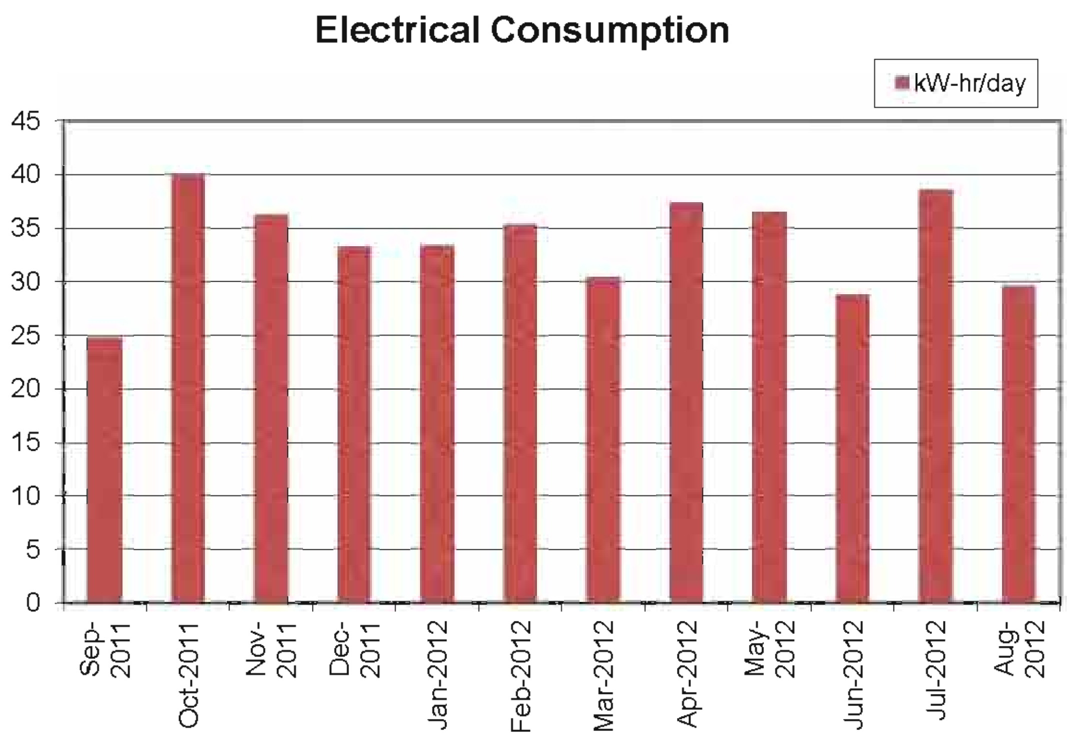
Water and Sewer Usage

The water is served by a well and septic system.

Electrical Usage: The following is a summary of electric use for the past year:

		Period	Cost	Usage	
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**
30	25	Sep-2011	$96	741	S3
31	40	Oct-2011	$154	1,238	S5
30	36	Nov-2011	$125	1,088	S4
31	33	Dec-2011	$119	1,031	S4
31	33	Jan-2012	$119	1,033	S4
29	35	Feb-2012	$133	1,025	S5
31	30	Mar-2012	$123	942	S4
30	37	Apr-2012	$145	1,123	S5
31	36	May-2012	$146	1,130	S5
30	29	Jun-2012	$113	862	S4
31	39	Jul-2012	$154	1,196	S5
31	30	Aug-2012	$120	917	S4
average:	34	Totals	$1,544	12,326	S4 average
		Square Footage		4480	
		kW-hr per sq ft per year =		2.8	

Electrical ECI:	$0.34	per sq ft/yr
Electrical ECU:	9,459	BTU/sq ft
Average Cost per kWh:	$0.13	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	4,480	sq ft
Annual Energy Costs	$2,867	dollars
Total Energy Cost Index (ECI):	$0.64	per sq ft/yr
Total Energy Utilization Index (EUI):	22,192	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	53.86%	percentage
Percentage of Annual Energy Costs for Gas	46.14%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace windows with high efficient, thermally insulated, Low-E type windows.	Reduce infiltration, reduce heating losses, reduce gas usage.
B2	Repair and replace door seals.	Reduce infiltration, reduce gas usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Insulate ductwork in crawl space.	Reduce heat loss through ductwork, improve furnace efficiency.
M2	Maintain furnace in accordance with manufacturer's scheduled maintenance program.	Extend life of equipment, improve performance of equipment.
M3	Future: Replace furnace in 5-10 years with high efficiency condensing type furnace.	Reduce future gas usage.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Insulate hot water piping.	Reduce heat losses through piping.
P2	Install low flow aerators on faucets.	Reduce water usage.
P3	Install sensor or timed usage control on faucets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install low ballast factor program start ballasts.	Extend life of bulb..
E2	Install wall-box motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.
E3	Install CFL lamps in place of incandescent lamps	Reduce electrical energy costs

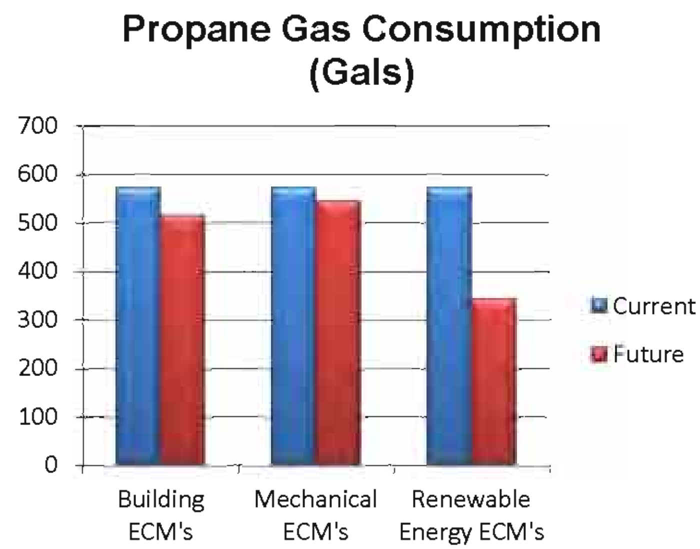
Renewable Energy Opportunities

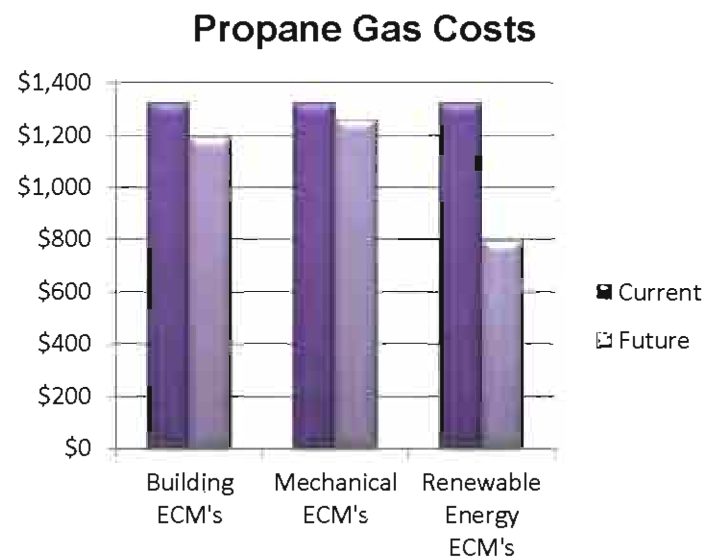
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Propane Gas

The following propane gas energy usage and cost savings is an estimate based on the building, mechanical and renewable energy conservation measures:





Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.29	12,733	$0.26	11,460
Mechanical	$0.29	12,733	$0.28	12,097
Renewable Energy	$0.29	12,733	$0.18	7,640

Water and Sewer

The recommended plumbing ECM's will result in an electrical energy savings by limiting usage of well pump.

Electrical Systems

The installation of low ballast factor fluorescent ballasts and premium 28-watt T8 lamps could provide about $100 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $100 per year of electrical savings.

The installation of approximately 2kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $300.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in exterior walls and some in the ceiling.

Exterior windows and doors have typical heat loss. The use of mini blinds in cold weather helps to reduce heat loss through windows. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References
Existing wall U-value: 0.062 Btu/hr/sq ft/deg F
Existing roof U-value: 0.047 Btu/hr/sq ft/deg F
Existing window U-value: 0.55 Btu/hr/sq ft/deg F
Existing ACH: 0.6

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #18 Culture Camp

Project Name: S10-12262 #18 Culture Camp — 02/15/2013
Prepared by: UPEA — 09:28AM

Air System Information

Air System Name	**#18 Culture Camp**	Number of zones	**1**
Equipment Class	**UNDEF**	Floor Area	**4418.0** ft²
Air System Type	**SZCAV**	Location	**Sault Ste Marie, Michigan**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**8.6**	Tons	Load occurs at	**Jul 1700**	
Total coil load	**103.5**	MBH	OA DB / WB	**80.8 / 68.2**	°F
Sensible coil load	**96.3**	MBH	Entering DB / WB	**76.5 / 63.7**	°F
Coil CFM at Jul 1700	**4833**	CFM	Leaving DB / WB	**57.6 / 56.4**	°F
Max block CFM	**4833**	CFM	Coil ADP	**55.5**	°F
Sum of peak zone CFM	**4833**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.930**		Resulting RH	**50**	%
ft²/Ton	**512.2**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**23.4**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**20.71**	gpm	Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**109.5**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**4833**	CFM	BTU/(hr-ft²)	**24.8**	
Max coil CFM	**4833**	CFM	Ent. DB / Lvg DB	**63.4 / 84.9**	°F
Water flow @ 20.0 °F drop	**10.96**	gpm			

Supply Fan Sizing Data

Actual max CFM	**4833**	CFM	Fan motor BHP	**2.65**	BHP
Standard CFM	**4707**	CFM	Fan motor kW	**2.10**	kW
Actual max CFM/ft²	**1.09**	CFM/ft²	Fan static	**2.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**315**	CFM	CFM/person	**21.50**	CFM/person
CFM/ft²	**0.08**	CFM/ft²			

Measurements	°F
Sp1	52.5

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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Energy Audit
Elderly Center
2076 Shunk Road
Sault Ste. Marie, MI

February 2013

Table of Contents

Summary

This facility was originally designed as a home for the aged. In its current state it is primarily used for Elder Care Services/Meal Program and Head Start. The 12,141 square foot building was built in 1980 and consists of 1 floor on a slab.

Existing Building Envelope Profile

The exterior wall construction is wood framing construction with interior gypsum board facing. The exterior of the building is covered in decorative brick façade. Four inch batt insulation is installed in the exterior wall cavities.

The pitched roof is wood frame truss construction with built-up roofing and asphalt shingles. The interior ceilings are gypsum board. There are several access panels to the attic area.

The floor construction is slab on grade with vinyl tile and carpet covering.

The windows are double hung vinyl clad, shaded and are in fair condition. Windows comprise approximately 30% of exterior wall area. The front doors are metal, 70% glass and it was observed that the doors do not close completely. Side and back doors are solid metal and metal doors with 30% glass. Weather stripping and door sweeps are in poor condition.

Existing Mechanical Systems Profile

HVAC

The exterior heating system is electric baseboard. Several of the heaters have been covered with a wood covering with holes to allow heat to migrate to space. Ventilation is provided by a natural gas fired forced air furnace with a direct outdoor air vent. Air distribution is supplied through ceiling diffusers and common return air grille. Ductwork is fiber board duct. There are several split system air conditioning systems and window air conditioning units.

Plumbing

The domestic hot water heating system is comprised of two natural gas fire hot water heaters. One water heater is a Bradford White model 1DOT, 100 gallon capacity and is good condition. The other water heater is a newer unit, AO Smith Model FCG 100, 98 gallon capacity and is in excellent condition. There is not a hot water return system. The domestic hot water piping is copper and insulated. The piping insulation is in fair condition.

Plumbing fixtures are primarily wall hung urinals with flush valves, tank type water closets and counter type lavatories with single handle faucets. Low flow aerators are not installed on any faucets.

The average time for hot water delivery to fixtures is 43 seconds.

Exhaust fans for the bathrooms are on separate switch.

Temperature Control Systems

The thermostats controlling the baseboard radiation are wall mounted non-programmable dial type.

Special Systems

The building has a full wet sprinkler fire protection system with smoke detectors on supply and return air at furnace.
There is a full commercial kitchen with hood and make-up air unit.

Existing Electrical Systems Profile

Lighting Systems: The majority of interior lighting is 4' fluorescent, with a mixture of 2-lamp and 4-lamp fixtures. Fixtures are primarily of the surface mount "wrap-around" style. Lamps and ballasts were upgraded in the past year to energy efficient T8 (25-watt, GE lamps and instant start electronic ballasts.) Interior lighting controls are primarily manual wall switches for each space. Several of the spaces with 4-lamp fixtures have dual-level switching. Exterior lighting consists of a few recessed incandescent "can" lights near exterior doors.

Power Systems: Electrical service is provided from Cloverland Electric (formerly Edison Sault). Several panels and disconnects are located in the main electrical closet off corridor behind the main large gathering room. Each wing also has an electrical closet with 2 branch panels. Power is 208Y/120-volt, 3-phase, 4-wire.

Special Systems: The building has an operational fire alarm system, serviced by Alert Electronics.

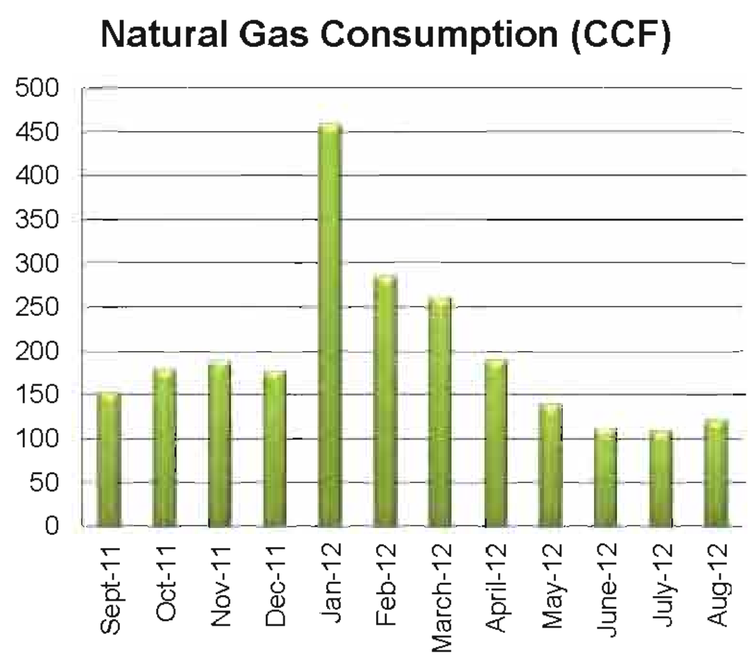
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$100	152
Oct-11	$113	179
Nov-11	$117	189
Dec-11	$107	176
Jan-12	$273	458
Feb-12	$172	285
March-12	$161	260
April-12	$117	190
May-12	$128	139
June-12	$42	111
July-12	$42	108
Aug-12	$51	121
Totals	$1,423	2,368

Natural Gas ECI:	$0.12	per sq ft/yr
Natural Gas ECU:	19,410	BTU/sq ft
Average Cost per CCF:	$0.60	$/CCF

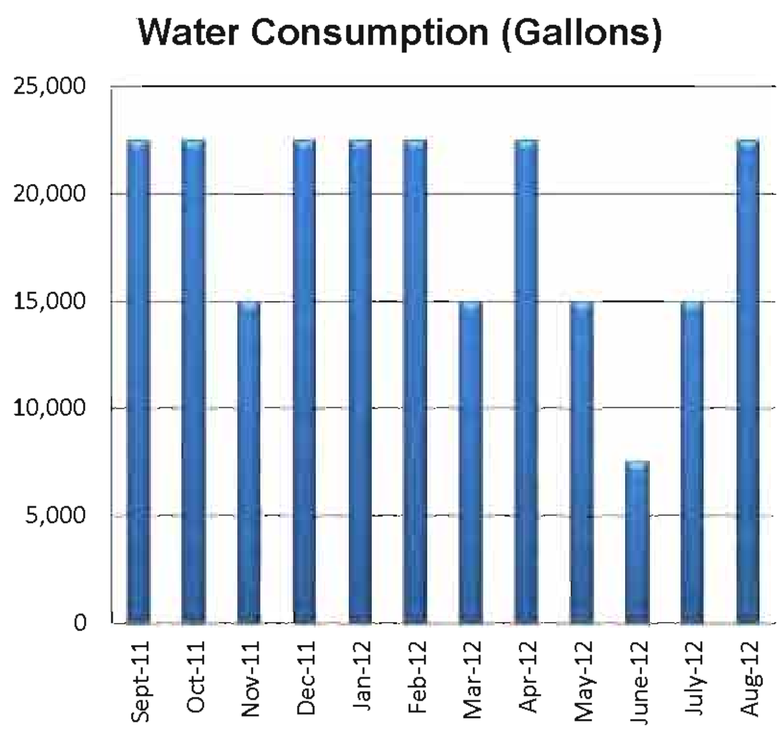


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$230	22,500
Oct-11	$230	22,500
Nov-11	$172	15,000
Dec-11	$230	22,500
Jan-12	$230	22,500
Feb-12	$230	22,500
Mar-12	$172	15,000
Apr-12	$230	22,500
May-12	$172	15,000
June-12	$115	7,500
July-12	$172	15,000
Aug-12	$230	22,500
Totals	$2,413	225,000

Cost per sq ft:	$0.20	per sq ft/yr
Average Usage per Fixture:	15,000	gallons/fix
Average Usage Cost per Fixture:	$0.011	$/gallon

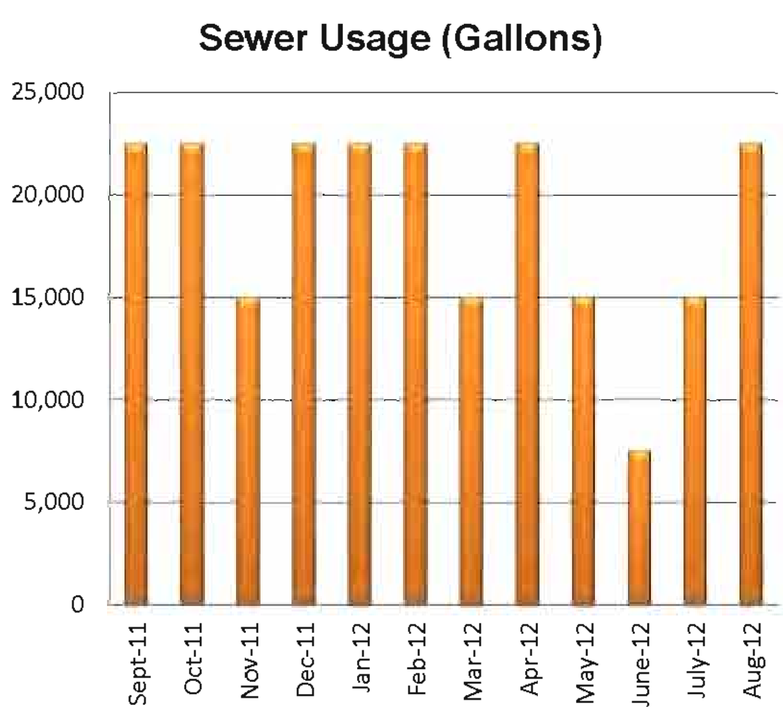


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$211	22,500
Oct-11	$211	22,500
Nov-11	$148	15,000
Dec-11	$211	22,500
Jan-12	$211	22,500
Feb-12	$211	22,500
Mar-12	$148	15,000
Apr-12	$211	22,500
May-12	$148	15,000
June-12	$88	7,500
July-12	$154	15,000
Aug-12	$219	22,500
Totals	$2,171	225,000

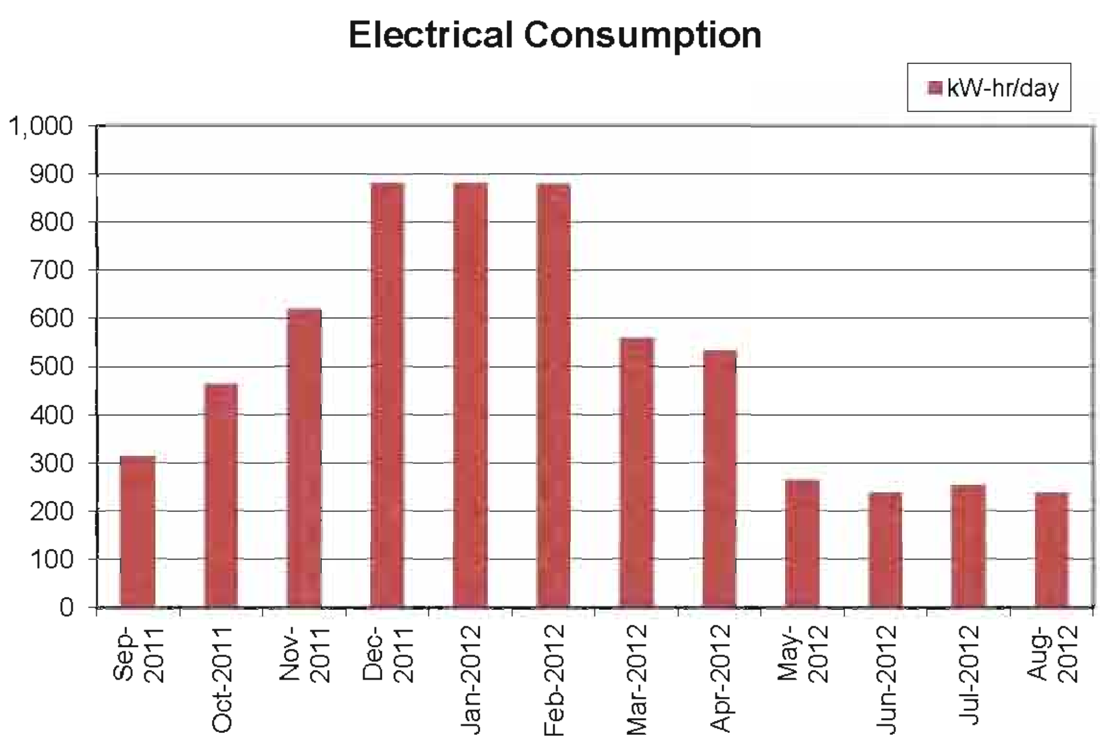
Cost per sq ft:	$0.18	per sq ft/yr
Average Usage per	15,000	gallons/fix
Average Usage Cost per Fixture:	$0.010	$/gallon



Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day	
30	313	Sep-2011	$995	9,390	$33	
29	463	Oct-2011	$1,413	13,435	$49	
32	620	Nov-2011	$2,032	19,830	$64	
33	879	Dec-2011	$3,043	29,023	$92	
29	880	Jan-2012	$2,675	25,514	$92	
31	879	Feb-2012	$2,854	27,236	$92	
29	560	Mar-2012	$1,725	16,242	$59	
30	534	Apr-2012	$1,676	16,019	$56	
32	264	May-2012	$928	8,437	$29	
30	239	Jun-2012	$792	7,168	$26	
32	254	Jul-2012	$898	8,135	$28	
28	238	Aug-2012	$718	6,659	$26	
average:	510	Totals	$19,747	187,088	$54	average
		Square Footage		12,141		
		kW-hr per sq ft per year =		15.4		

Electrical ECI:	$1.63	per sq ft/yr
Electrical ECU:	52,978	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	12,141	sq ft
Annual Energy Costs	$21,170	dollars
Total Energy Cost Index (ECI):	$1.74	per sq ft/yr
Total Energy Utilization Index (EUI):	72,388	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	93.28%	percentage
Percentage of Annual Energy Costs for Gas	6.72%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Install new doors, replace seals and weatherstripping.	Reduce air infiltration, reduce heat loss through doors.
B2	Reseal windows.	Reduce air infiltration, reduce heat loss through windows.
B3	Add insulation above ceiling.	Reduce heat loss through ceiling, decrease electrical and natural gas usage.
B4	Install energy star rates appliances.	Reduce electrical usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Remove wood coverings on exterior baseboard.	Reduce electrical usage by providing better coverage through convection at exterior walls, equipment will operate less often.
M2	Institute comprehensive preventative maintenance program for equipment.	Extend life of equipment, reduce utility costs through efficient operation of equipment.
M3	Future: Replace furnace within 10 years to 95%+ high efficiency furnace.	Reduce natural gas utility costs.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce electrical and natural gas usage. Allow building space temperatures to be adjusted during unoccupied hours.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install insulated hot water return system.	Reduce water usage waiting for hot water delivery.
P2	Install low flow aerators on faucets.	Reduce water usage.
P3	Repair or replace piping insulation.	Reduce heat loss through hot water piping, reduce natural gas utility costs.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install low ballast factor program start ballasts.	Extend life of bulb..
E2	Replace exterior "can" lights with LED type fixtures	Reduce electrical energy costs.
E3	Install wall-box motion sensors to automatically turn off lights in individual offices and other small rooms.	Reduce electrical energy costs.

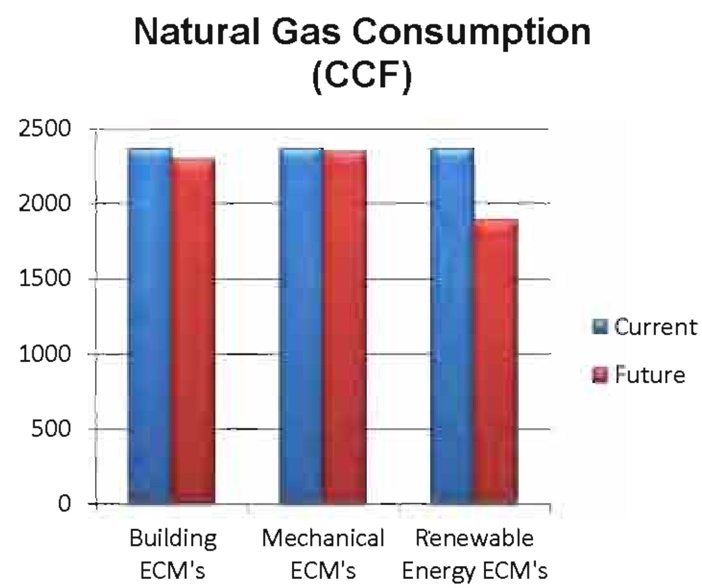
Renewable Energy Opportunities

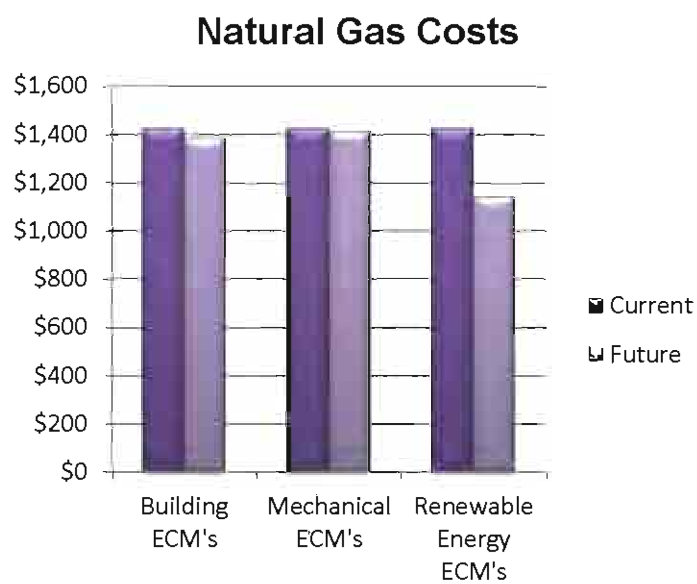
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and electrical utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas usage and cost savings is an estimate based on the building, mechanical and renewable energy conservation measures:

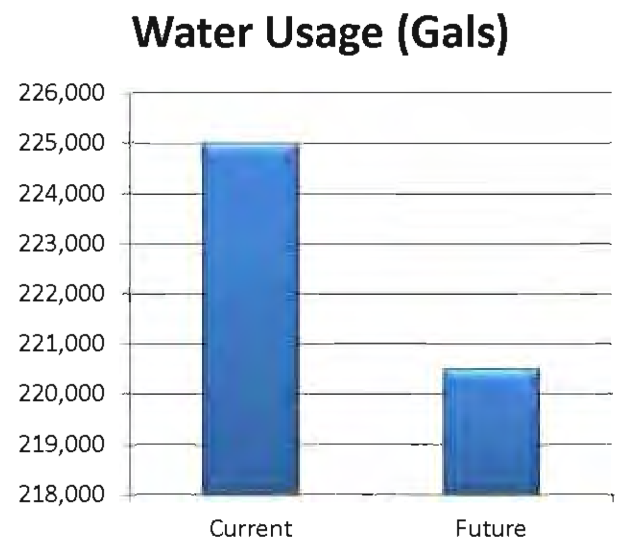




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.12	19,410	$0.11	18,828
Mechanical	$0.12	19,410	$0.12	19,216
Renewable Energy	$0.12	19,410	$0.09	15,528

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

The installation of low ballast factor fluorescent ballasts could provide about $500 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $1000 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $400 per year.

The installation of approximately 5kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $1,000

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in exterior walls and some in the ceiling.

Exterior windows and doors have typical heat loss, particularly areas with double doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

One thru-wall window air conditioning unit had some excess heat loss & should be sealed more carefully or removed. This was located in the far south-east corner of building.

References
Existing wall U-value: 0.071 Btu/hr/sq ft/deg F
Existing roof U-value: 0.068 Btu/hr/sq ft/deg F
Existing window U-value: 0.62 Btu/hr/sq ft/deg F
Existing ACH: 0.75

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #9 Elder Center

Project Name: S10-12262 #9 Elder Care Center — 02/15/2013
Prepared by: UPEA — 08:39AM

Air System Information

Air System Name	#9 Elder Center	Number of zones	1
Equipment Class	UNDEF	Floor Area	12000.0 ft²
Air System Type	SZCAV	Location	Sault Ste Marie, Michigan

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	24.5	Tons	Load occurs at	Jul 1400	
Total coil load	293.8	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	274.0	MBH	Entering DB / WB	76.5 / 63.7	°F
Coil CFM at Jul 1400	13899	CFM	Leaving DB / WB	57.8 / 56.6	°F
Max block CFM	13899	CFM	Coil ADP	55.7	°F
Sum of peak zone CFM	13899	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.933		Resulting RH	50	%
ft²/Ton	490.2		Design supply temp.	58.0	°F
BTU/(hr-ft²)	24.5		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	58.78	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	276.3	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	13899	CFM	BTU/(hr-ft²)	23.0	
Max coil CFM	13899	CFM	Ent. DB / Lvg DB	63.8 / 82.7	°F
Water flow @ 20.0 °F drop	27.64	gpm			

Supply Fan Sizing Data

Actual max CFM	13899	CFM	Fan motor BHP	7.61	BHP
Standard CFM	13539	CFM	Fan motor kW	6.04	kW
Actual max CFM/ft²	1.16	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	938	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	53.7

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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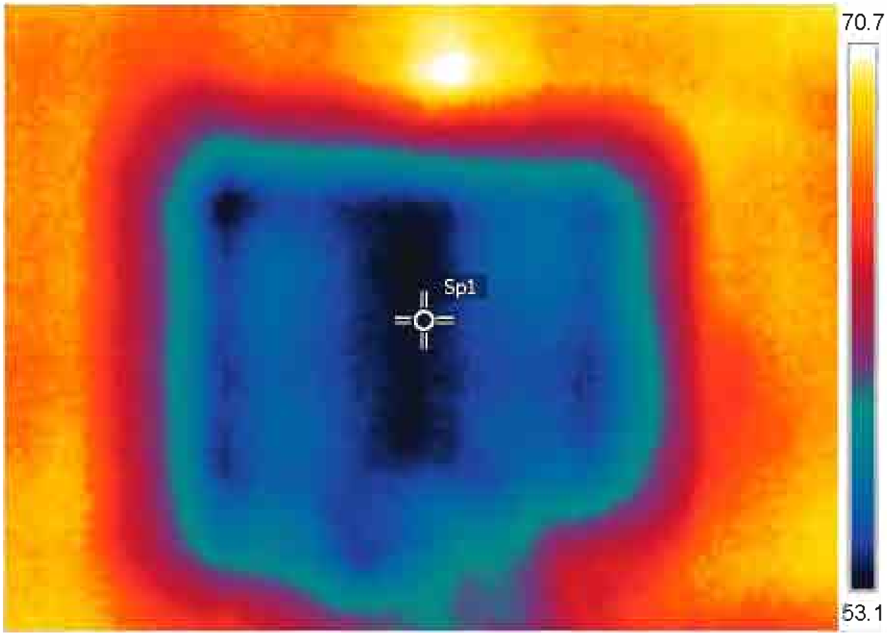

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UPEA
ENGINEERS & ARCHITECTS

Energy Audit
Enrollment Building
2428 Shunk Road
Sault Ste. Marie, MI

February 2013

Table of Contents

Summary

The Enrollment Building is a 1-story slab on grade structure of 921 square feet constructed in 1974. The building has 3 individual private offices, bathroom facilities, and file storage area.

Existing Building Envelope Profile

Wall Construction: Exterior walls are frame construction with painted drywall interior finish. The front of the building exterior has horizontal vinyl siding. The sides of the building have vertical siding.

Roof Construction: The building roof is sloped with shingle roofing and rain gutters.

Floor Construction: Building floor is concrete slab on grade with mixture of carpet and tile floor coverings.

Window and Door Construction: Exterior windows and doors are commercial grade.

Existing Mechanical Systems Profile

HVAC

The heating system is electric baseboard. There is a window mounted air conditioning unit serving office area.

Plumbing

The domestic hot water system is served by an electric hot water heater, State model PV6. The water heater is located under the kitchen sink. The water piping is copper and is not insulated.

The average hot water delivery time to plumbing fixtures is 5 seconds.

The plumbing fixtures are floor mounted tank type water closets, countertop lavatories with single handle manual faucets and a stainless steel kitchen sink with dual handle manual faucet.

Temperature Control Systems

The heating system is controlled wall mounted non-programmable thermostats and baseboard mounted dial type controls.

Existing Electrical Systems Profile

Lighting Systems: The existing interior lighting is primarily 4' linear fluorescent, surface mount, wrap-around style fixtures. Lamps and ballasts were recently upgraded to energy efficient T8 lamps and electronic ballasts.

Power Systems: Electrical service is 100-amp, 240/120-volt, single phase and is fed from the Youth Education and Activities Building which is located on the same site. The electrical use for the Cloverland Electric meter at the other building is allocated (split 50/50) with this building.

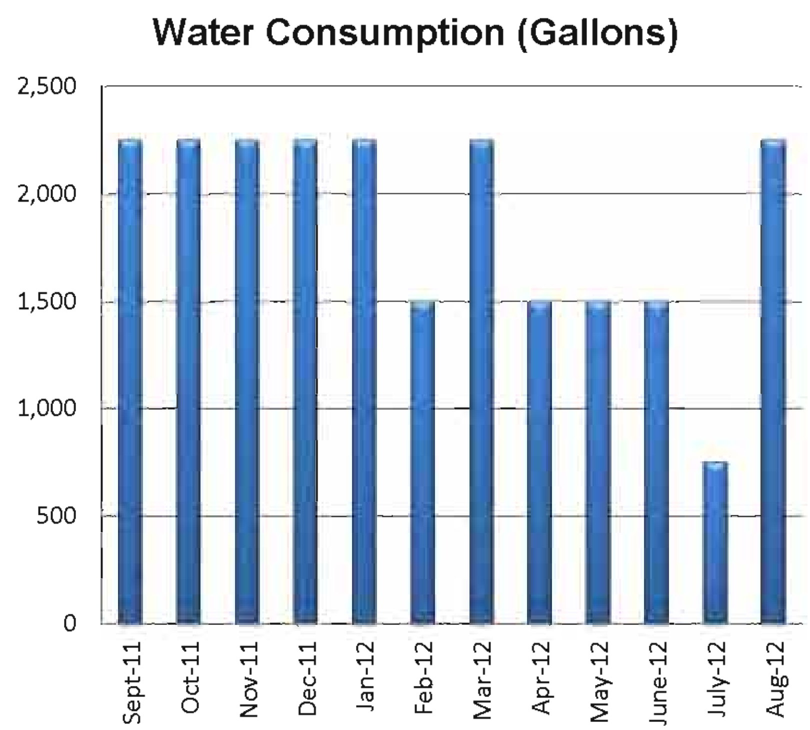
Existing Energy Consumption and Energy Cost Analysis

Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$19	2,250
Oct-11	$19	2,250
Nov-11	$19	2,250
Dec-11	$19	2,250
Jan-12	$19	2,250
Feb-12	$13	1,500
Mar-12	$19	2,250
Apr-12	$13	1,500
May-12	$13	1,500
June-12	$13	1,500
July-12	$7	750
Aug-12	$19	2,250
Totals	$192	22,500

Cost per sq ft:	$0.21	per sq ft/yr
Average Usage per Fixture:	3,750	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon

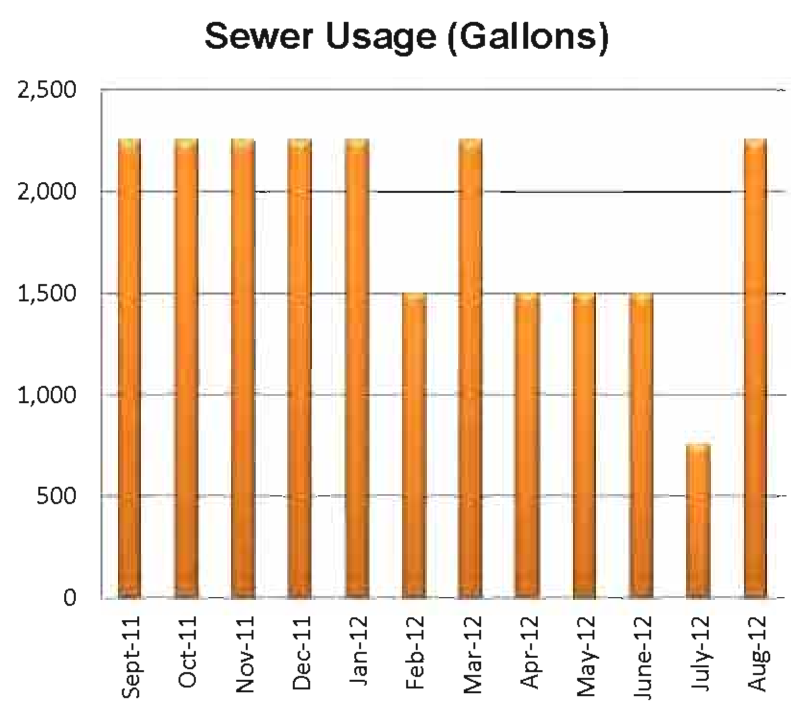


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$21	2,250
Oct-11	$21	2,250
Nov-11	$21	2,250
Dec-11	$21	2,250
Jan-12	$21	2,250
Feb-12	$15	1,500
Mar-12	$21	2,250
Apr-12	$15	1,500
May-12	$15	1,500
June-12	$15	1,500
July-12	$9	750
Aug-12	$22	2,250
Totals	$217	22,500

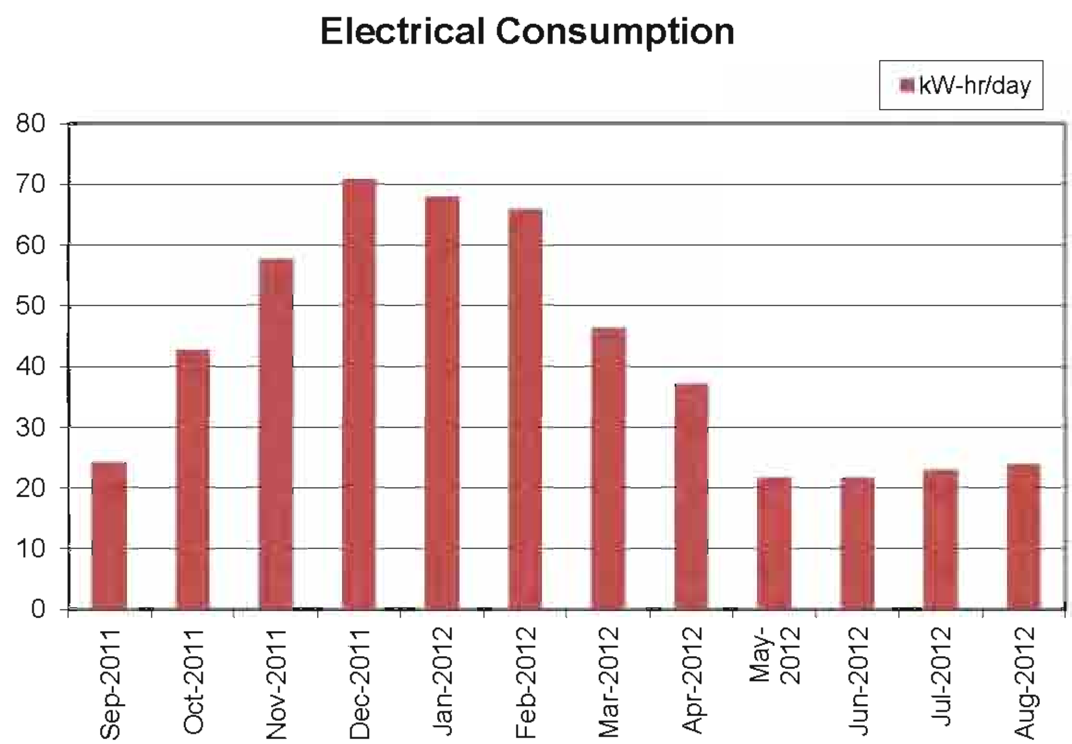
Cost per sq ft:	$0.24	per sq ft/yr
Average Usage per	3,750	gallons/fix
Average Usage Cost per Fixture:	$0.010	$/gallon



Electrical Usage: The following is a summary of electric use for the past year:
(Actual meter use and bills are twice these amounts, but electric costs are allocated 50/50 with the Youth Education & Activities Building located on the same site)

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day	
29	24	Sep-2011	$81	702	$2.79	
28	43	Oct-2011	$134	1,192	$4.70	
29	58	Nov-2011	$186	1,672	$6.41	
35	71	Dec-2011	$278	2,476	$7.94	
29	68	Jan-2012	$222	1,968	$7.66	
32	66	Feb-2012	$238	2,110	$7.44	
28	46	Mar-2012	$148	1,294	$5.29	
34	37	Apr-2011	$144	1,260	$4.24	
30	22	May-2011	$77	647	$2.57	
30	22	Jun-2012	$76	648	$2.53	
33	23	Jul-2012	$88	757	$2.67	
29	24	Aug-2012	$78	689	$2.69	
average:	42	Totals	$1,750	15,415	$4.75	average
		Square Footage		921		
		kW-hr per sq ft per year =		16.7		

Electrical ECI:	$1.90	per sq ft/yr
Electrical ECU:	57,543	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	921	sq ft
Annual Energy Costs	$1,750	dollars
Total Energy Cost Index (ECI):	$1.90	per sq ft/yr
Total Energy Utilization Index (EUI):	57,543	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	100.00%	percentage
Percentage of Annual Energy Costs for Gas	0.00%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace windows with high efficiency, low e type windows.	Reduce infiltration, reduce electrical usage.
B2	Install a central ventilation system to provide outdoor air to occupied spaces in lieu of using natural ventilation to meet minimum outdoor air requirements.	Reduce electrical usage.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce energy usage during unoccupied hours.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install low flow aerators on faucets.	Reduce water usage.
P2	Install sensor or timed operators on faucets and water closet.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install motion sensors to automatically turn of lights when spaces are not occupied.	Reduce electrical energy use/cost

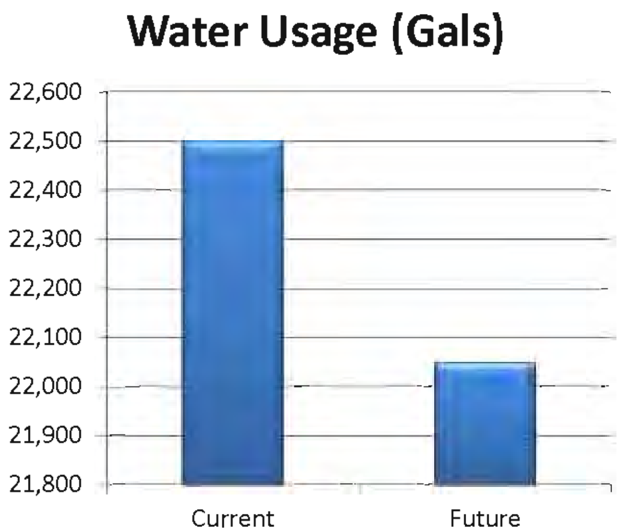
Renewable Energy Opportunities

ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar system for electrical usage.	Reduce electrical usage.

Potential Energy Cost Savings

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

The installation of motion sensors would provide approximately $75 in electrical energy savings per year.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in exterior walls and some in the ceiling.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References
Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.55 Btu/hr/sq ft/deg F
Existing ACH: 0.6

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #36 Enrollment

Project Name. S10-12262 #36 Enrollment 02/15/2013
Prepared by. UPEA 11.06AM

Air System Information

Air System Name	#36 Enrollment		Number of zones	1	
Equipment Class	UNDEF		Floor Area	900.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	2.3	Tons	Load occurs at	Jul 1500	
Total coil load	27.3	MBH	OA DB / WB	83.0 / 69.0	°F
Sensible coil load	25.9	MBH	Entering DB / WB	76.7 / 63.9	°F
Coil CFM at Jul 1500	1327	CFM	Leaving DB / WB	58.2 / 57.0	°F
Max block CFM	1327	CFM	Coil ADP	56.1	°F
Sum of peak zone CFM	1327	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.947		Resulting RH	50	%
ft²/Ton	395.1		Design supply temp.	58.0	°F
BTU/(hr-ft²)	30.4		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	5.47	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	35.0	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	1327	CFM	BTU/(hr-ft²)	38.9	
Max coil CFM	1327	CFM	Ent. DB / Lvg DB	64.7 / 89.8	°F
Water flow @ 20.0 °F drop	3.50	gpm			

Supply Fan Sizing Data

Actual max CFM	1327	CFM	Fan motor BHP	0.73	BHP
Standard CFM	1292	CFM	Fan motor kW	0.58	kW
Actual max CFM/ft²	1.47	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	70	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	31.9

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

11/27/2012 11:20:48 AM

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UPEA ENGINEERS & ARCHITECTS

Energy Audit
Environmental Building
206 Greenough
Sault Ste. Marie, MI

February 2013

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Summary

The building is located on the corner of Portage and a Greenough street (across from the St. Mary's river) was built in 1977 and is approximately 3,165 square feet. The Tribe added on to the building including a 2nd floor after purchasing the facility where Tribal Administration resided until the current facility (523 Ashmun) was renovated. This office space is currently being utilized by the Tribal Environmental Department.

Profile

Wall Construction: Some exterior walls are masonry block. Some areas are wood framed. Exterior siding is vinyl.

Roof Construction: Sloped roof, wood trusses, shingle roof.

Floor Construction: First floor is concrete slab, upper floors are wood framed with wood decking. Floor coverings are a mixture of carpet and tile.

Window and Door Construction: Windows are wood frame with wood sash, vinyl clad, double pane, operable. Several windows have plastic weatherizing installed. Weather stripping and seals are in poor condition. The doors are solid wood and metal construction with wood and metal frames. Entryways and sweeps are in poor condition. There are visible gaps in the door seals.

Existing Mechanical Systems Profile

HVAC

The heating system is served by a single natural gas fired atmospheric boiler, Weil McLain PGP6, 173 MBH input, circulation pump, Taco model and perimeter hot water baseboard. The boiler is located in a second floor mechanical room and is in poor condition. The mechanical room is too small to provide enough combustion air for the boiler, making the boiler very inefficient. The heating piping is copper and is not insulated.

Plumbing

The domestic water system is served by a single electric storage tank hot water heater, Bradford White, model M250T, 50 gallon storage capacity, located on the first floor. The water heater is in good condition. There is not a hot water return system. The water piping is copper and is not insulated.

The average time for hot water delivery to the plumbing fixtures is 12 seconds.

The plumbing fixtures are floor mounted tank type water closets, stainless steel sinks with single handle manual faucets and countertop lavatories.

Temperature Control Systems

The hot water heating system is controlled by a single wall mounted non-programmable dial type thermostat.

Special Systems

There are several lab and testing areas, including a disassembled commercial fume hood.

Existing Electrical Systems Profile

Lighting Systems: Existing interior lighting is mostly linear fluorescent, T12. Most fixtures are lensed and have 4 lamps. Interior lighting controls are standard manual wall-box switches.

Power Systems: Electrical power is from Cloverland Electric (formerly Edison Sault) and is single phase, 240/120-volt. There are (2) panels located on the 1st floor.

Special Systems: The building has a fire alarm system.

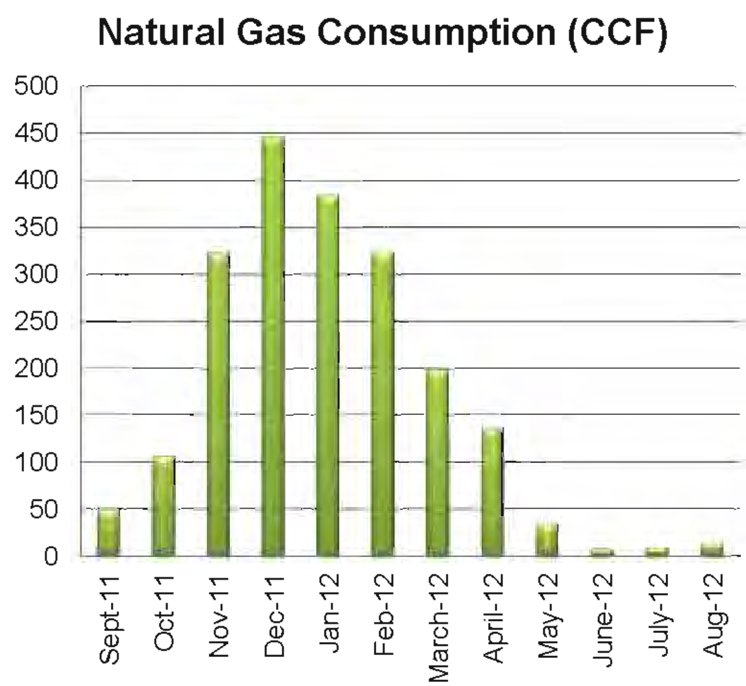
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$67	49
Oct-11	$170	106
Nov-11	$293	323
Dec-11	$382	446
Jan-12	$322	383
Feb-12	$282	323
March-12	$181	197
April-12	$133	136
May-12	$42	34
June-12	$31	7
July-12	$31	9
Aug-12	$37	15
Totals	$1,971	2,028

Natural Gas ECI:	$0.62	per sq ft/yr
Natural Gas EUI:	64,076	BTU/sq ft
Average Cost per CCF:	$0.97	$/CCF

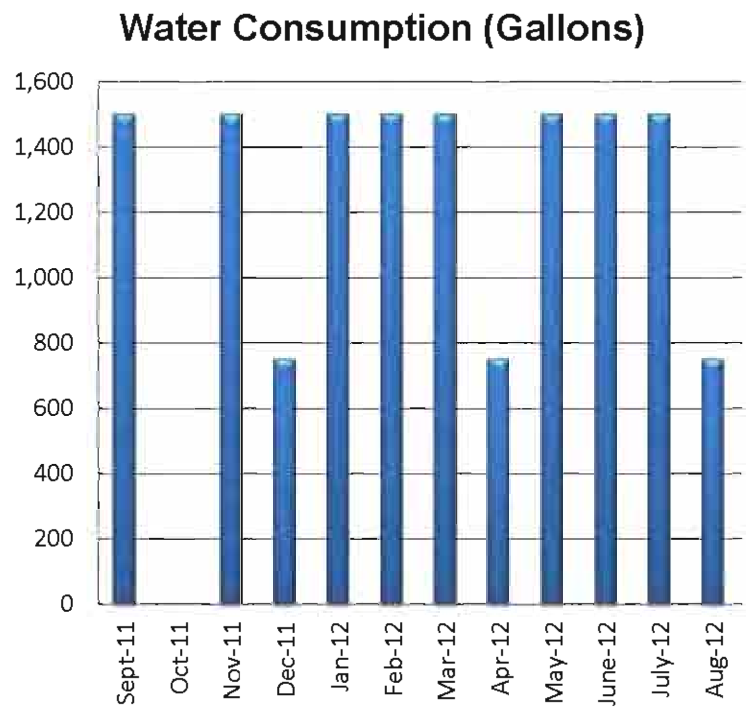


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$13	1,500
Oct-11	$1	0
Nov-11	$13	1,500
Dec-11	$7	750
Jan-12	$13	1,500
Feb-12	$13	1,500
Mar-12	$13	1,500
Apr-12	$7	750
May-12	$13	1,500
June-12	$13	1,500
July-12	$13	1,500
Aug-12	$7	750
Totals	$126	14,250

Cost per sq ft:	$0.04	per sq ft/yr
Average Usage per Fixture:	1,425	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon

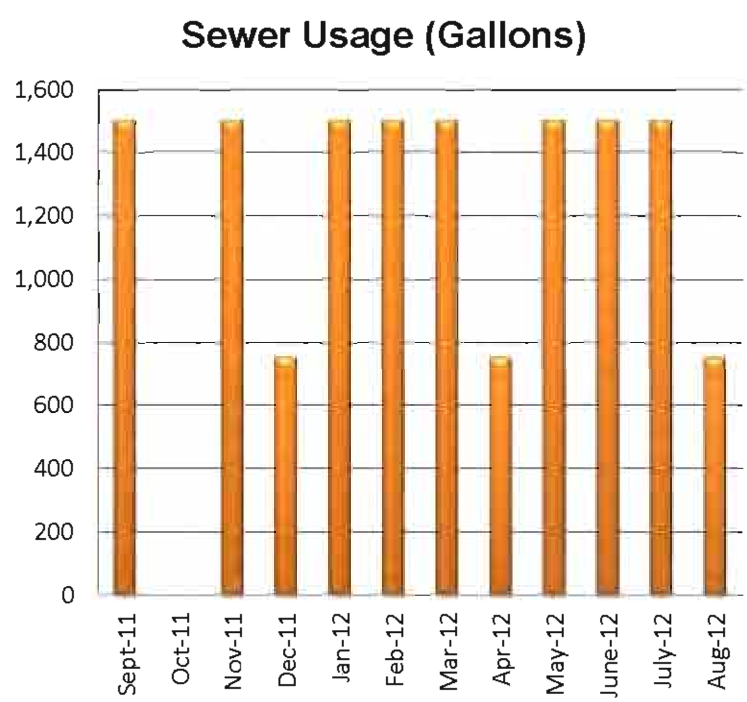


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$15	1,500
Oct-11	$3	0
Nov-11	$15	1,500
Dec-11	$9	750
Jan-12	$15	1,500
Feb-12	$15	1,500
Mar-12	$15	1,500
Apr-12	$9	750
May-12	$15	1,500
June-12	$15	1,500
July-12	$16	1,500
Aug-12	$9	750
Totals	$151	14,250

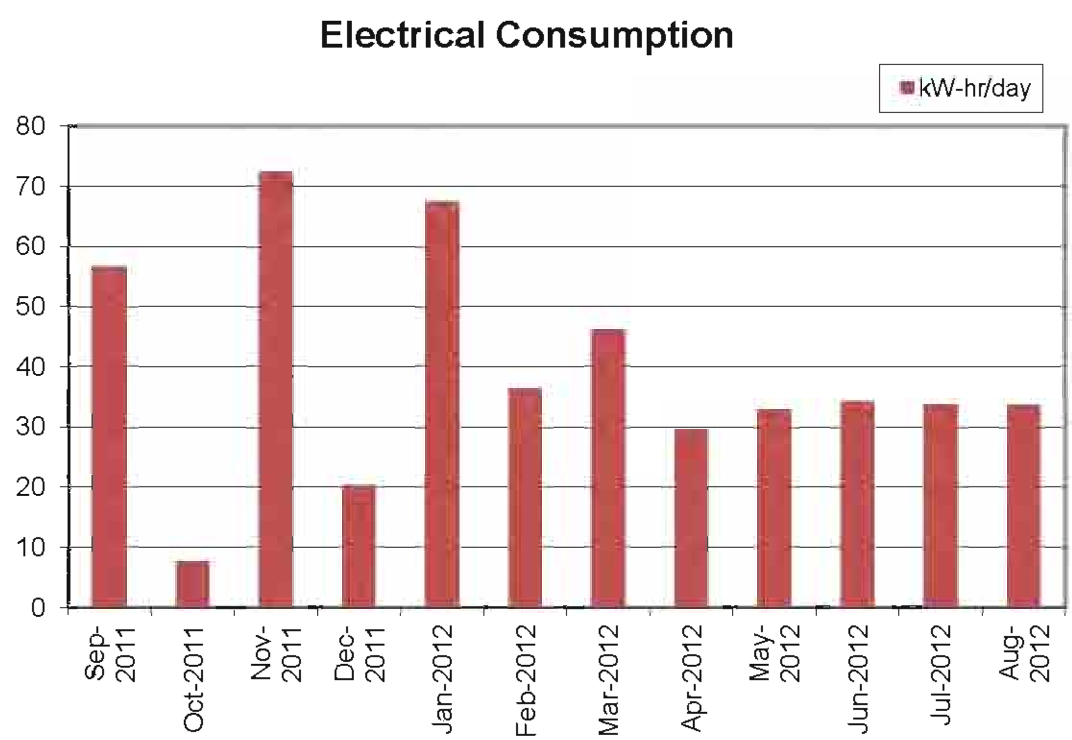
Cost per sq ft:	$0.05	per sq ft/yr
Average Usage per	1,425	gallons/fix
Average Usage Cost per Fixture:	$0.011	$/gallon



Electrical Usage: The following is a summary of electric use for the past year:

		Period	Cost	Usage		
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**	
30	57	Sep-2011	$203	1,696	S7	
31	8	Oct-2011	$45	235	S1	
26	72	Nov-2011	$223	1,881	S9	
31	20	Dec-2011	$88	625	S3	
33	67	Jan-2012	$264	2,224	S8	
29	36	Feb-2012	$135	1,053	S5	
32	46	Mar-2012	$182	1,480	S6	
35	30	Apr-2012	$134	1,039	S4	
30	33	May-2012	$128	985	S4	
30	34	Jun-2012	$131	1,027	S4	
33	34	Jul-2012	$141	1,117	S4	
29	34	Aug-2012	$123	976	S4	
average:	39	Totals	$1,798	14,338	S5	average
		Square Footage		3165		
		kW-hr per sq ft per year =		4.5		

Electrical ECI:	$0.57	per sq ft/yr
Electrical ECU:	15,575	BTU/sq ft
Average Cost per kWh:	$0.13	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	3,165	sq ft
Annual Energy Costs	$3,769	dollars
Total Energy Cost Index (ECI):	$1.19	per sq ft/yr
Total Energy Utilization Index (EUI):	79,651	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	47.70%	percentage
Percentage of Annual Energy Costs for Gas	52.30%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace windows and doors with high efficiency type doors and windows.	Reduce infiltration, reduce gas usage.
B2	Repair and seal openings in exterior walls from existing vents.	Reduce infiltration and heat loss, reduce energy costs.
B3	Install Energy Star rated appliances.	Reduce electrical usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace boiler with sealed combustion, high efficiency type.	Reduce gas usage.
M2	Insulate hot water piping.	Reduce heat loss through pipe.
M3	Implement a comprehensive preventative maintenance program for all mechanical equipment.	Extend life of equipment, increase efficiency of equipment.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostat.	Reduce energy usage during unoccupied hours.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Insulate domestic hot water piping.	Reduce heat loss through pipes.
P2	Install low flow aerators on faucets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace lighting with new fixtures with 28-watt premium T8 lamps and program start electronic ballasts.	Reduce electrical energy costs and extend life of bulbs.
E2	Install wall-box motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.

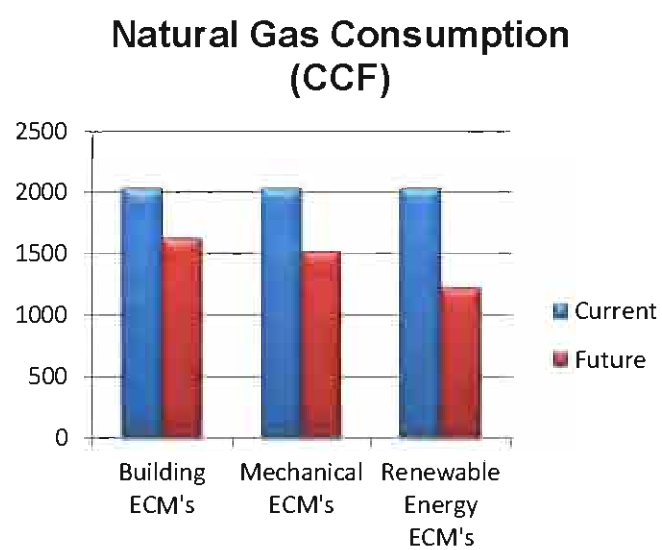
Renewable Energy Opportunities

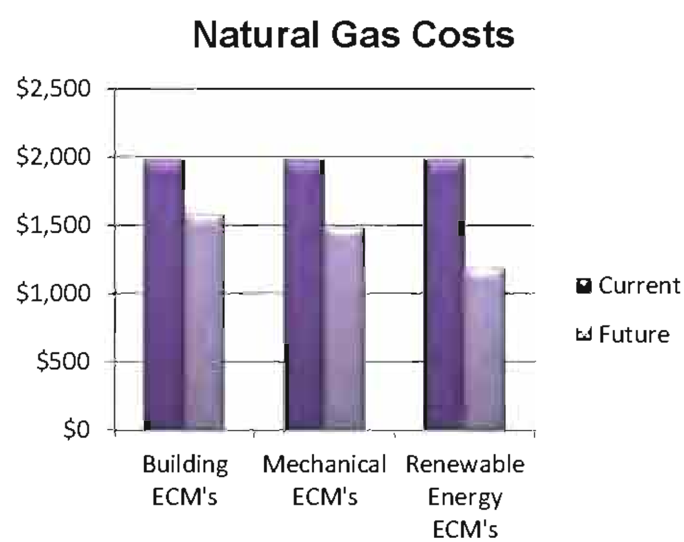
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:

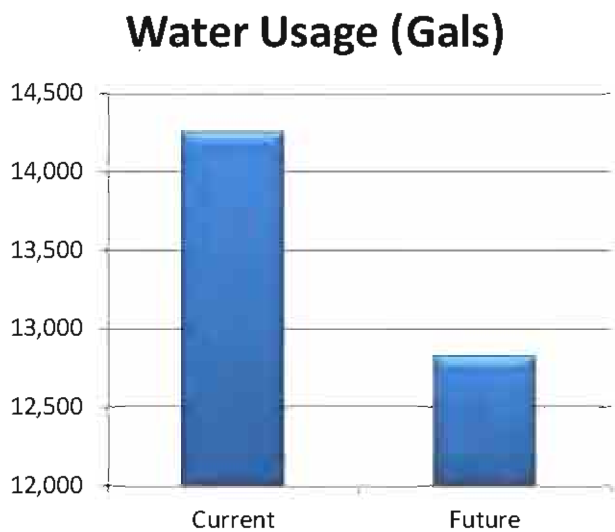




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	EUI (BTU/sq ft)	ECI (per sq ft/yr)	EUI (BTU/sq ft)
Building	$0.62	64,076	$0.50	51,261
Mechanical	$0.62	64,076	$0.47	48,057
Renewable Energy	$0.62	64,076	$0.37	38,445

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

The installation of program start fluorescent ballasts and premium 28-watt T8 lamps is recommend and could provide about $500 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $200 per year of electrical savings.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References
Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.55 Btu/hr/sq ft/deg F
Existing ACH: 0.6

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #28 Envronmental

Project Name: S10-12262 #28 Environmental — 02/15/2013
Prepared by: UPEA — 10:45AM

Air System Information

Air System Name	#28 Envronmental	Number of zones	1
Equipment Class	UNDEF	Floor Area	3200.0 ft²
Air System Type	SZCAV	Location	Sault Ste Marie, Michigan

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	6.5	Tons	Load occurs at	Jul 1600	
Total coil load	78.3	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	72.8	MBH	Entering DB / WB	76.6 / 63.5	°F
Coil CFM at Jul 1600	3567	CFM	Leaving DB / WB	57.2 / 56.0	°F
Max block CFM	3567	CFM	Coil ADP	55.0	°F
Sum of peak zone CFM	3567	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.929		Resulting RH	49	%
ft²/Ton	490.6		Design supply temp.	58.0	°F
BTU/(hr-ft²)	24.5		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	15.66	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	81.5	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	3567	CFM	BTU/(hr-ft²)	25.5	
Max coil CFM	3567	CFM	Ent. DB / Lvg DB	63.3 / 85.0	°F
Water flow @ 20.0 °F drop	8.16	gpm			

Supply Fan Sizing Data

Actual max CFM	3567	CFM	Fan motor BHP	1.95	BHP
Standard CFM	3475	CFM	Fan motor kW	1.55	kW
Actual max CFM/ft²	1.11	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

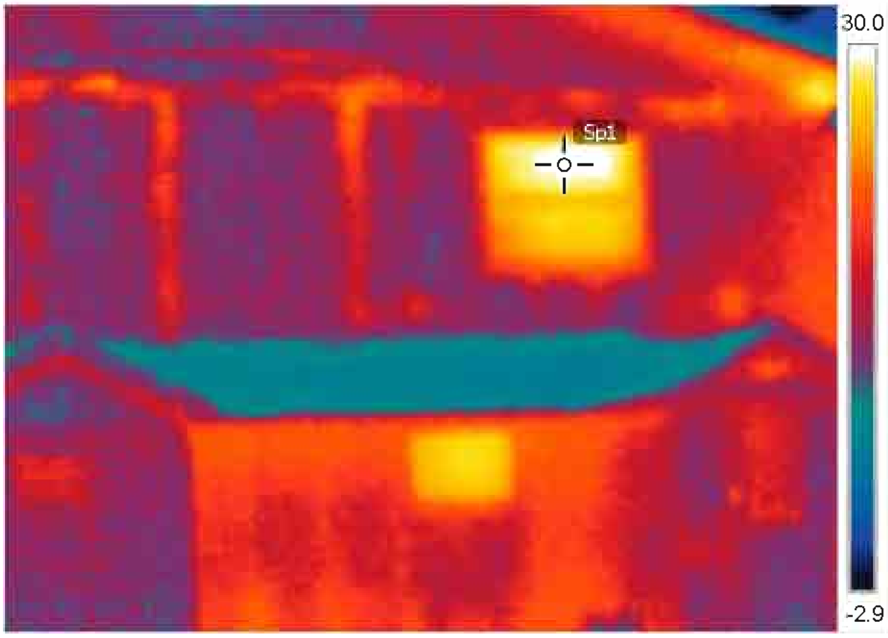
Design airflow CFM	250	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Infrared photos taken with FLIR E40 Camera
Building # 28 Environmental
206 Greenough, Sault Sainte Marie, MI

Measurements	°F
Sp1	29.5

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

1/16/2013 8:16:30 AM



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DC_1725.jpg

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Sp1	28.9

Parameters	
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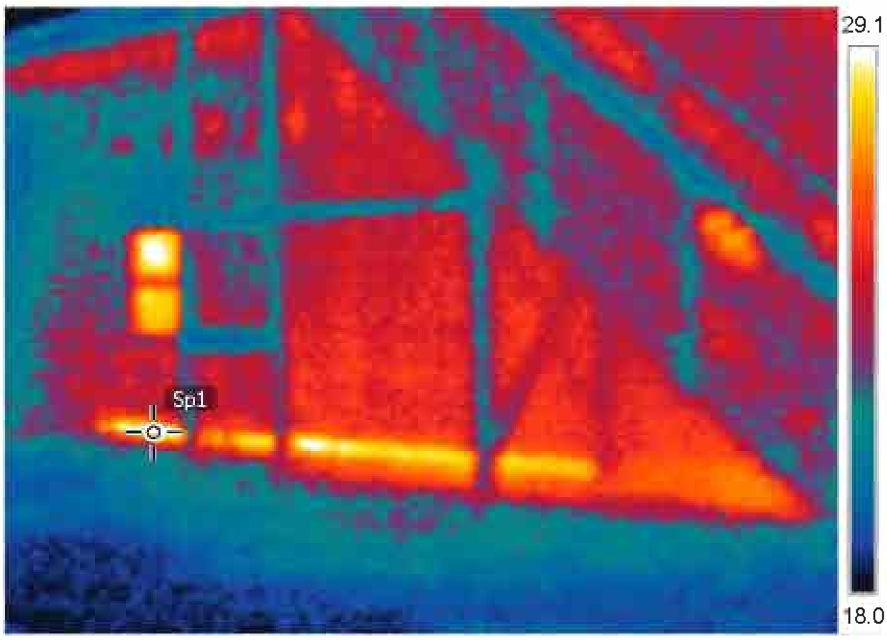

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1/16/2013 8:18:04 AM

DC_1739.jpg

Energy Audit
Tribal Health Clinic
4935 Zee-ba-Tik Lane
Newberry, MI

February 2013

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Summary

The Newberry Tribal Health facility is located next to Sault Tribe Housing on M-28 in Newberry, MI. It is a one story 3,336 square foot building that was constructed in 1974. The buildings primary use is Health but also contains a meeting space and kitchen for small gatherings.

Existing Building Envelope Profile

Wall Construction: The exterior wall construction is metal siding with wood framing, batt insulation and gypsum board interior finish.

Roof Construction: The roof construction is metal with wood trusses. The attic space is not ventilated. The ceiling is gypsum board without insulation above the ceiling.

Floor Construction: Concrete slab on grade with tile floors.

Window and Door Construction: Commercial type windows and doors. The front doors do not seal when closed.

Existing Mechanical Systems Profile

HVAC

The heating and cooling system is served by two natural gas forced air furnaces. One furnace serves the meeting area and adjacent rooms, Carrier, model MCA080. The other furnace serves the office areas, Carrier, model MCA100. Both units are in excellent condition. The condensing units for both furnaces are located outside on grade, one unit is a Goodman model is in good condition, the other unit is fair condition. Duct distribution supply air system is through ceiling diffusers and wall grilles. The return air system uses a central grille for return. The supply air ductwork is insulated and in excellent condition.

There is no outdoor air ventilation supplied to air system.

There is an electric ceiling mounted unit heater serving the vestibule area.

Plumbing

The domestic hot water system is served by a single natural gas fired storage tank type water heater, power vented, Ruud, model PRVP40, 40 gallon capacity. The water piping is copper and is not insulated. There is not a hot water return system.

The average hot water delivery time to plumbing fixtures is 5 seconds.

The plumbing fixtures are floor mounted tank type water closets, wall mounted lavatories with single manual faucets and stainless sinks with dual handle faucets and foot operated controls.

The exhaust fans for the bathrooms are switched with the lights.

There is an electric water cooler in the meeting room.

Temperature Control Systems

The thermostats are wall mounted programmable type.

Existing Electrical Systems Profile

Lighting Systems: Interior lighting is primarily 4-lamp recessed lensed "troffer" fixtures with newer energy efficient 32-watt T8 lamps and instant start electronic ballasts. Interior lighting control is via manual wall box switches. There are some exterior HID "wall-pack" fixtures.

Power Systems: Electrical service is 200-amp, 240/120-volt, 1-phase, 3-wire.

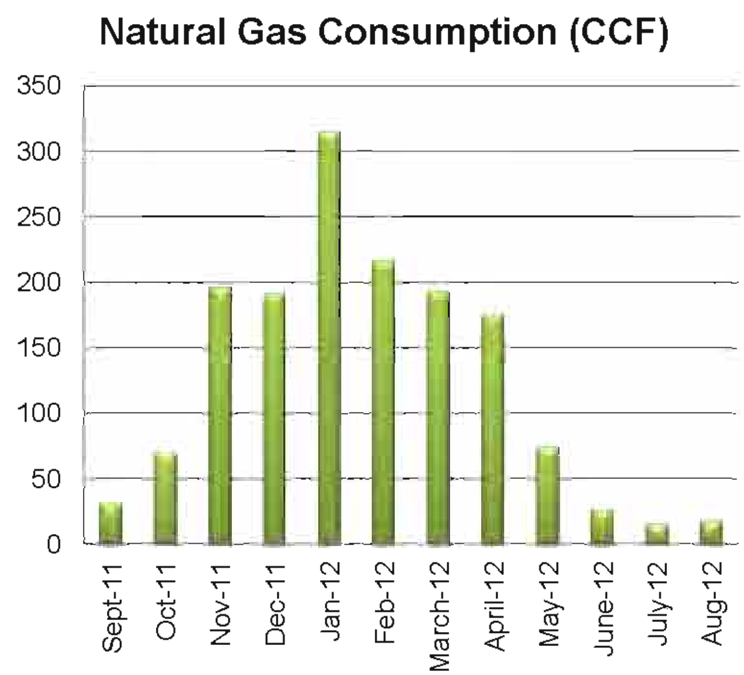
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$36	31
Oct-11	$63	69
Nov-11	$148	196
Dec-11	$143	191
Jan-12	$218	315
Feb-12	$156	217
March-12	$146	193
April-12	$131	175
May-12	$66	74
June-12	$34	26
July-12	$28	15
Aug-12	$29	18
Totals	$1,198	1,520

Natural Gas ECI:	$0.36	per sq ft/yr
Natural Gas ECU:	45,564	BTU/sq ft
Average Cost per CCF:	$0.79	$/CCF

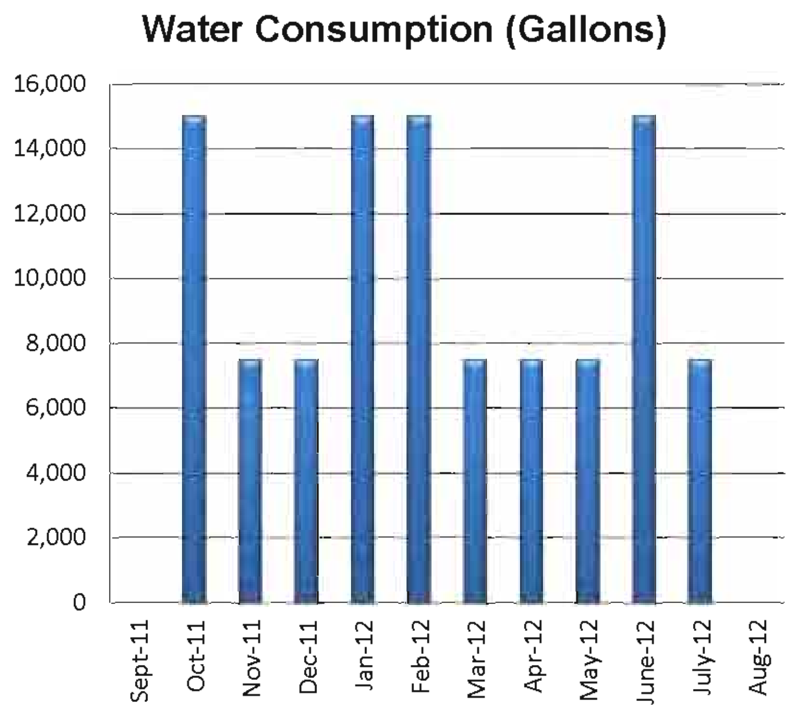


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$29	0
Oct-11	$29	15,000
Nov-11	$29	7,500
Dec-11	$29	7,500
Jan-12	$29	15,000
Feb-12	$29	15,000
Mar-12	$29	7,500
Apr-12	$29	7,500
May-12	$29	7,500
June-12	$29	15,000
July-12	$29	7,500
Aug-12	$29	0
Totals	$348	105,000

Cost per sq ft:	$0.10	per sq ft/yr
Average Usage per Fixture:	17,500	gallons/fix
Average Usage Cost per Fixture:	$0.003	$/gallon

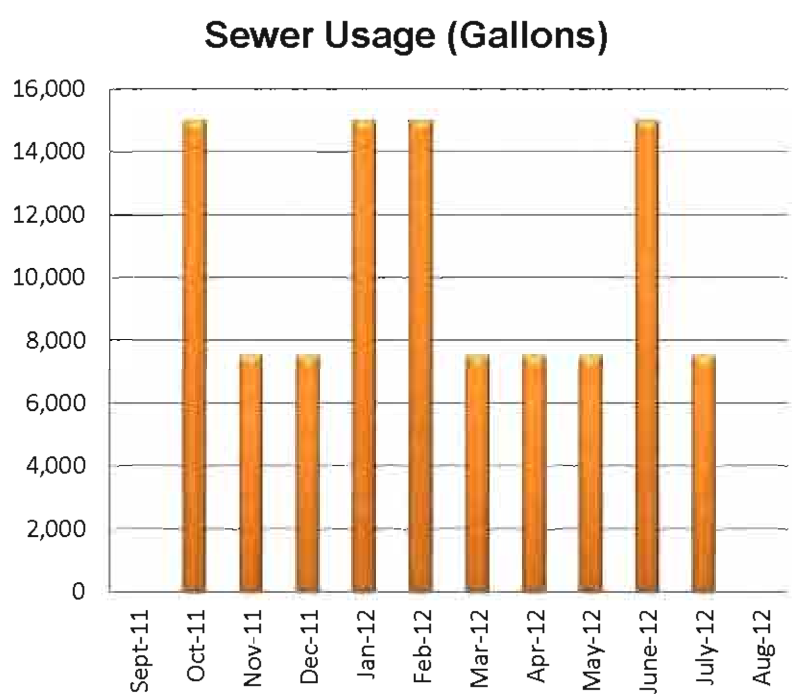


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period.

Month	Cost	Gallons
Sept-11	$22	0
Oct-11	$22	15,000
Nov-11	$22	7,500
Dec-11	$22	7,500
Jan-12	$22	15,000
Feb-12	$22	15,000
Mar-12	$22	7,500
Apr-12	$22	7,500
May-12	$22	7,500
June-12	$22	15,000
July-12	$22	7,500
Aug-12	$22	0
Totals	$264	105,000

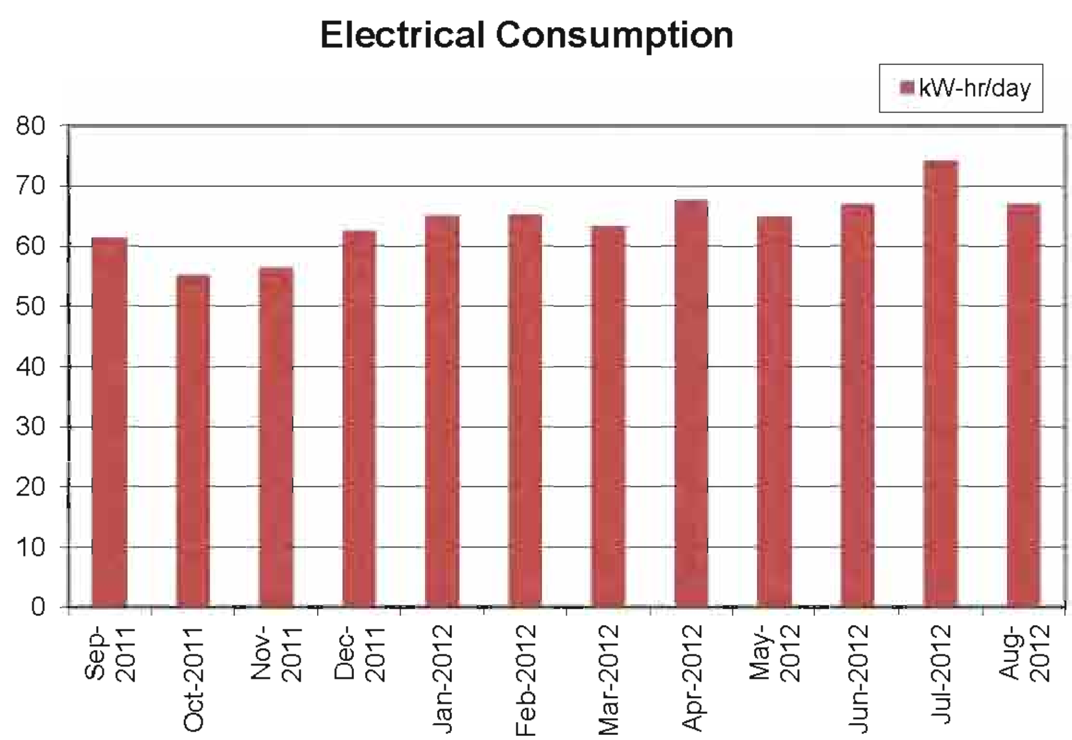
Cost per sq ft:	$0.08	per sq ft/yr
Average Usage per	17,500	gallons/fix
Average Usage Cost per Fixture:	$0.003	$/gallon



Electrical Usage: The following is a summary of electric use for the past year:

		Period	Cost	Usage		
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**	
30	61	Sep-2011	$264	1,840	S9	
31	55	Oct-2011	$248	1,709	S8	
30	56	Nov-2011	$227	1,694	S8	
31	62	Dec-2011	$253	1,935	S8	
31	65	Jan-2012	$264	2,015	S9	
29	65	Feb-2012	$279	1,892	$10	
31	63	Mar-2012	$287	1,961	S9	
30	68	Apr-2012	$295	2,026	$10	
31	65	May-2012	$294	2,013	S9	
30	67	Jun-2012	$293	2,007	$10	
31	74	Jul-2012	$329	2,300	$11	
31	67	Aug-2012	$301	2,073	$10	
average:	64	Totals	$3,334	23,465	S9	average
		Square Footage		3336		
		kW-hr per sq ft per year =		7.0		

Electrical ECI:	$1.00	per sq ft/yr
Electrical ECU:	24,182	BTU/sq ft
Average Cost per kWh:	$0.14	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	3,336	sq ft
Annual Energy Costs	$4,532	dollars
Total Energy Cost Index (ECI):	$1.36	per sq ft/yr
Total Energy Utilization Index (EUI):	69,746	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	73.57%	percentage
Percentage of Annual Energy Costs for Gas	26.43%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Install insulation above the ceiling.	Reduce heat loss through ceiling, reduce gas usage.
B2	Install Energy Star rated appliances.	Reduce electrical usage and utility costs.
B3	Repair or replace door and window seals and weather stripping.	Reduce infiltration, reduce gas usage.
B4	Replace or re-install front door to seal completely.	Reduce infiltration, reduce electrical usage from vestibule unit heater.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Implement comprehensive maintenance program for furnaces and condensing units.	Extend equipment life, improve efficiency of equipment.
M2	Install energy recovery ventilators for outdoor air ventilation to furnaces.	Provide clean air to meeting room and offices, eliminate need to open windows for fresh air, reduce gas usage.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install sensor or timed controls on faucets.	Reduce water usage.
P2	Install low flow aerators on faucets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install low ballast factor program start ballasts.	Extend life of bulb..
E2	Replace exterior lights with LED type fixtures	Reduce electrical energy costs.
E3	Install wall-box motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.

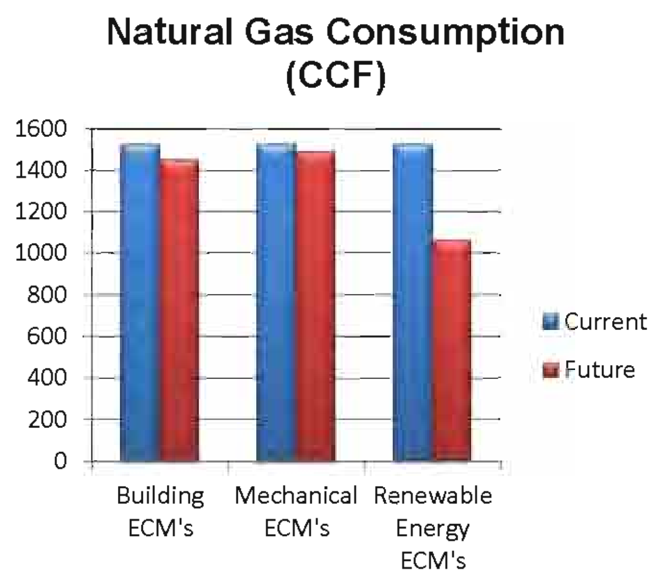
Renewable Energy Opportunities

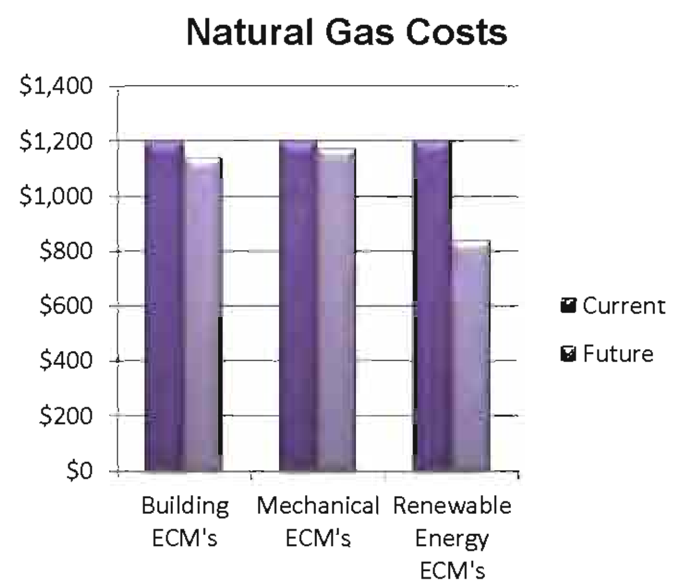
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.
R2	Install wind power energy system for electrical usage.	Reduce electrical utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, and renewable energy conservation measures:

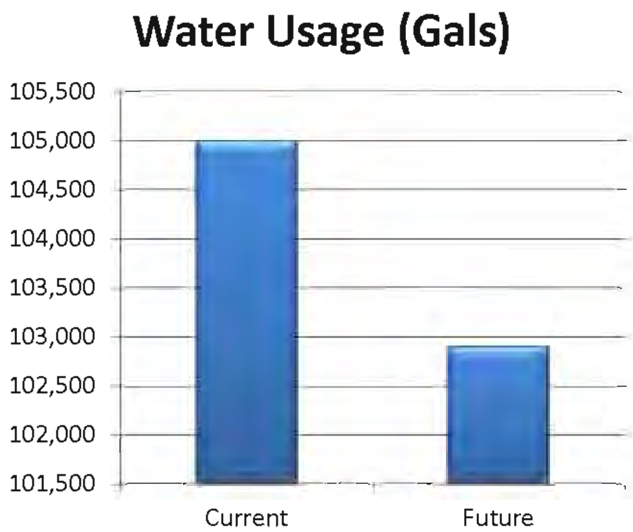




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.36	45,564	$0.34	43,285
Mechanical	$0.36	45,564	$0.35	44,652
Renewable Energy	$0.36	45,564	$0.25	31,894

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

The installation of low ballast factor fluorescent ballasts and premium 28-watt T8 lamps could provide about $200 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $500 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $100 per year.

The installation of approximately 4kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $800

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in exterior walls and some in the ceiling.

Exterior windows and doors have typical heat loss, particularly areas with double doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References
Existing wall U-value: 0.046 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.55 Btu/hr/sq ft/deg F
Existing ACH: 0.6

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #20 Tribal Health Newb

Project Name: S10-12262 #20 Tribal Health Newberry 02/15/2013
Prepared by: UPEA 09.33AM

Air System Information

Air System Name	#20 Tribal Health Newb	Number of zones	1
Equipment Class	UNDEF	Floor Area	3249.0 ft²
Air System Type	SZCAV	Location	Sault Ste Marie, Michigan

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	6.8	Tons	Load occurs at	Jul 1600	
Total coil load	81.7	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	76.3	MBH	Entering DB / WB	76.6 / 63.7	°F
Coil CFM at Jul 1600	3835	CFM	Leaving DB / WB	57.7 / 56.5	°F
Max block CFM	3835	CFM	Coil ADP	55.6	°F
Sum of peak zone CFM	3835	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.934		Resulting RH	50	%
ft²/Ton	477.2		Design supply temp.	58.0	°F
BTU/(hr-ft²)	25.1		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	16.35	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	91.1	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	3835	CFM	BTU/(hr-ft²)	28.0	
Max coil CFM	3835	CFM	Ent. DB / Lvg DB	63.5 / 86.1	°F
Water flow @ 20.0 °F drop	9.12	gpm			

Supply Fan Sizing Data

Actual max CFM	3835	CFM	Fan motor BHP	2.10	BHP
Standard CFM	3736	CFM	Fan motor kW	1.67	kW
Actual max CFM/ft²	1.18	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	251	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	31.3

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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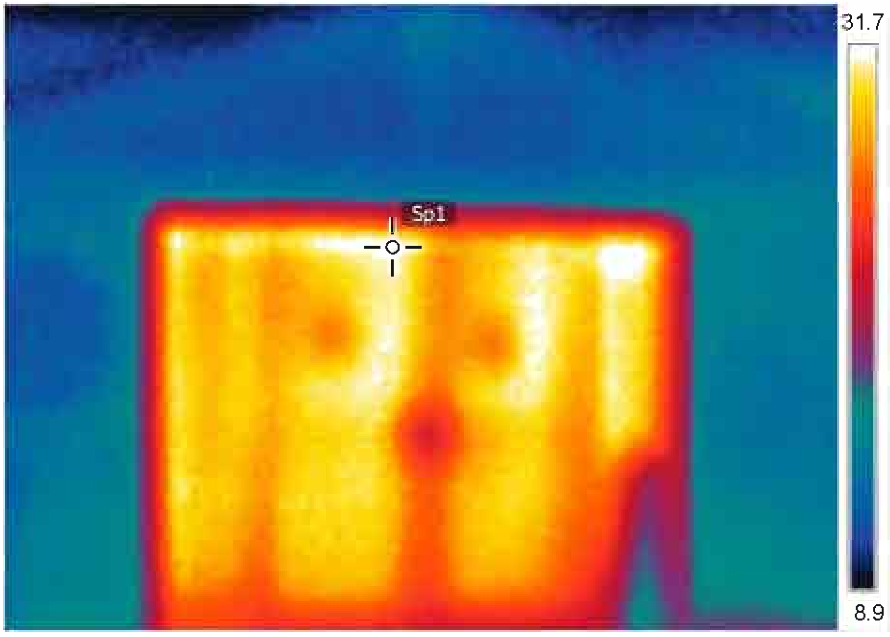

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DC_1105.jpg

Measurements	°F
Sp1	35.8

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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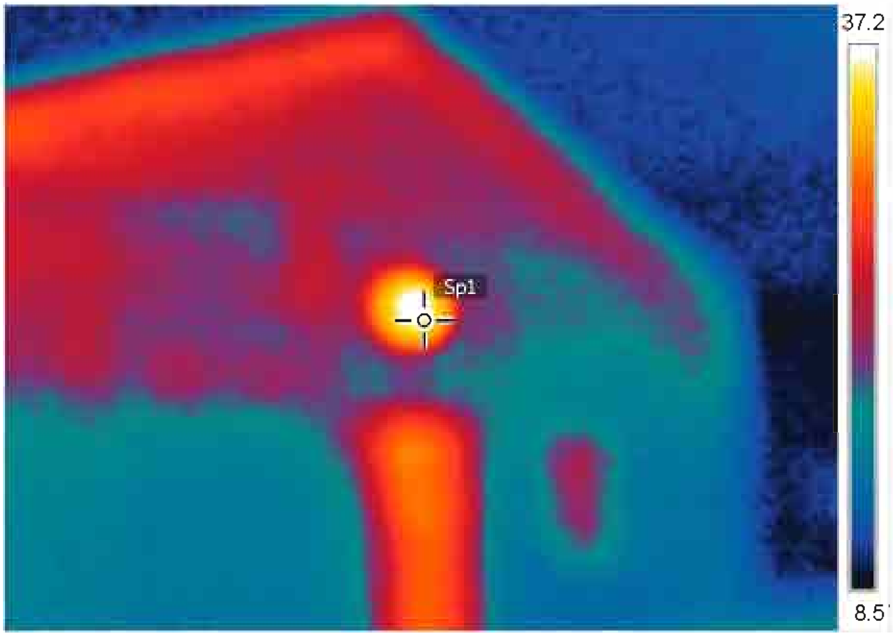

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Energy Audit
Community Center/Health & Human Services
3355 North 3 Mile Road
Hessel, MI

February 2013

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Attachments:

Summary

The Community Center / Health & Human Services Building located in Hessel, Michigan, is a 1-story structure on a crawl space that was built in 1992. This facility is approximately 4,500 square feet in size and has had some updating and renovations since the original construction.

Existing Building Envelope Profile

Wall Construction: Exterior walls are wood frame, with painted drywall finishes on the interior and vinyl siding on exterior.

Roof Construction: Roof is wood frame with membrane.

Floor Construction: Floor is wood frame over crawl space. Floor coverings are mostly tile, with some carpet in office spaces.

Window and Door Construction: Windows are vinyl clad double glaze with wood sash. The windows are in good condition. The doors are steel construction, door seals and weather stripping are in good condition.

Existing Mechanical Systems Profile

HVAC

The HVAC system is served by two propane gas fired down flow type, forced air furnaces, Lennox model G51MP with matching condensing units located outside. The furnaces were installed in 2001. The duct distribution is through supply air ductwork in the crawlspace with delivery through floor grills and common return grilles. The main ductwork is fiber board, branch supply ductwork is insulated flex duct.

Plumbing

The domestic hot water system is served by a single storage tank, propane fired hot water heater, Reliance model 501, 40 gallon storage capacity. The water heater is in fair condition. The water piping is copper and is not insulated. There is not a hot water return system installed.

The plumbing fixtures are floor mounted tank type water closets, countertop lavatories with dual handle manual faucets, and wall mounted urinals with top mounted Sloan flush valves. The faucets do not have low flow aerators installed.

The average hot water delivery time to plumbing fixtures is 3 seconds.

The exhaust fans are switched with the lights.

Temperature Control Systems

The thermostats are wall mounted non-programmable type.

Special Systems

There is a commercial kitchen hood and up blast exhaust fan. There is not a make-up air unit serving the kitchen.

Existing Electrical Systems Profile

Lighting Systems: The majority of interior lighting is 4' fluorescent, with a mixture of 2-lamp and 4-lamp fixtures. Fixtures are primarily of the surface mount "wrap-around" style. Lamps and ballasts were upgraded in the past year to energy efficient T8 lamps and instant start electronic ballasts. Interior lighting controls are primarily manual wall switches for each space. Exterior lighting consists of a few recessed incandescent "can" lights near exterior doors and several HID "wall-pack" type fixtures.

Power Systems: Electrical service consists of (2) 200-amp panels located in central mechanical room.

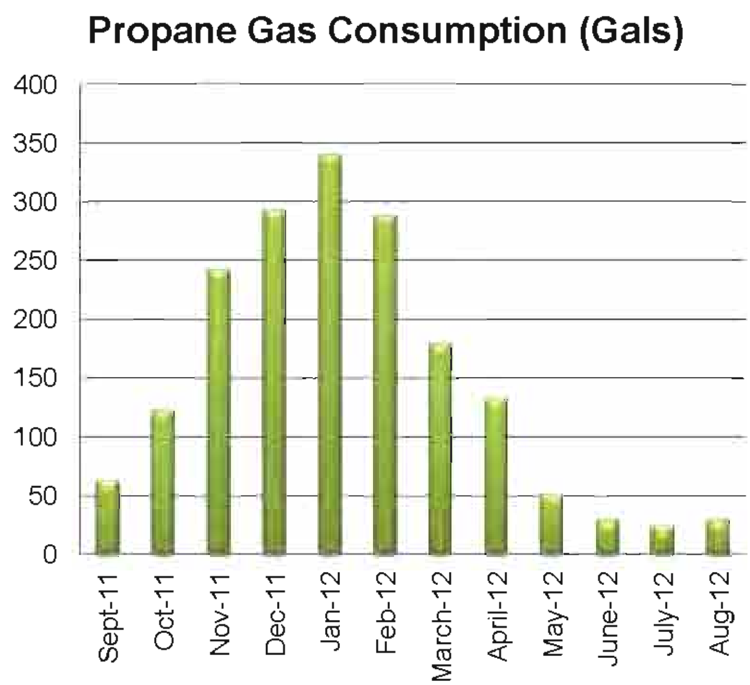
Existing Energy Consumption and Energy Cost Analysis

Propane Usage (Estimate)

The following graphical data represents a monthly weighted average of usage and costs for a building of this construction type and use group for the September 2011 to August 2012 heating season:

Month	Cost	Gals
Sept-11	$168	62
Oct-11	$319	123
Nov-11	$601	242
Dec-11	$708	293
Jan-12	$767	339
Feb-12	$655	288
March-12	$432	180
April-12	$316	132
May-12	$128	51
June-12	$93	29
July-12	$84	24
Aug-12	$96	29
Totals	$4,367	1,792

Propane Gas ECI:	$0.97	per sq ft/yr
Propane Gas ECU:	39,822	BTU/sq ft
Average Cost per Gal:	$2.44	$/Gal

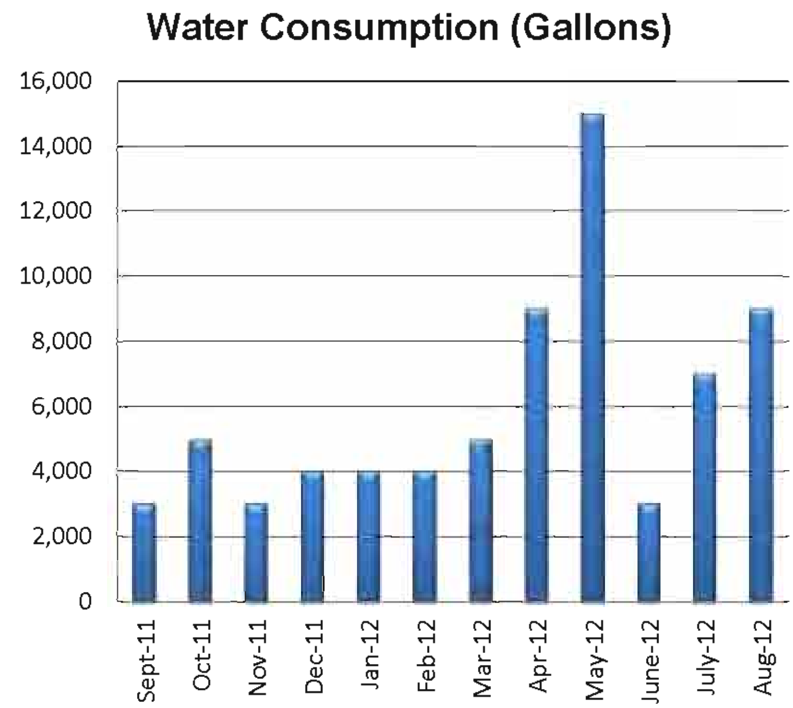


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period. Costs do not include monthly base rate charge.

Month	Cost	Gallons
Sept-11	$15	3,000
Oct-11	$25	5,000
Nov-11	$15	3,000
Dec-11	$20	4,000
Jan-12	$20	4,000
Feb-12	$20	4,000
Mar-12	$25	5,000
Apr-12	$45	9,000
May-12	$75	15,000
June-12	$15	3,000
July-12	$35	7,000
Aug-12	$45	9,000
Totals	$355	71,000

Cost per sq ft:	$0.08	per sq ft/yr
Average Usage per Fixture:	11,833	gallons/fix
Average Usage Cost per Fixture:	$0.005	$/gallon

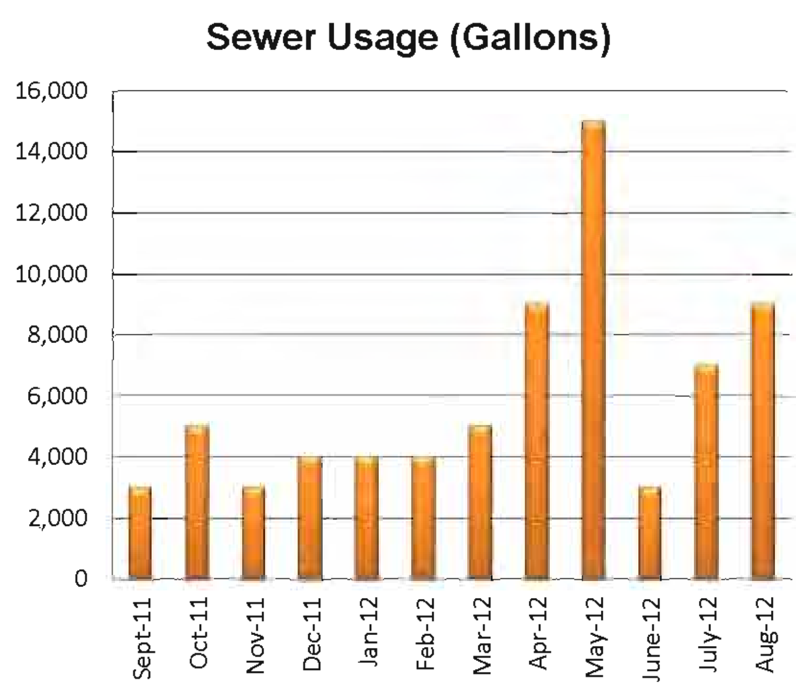


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period. Costs do not include monthly base rate charge.

Month	Cost	Gallons
Sept-11	$21	3,000
Oct-11	$35	5,000
Nov-11	$21	3,000
Dec-11	$28	4,000
Jan-12	$28	4,000
Feb-12	$28	4,000
Mar-12	$35	5,000
Apr-12	$63	9,000
May-12	$105	15,000
June-12	$21	3,000
July-12	$49	7,000
Aug-12	$63	9,000
Totals	$497	71,000

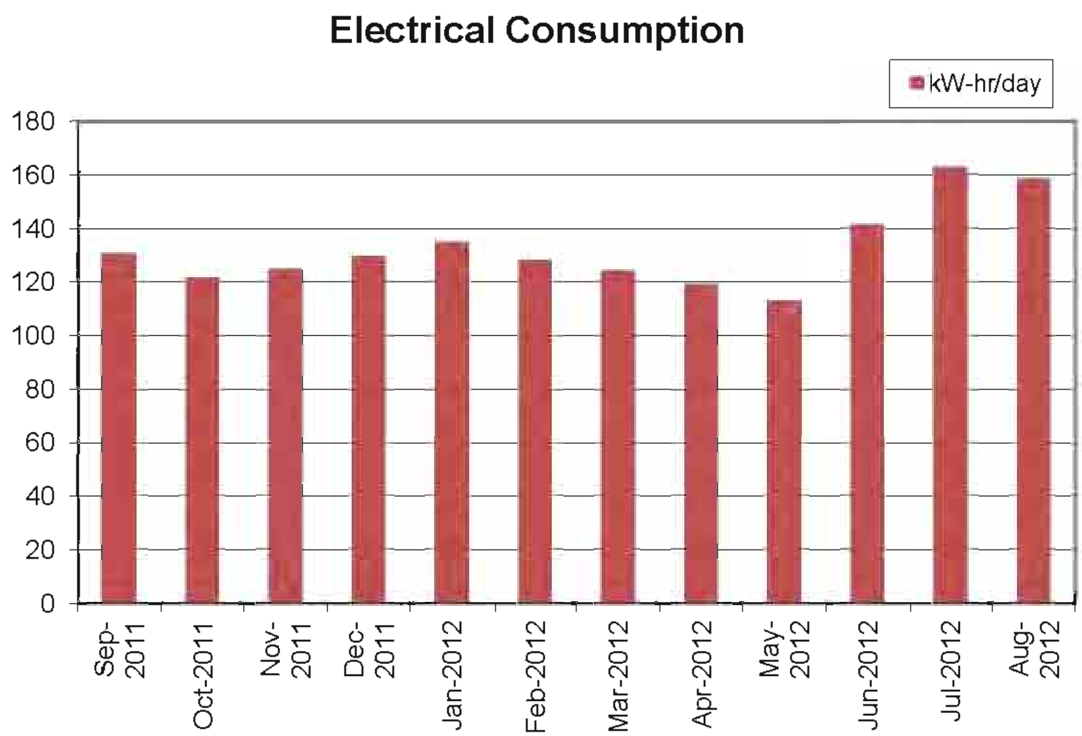
Cost per sq ft:	$0.11	per sq ft/yr
Average Usage per	11,833	gallons/fix
Average Usage Cost per Fixture:	$0.007	$/gallon



Electrical Usage: The following is a summary of electric use for the past year:

		Period	Cost	Usage		
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**	
30	131	Sep-2011	$466	3,915	$16	
31	121	Oct-2011	$449	3,765	$14	
30	125	Nov-2011	$407	3,748	$14	
31	130	Dec-2011	$436	4,018	$14	
31	135	Jan-2012	$456	4,179	$15	
29	128	Feb-2012	$458	3,711	$16	
31	124	Mar-2012	$474	3,851	$15	
30	119	Apr-2012	$440	3,568	$15	
31	113	May-2012	$432	3,500	$14	
30	141	Jun-2012	$521	4,237	$17	
31	163	Jul-2012	$619	5,047	$20	
31	159	Aug-2012	$603	4,916	$19	
average:	132	Totals	$5,762	48,455	$16	average
		Square Footage		4500		
		kW-hr per sq ft per year =		10.8		

Electrical ECI:	$1.28	per sq ft/yr
Electrical ECU:	37,020	BTU/sq ft
Average Cost per kWh:	$0.12	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	4,500	sq ft
Annual Energy Costs	$10,129	dollars
Total Energy Cost Index (ECI):	$2.25	per sq ft/yr
Total Energy Utilization Index (EUI):	76,842	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	56.88%	percentage
Percentage of Annual Energy Costs for Gas	43.12%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Install either lay in ceiling or additional ceiling exhaust fans in main meeting room.	Reduce volume of room required for heating and cooling.
B2	Inspect and replace window and door seals and weatherstripping.	Reduce infiltration, reduce heat loss through doors and windows.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Install energy air ventilators for outside air to furnaces.	Improve indoor air quality.
M2	Implement a comprehensive maintenance program for mechanical equipment to include regular filter changes.	Improve indoor air quality, extend life of equipment.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce energy usage during unoccupied hours.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install low flow aerators on faucets.	Reduce water usage.
P2	Install sensor or timed controls on faucets and water closets.	Reduce water usage.
P3	Install a well water system.	Reduce water costs, eliminate high service charge fees.
P4	Replace water heater with high efficiency type water heater.	Reduce gas usage and costs.
P5	Replace urinals with waterless urinals.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install low ballast factor program start ballasts.	Extend life of bulb..
E2	Replace exterior lights with LED type fixtures	Reduce electrical energy costs.
E3	Install wall-box motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.

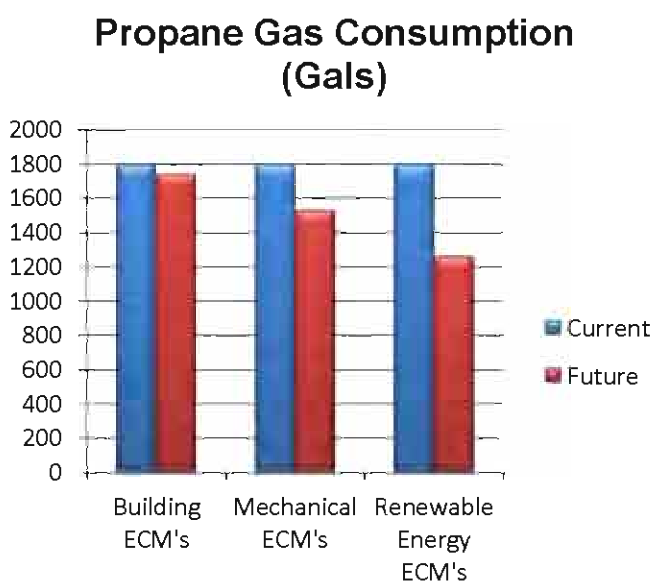
Renewable Energy Opportunities

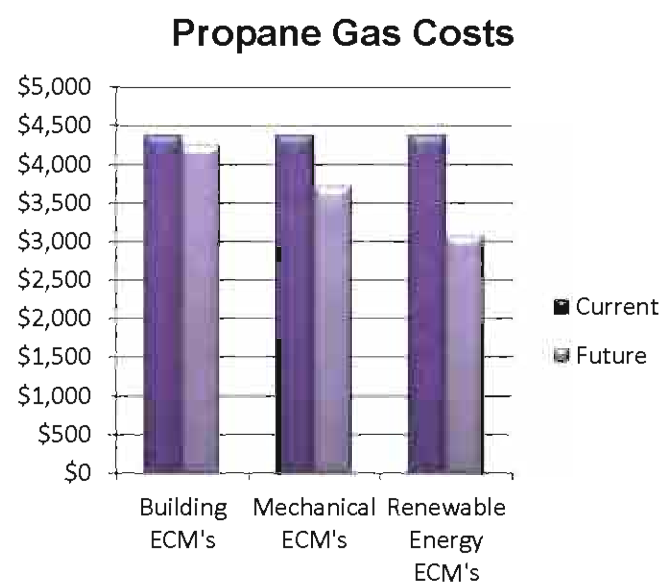
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Propane Gas

The following propane gas energy usage and cost savings is an estimate based on the building, mechanical and renewable energy conservation measures:

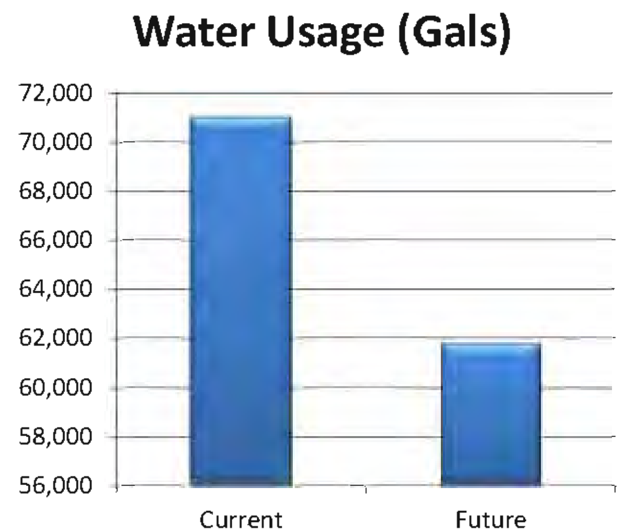


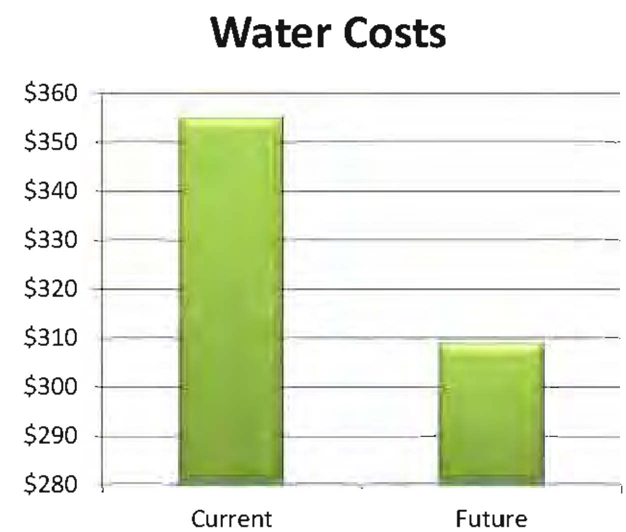


Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.97	39,822	$0.94	38,628
Mechanical	$0.97	39,822	$0.82	33,849
Renewable Energy	$0.97	39,822	$0.68	27,876

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures: An additional annual costs savings of $4476 could be realized depending on the feasibility of an installed well system.





Electrical Systems

The installation of low ballast factor fluorescent ballasts and premium 28-watt T8 lamps could provide about $500 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $1000 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $400 per year.

The installation of approximately 5kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $1,000

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in exterior walls and some in the ceiling.

Exterior windows and doors have typical heat loss, particularly areas with double doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References
Existing wall U-value: xx Btu/hr/sq ft/deg F
Existing roof U-value: xx Btu/hr/sq ft/deg F
Existing window U-value: xx Btu/hr/sq ft/deg F
Existing ACH: xx

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #17 Comm Center Hessel

Project Name: S10-12262 #17 Comm Health Hessel — 02/15/2013
Prepared by: UPEA — 09:22AM

Air System Information

Air System Name	#17 Comm Center Hessel		Number of zones	1	
Equipment Class	UNDEF		Floor Area	4500.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	9.1	Tons	Load occurs at	Jul 1600	
Total coil load	108.7	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	102.4	MBH	Entering DB / WB	76.6 / 64.6	°F
Coil CFM at Jul 1600	5669	CFM	Leaving DB / WB	59.4 / 58.3	°F
Max block CFM	5669	CFM	Coil ADP	57.5	°F
Sum of peak zone CFM	5669	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.942		Resulting RH	53	%
ft²/Ton	496.8		Design supply temp.	58.0	°F
BTU/(hr-ft²)	24.2		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	21.75	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	143.0	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	5669	CFM	BTU/(hr-ft²)	31.8	
Max coil CFM	5669	CFM	Ent. DB / Lvg DB	63.7 / 87.7	°F
Water flow @ 20.0 °F drop	14.31	gpm			

Supply Fan Sizing Data

Actual max CFM	5669	CFM	Fan motor BHP	0.00	BHP
Standard CFM	5522	CFM	Fan motor kW	0.00	kW
Actual max CFM/ft²	1.26	CFM/ft²	Fan static	0.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	352	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	72.7

Parameters	
Emissivity	0.95
Refl. temp	68 °F

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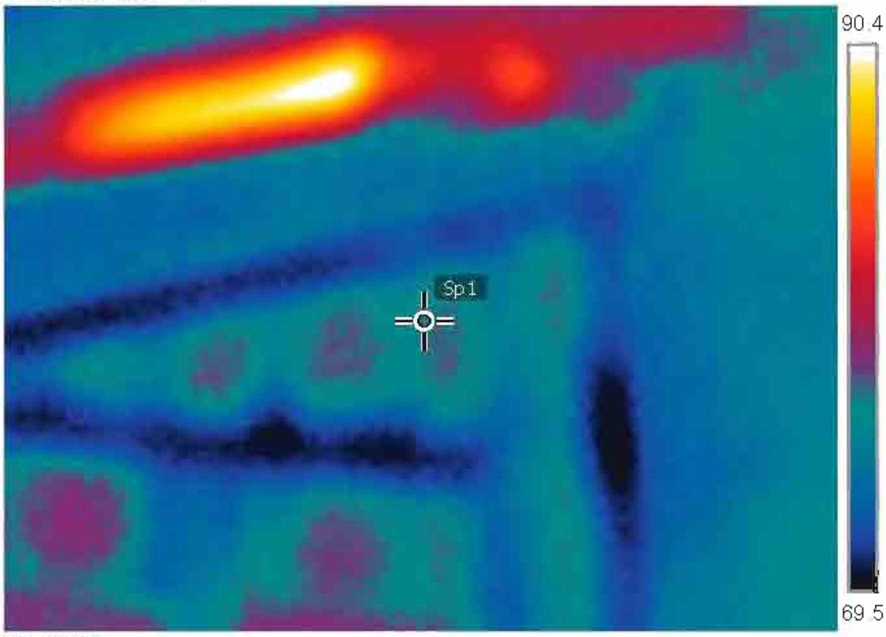

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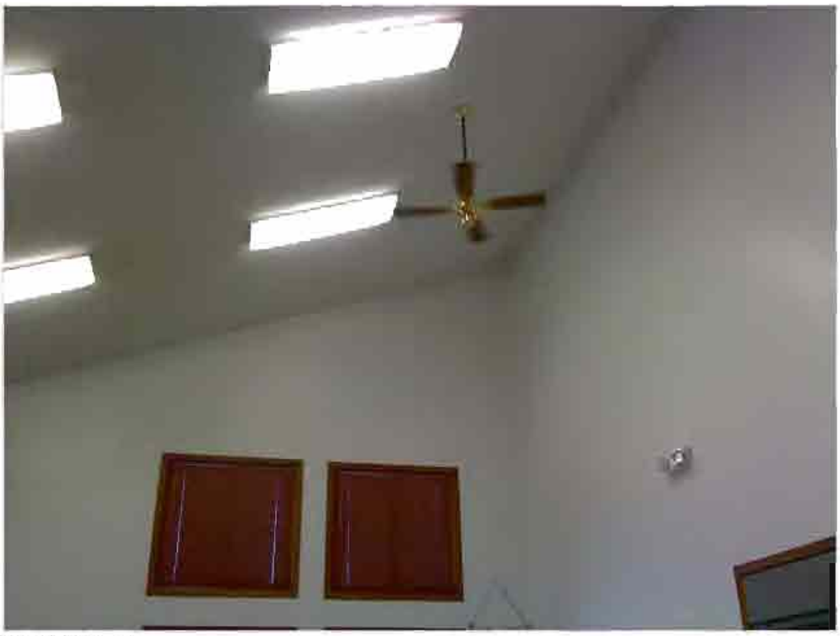

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Measurements	°F
Sp1	64.5

Parameters

Emissivity	0 95
Refl temp	68 °F

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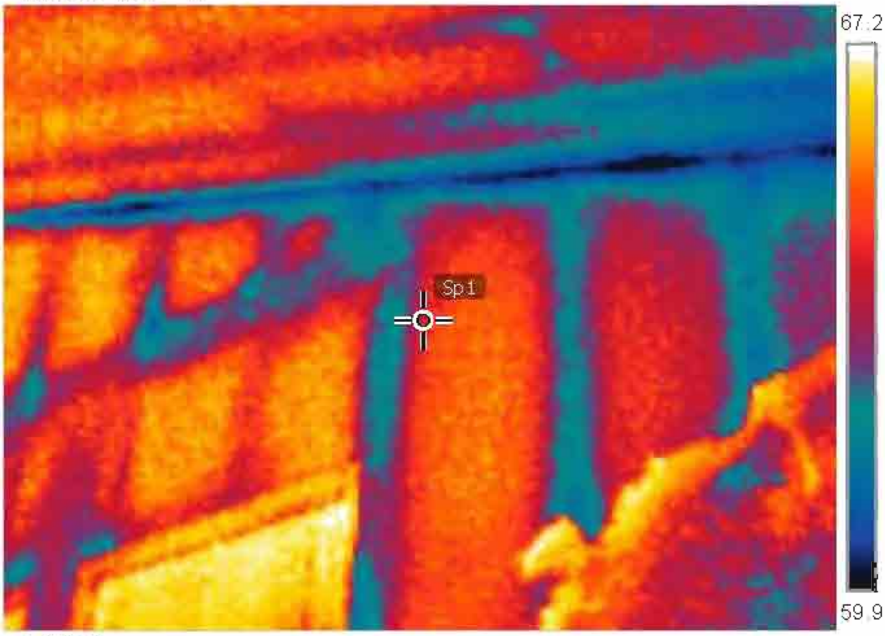

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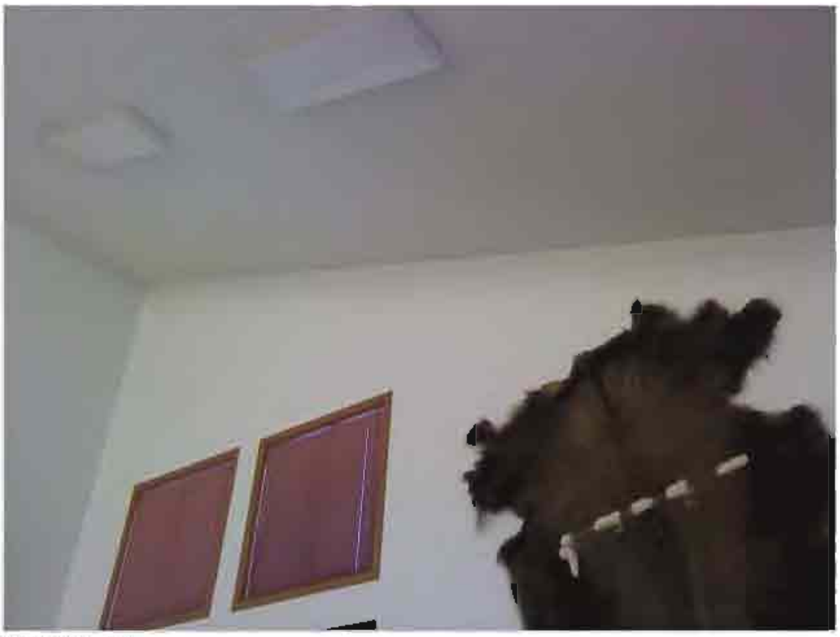

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Energy Audit
Sault Tribe Housing Fleet Building
154 Parkside Drive
Kincheloe, MI

February 2013

Table of Contents

Attachments:

Summary

The Housing Fleet Building located at 154 Parkside drive is a 2,400 square foot office/garage facility adjacent to the Housing Main Office and Warehouse.

Existing Building Envelope Profile

Wall Construction: Exterior walls are wood frame with vertical metal exterior siding.

Roof Construction: Roof is wood frame with metal roofing.

Floor Construction: Concrete slab on grade.

Window and Door Construction: There are overhead doors into garage area. Personnel doors and windows are located in the office area only.

Existing Mechanical Systems Profile

HVAC

The heating in the office areas is served by perimeter electric baseboard. The garage is served by a horizontal propane gas fired air furnace installed in 2008 and an electric unit heater. The furnace is in good condition.

There is a central exhaust system for the garage consisting of a sidewall fan and intake louver with motorized damper.

Plumbing

There are no plumbing fixtures at this facility.

Temperature Control Systems

Thermostats are wall mounted non-programmable type.

Existing Electrical Systems Profile

Lighting Systems: Garage area lights are 8' T12 high-output fluorescent and should be upgraded to T8.

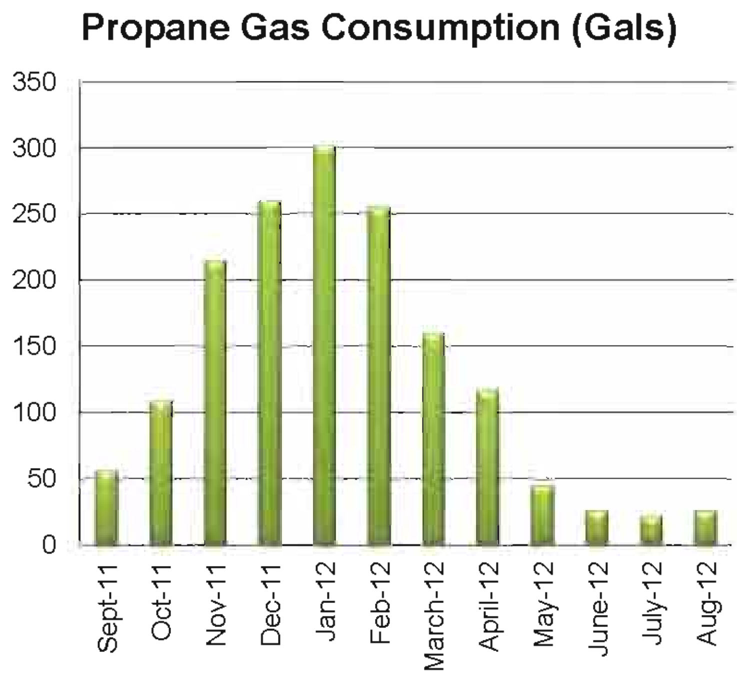
Power Systems: Electrical service is from Cloverland Electric and is 200-amp, single-phase, 240/120-volt.

Existing Energy Consumption and Energy Cost Analysis

Propane Gas Usage

Month	Cost	Gals
Sept-11	$145	55
Oct-11	$275	109
Nov-11	$518	215
Dec-11	$610	259
Jan-12	$661	301
Feb-12	$565	255
March-12	$372	159
April-12	$273	117
May-12	$111	45
June-12	$80	26
July-12	$73	21
Aug-12	$83	26
Totals	$3,764	1,587

Propane Gas ECI:	$1.57	per sq ft/yr
Propane Gas ECU:	66,125	BTU/sq ft
Average Cost per Gal:	$2.37	$/Gal



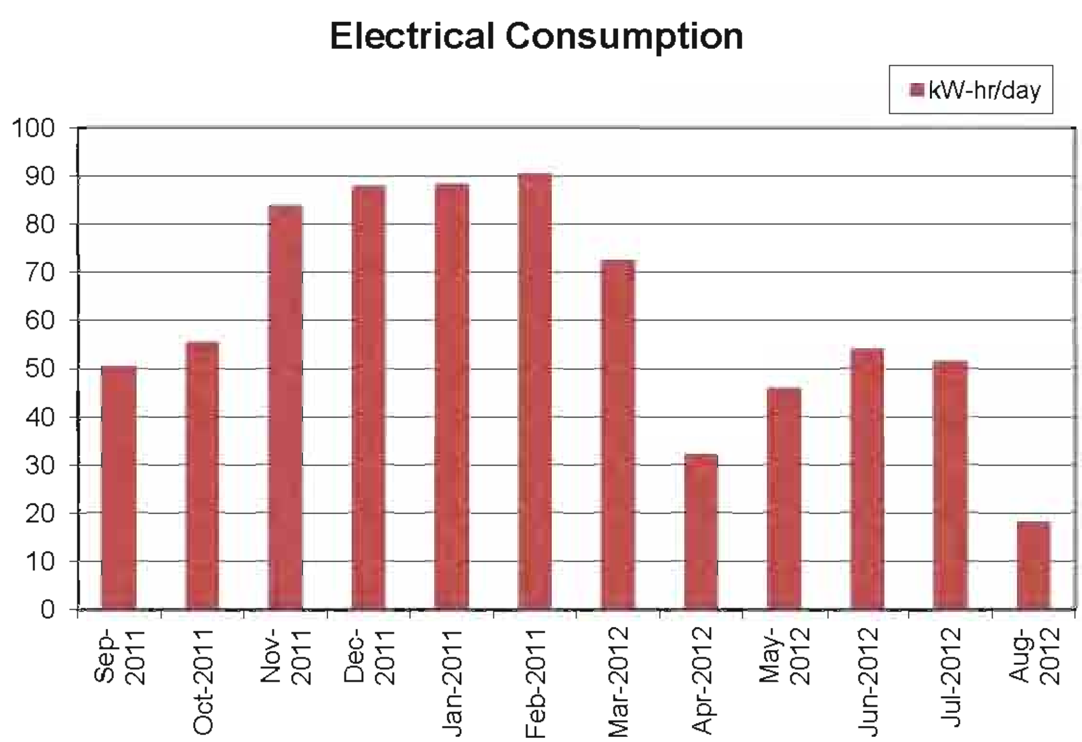
Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day	
30	51	Sep-2011	$175	1,515	$6	
27	55	Oct-2011	$173	1,498	$6	
30	84	Nov-2011	$279	2,515	$9	
31	88	Dec-2011	$311	2,722	$10	
28	88	Jan-2011	$272	2,469	$10	
33	90	Feb-2011	$328	2,986	$10	
31	72	Mar-2012	$258	2,245	$8	
30	32	Apr-2012	$117	965	$4	
30	46	May-2012	$162	1,376	$5	
30	54	Jun-2012	$187	1,621	$6	
33	51	Jul-2012	$196	1,697	$6	
32	18	Aug-2012	$74	586	$2	
average:	61	Totals	$2,533	22,195	$7	average

Square Footage 2400

kW-hr per sq ft per year = 9.2

Electrical ECI:	$1.06	per sq ft/yr
Electrical ECU:	31,794	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	2,400	sq ft
Annual Energy Costs	$6,297	dollars
Total Energy Cost Index (ECI):	$2.62	per sq ft/yr
Total Energy Utilization Index (EUI):	97,919	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	40.22%	percentage
Percentage of Annual Energy Costs for Gas	59.78%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace windows and doors with high efficiency type, insulated door and windows.	Reduce infiltration, reduce electrical energy usage.
B2	Replace garage doors with insulated doors.	Reduce infiltration, reduce gas usage.
B3	Add insulation to exterior walls.	Reduce gas usage and costs.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Implement a comprehensive maintenance program for the mechanical equipment to include filter changes and general maintenance.	Extend life of equipment, improve efficiency of equipment.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce energy usage during unoccupied hours.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Upgrade/replace garage lighting with T8	Reduce electrical energy costs.

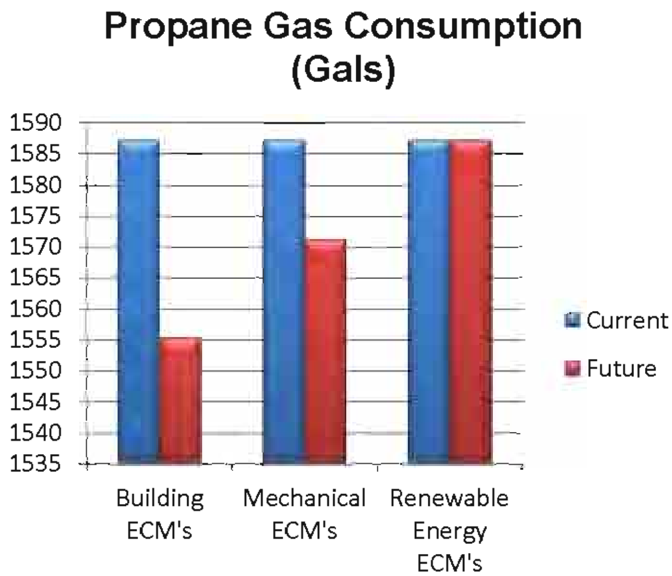
Renewable Energy Opportunities

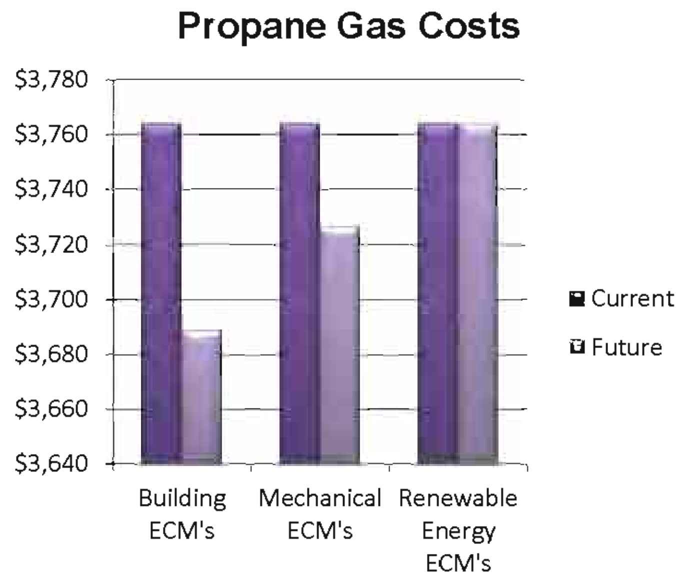
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Propane Gas

The following propane gas energy usage and cost savings is an estimate based on the building, mechanical and renewable energy conservation measures:





Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$1.57	66,125	$1.54	64,803
Mechanical	$1.57	66,125	$1.55	65,464
Renewable Energy	$1.57	66,125	$1.57	66,125

Electrical Systems

Upgrading the garage area lighting to premium 28-watt T8 lamps and program start electronic ballast could provide about $200 in electrical savings per year.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected.

Exterior windows and doors have typical heat loss, particularly overhead doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References
Existing wall U-value: 0.046 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 0.8

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #31 Hsg Fleet

Project Name: S10-12262 #31 Hsg Fleet — 02/15/2013
Prepared by: UPEA — 10:54AM

Air System Information

Air System Name	#31 Hsg Fleet		Number of zones	1	
Equipment Class	UNDEF		Floor Area	2400.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	3.2	Tons	Load occurs at	Jul 1700	
Total coil load	38.6	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	34.6	MBH	Entering DB / WB	77.0 / 64.1	°F
Coil CFM at Jul 1700	1701	CFM	Leaving DB / WB	57.6 / 56.4	°F
Max block CFM	1701	CFM	Coil ADP	55.5	°F
Sum of peak zone CFM	1701	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.898		Resulting RH	50	%
ft²/Ton	746.9		Design supply temp.	58.0	°F
BTU/(hr-ft²)	16.1		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	7.72	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	31.7	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	1701	CFM	BTU/(hr-ft²)	13.2	
Max coil CFM	1701	CFM	Ent. DB / Lvg DB	60.5 / 78.2	°F
Water flow @ 20.0 °F drop	3.17	gpm			

Supply Fan Sizing Data

Actual max CFM	1701	CFM	Fan motor BHP	0.93	BHP
Standard CFM	1657	CFM	Fan motor kW	0.74	kW
Actual max CFM/ft²	0.71	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	188	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Infrared photos taken with FLIR E40 Camera
Building # 31 Housing Fleet Building
154 Parkside, Kincheloe, MI

Measurements	°F
Sp1	23.6

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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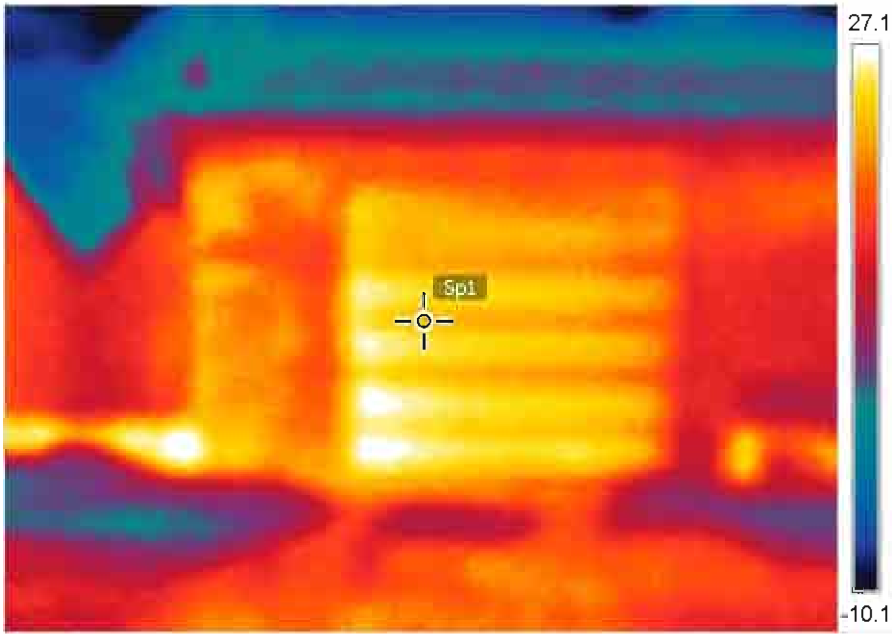

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Energy Audit
Housing Office
154 Parkside
Kincheloe, MI

February 2013

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Attachments:

Summary

The Sault Tribe Housing office building is located at 154 Parkside Drive in Kincheloe, MI. The building is a 40' x 100' metal building with a 51' x 68' wood frame addition that was added in 2011. The original building was constructed in 1983. Total square foot, including a smaller attic/2nd floor space is 8,800 square feet. The building has individual offices, file storage areas, mechanical spaces, conference rooms, bathrooms, and some attic storage area.

Existing Building Envelope Profile

Wall Construction: The original building is a typical metal building with rigid frame metal wall/roof truss members and perlins. The new addition is wood frame walls. The entire building has new vinyl siding on the exterior. The interior wall finish is painted drywall throughout.

Roof Construction: The original roof is a shallow (approx 2/12) slope. The addition is also a shallow slope membrane roof on wood truss.

Floor Construction: The floors are concrete slab on grade construction. Most of the floor coverings are carpet.

Window and Door Construction: Windows are vinyl and the exterior doors are metal.

Existing Mechanical Systems Profile

HVAC

The building HVAC system is served by four natural gas fired up flow sealed combustion condensing furnaces, Carrier models 58MCA and 59TP with matching outdoor condensing units. Outdoor air is supplied through direct intake ductwork to the return air side of the furnaces. The furnaces were in installed in 2005 and 2012 and are in excellent condition. The ductwork distribution is above the ceiling. The ductwork is insulated above the ceiling, however it is not insulated in the mechanical rooms.

Plumbing

The domestic hot water system is served by a single storage tank type, natural gas fired residential grade hot water heater, True Value Master Plumber model, 40 gallon storage capacity. The water has some rusting on the jacket and base plate. The water heater is in fair condition. The water piping is copper and is not insulated. There is not a hot water return system.

The average hot water delivery time to plumbing fixtures is 30 seconds.

The plumbing fixtures are floor mount tank type water closets and countertop lavatories with dual control manual faucets.

The exhaust fans for the bathrooms are a combination of switched with the lights and separate manual switch.

Temperature Control Systems

The thermostats are wall mounted programmable type.

Existing Electrical Systems Profile

Lighting Systems: Most interior lighting is energy efficient linear fluorescent T8 lamps and electronic ballasts. Almost all fixtures are recessed lensed "troffers" in a lay-in ceiling. Most offices have 3-lamp fixtures, corridors have 2-lamp fixtures. Lamps are 32-watt. Lighting control is via manual wall box switches.

Power Systems: Electrical Service is from Cloverland Electric. Main panel is located in original part of building mechanical room.

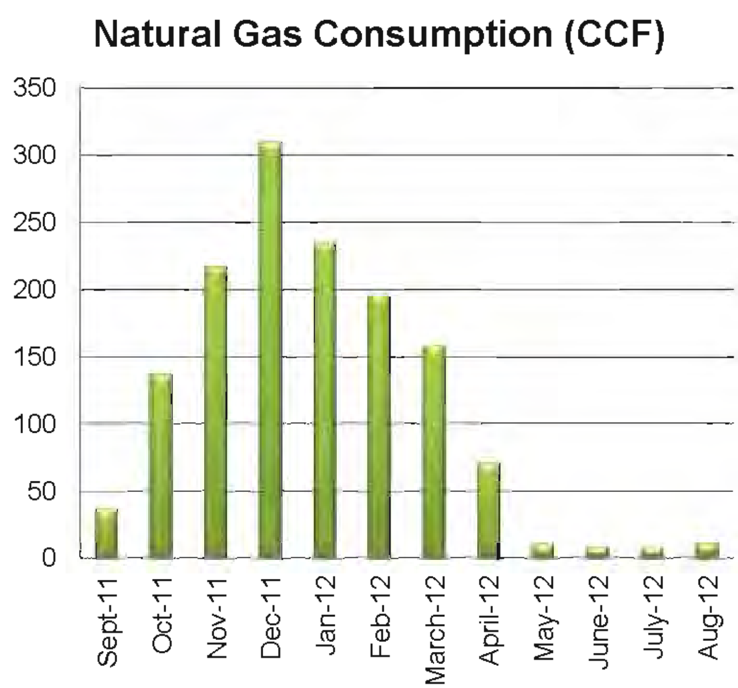
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$57	36
Oct-11	$144	137
Nov-11	$205	217
Dec-11	$271	309
Jan-12	$207	235
Feb-12	$177	196
March-12	$150	158
April-12	$81	71
May-12	$23	10
June-12	$54	8
July-12	$30	7
Aug-12	$62	11
Totals	$1,461	1,395

Natural Gas ECI:	$0.17	per sq ft/yr
Natural Gas ECU:	15,852	BTU/sq ft
Average Cost per CCF:	$1.05	$/CCF

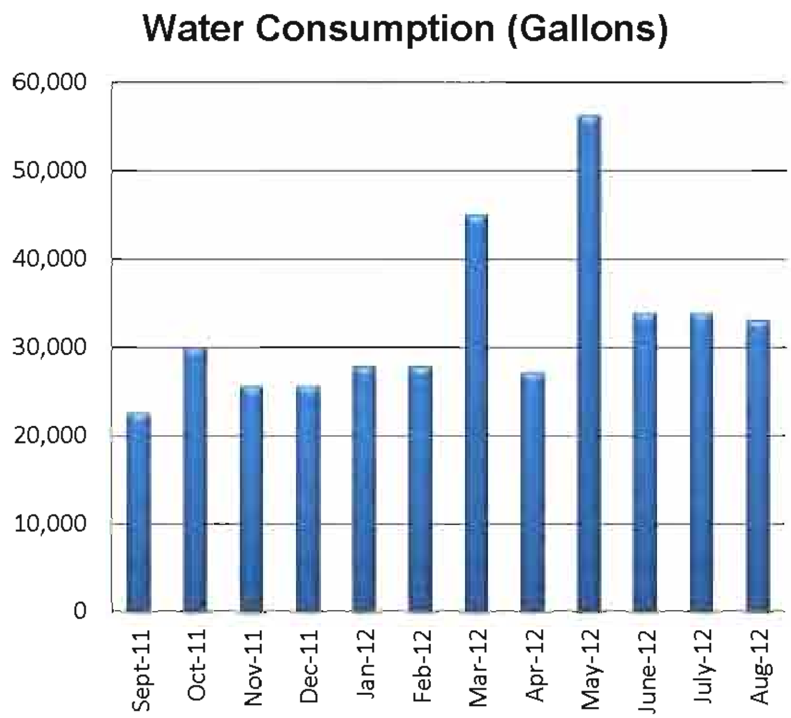


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$5	22,500
Oct-11	$5	30,000
Nov-11	$5	25,500
Dec-11	$5	25,500
Jan-12	$5	27,750
Feb-12	$5	27,750
Mar-12	$5	45,000
Apr-12	$6	27,000
May-12	$8	56,250
June-12	$6	33,750
July-12	$6	33,750
Aug-12	$6	33,000
Totals	$67	387,750

Cost per sq ft:	$0.01	per sq ft/yr
Average Usage per Fixture:	64,625	gallons/fix
Average Usage Cost per Fixture:	$0.0002	$/gallon

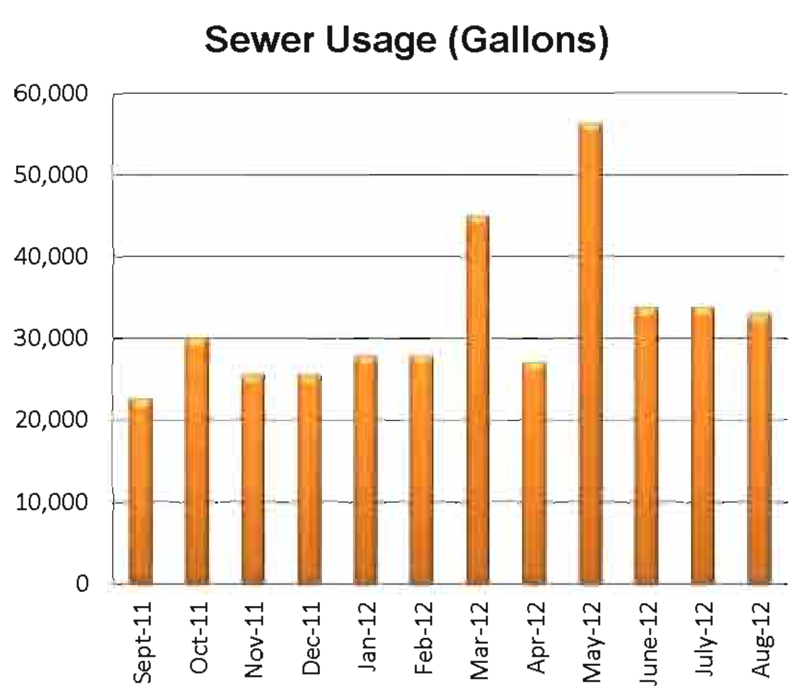


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$16	22,500
Oct-11	$16	30,000
Nov-11	$16	25,500
Dec-11	$16	25,500
Jan-12	$16	27,750
Feb-12	$16	27,750
Mar-12	$16	45,000
Apr-12	$17	27,000
May-12	$26	56,250
June-12	$17	33,750
July-12	$17	33,750
Aug-12	$17	33,000
Totals	$206	387,750

Cost per sq ft:	$0.02	per sq ft/yr
Average Usage per	64,625	gallons/fix
Average Usage Cost per Fixture:	$0.001	$/gallon



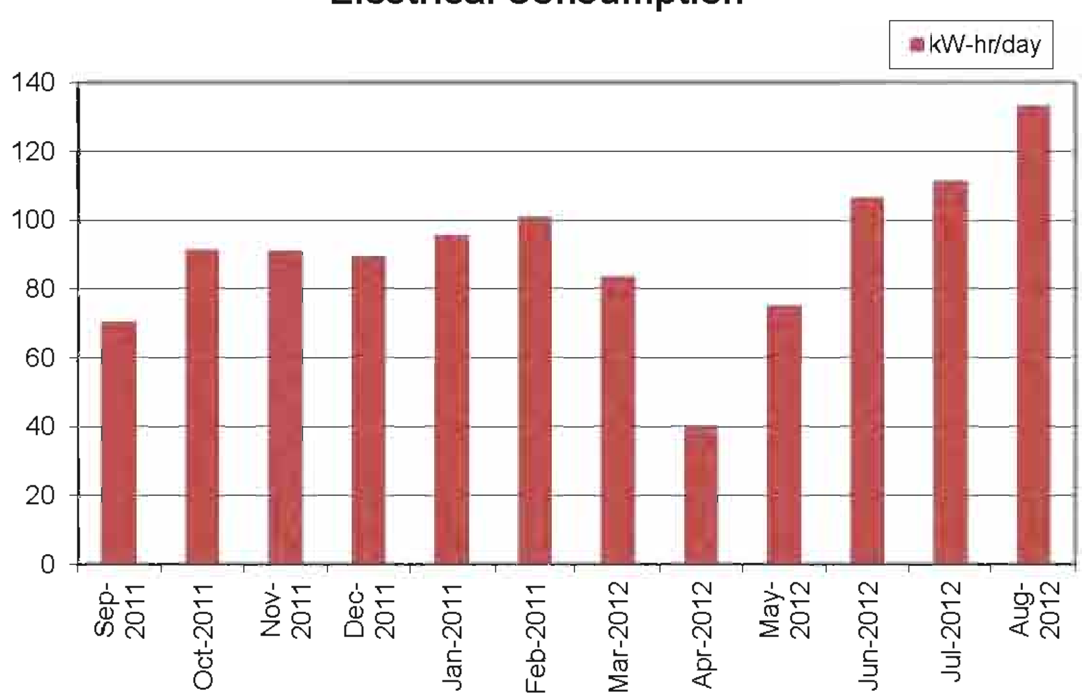
Electrical Usage: The following is a summary of electric use for the past year:

Note: Some data provided indicates that the electric meter may have not been working and was changed out early in 2012, some data was used from the previous year. Monthly data should be reviewed for 2013 to examine electrical use trends. UPEA believes the following summary is accurate for an annual average, but monthly data may not be an accurate prediction for this year.

		Period	Cost	Usage		
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**	
30	70	Sep-2011	$239	2,112	S8	
27	91	Oct-2011	$277	2,462	$10	
30	91	Nov-2011	$302	2,734	$10	
31	89	Dec-2011	$316	2,771	$10	
28	95	Jan-2011	$298	2,672	$11	
33	101	Feb-2011	$366	3,328	$11	
31	84	Mar-2012	$296	2,592	$10	
30	40	Apr-2012	$142	1,190	S5	
30	75	May-2012	$259	2,256	S9	
30	106	Jun-2012	$315	3,191	$11	
33	111	Jul-2012	$385	3,672	$12	
32	133	Aug-2012	$472	4,262	$15	
average:	91	Totals	$3,669	33,242	$10	average
		Square Footage		8800		
		kW-hr per sq ft per year =		3.8		

Electrical ECI:	$0.42	per sq ft/yr
Electrical ECU:	12,987	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh

Electrical Consumption



Total Energy Use Summary

Summary		
Total Gross Area of Building:	8,800	sq ft
Annual Energy Costs	$5,130	dollars
Total Energy Cost Index (ECI):	$0.58	per sq ft/yr
Total Energy Utilization Index (EUI):	28,839	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	71.52%	percentage
Percentage of Annual Energy Costs for Gas	28.48%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Add insulation above the ceiling.	Reduce heat loss through ceiling, reduce gas usage and utility costs.
B2	Inspect and replace window and door seals.	Reduce infiltration, reduce energy usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace older furnaces with high efficiency condensing type furnaces.	Reduce gas usage and utility costs.
M2	Insulate ductwork in mechanical room.	Reduce heat loss across ductwork, improve equipment efficiency.
M3	Install energy recovery ventilators for outdoor air intake.	Reduce cooling and heating load requirements, reduce gas energy costs.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Replace water heater with instantaneous or point of use type.	Reduce jacket loss, improve hot water system efficiency.
P2	Install hot water return system.	Reduce water usage, increase hot water delivery time to fixtures.
P3	Install sensor or timed controls on faucets and water closets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install low ballast factor program start ballasts.	Extend life of bulb..
E2	Install motion sensors to automatically turn off lights in interior spaces.	Reduce electrical energy costs.

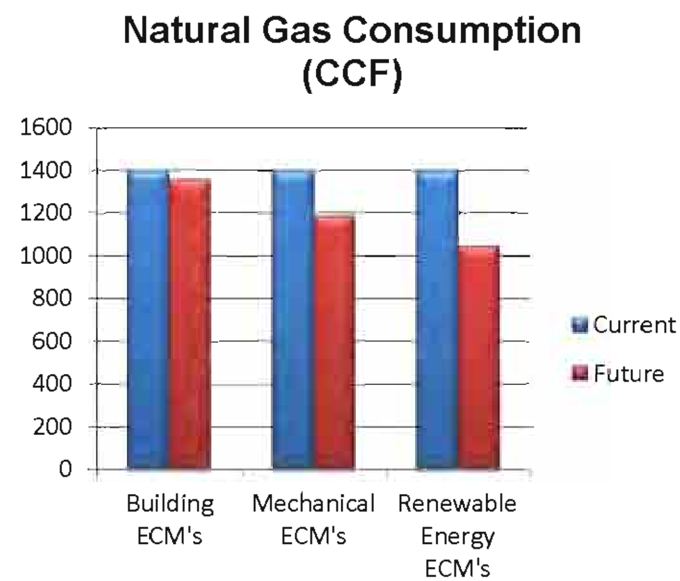
Renewable Energy Opportunities

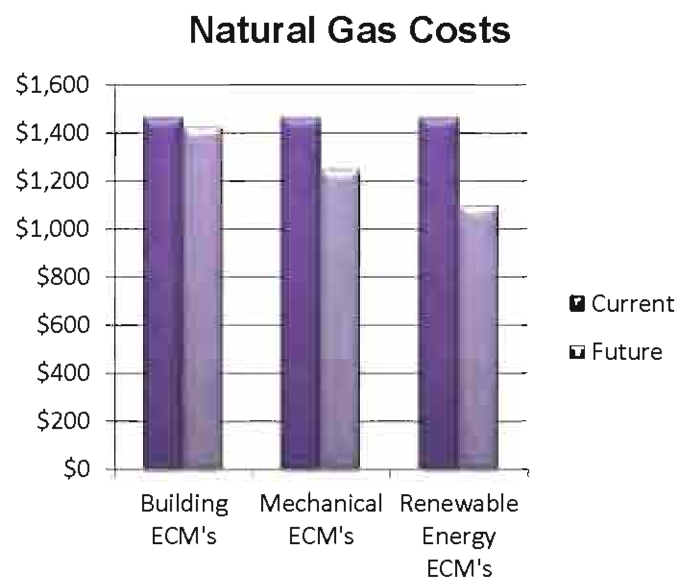
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:

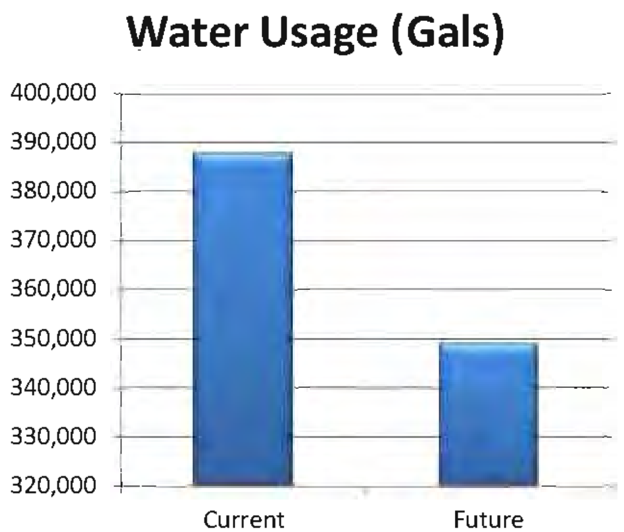


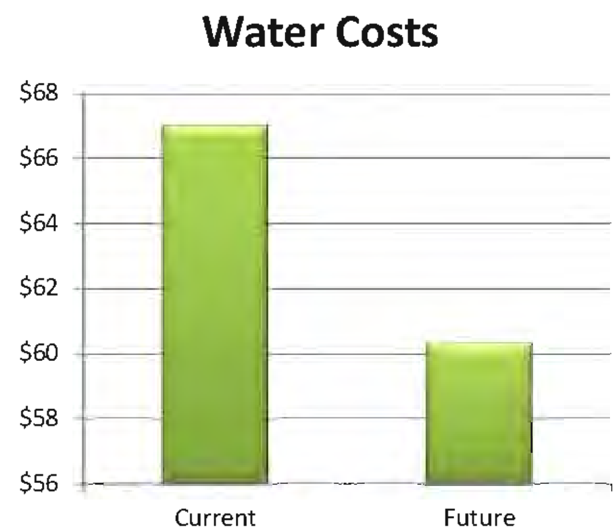


Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.17	15,852	$0.16	15,377
Mechanical	$0.17	15,852	$0.14	13,474
Renewable Energy	$0.17	15,852	$0.12	11,889

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:





Electrical Systems

The installation of low ballast factor fluorescent ballasts and 28-watt premium T8 lamps could provide about $500 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $1000 per year of electrical savings.

The installation of approximately 5kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $1,000.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value: 0.062 Btu/hr/sq ft/deg F
Existing roof U-value: 0.047 Btu/hr/sq ft/deg F
Existing window U-value: 0.55 Btu/hr/sq ft/deg F
Existing ACH: 0.6

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #16 Housing Office

Project Name. S10-12262 #16 Housing Office — 02/15/2013
Prepared by. UPEA — 09.24AM

Air System Information

Air System Name	**#16 Housing Office**		Number of zones	**1**	
Equipment Class	**UNDEF**		Floor Area	**7921.0**	ft²
Air System Type	**SZCAV**		Location	**Sault Ste Marie, Michigan**	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**15.0**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**180.1**	MBH	OA DB / WB	**83.0 / 69.0**	°F
Sensible coil load	**167.4**	MBH	Entering DB / WB	**76.8 / 64.1**	°F
Coil CFM at Jul 1500	**8516**	CFM	Leaving DB / WB	**58.2 / 56.9**	°F
Max block CFM	**8516**	CFM	Coil ADP	**56.1**	°F
Sum of peak zone CFM	**8516**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.929**		Resulting RH	**50**	%
ft²/Ton	**527.9**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**22.7**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**36.03**	gpm	Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**191.0**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**8516**	CFM	BTU/(hr-ft²)	**24.1**	
Max coil CFM	**8516**	CFM	Ent. DB / Lvg DB	**63.1 / 84.4**	°F
Water flow @ 20.0 °F drop	**19.11**	gpm			

Supply Fan Sizing Data

Actual max CFM	**8516**	CFM	Fan motor BHP	**4.66**	BHP
Standard CFM	**8295**	CFM	Fan motor kW	**3.70**	kW
Actual max CFM/ft²	**1.08**	CFM/ft²	Fan static	**2.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**619**	CFM	CFM/person	**21.50**	CFM/person
CFM/ft²	**0.08**	CFM/ft²			

Measurements	°F
Sp1	27.6

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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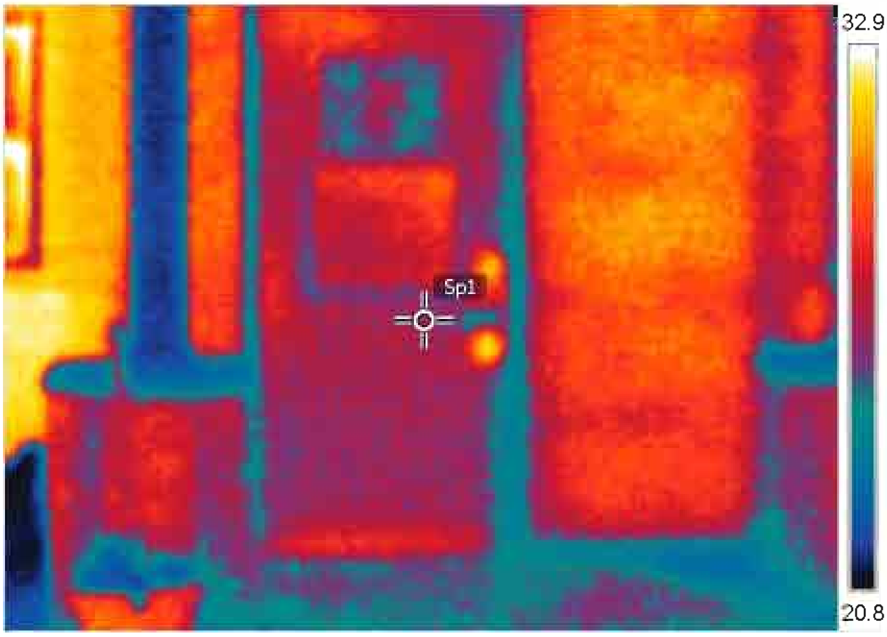

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Measurements	°F
Sp1	28.1

Parameters	
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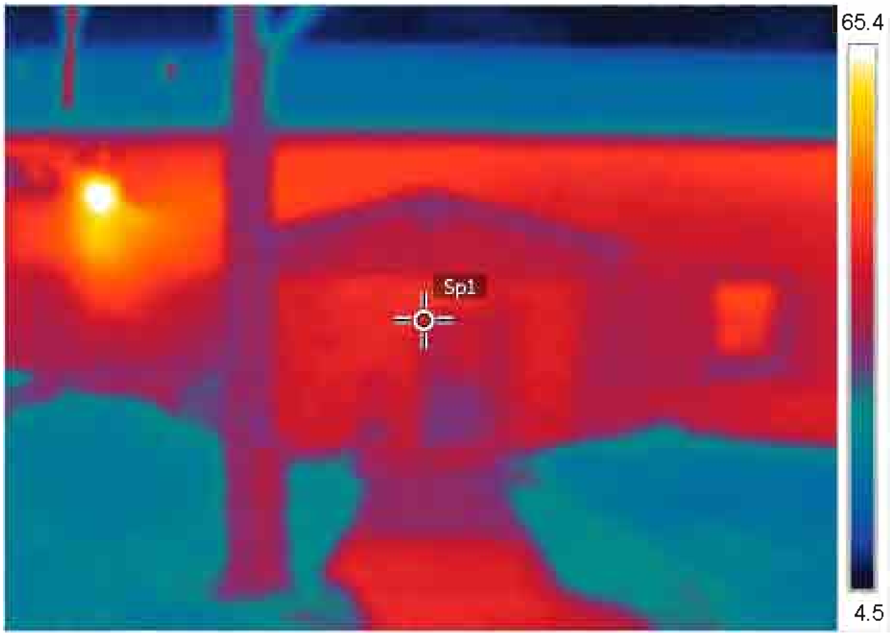

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Measurements	°F
Sp1	31.1

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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Energy Audit
Sault Tribe Housing Warehouse
154 Parkside Drive
Kincheloe, MI

February 2013

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Attachments:

Summary

The warehouse building used by Sault Tribe Housing is located at 154 Parkside Drive in Kincheloe and contains office space and a large general storage warehouse area. The building is 2,400 square feet and was constructed in 2008.

Existing Building Envelope Profile

Wall Construction: Exterior walls are wood framed with vinyl exterior siding and drywall interior.

Roof Construction: The roof is wood trusses with sloped metal roofing. The east (office) portion of building has a lower ceiling height.

Floor Construction: Floors are concrete slab on grade.

Window and Door Construction: There is a large overhead door to the north for deliveries. Personnel doors are to the east. The office contains several windows.

Existing Mechanical Systems Profile

HVAC

The heating in the office areas is served by perimeter electric baseboard. The warehouse is served by single ceiling hung propane gas fired unit heater.

Plumbing

There are no plumbing fixtures at this facility.

Temperature Control Systems

Thermostats are wall mounted non-programmable type.

Existing Electrical Systems Profile

Lighting Systems: Interior lighting is T8 linear fluorescent, with instant start electronic ballasts.

Power Systems: Electrical service is from Cloverland Electric, 200-amp, 240/120-volt, single-phase.

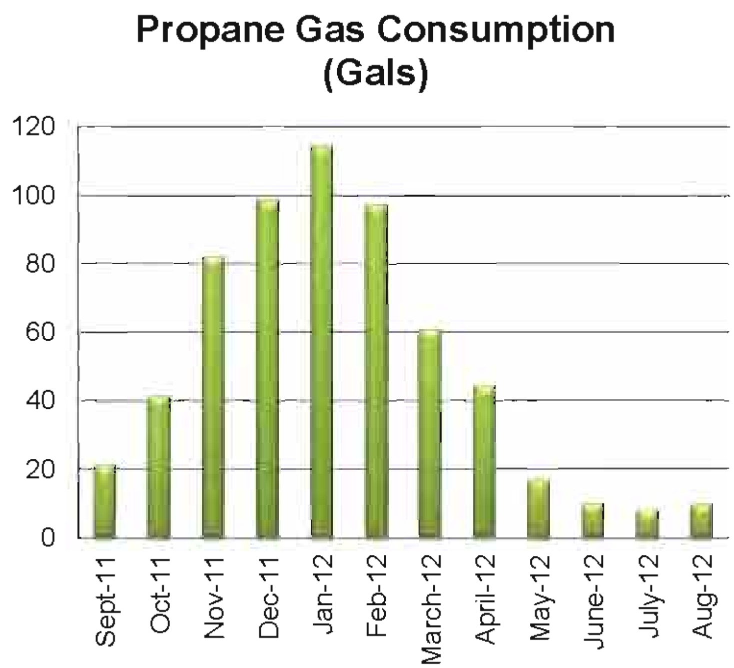
Existing Energy Consumption and Energy Cost Analysis

Propane Usage (Estimate)

The following graphical data represents a monthly weighted average of usage and costs for a building of this construction type and use group for the September 2011 to August 2012 heating season:

Month	Cost	Gals
Sept-11	$59	21
Oct-11	$112	41
Nov-11	$210	82
Dec-11	$248	99
Jan-12	$269	114
Feb-12	$229	97
March-12	$151	60
April-12	$111	44
May-12	$45	17
June-12	$32	10
July-12	$30	8
Aug-12	$34	10
Totals	$1,529	603

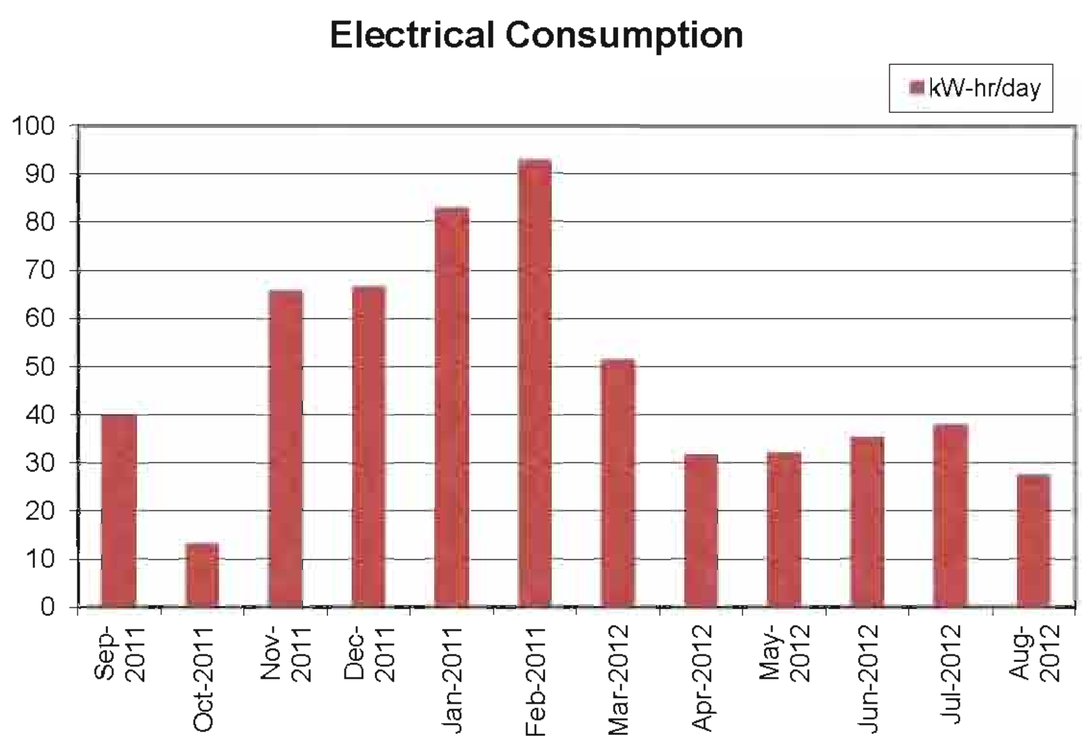
Propane Gas ECI:	$0.64	per sq ft/yr
Propane Gas ECU:	25,125	BTU/sq ft
Average Cost per Gal:	$2.54	$/Gal



Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period **Month**	Cost **Cost**	Usage **kWh**	**cost/day**	
30	40	Sep-2011	$140	1,194	S5	
27	13	Oct-2011	$49	354	S2	
30	66	Nov-2011	$263	1,972	S9	
31	67	Dec-2011	$238	2,065	S8	
28	83	Jan-2011	$255	2,320	S9	
33	93	Feb-2011	$337	3,067	$10	
31	51	Mar-2012	$186	1,592	S6	
30	32	Apr-2012	$115	949	S4	
30	32	May-2012	$117	963	S4	
30	35	Jun-2012	$126	1,057	S4	
33	38	Jul-2012	$147	1,249	S4	
32	28	Aug-2012	$106	882	S3	
average:	48	Totals	$2,081	17,664	S6	average
		Square Footage		2400		
		kW-hr per sq ft per year =		7.4		

Electrical ECI:	$0.87	per sq ft/yr
Electrical ECU:	25,304	BTU/sq ft
Average Cost per kWh:	$0.12	$/kWh



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Total Energy Use Summary

Summary		
Total Gross Area of Building:	2,400	sq ft
Annual Energy Costs	$3,610	dollars
Total Energy Cost Index (ECI):	$1.50	per sq ft/yr
Total Energy Utilization Index (EUI):	50,429	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	57.64%	percentage
Percentage of Annual Energy Costs for Gas	42.36%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace windows and doors with high efficiency type, insulated door and windows.	Reduce infiltration, reduce electrical energy usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace unit heater in garage with high efficiency type unit heater.	Reduce gas usage and utility costs.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce energy usage during unoccupied hours.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.

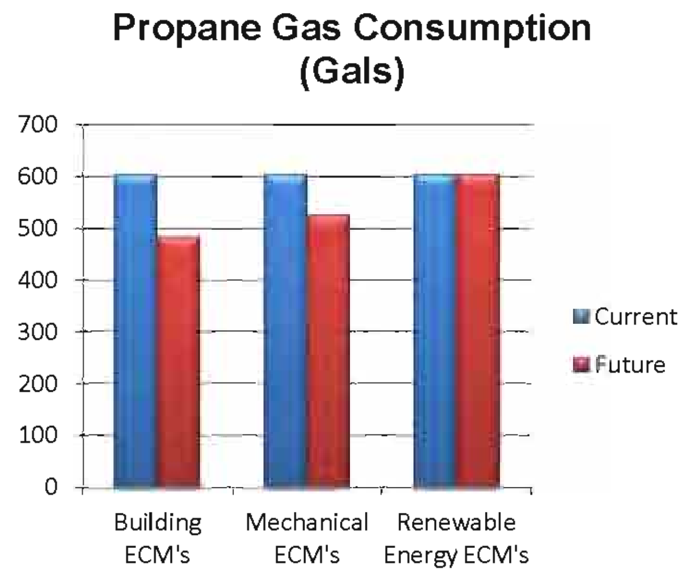
Renewable Energy Opportunities

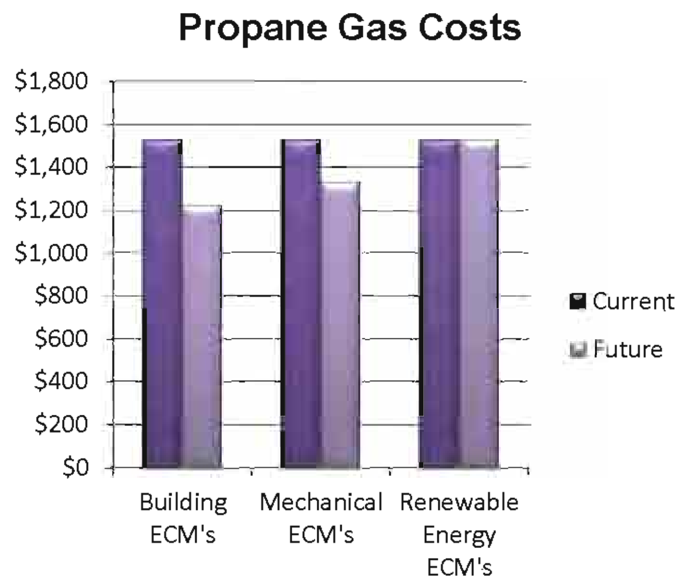
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for electrical usage.	Reduce carbon footprint, reduce utility costs.

Potential Energy Cost Savings

Propane Gas

The following propane gas energy usage and cost savings is an estimate based on the building, mechanical and renewable energy conservation measures:





Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.64	25,125	$0.51	20,100
Mechanical	$0.64	25,125	$0.55	21,859
Renewable Energy	$0.64	25,125	$0.64	25,125

Electrical Systems

The installation of motion sensors to control interior lighting could result in approximately $150 per year of electrical savings.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected.

Exterior windows and doors have typical heat loss, particularly overhead doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value: 0.046 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 0.8

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #30 Hsg Warehouse

Project Name: S10-12262 #30 Hsg Warehouse — 02/15/2013
Prepared by: UPEA — 10:53AM

Air System Information

Air System Name	#30 Hsg Warehouse		Number of zones	1	
Equipment Class	UNDEF		Floor Area	2400.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	3.4	Tons	Load occurs at	Aug 1600	
Total coil load	41.2	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	37.8	MBH	Entering DB / WB	76.7 / 64.1	°F
Coil CFM at Aug 1600	1936	CFM	Leaving DB / WB	58.1 / 56.9	°F
Max block CFM	1936	CFM	Coil ADP	56.0	°F
Sum of peak zone CFM	1936	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.919		Resulting RH	51	%
ft²/Ton	699.8		Design supply temp.	58.0	°F
BTU/(hr-ft²)	17.1		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	8.24	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	43.1	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	1936	CFM	BTU/(hr-ft²)	17.9	
Max coil CFM	1936	CFM	Ent. DB / Lvg DB	63.1 / 84.3	°F
Water flow @ 20.0 °F drop	4.31	gpm			

Supply Fan Sizing Data

Actual max CFM	1936	CFM	Fan motor BHP	1.06	BHP
Standard CFM	1886	CFM	Fan motor kW	0.84	kW
Actual max CFM/ft²	0.81	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	144	CFM	CFM/person	16.50	CFM/person
CFM/ft²	0.06	CFM/ft²			

Measurements	°F
Sp1	53.6

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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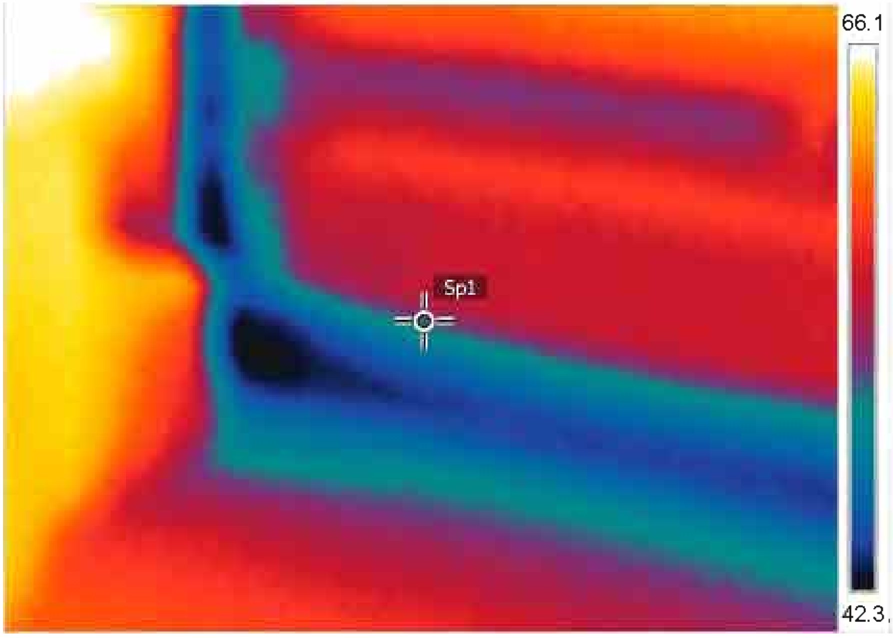

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Energy Audit
George K. Nolan Judicial Building
2175 Shunk Road
Sault Ste. Marie, MI

February 2013

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Attachments:

Summary

The George K. Nolan Judicial Building is an 8,000 square foot building built in 2000. The building is a 1 story building on a crawl space. When originally built it housed Tribal Police, Tribal Court and the Gaming Commission. The Gaming Commission has since been moved and the building has currently been renovated to increase the Judicial / Tribal Court area. Tribal Fish & Game Department also has offices in the building. The building is located between the Motor Pool and MidJim Convenience Store.

Existing Building Envelope Profile

Exterior walls are wood frame construction with drywall on interior.

The building has wood truss pitched roof with traditional shingle roofing.

The floor consists of wood floor trusses, wood decking, and fiberglass insulation.

The windows are double glaze, wood frame with vinyl cladding. Weather stripping and seals are in good condition. Front door is steel with plus 70% glass. Visible gaps were noticed on front door. Side doors are steel with 30% glass. Door seals and weather stripping are in good condition.

Existing Mechanical Systems Profile

HVAC

The building is zoned using multiple natural gas fired furnaces located throughout the building. Two furnaces serving the south side of building are Carrier, model 58MCA100 and in excellent condition. The remaining furnaces are a combination of newer high efficiency furnaces and older less efficient units. Each unit has a matching condensing unit for air conditioning. Duct distribution is above the ceiling. Duct is not insulated. Outdoor air ventilation is provided by exterior wall mounted louvers ducted directly to the return air duct for each furnace.

Plumbing

The domestic hot water is provided by two hot water heaters. One hot water heater serving the south side is a small electric mobile home type, AO Smith. The hot water heater serving the north side is a gas fired storage type, AO Smith, 50 gallon capacity. There is not a hot water return system for either of these units. The piping is not insulated.

The plumbing fixtures are tank type water closets and countertop lavatories with single handle faucets. The faucets do not have low flow aerators.

The exhaust fans for the bathrooms are controlled with the light switch.

Temperature Control Systems

Thermostats for each zone are Honeywell wall mounted programmable type.

Special Systems

The building has a full wet pipe sprinkler system.

Existing Electrical Systems Profile

Lighting Systems: Interior lighting is primarily energy efficient T8 linear flourescent lamps and electronic ballasts. There are several locations with recessed "can" compact fluorescent fixtures. The exterior has several HID recessed "can" lights at exterior doors. Interior lighting control is via manual wall-box switches.

Power Systems: Electrical power is provided from Cloverland Electric (formerly Edison Sault). Service is 600-amp, 208Y/120-volt, 3-phase, 4-wire. The main panel and several sub-panels are located in mechanical/furnace rooms.

Special Systems: The building is protected by a fire alarm system.

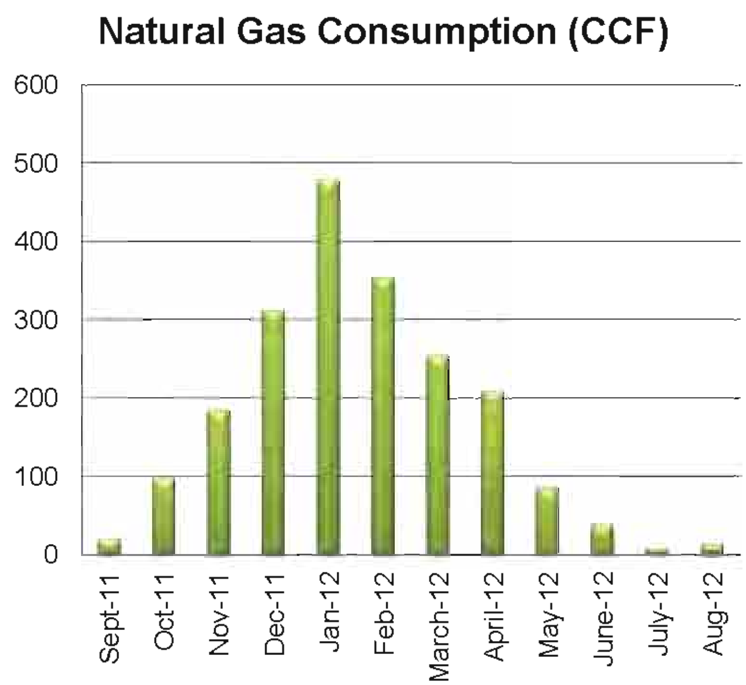
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$13	20
Oct-11	$61	97
Nov-11	$114	184
Dec-11	$190	312
Jan-12	$286	479
Feb-12	$213	354
March-12	$157	254
April-12	$127	207
May-12	$78	85
June-12	$14	38
July-12	$3	9
Aug-12	$5	13
Totals	$1,261	2,052

Natural Gas ECI:	$0.16	per sq ft/yr
Natural Gas ECU:	25,650	BTU/sq ft
Average Cost per CCF:	$0.61	$/CCF

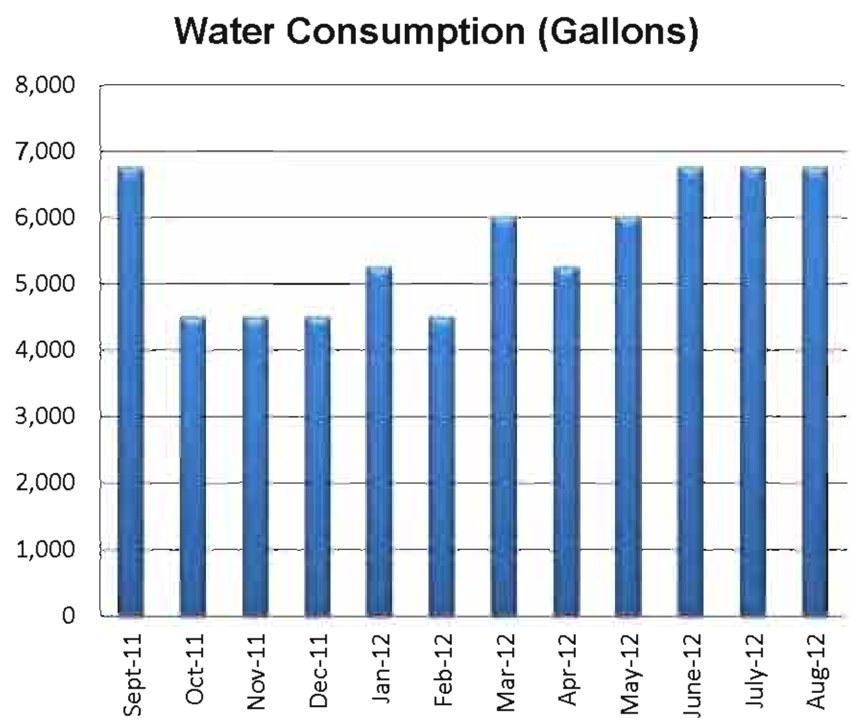


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$59	6,750
Oct-11	$42	4,500
Nov-11	$42	4,500
Dec-11	$42	4,500
Jan-12	$47	5,250
Feb-12	$42	4,500
Mar-12	$53	6,000
Apr-12	$47	5,250
May-12	$53	6,000
June-12	$59	6,750
July-12	$59	6,750
Aug-12	$59	6,750
Totals	$604	67,500

Cost per sq ft:	$0.08	per sq ft/yr
Average Usage per Fixture:	6,750	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon

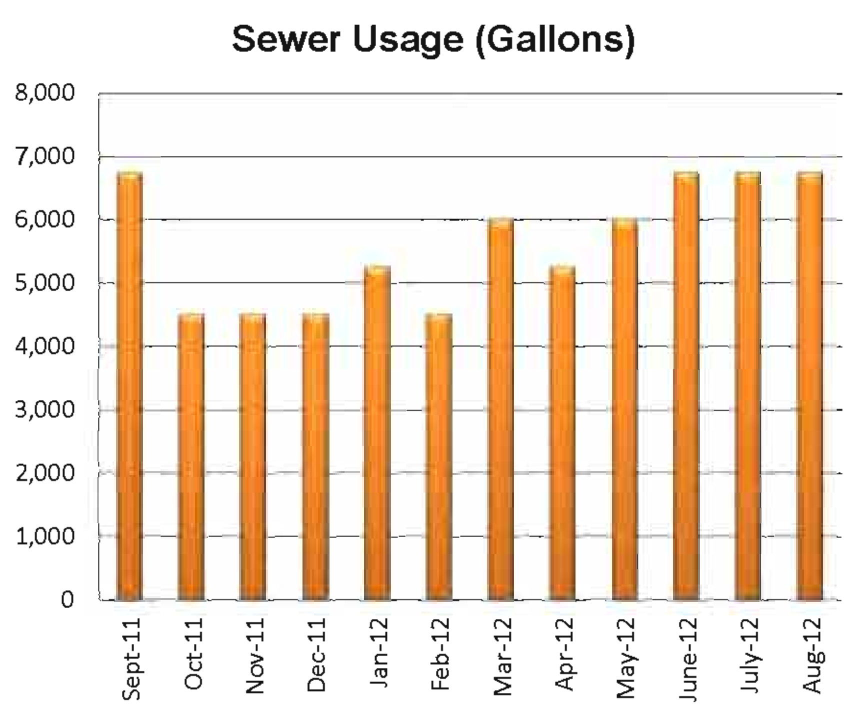


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$50	6,750
Oct-11	$44	4,500
Nov-11	$44	4,500
Dec-11	$44	4,500
Jan-12	$113	5,250
Feb-12	$38	4,500
Mar-12	$57	6,000
Apr-12	$50	5,250
May-12	$57	6,000
June-12	$65	6,750
July-12	$65	6,750
Aug-12	$65	6,750
Totals	$692	67,500

Cost per sq ft:	$0.09	per sq ft/yr
Average Usage per	6,750	gallons/fix
Average Usage Cost per Fixture:	$0.010	$/gallon



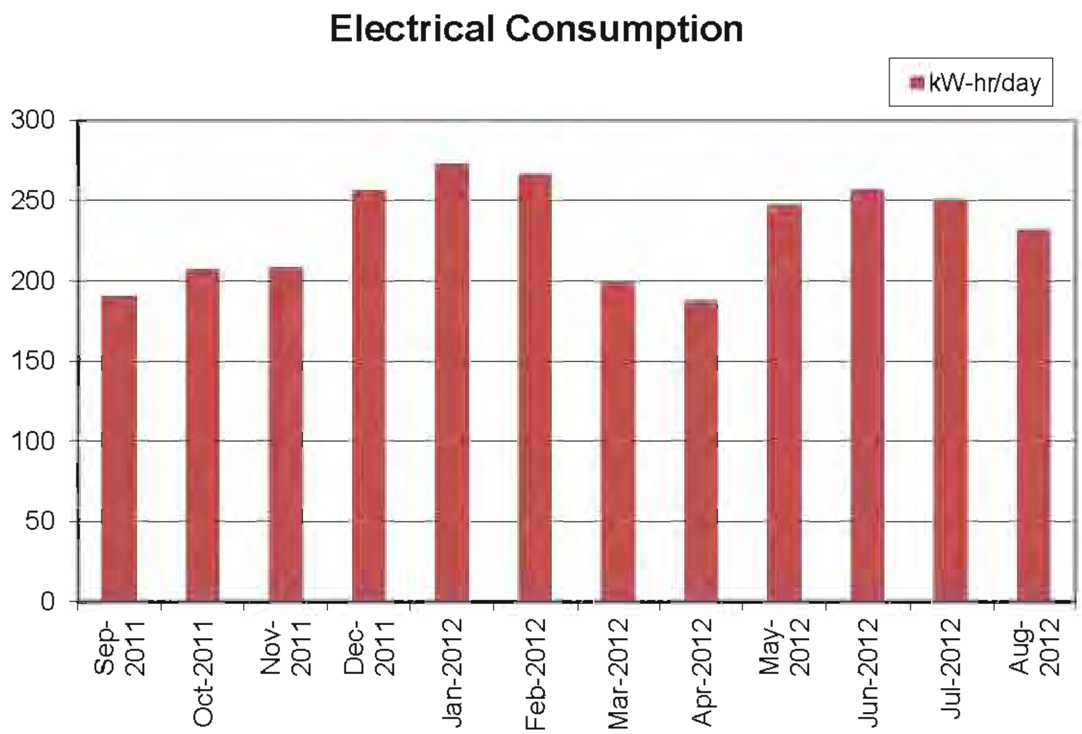
Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Month (Period)	Cost (Cost)	kWh (Usage)	cost/day	
29	190	Sep-2011	$608	5,520	$21	
28	207	Oct-2011	$639	5,800	$23	
29	208	Nov-2011	$652	6,040	$22	
35	256	Dec-2011	$998	8,960	$29	
29	273	Jan-2012	$883	7,920	$30	
32	266	Feb-2012	$949	8,520	$30	
28	199	Mar-2012	$623	5,560	$22	
29	188	Apr-2012	$610	5,440	$21	
34	247	May-2012	$936	8,400	$28	
30	257	Jun-2012	$861	7,700	$29	
33	251	Jul-2012	$913	8,280	$28	
29	232	Aug-2012	$724	6,720	$25	
average:	231	Totals	$9,396	84,860	$26	average

Square Footage 8000

kW-hr per sq ft per year = 10.6

Electrical ECI:	$1.17	per sq ft/yr
Electrical ECU:	36,469	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	8,000	sq ft
Annual Energy Costs	$10,657	dollars
Total Energy Cost Index (ECI):	$1.33	per sq ft/yr
Total Energy Utilization Index (EUI):	62,119	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	88.17%	percentage
Percentage of Annual Energy Costs for Gas	11.83%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Examine exterior doors, re-install to eliminate gaps.	Reduce infiltration.
B2	Examine window seals, re-apply sealant as required.	Reduce infiltration.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Insulate all supply air ductwork.	Reduce heat loss through duct, reduce gas utility costs.
M2	Install energy recovery ventilators to replace direct outdoor air connections to furnaces.	Reduce heating and cooling load requirements for furnaces, reduce gas usage and utility costs.
M3	Replace older furnaces with higher efficiency condensing type furnaces.	Reduce gas usage and utility costs.
M4	Implement a comprehensive maintenance program for all mechanical equipment, in accordance with manufacturer's recommendations, monthly, yearly service.	Extend life of equipment, improve efficiency of systems.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Centralize domestic hot water to one location. Remove electric hot water heater. Install instantaneous or on demand type water heaters.	Eliminate standby losses experienced with tank type water heaters. Ease of maintenance.
P2	Insulate hot water piping.	Reduce heat loss through pipe.
P3	Install low flow aerators on faucets.	Reduce water usage.
P4	Install sensor operated controls on faucets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install low ballast factor program start ballasts.	Extend life of bulb..
E2	Replace exterior "can" lights with LED type fixtures	Reduce electrical energy costs.
E3	Install wall-box motion sensors to automatically turn off lights in individual offices and other small rooms.	Reduce electrical energy costs.

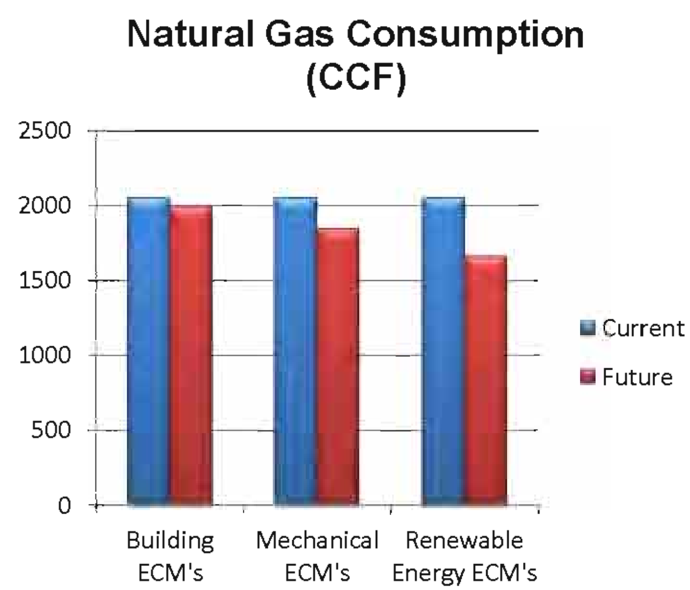
Renewable Energy Opportunities

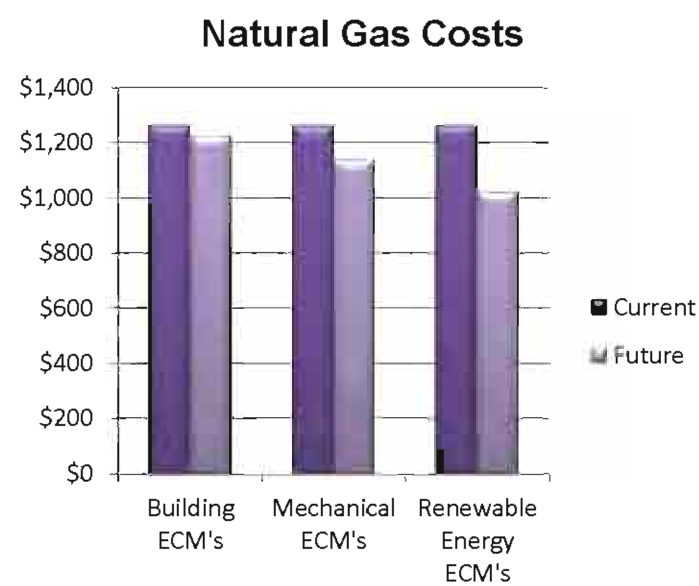
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and electrical utility costs.
R2	Install wind energy system to supplement electrical usage.	Reduce electrical utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical and renewable energy conservation measures:

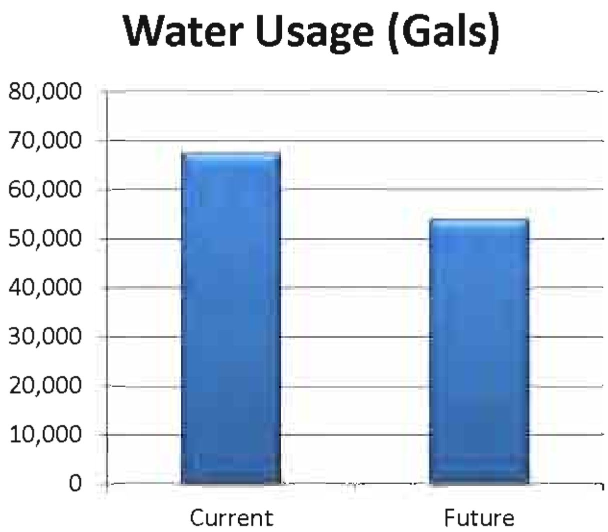




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.16	25,650	$0.15	24,881
Mechanical	$0.16	25,650	$0.14	23,085
Renewable Energy	$0.16	25,650	$0.13	20,777

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

The installation of low ballast factor fluorescent ballasts could provide about $500 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $1000 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $100 per year.

The installation of approximately 5kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $1,000

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

There is a small shed addition at the back corner of the building. There appears to be excessive heat loss from the addition and where it ties to the original building.

Crawl space vents appear to be a source of heat loss and should be closed in winter.

References
Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.066 Btu/hr/sq ft/deg F
Existing window U-value: 0.59 Btu/hr/sq ft/deg F
Existing ACH: 0.40

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #13 George Nolan

Project Name. S10-12262 #13 George Nolan — 02/15/2013
Prepared by. UPEA — 08.52AM

Air System Information

Air System Name	#13 George Nolan	Number of zones	1
Equipment Class	UNDEF	Floor Area	7921.0 ft²
Air System Type	SZCAV	Location	Sault Ste Marie, Michigan

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	16.3	Tons	Load occurs at	Jul 1500	
Total coil load	195.7	MBH	OA DB / WB	83.0 / 69.0	°F
Sensible coil load	182.5	MBH	Entering DB / WB	76.7 / 63.8	°F
Coil CFM at Jul 1500	9159	CFM	Leaving DB / WB	57.7 / 56.5	°F
Max block CFM	9159	CFM	Coil ADP	55.6	°F
Sum of peak zone CFM	9159	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.933		Resulting RH	50	%
ft²/Ton	485.7		Design supply temp.	58.0	°F
BTU/(hr-ft²)	24.7		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	39.16	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	206.2	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	9159	CFM	BTU/(hr-ft²)	26.0	
Max coil CFM	9159	CFM	Ent. DB / Lvg DB	63.4 / 84.8	°F
Water flow @ 20.0 °F drop	20.63	gpm			

Supply Fan Sizing Data

Actual max CFM	9159	CFM	Fan motor BHP	5.02	BHP
Standard CFM	8921	CFM	Fan motor kW	3.98	kW
Actual max CFM/ft²	1.16	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	619	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	29.8

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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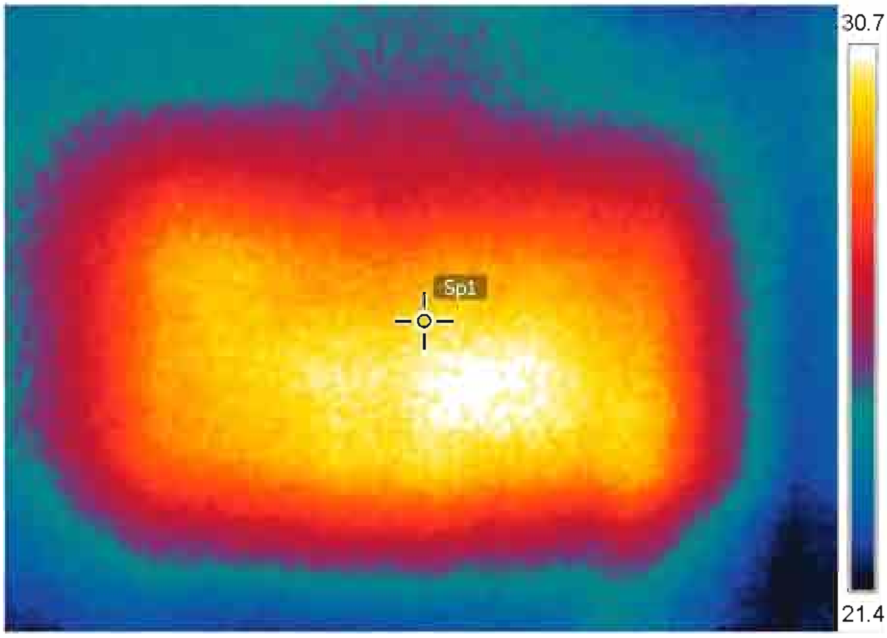

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Infrared photos taken with FLIR E40 Camera
Building #13 George Nolan Judicial Building
2175 Shunk Road, Sault Ste. Marie, MI

Measurements	°F
Sp1	38.6

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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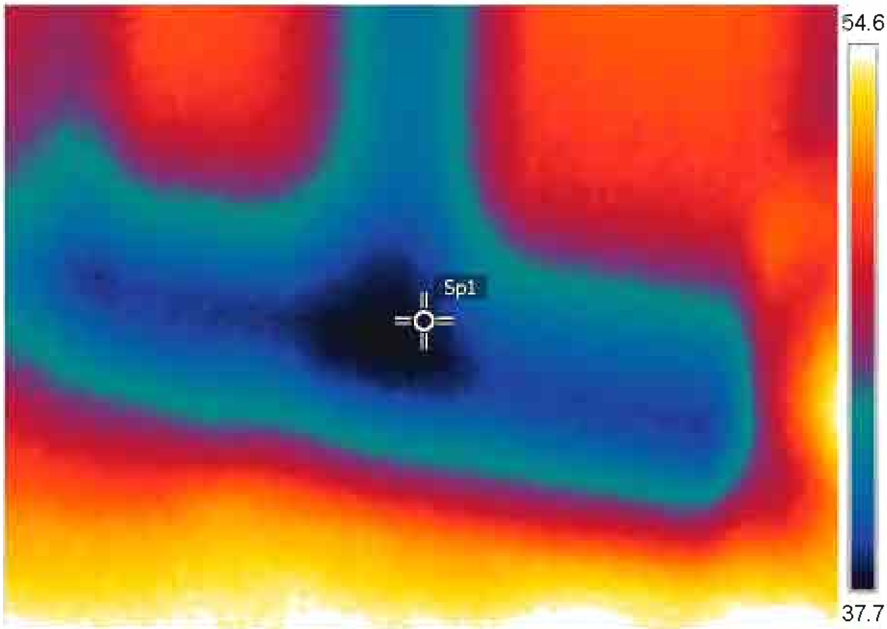

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Energy Audit
Lambert Center
225 Waseh Drive
St. Ignace, MI 49781

February 2013

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Attachments:

Summary

This one story building built in 1987 contains approximately 12,303 square feet. The facility is currently being utilized for Child Care and Head Start programs. Approximately 3/4 of the building formerly utilized by Dental and Health Services is vacant.

Existing Building Envelope Profile

The building is 1 story with crawl space. Crawl space and foundation walls are cement block, with 2" rigid insulation on the interior and below grade on the exterior.

Wall Construction: Exterior walls are 2x6 wood framed with vertical T-111 exterior siding, fiberglass insulation, and interior gypsum board.

Roof Construction: Roof system is pre-engineered wood trusses, gypsum board on bottom chord of trusses, fiberglass batt insulation in roof cavity and fiberglass shingles.

Floor Construction: Floor construction is wood framed above crawl space, un-insulated. Floor coverings are a mixture of carpet and VCT.

Window and Door Construction: Exterior window are vinyl sliding type. Exterior doors are in a wood frame; doors have ½ glass.

Existing Mechanical Systems Profile

HVAC

The heating system is served by five electric horizontal air handling units located in the crawl space with matching condensing units located on pads outside. The furnaces also have electric reheat coils installed in the supply ductwork. The furnaces are in poor condition. The duct distribution system is in the crawl space, terminal devices are floor grilles. The ductwork is insulated and in good condition.

Plumbing

The domestic hot water is served by four electric storage tank type hot water heaters. Two of the units are located in the crawl space, the other units are located in mechanical rooms on first floor. The units are in good condition. The water piping is copper and is not insulated. There is not a return hot water system for any of the water heaters.

The plumbing fixtures are floor mounted tank type water closets, countertop lavatories with single handle manual controls, stainless steel sinks with single handle manual controls and wall mounted urinals with top mounted flush valves. Low flow aerators are not installed.

The average hot water delivery time to the plumbing fixtures is 2.5 seconds.

The bathroom exhaust fans are switched with the lights.

Temperature Control Systems

The heating and cooling systems are controlled by wall mounted non-programmable thermostats.

Existing Electrical Systems Profile

Lighting Systems: The majority of interior lighting was recently upgraded to energy efficient T8 lamps and electronic ballasts. Ballasts are GE Ultramax, Instant Start. Lamps are Tungsram F32T8-741-ECO. Light fixtures are ceiling surface mount 2 and 4 lamp 4' fluorescent, either wrap-around or "modular" type.

Interior lighting control is via standard manual wall switches.

Exterior lighting consists of 6 "wall-pack" and 6 pole mounted "shoe-box" fixtures; 175-watt metal halide.

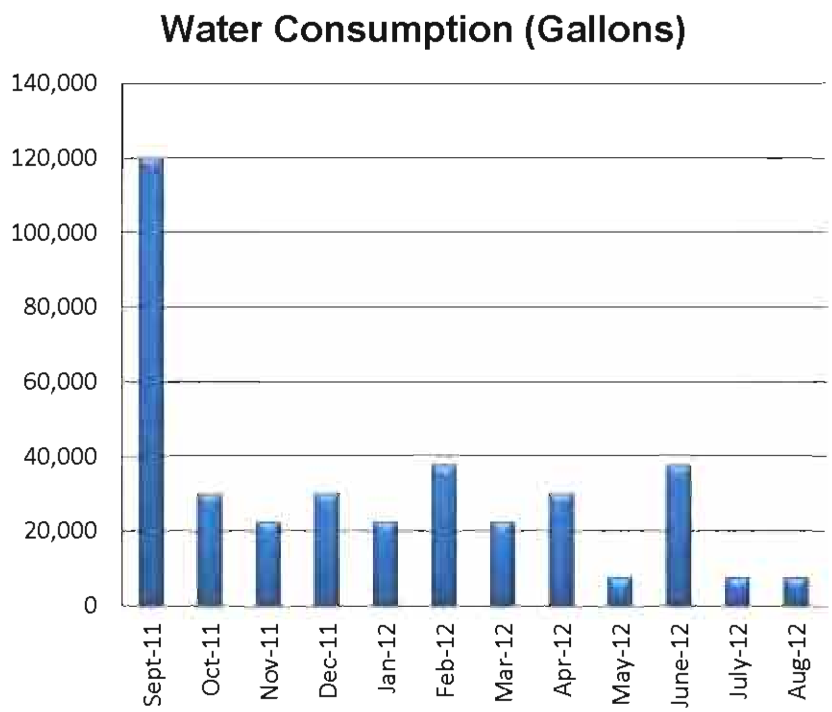
Power Systems: Electric power is via Cloverland Electric (formerly Edison Sault) pad mount transformer at the back of the building, with a main breaker box on back wall. There are 6 branch circuit panels located in various closets which serve lighting, receptacles and electric furnaces.

Existing Energy Consumption and Energy Cost Analysis
Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period.

Month	Cost	Gallons
Sept-11	$136	120,000
Oct-11	$79	30,000
Nov-11	$74	22,500
Dec-11	$79	30,000
Jan-12	$74	22,500
Feb-12	$84	37,500
Mar-12	$74	22,500
Apr-12	$79	30,000
May-12	$64	7,500
June-12	$84	37,500
July-12	$65	7,500
Aug-12	$65	7,500
Totals	$957	375,000

Cost per sq ft:	$0.08	per sq ft/yr
Average Usage per Fixture:	37,500	gallons/fix
Average Usage Cost per Fixture:	$0.003	$/gallon

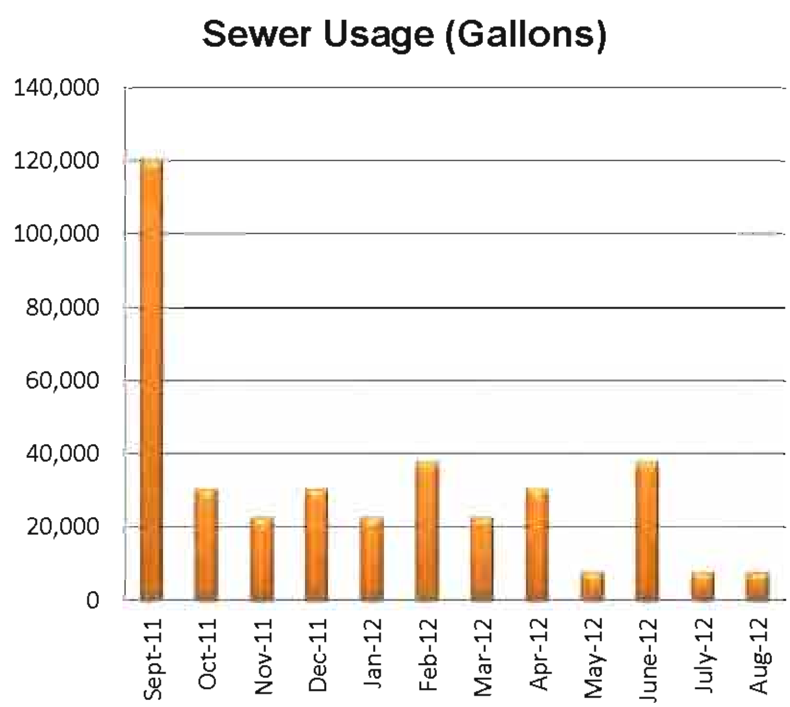


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period.

Month	Cost	Gallons
Sept-11	$219	120,000
Oct-11	$156	30,000
Nov-11	$151	22,500
Dec-11	$156	30,000
Jan-12	$151	22,500
Feb-12	$161	37,500
Mar-12	$161	22,500
Apr-12	$167	30,000
May-12	$149	7,500
June-12	$86	37,500
July-12	$148	7,500
Aug-12	$148	7,500
Totals	$1,853	375,000

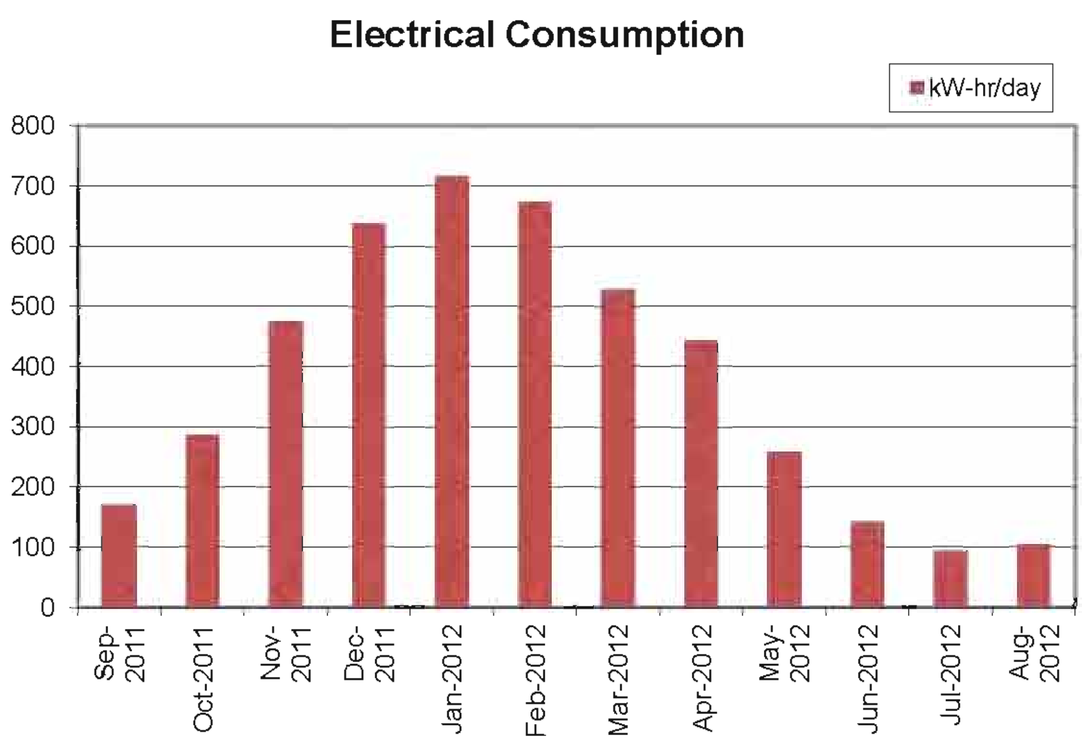
Cost per sq ft:	$0.15	per sq ft/yr
Average Usage per	37,500	gallons/fix
Average Usage Cost per Fixture:	$0.005	$/gallon



Electrical Usage: The following is a summary of electric use for the past year:

Electrical Consumption

		Period	Cost	Usage	
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**
30	171	Sep-2011	$565	5,120	$19
29	287	Oct-2011	$912	8,320	$31
33	475	Nov-2011	$1,708	15,680	$52
27	637	Dec-2011	$1,852	17,200	$69
35	715	Jan-2012	$2,769	25,040	$79
27	673	Feb-2012	$2,011	18,160	$74
30	528	Mar-2012	$1,755	15,840	$59
28	443	Apr-2012	$1,376	12,400	$49
36	258	May-2012	$1,033	9,280	$29
27	142	Jun-2012	$434	3,840	$16
28	94	Jul-2012	$298	2,640	$11
35	105	Aug-2012	$412	3,680	$12
average:	377	Totals	$15,126	137,200	$42 average



Electrical ECI:	$1.23	per sq ft/yr
Electrical ECU:	22,462	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh

Total Energy Use Summary

Summary		
Total Gross Area of Building:	12,303	sq ft
Annual Energy Costs	$15,126	dollars
Total Energy Cost Index (ECI):	$1.23	per sq ft/yr
Total Energy Utilization Index (EUI):	22,462	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	100.00%	percentage
Percentage of Annual Energy Costs for Gas	0.00%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Add insulation above ceiling	Reduce heat loss
B2	Inspect weather stripping on doors and windows and other things.	Reduction in heat loss through windows and doors.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace air handling units with high efficiency type air handlers.	Reduce electrical usage.
M2	Implement a preventative maintenance program for all mechanical equipment.	Extend life of equipment, improve performance of equipment.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats	Reduce energy usage during unoccupied periods.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install low flow aerators on lavatory and sink faucets.	Reduce water and sewer usage.
P2	Install waterless urinals.	Reduce water usage.
P3	Install sensor or timed controls on plumbing fixtures.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install low ballast factor program start ballasts.	Extend life of bulb..
E2	Install 28-watt premium T8 linear fluorescent lamps.	Reduce electrical energy costs.
E3	Replace exterior "wall-pack" and pole lights with LED type fixtures	Reduce electrical energy costs.
E4	Install wall-box motion sensors to automatically turn off lights in individual offices and other small rooms.	Reduce electrical energy costs.

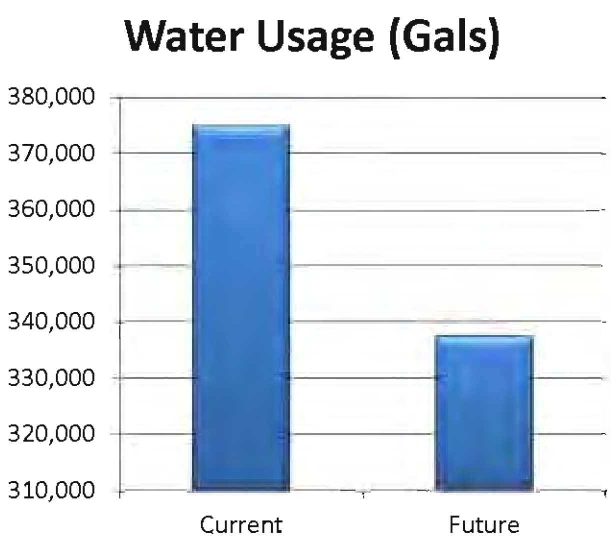
Renewable Energy Opportunities

ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and electrical utility costs.

Potential Energy Cost Savings

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

The installation of motion sensors to control interior lighting could result in approximately $1000 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $400 per year.

The installation of approximately 5kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $1,000.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in exterior walls and some in the ceiling.

Exterior windows and doors have typical heat loss, particularly areas with double doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

The crawl space exterior perimeter insulation should be extended above grade with a protective coating added to further reduce heat loss. It is unknown why the crawl space has vents when the floor is not insulated. There was some heat loss detected at the “Bilco” doors that access the crawl space.

One thru-wall window air conditioning unit had some excess heat loss & should be sealed more carefully or removed.

References

Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 1.0

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #8 Lambert Center

Project Name: S10-12262 #8 Lambert — 02/14/2013
Prepared by: UPEA — 02:54PM

Air System Information

Air System Name	#8 Lambert Center	Number of zones	1
Equipment Class	UNDEF	Floor Area	12100.0 ft²
Air System Type	SZCAV	Location	Sault Ste Marie, Michigan

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	24.6	Tons	Load occurs at	Jul 1500	
Total coil load	295.0	MBH	OA DB / WB	83.0 / 69.0	°F
Sensible coil load	275.7	MBH	Entering DB / WB	76.9 / 64.1	°F
Coil CFM at Jul 1500	14076	CFM	Leaving DB / WB	58.2 / 57.0	°F
Max block CFM	14076	CFM	Coil ADP	56.2	°F
Sum of peak zone CFM	14076	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.935		Resulting RH	50	%
ft²/Ton	492.2		Design supply temp.	58.0	°F
BTU/(hr-ft²)	24.4		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	59.03	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	271.9	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	14076	CFM	BTU/(hr-ft²)	22.5	
Max coil CFM	14076	CFM	Ent. DB / Lvg DB	63.6 / 82.0	°F
Water flow @ 20.0 °F drop	27.21	gpm			

Supply Fan Sizing Data

Actual max CFM	14076	CFM	Fan motor BHP	7.71	BHP
Standard CFM	13711	CFM	Fan motor kW	6.12	kW
Actual max CFM/ft²	1.16	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	946	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	47.0

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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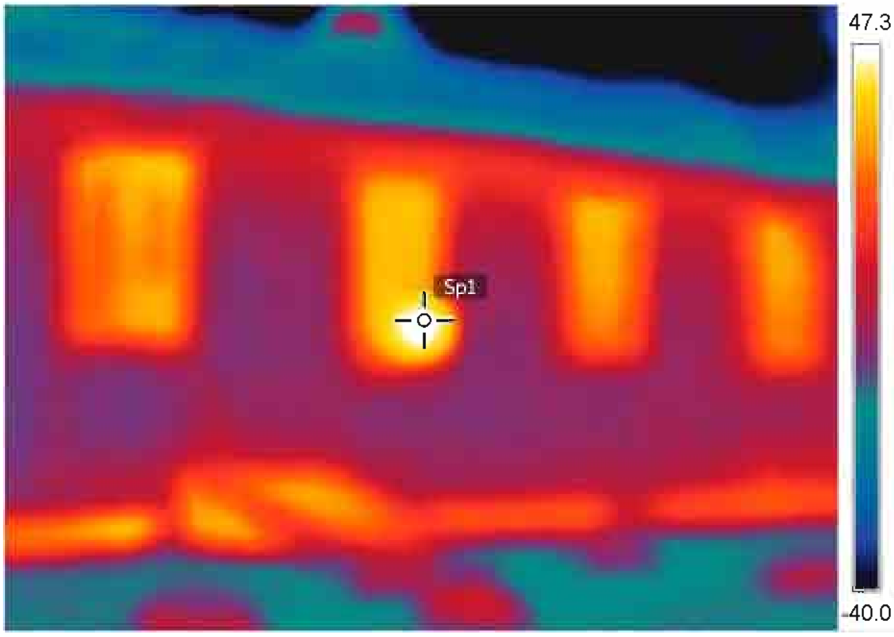

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Energy Audit
McCann Elderly Center
399 McCann
St. Ignace, MI

February 2013

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Summary

The McCann Elderly Center was originally part of the McCann Elementary School for the St. Ignace School District. The 3,486 square foot portion utilized for the Elderly center is the only part of the school building still standing from the original construction in 1965. The building contains a large kitchen and all purpose room and is primarily used for the Elder Meals but also may be utilized for meetings and gatherings.

Existing Building Envelope Profile

Wall Construction: Exterior walls are single wythe 12" masonry block construction. The existing building overall outside dimensions are approximately 62' x 57'. The main large room has a drop ceiling height of 12'-3".

Roof Construction: The roof is typical commercial flat roof with bar joists, metal deck, and membrane roofing. Full panel open grilles were added to the lay-in ceiling due to moisture issues.

Floor Construction: Floors are concrete with tile floor coverings.

Window and Door Construction: Exterior doors and windows are commercial type. Doors are hollow metal in metal frames. The windows are aluminum frame type. Condensation was observed on the windows. Rear door had visible gaps and excessive moisture at the threshold.

Existing Mechanical Systems Profile

HVAC

The heating and air conditioning system is served by three natural gas forced air furnaces, Rheem models located in the mechanical room. The supply air ductwork distribution is below the slab with floor grilles. The floor grilles are in poor condition. The return air system is central sidewall grilles for each furnace. The furnaces are in good condition. The ductwork is not insulated above grade. The condensing units are roof mounted.

Plumbing

The domestic hot water system is served by a single electric storage tank type water heater, Bradford White model M28ORD, 80 gallon capacity, installed in 2010. The water heater is in excellent condition. The water piping is copper and is not insulated.

The average hot water delivery time to the plumbing fixtures is 2.5 seconds.

The plumbing fixtures are floor mounted tank type water closets and wall mounted lavatories with single manual faucets.

The bathroom exhaust fans are switched with the lights.

Temperature Control Systems

The furnaces are controlled with wall mounted programmable thermostats, Climate Technologies and White Rogers models.

Special Systems

There is a full commercial kitchen with an exhaust hood and roof mounted upblast fan and make-up air unit. There is an exhaust hood for the dishwasher.

Existing Electrical Systems Profile

Lighting Systems: Interior lighting is energy efficient T8 linear fluorescent and electronic ballasts. Most fixtures are 4-lamp lensed recessed "troffers". There are a few 2-lamp fixtures in kitchen and storage room. Lighting control is via standard manual wall box switches. One 8' T12HO fixture in kitchen should be upgraded to T8. There are (2) small "wall-pack" exterior lights near entry doors.

Power Systems: Electrical service is located in the mechanical room and consists of (2) 225-amp mains. Service is overhead from Cloverland Electric and is 3-phase, 4-wire, 208/120-volt.

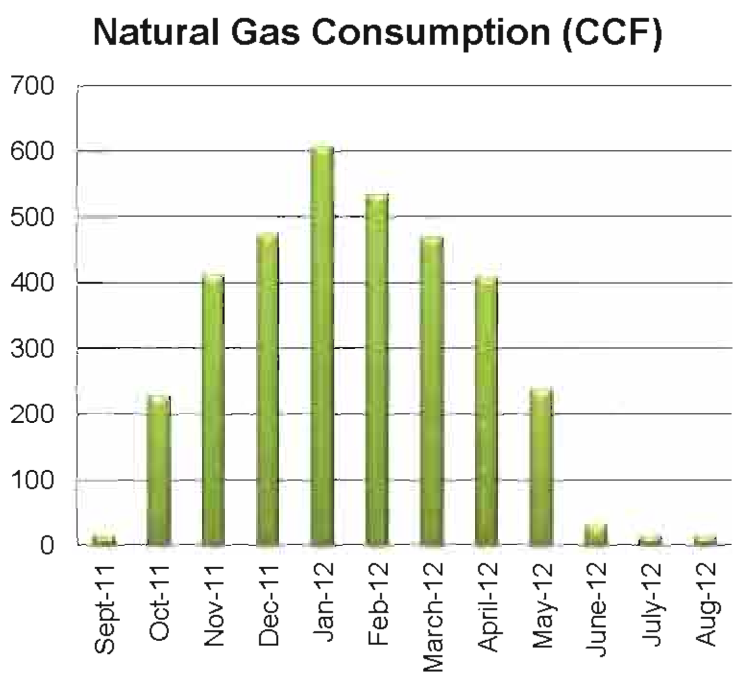
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$27	16
Oct-11	$184	227
Nov-11	$311	410
Dec-11	$349	474
Jan-12	$429	607
Feb-12	$380	535
March-12	$349	470
April-12	$299	408
May-12	$183	238
June-12	$40	32
July-12	$30	14
Aug-12	$28	14
Totals	$2,609	3,445

Natural Gas ECI:	$0.75	per sq ft/yr
Natural Gas ECU:	98,429	BTU/sq ft
Average Cost per CCF:	$0.76	$/CCF

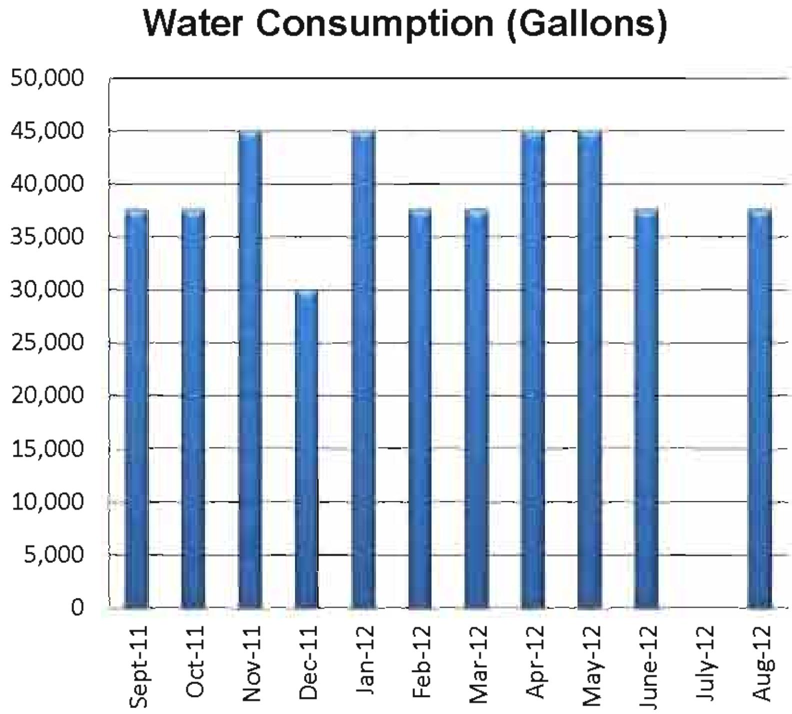


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$84	37,500
Oct-11	$84	37,500
Nov-11	$88	45,000
Dec-11	$79	30,000
Jan-12	$88	45,000
Feb-12	$84	37,500
Mar-12	$84	37,500
Apr-12	$89	45,000
May-12	$89	45,000
June-12	$84	37,500
July-12	$0	0
Aug-12	$84	37,500
Totals	$937	435,000

Cost per sq ft:	$0.27	per sq ft/yr
Average Usage per Fixture:	72,500	gallons/fix
Average Usage Cost per Fixture:	$0.002	$/gallon

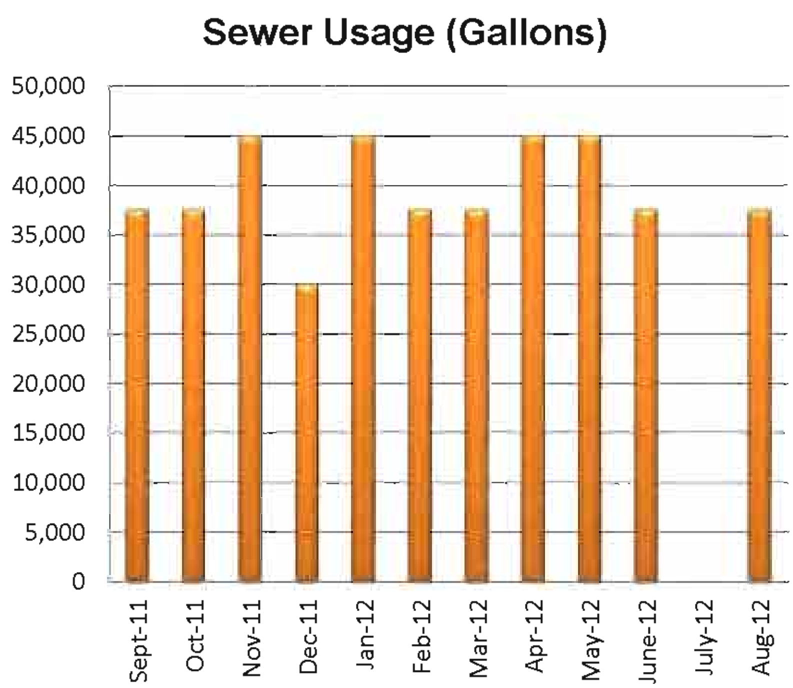


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$77	37,500
Oct-11	$77	37,500
Nov-11	$82	45,000
Dec-11	$73	30,000
Jan-12	$82	45,000
Feb-12	$77	37,500
Mar-12	$86	37,500
Apr-12	$91	45,000
May-12	$91	45,000
June-12	$86	37,500
July-12	$0	0
Aug-12	$86	37,500
Totals	$908	435,000

Cost per sq ft:	$0.26	per sq ft/yr
Average Usage per	72,500	gallons/fix
Average Usage Cost per Fixture:	$0.002	$/gallon



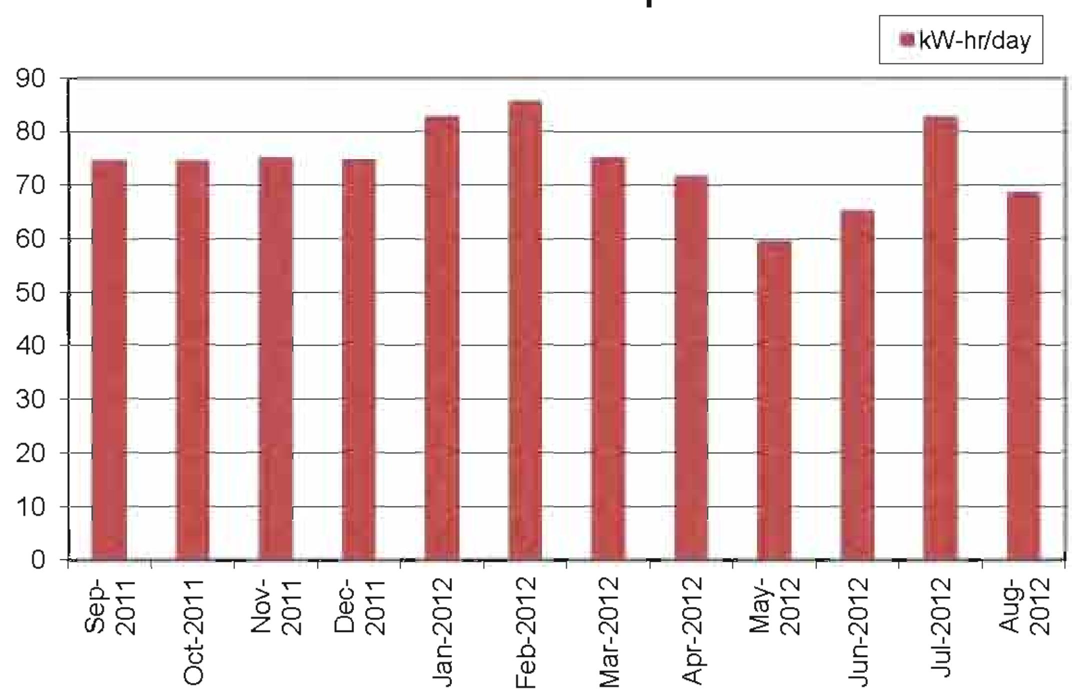
Electrical Usage: The following is a summary of electric use for the past year:

		Period	Cost	Usage		
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**	
29	74	Sep-2011	$245	2,160	S8	
29	74	Oct-2011	$245	2,160	S8	
33	75	Nov-2011	$279	2,480	S8	
30	75	Dec-2011	$253	2,240	S8	
29	83	Jan-2012	$275	2,400	S9	
28	86	Feb-2012	$275	2,400	$10	
32	75	Mar-2012	$275	2,400	S9	
29	72	Apr-2012	$240	2,080	S8	
35	59	May-2012	$240	2,080	S7	
27	65	Jun-2012	$205	1,760	S8	
29	83	Jul-2012	$272	2,400	S9	
35	69	Aug-2012	$272	2,400	S8	
average:	74	Totals	$3,076	26,960	S8	average

Square Footage	3486
kW-hr per sq ft per year =	7.7

Electrical ECI:	$0.88	per sq ft/yr
Electrical ECU:	26,589	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh

Electrical Consumption



Total Energy Use Summary

Summary		
Total Gross Area of Building:	3,486	sq ft
Annual Energy Costs	$5,685	dollars
Total Energy Cost Index (ECI):	$1.63	per sq ft/yr
Total Energy Utilization Index (EUI):	125,017	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	54.11%	percentage
Percentage of Annual Energy Costs for Gas	45.89%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace windows with thermally insulated, high efficiency Low-E type.	Reduce infiltration and condensation, reduce gas usage and utility costs.
B2	Replace doors and seals.	Reduce infiltration and condensation, reduce gas usage and utility costs.
B3	Add insulation above ceiling.	Reduce heat loss through ceiling, reduce moisture issues, reduce gas usage and utility costs.
B4	Add interior walls to existing exterior block walls; to include batt or blown-in insulation and drywall.	Reduce heat loss through exterior walls, reduce gas usage and utility costs.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Insulate ductwork.	Reduce heat losses through ductwork.
M2	Replace or repair floor grilles.	Provide better heating/cooling coverage, reduce gas and electrical usage.
M3	Implement a preventative maintenance program on all mechanical equipment in accordance with manufacturer's recommendations.	Extend life of equipment, improve equipment efficiency.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Insulate hot water piping.	Reduce heat losses through piping, improve hot water demand efficiency.
P2	Replace electric water heater with instantaneous or point of use type.	Reduce standby losses that occur in storage type water heaters, reduce electrical usage.
P3	Install low flow aerators on faucets.	Reduce water usage.
P4	Install sensor or timed type controls on faucets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace refrigerators and freezers with newer "Energy Star" rated more efficient units.	Reduce electrical energy use.

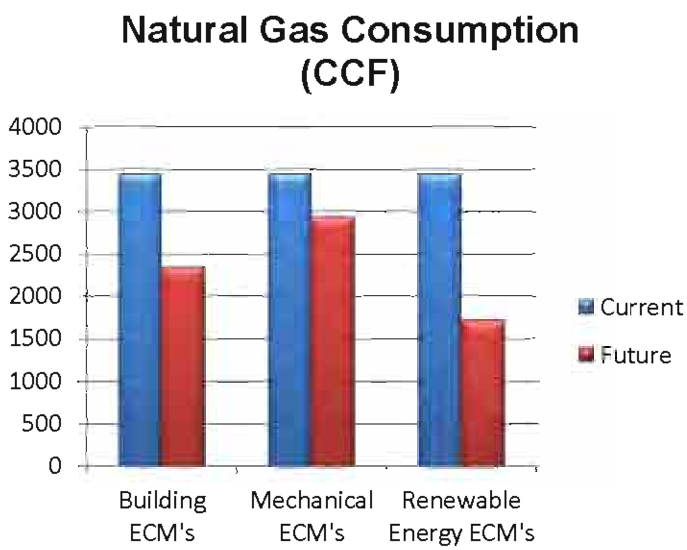
Renewable Energy Opportunities

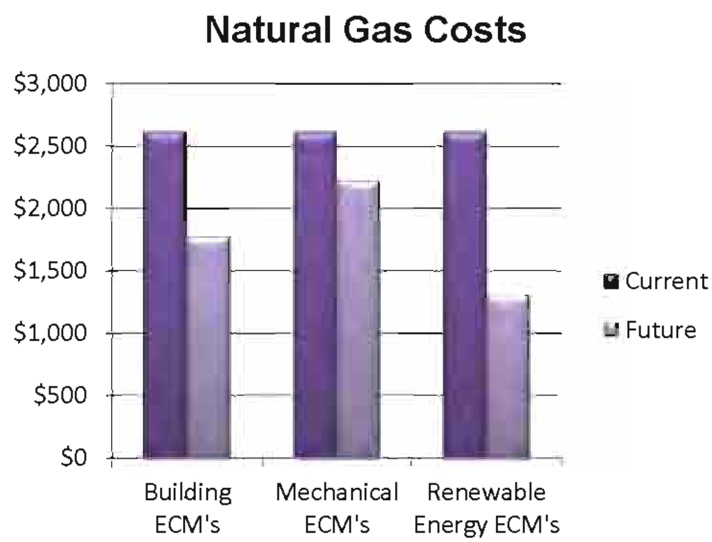
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.
R2	Install wind power energy system for electrical usage.	Reduce electrical utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, and renewable energy conservation measures:

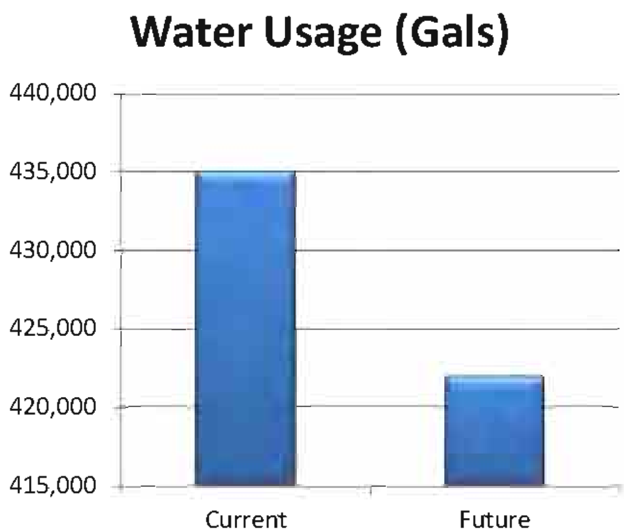




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.75	98,429	$0.51	66,931
Mechanical	$0.75	98,429	$0.63	83,664
Renewable Energy	$0.75	98,429	$0.37	49,214

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

The installation of newer "energy-star" rated refrigerators and freezers could provide about $300 per year of electrical savings.

The installation of approximately 5kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $1,000

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in exterior walls and some in the ceiling.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References
Existing wall U-value: 0.59 Btu/hr/sq ft/deg F
Existing roof U-value: 0.12 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 0.8

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #19 McCann

Project Name: S10-12262 #19 McCann 02/15/2013
Prepared by: UPEA 09:30AM

Air System Information

Air System Name	#19 McCann		Number of zones	1	
Equipment Class	UNDEF		Floor Area	3486.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	5.4	Tons	Load occurs at	Jul 1800	
Total coil load	65.1	MBH	OA DB / WB	78.4 / 67.4	°F
Sensible coil load	59.7	MBH	Entering DB / WB	76.4 / 63.9	°F
Coil CFM at Jul 1800	3052	CFM	Leaving DB / WB	57.8 / 56.7	°F
Max block CFM	3052	CFM	Coil ADP	55.8	°F
Sum of peak zone CFM	3052	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.917		Resulting RH	50	%
ft²/Ton	642.4		Design supply temp.	58.0	°F
BTU/(hr-ft²)	18.7		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	13.03	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	96.0	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	3052	CFM	BTU/(hr-ft²)	27.5	
Max coil CFM	3052	CFM	Ent. DB / Lvg DB	61.3 / 91.2	°F
Water flow @ 20.0 °F drop	9.61	gpm			

Supply Fan Sizing Data

Actual max CFM	3052	CFM	Fan motor BHP	1.67	BHP
Standard CFM	2972	CFM	Fan motor kW	1.33	kW
Actual max CFM/ft²	0.88	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	273	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	58.1

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

1/15/2013 10:46:50 AM

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1/15/2013 10:46:50 AM

DC_1401.jpg

Energy Audit
Niigaanagiizhik Ceremonial Building
11 Ice Circle
Sault Ste. Marie, MI

February 2013

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Summary

The Niigaanazhik Ceremonial building is a log structure built in 1997. It is an 8,400 square foot, 1 story building on a crawl space. The building is used primarily for ceremonies and gatherings and is located across from the Pow Wow Grounds.

Existing Building Envelope Profile

Wall Construction: The building has wood-framed exterior walls, with a crawl space. The crawl space foundation walls are insulated and include vents. The building approximate overall dimensions are 160' by 60'.

Roof Construction: The building has a pitched roof, with "scissors" trusses and traditional shingle roofing.

Floor Construction: The floor is wood floor trusses, un-insulated with wood decking.

Window and Door Construction: The doors are steel flush type with push bars. The front door approach shows signs of wear. Seals and weather stripping are in good condition. The windows are single pane, wood frame, vinyl clad with shading. Window seals and weather stripping are in good condition.

Existing Mechanical Systems Profile

HVAC

There is a single cooling only air handling unit, Carrier model 30TH21, located in the mechanical room. Duct supply air distribution is overhead with exposed spiral duct and sidewall registers and crawl space with floor registers. There is a single return air grille located in hallway. Each supply air branch has a gas fired duct heater, Sterling model QVED, direct vented through roof. The ductwork in the crawl space is not insulated. Duct insulation in the mechanical room is in good condition.

Plumbing

There are two domestic water heaters, gas fired. One water heater serves the kitchen, Rheem model G76-200, 76 gallon storage capacity and is in excellent condition. One water heater serves the plumbing fixtures, Rheem model saVP75E-1 and is also in excellent condition. All of the plumbing piping is insulated, insulation is in good condition. Domestic water piping is copper. There is not a hot water return system.

The average time for hot water delivery to the fixtures is 35 seconds.

Plumbing fixtures are tank type water closets, urinals with flush valves and countertop lavatories with single handle faucets.

There is a ceiling mounted exhaust fan for each bathroom, controls are interlocked with light switch.

Temperature Control Systems

The main programmable controller is a Honeywell model, located in the mechanical room. Sensors are located in the ductwork and in the hallway.

Special Systems

The building has a full commercial kitchen with exhaust hood and make-up air unit. The make-up air unit is in good condition.

Existing Electrical Systems Profile

Lighting Systems: The building interior lighting is primarily energy efficient T8 fluorescent with electronic ballasts. The ceremonial room has 90-watt halogen floods in recessed "can" lights, controlled by wall dimmers. There are several exterior wall mounted fixtures and 7 poles with (2) ~400W HID lights to provide illumination of the parking lot.

Power Systems: Electrical power is provided by Cloverland Electric (formerly Edison Sault). The service is 400-amp, 3-phase, 4-wire, 208Y/120-volt. There is (1) main panel and (2) sub-panels in the Laundry/Electrical room.

Special Systems: The building has a Silent Knight fire alarm maintained by Alert Electronics.

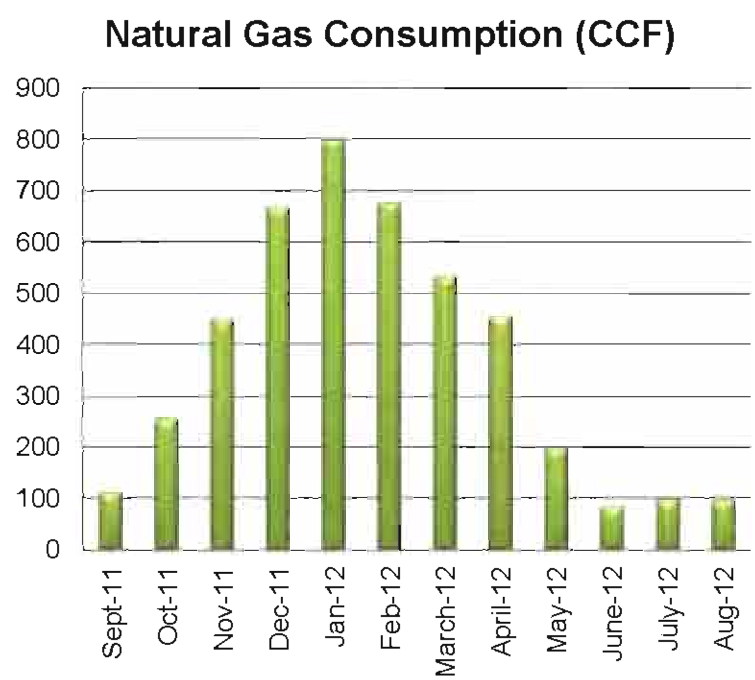
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$72	110
Oct-11	$161	255
Nov-11	$277	448
Dec-11	$406	666
Jan-12	$475	797
Feb-12	$406	675
March-12	$328	531
April-12	$279	453
May-12	$181	197
June-12	$31	83
July-12	$38	98
Aug-12	$41	96
Totals	$2,695	4,409

Natural Gas ECI:	$0.32	per sq ft/yr
Natural Gas ECU:	52,488	BTU/sq ft
Average Cost per CCF:	$0.61	$/CCF

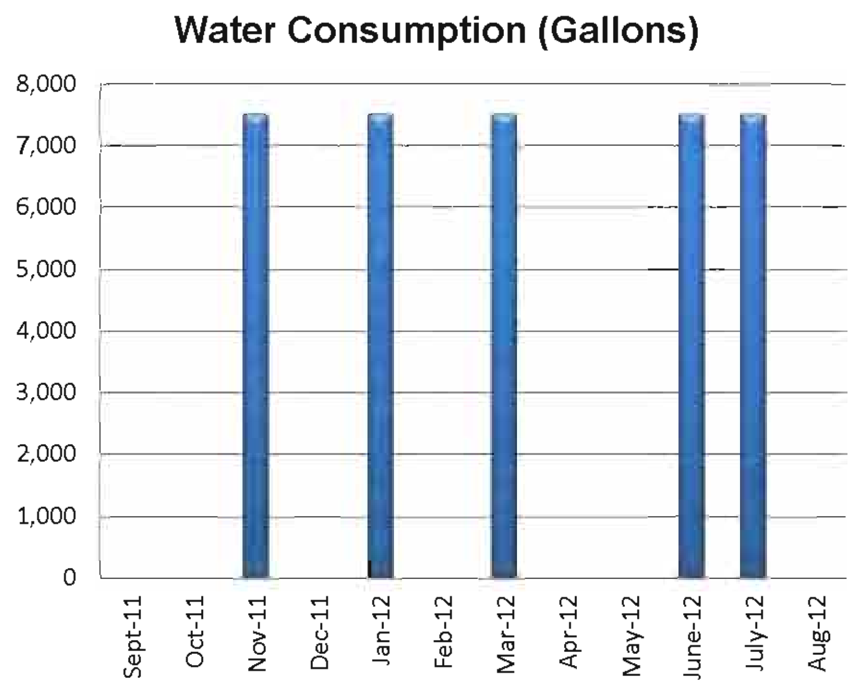


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$17	0
Oct-11	$17	0
Nov-11	$76	7,500
Dec-11	$17	0
Jan-12	$76	7,500
Feb-12	$17	0
Mar-12	$76	7,500
Apr-12	$17	0
May-12	$17	0
June-12	$76	7,500
July-12	$76	7,500
Aug-12	$17	0
Totals	$499	37,500

Cost per sq ft:	$0.06	per sq ft/yr
Average Usage per Fixture:	3,750	gallons/fix
Average Usage Cost per Fixture:	$0.013	$/gallon

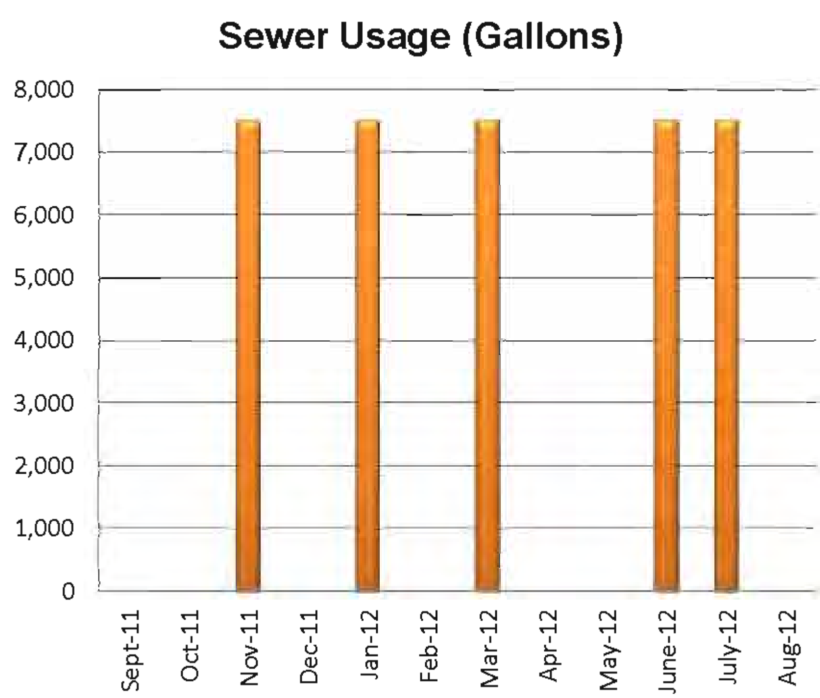


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$17	52,500
Oct-11	$17	82,500
Nov-11	$83	52,500
Dec-11	$17	52,500
Jan-12	$83	52,500
Feb-12	$17	67,500
Mar-12	$83	52,500
Apr-12	$17	82,500
May-12	$17	60,000
June-12	$83	60,000
July-12	$83	60,000
Aug-12	$17	240,000
Totals	$534	915,000

Cost per sq ft:	$0.06	per sq ft/yr
Average Usage per	91,500	gallons/fix
Average Usage Cost per Fixture:	$0.001	$/gallon

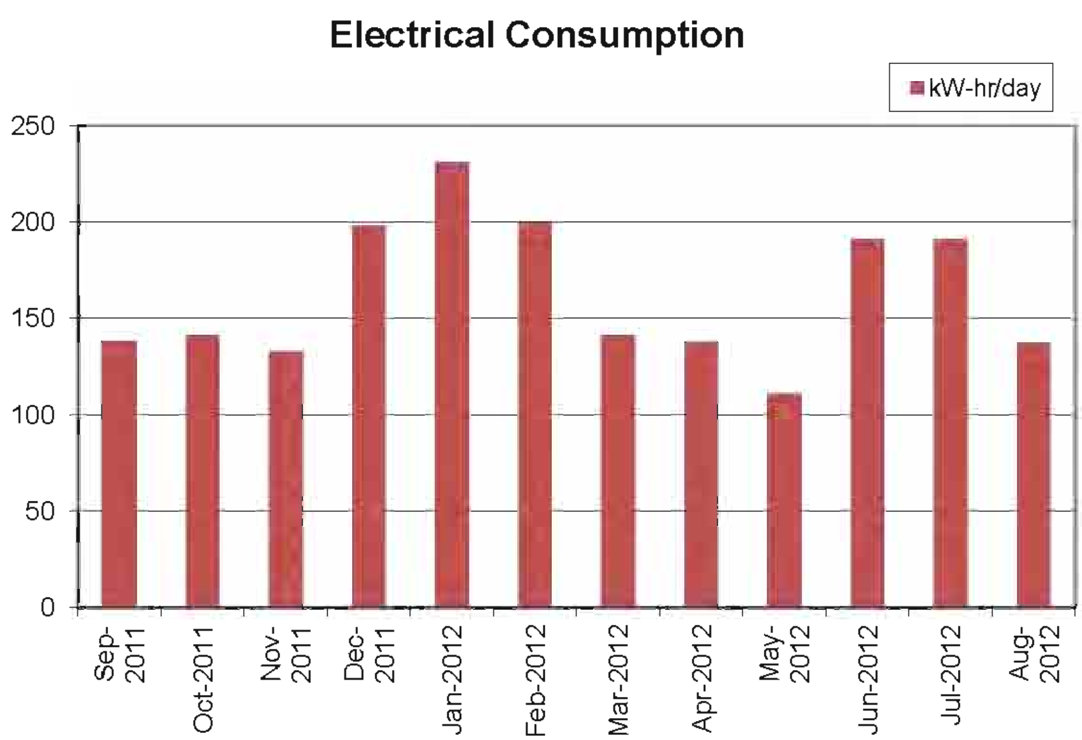


Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day	
29	138	Sep-2011	$445	4,007	$15	
28	141	Oct-2011	$439	3,957	$16	
29	133	Nov-2011	$418	3,850	$14	
35	198	Dec-2011	$774	6,929	$22	
29	231	Jan-2012	$748	6,698	$26	
32	199	Feb-2012	$713	6,379	$22	
28	141	Mar-2012	$447	3,959	$16	
30	138	Apr-2012	$466	4,131	$16	
33	111	May-2012	$413	3,653	$13	
30	191	Jun-2012	$636	5,739	$21	
33	191	Jul-2012	$698	6,309	$21	
29	137	Aug-2012	$432	3,974	$15	
average:	162	Totals	$6,630	59,585	$18	average

Square Footage	8400
kW-hr per sq ft per year =	7.1

Electrical ECI:	$0.79	per sq ft/yr
Electrical ECU:	24,387	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	8,400	sq ft
Annual Energy Costs	$9,325	dollars
Total Energy Cost Index (ECI):	$1.11	per sq ft/yr
Total Energy Utilization Index (EUI):	76,875	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	71.10%	percentage
Percentage of Annual Energy Costs for Gas	28.90%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Examine and repair window and door seals and weather stripping.	Reduce air infiltration.
B2	Add insulation in attic space, insulate energy heels in attic.	Reduce heat loss from occupied space through ceiling, reduce gas usage and utility costs.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Insulate ductwork in crawl space.	Reduce heat loss in ductwork through unheated space.
M2	Install energy recovery ventilator for outdoor air to air handling unit.	Reduce cooling and heating loads by delivering tempered air to unit.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install hot water return system.	Reduce water usage, increase hot water delivery time.
P2	Install waterless urinals.	Eliminate water usage to urinals.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Upgrade Laundry & Mechanical room lighting to 28-watt T8 & program start ballasts	Reduce electrical energy costs
E2	Replace exterior wall and pole lights with LED	Reduce electrical energy costs
E3	Replace ceremonial “can” lights with dimmable LED	Reduce electrical energy costs

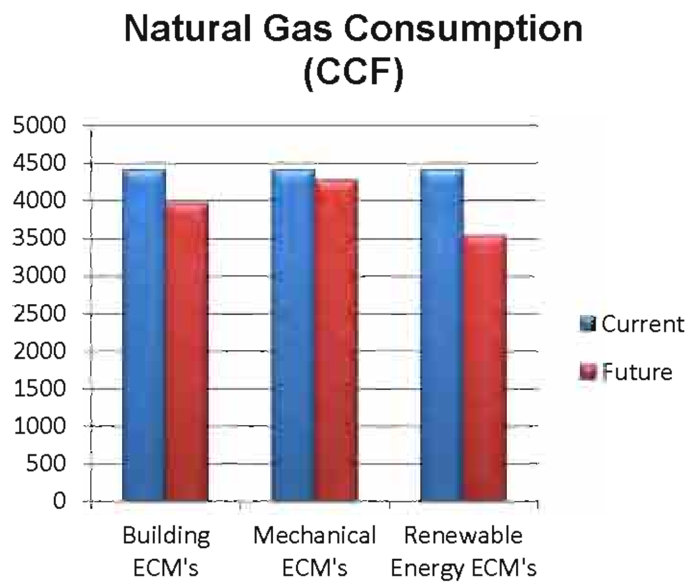
Renewable Energy Opportunities

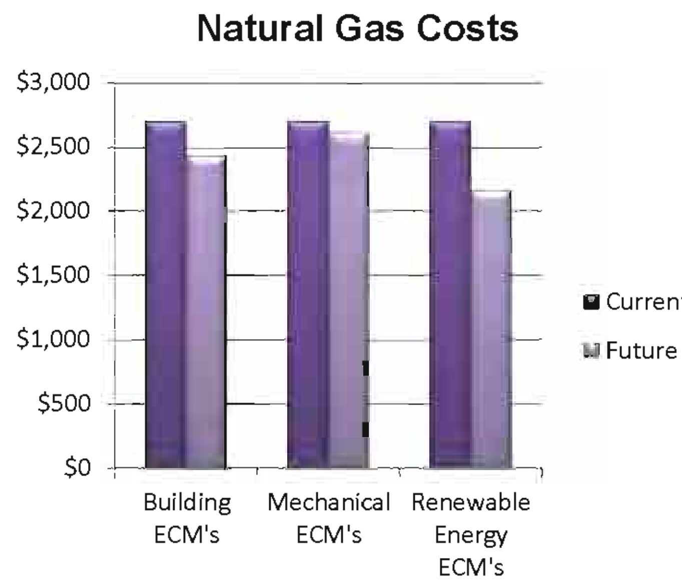
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.
R2	Install wind power energy system for electrical usage.	Reduce electrical utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:

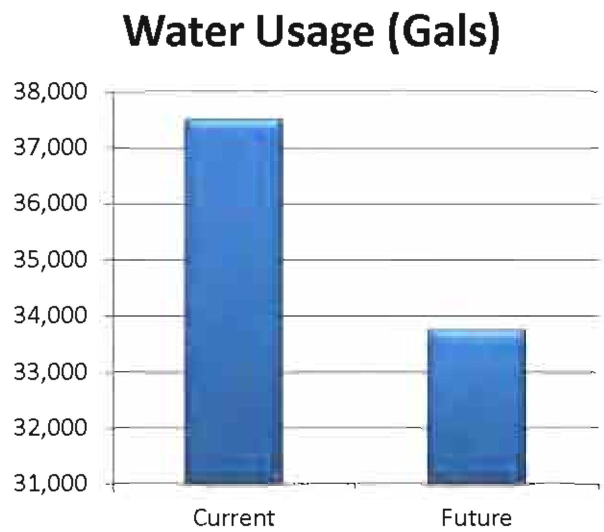




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	EUI (BTU/sq ft)	ECI (per sq ft/yr)	EUI (BTU/sq ft)
Building	$0.32	52,488	$0.29	47,239
Mechanical	$0.32	52,488	$0.31	50,913
Renewable Energy	$0.32	52,488	$0.26	41,990

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

The installation of low ballast factor fluorescent ballasts and T8 lamps in the laundry and mechanical rooms could provide about $100 per year of electrical savings.

Upgrading ceremonial room lights to LED should save about $150 per year.

Additionally, upgrading exterior light fixtures to LED type could save another $350 per year.

The installation of approximately 6kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $1000.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in the vaulted ceiling areas.

Exterior windows and doors have typical heat loss, particularly at double doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found. The crawl space shows some heat loss through foundation walls.

References
Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.065 Btu/hr/sq ft/deg F
Existing window U-value: 0.48 Btu/hr/sq ft/deg F
Existing ACH: 0.5

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #12 Niig Ceremonial Bldg

Project Name. S10-12262 #12 Niig Ceremonial Bldg 02/15/2013
Prepared by. UPEA 08.47AM

Air System Information

Air System Name	#12 Niig Ceremonial Bldg		Number of zones	1	
Equipment Class	UNDEF		Floor Area	8464.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	16.3	Tons	Load occurs at	Jul 1500	
Total coil load	196.1	MBH	OA DB / WB	83.0 / 69.0	°F
Sensible coil load	182.0	MBH	Entering DB / WB	76.7 / 63.8	°F
Coil CFM at Jul 1500	9097	CFM	Leaving DB / WB	57.7 / 56.4	°F
Max block CFM	9097	CFM	Coil ADP	55.5	°F
Sum of peak zone CFM	9097	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.928		Resulting RH	50	%
ft²/Ton	517.8		Design supply temp.	58.0	°F
BTU/(hr-ft²)	23.2		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	39.25	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	204.2	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	9097	CFM	BTU/(hr-ft²)	24.1	
Max coil CFM	9097	CFM	Ent. DB / Lvg DB	63.2 / 84.6	°F
Water flow @ 20.0 °F drop	20.43	gpm			

Supply Fan Sizing Data

Actual max CFM	9097	CFM	Fan motor BHP	4.98	BHP
Standard CFM	8861	CFM	Fan motor kW	3.95	kW
Actual max CFM/ft²	1.07	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	662	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Infrared photos taken with FLIR E40 Camera
Building #12 Niigaanagiizhik Ceremonial Building
11 Ice Circle, Sault Ste. Marie, MI

Measurements	°F
Sp1	17.4

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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11/27/2012 10:01:34 AM

DC_0633.jpg

Measurements	°F
Sp1	20.9

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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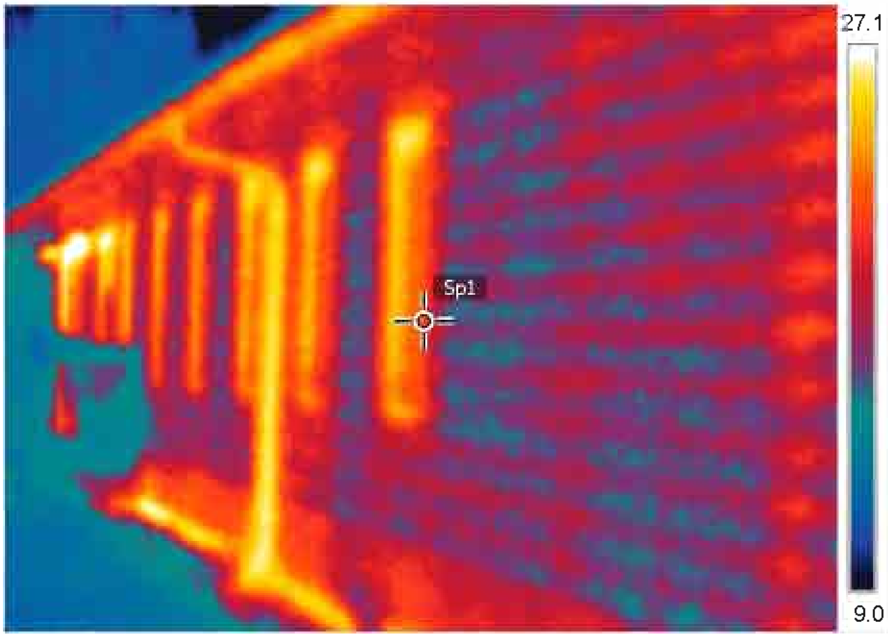

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Energy Audit
Northern Hospitality
827 Ashmun Street
Sault Ste. Marie, MI

February 2013

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Summary

The building located at 827 Ashmun Street (former Heartland building) in Sault Ste. Marie, MI was built in 1955. The building was purchased and renovated by the Tribe in 2006 to house Northern Hospitality for the retail sale of furniture and flooring. The facility consists of 1 floor with approximately 10,290 square foot of space and includes office, retail showroom, break room, mechanical room and a loading area.

Existing Building Envelope Profile

Wall Construction: The building exterior walls are cement block, with brick veneer on the street side. Exterior walls appear to have little or no insulation.

Roof Construction: The roof is a traditional commercial "flat" style, with bar-joists, metal deck, and membrane roof system. There is not insulation below the roof deck.

Floor Construction: The floors are concrete slab in main and loading areas. The office/main entrance areas have wood sub floor.

Window and Door Construction: The building has only a few windows and doors, of the commercial aluminum frame and insulated glass type. There is one overhead door in the back with access to the warehouse space. There are visible gaps in the overhead door.

Existing Mechanical Systems Profile

HVAC

There are two horizontal air handling units with DX (air conditioning) and hot water coils serving the showroom. The condensing units are located on the roof. Both units are in excellent condition. Duct distribution is through exposed round duct with sidewall registers with common returns at the bottom of the units. The hot water piping is not insulated. There is perimeter baseboard radiation located in the front entryway only.

Heating hot water is supplied by a gas fired cast iron boiler located in the first floor mechanical room, installed in 1950. The boiler and accessories are very poor condition.

The warehouse and shipping areas are served by ceiling mounted hot water unit heaters.

Plumbing

The break room and bathrooms are served by an electric point of use water heater, Bradford White model M16U6 located below the break room sink.

The plumbing fixtures are tank type water closets, countertop type lavatories and a stainless steel sink in break room. The faucets do not have low flow aerators installed.

The exhaust fans for the bathrooms are interlocked with the light switch.

Temperature Control Systems

The air handling units are controlled by wall mounted programmable thermostats.

The unit heaters are controlled by wall mounted non-programmable dial type thermostats.

Existing Electrical Systems Profile

Lighting Systems: Interior lighting is a mixture of linear fluorescent and compact fluorescent track heads. There are (2) small wall-pack lights at the back of the building.

Power Systems: Electrical service is 200-amp, 208Y/120-volt, 3-phase, 4-wire from Cloverland Electric (formerly Edison Sault). The meter is on the exterior south corner. There is one main 200-amp panel and (1) subpanel.

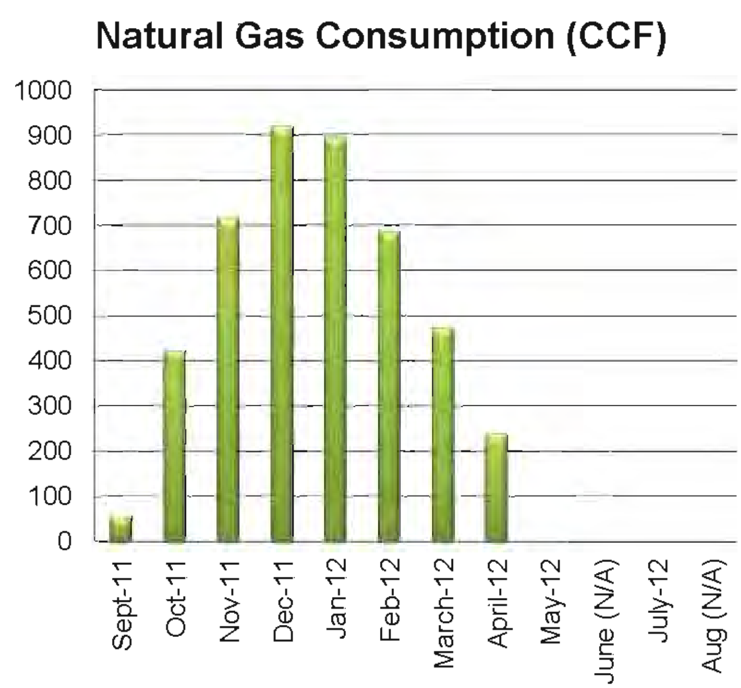
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$72	54
Oct-11	$392	421
Nov-11	$619	715
Dec-11	$758	917
Jan-12	$716	891
Feb-12	$557	686
March-12	$399	473
April-12	$211	235
May-12	$41	1
June-12 (N/A)	$0	0
July-12	$48	0
Aug-12 (N/A)	$0	0
Totals	$3,813	4,393

Natural Gas ECI:	$0.37	per sq ft/yr
Natural Gas ECU:	42,650	BTU/sq ft
Average Cost per CCF:	$0.87	$/CCF

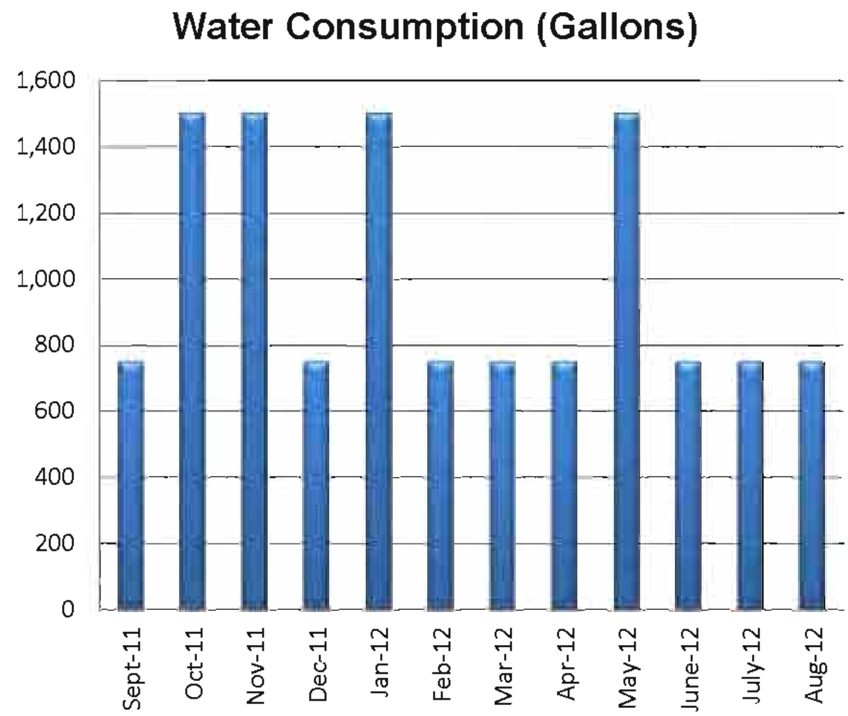


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$7	750
Oct-11	$13	1,500
Nov-11	$13	1,500
Dec-11	$7	750
Jan-12	$13	1,500
Feb-12	$7	750
Mar-12	$7	750
Apr-12	$7	750
May-12	$13	1,500
June-12	$7	750
July-12	$7	750
Aug-12	$7	750
Totals	$108	12,000

Cost per sq ft:	$0.01	per sq ft/yr
Average Usage per Fixture:	1,500	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon

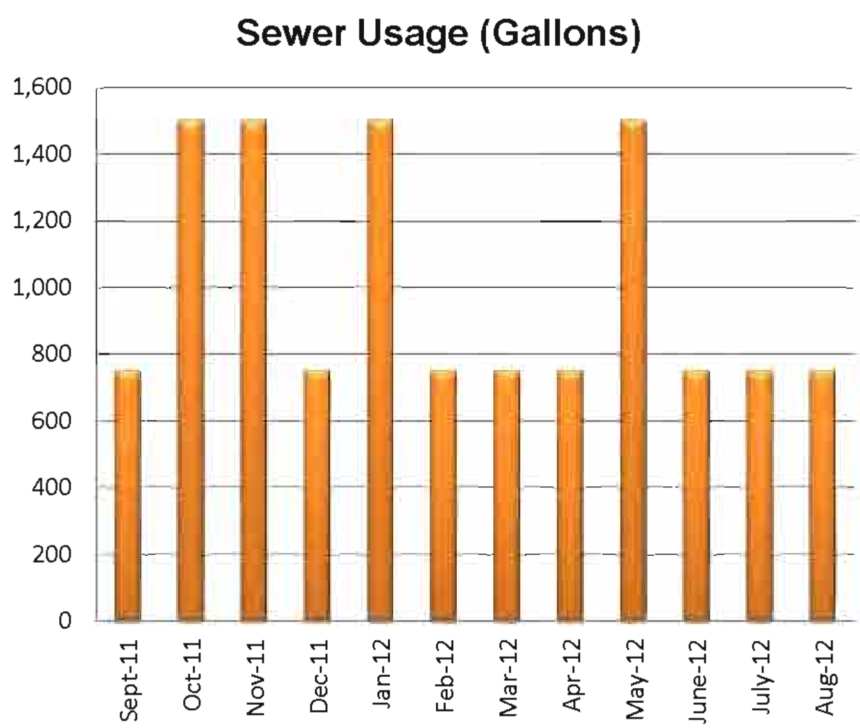


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$9	750
Oct-11	$15	1,500
Nov-11	$15	1,500
Dec-11	$9	750
Jan-12	$15	1,500
Feb-12	$9	750
Mar-12	$9	750
Apr-12	$9	750
May-12	$15	1,500
June-12	$9	750
July-12	$9	750
Aug-12	$9	750
Totals	$132	12,000

Cost per sq ft:	$0.01	per sq ft/yr
Average Usage per	1,500	gallons/fix
Average Usage Cost per Fixture:	$0.011	$/gallon

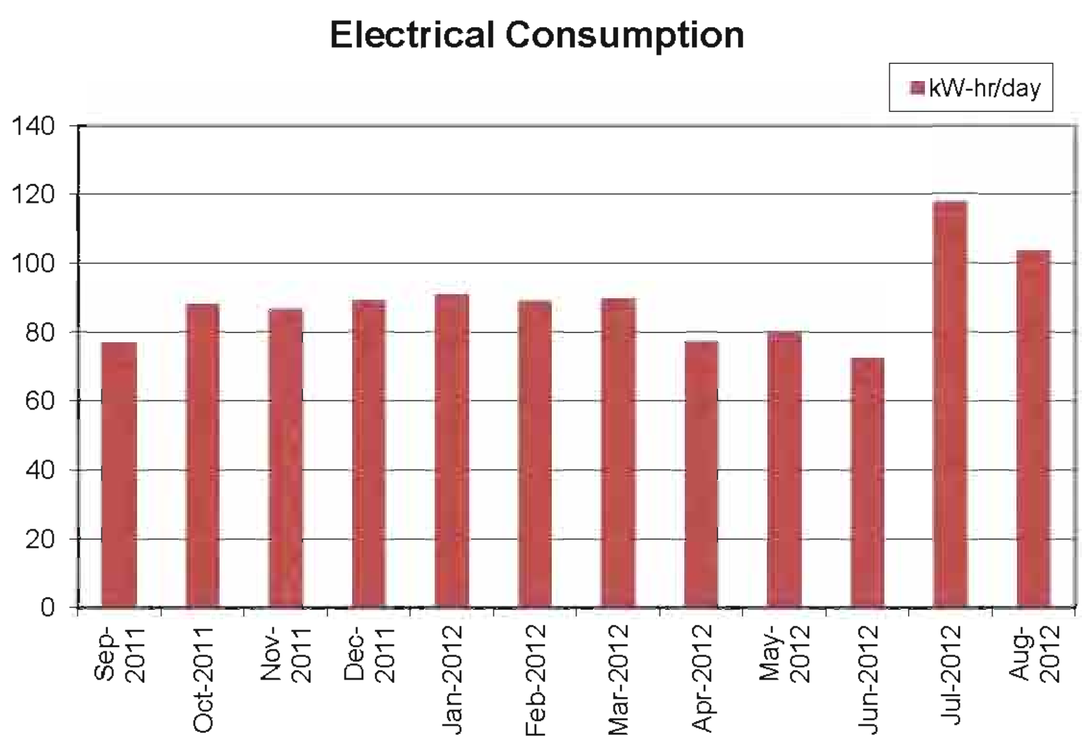


Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day	
30	77	Sep-2011	$269	2,303	S9	
29	88	Oct-2011	$296	2,553	$10	
28	87	Nov-2011	$282	2,426	$10	
28	89	Dec-2011	$577	2,493	$21	
36	91	Jan-2012	$379	3,268	$11	
31	89	Feb-2012	$323	2,756	$10	
30	90	Mar-2012	$316	2,691	$11	
29	77	Apr-2012	$265	2,234	S9	
29	80	May-2012	$274	2,309	S9	
34	73	Jun-2012	$291	2,466	S9	
29	118	Jul-2012	$392	3,420	$14	
34	104	Aug-2012	$403	3,521	$12	
average:	88	Totals	$4,066	32,440	$11	average

Square Footage	10290
kW-hr per sq ft per year =	3.2

Electrical ECI:	$0.40	per sq ft/yr
Electrical ECU:	10,839	BTU/sq ft
Average Cost per kWh:	$0.13	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	10,290	sq ft
Annual Energy Costs	$7,879	dollars
Total Energy Cost Index (ECI):	$0.77	per sq ft/yr
Total Energy Utilization Index (EUI):	53,530	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	51.61%	percentage
Percentage of Annual Energy Costs for Gas	48.39%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Add rigid insulation to bottom of roof deck.	Reduce heat loss through roof, reduce electrical and gas usage and utility cost.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace boiler with high efficiency boiler, replace pumps and accessories.	Reduce gas usage and utility costs, improve hot water heating system performance.
M2	Add perimeter radiation on exterior walls.	Reduce electrical usage from air handling units. Units will run less to provide heating for losses through exterior walls during heating season.
M3	Insulate hot water heating supply and return piping.	Reduce heat losses through piping, improve performance of terminal units.
M4	Replace unit heaters with high efficiency type unit heaters.	Reduce gas usage and utility costs.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace compact fluorescent track heads with LED type.	Reduce electrical energy costs
E2	Upgrade fluorescent fixtures with low-ballast factor programmed start ballasts and premium T8 lamps	Reduce electrical energy costs
E3	Replace exterior wall packs with LED type	Reduce electrical energy costs

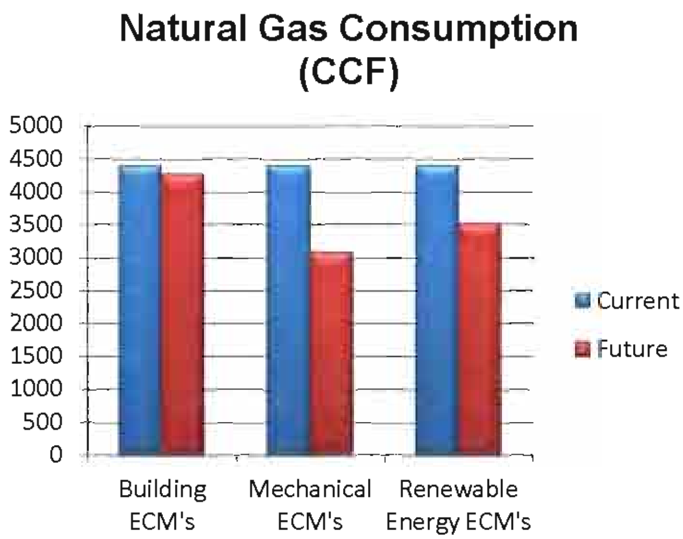
Renewable Energy Opportunities

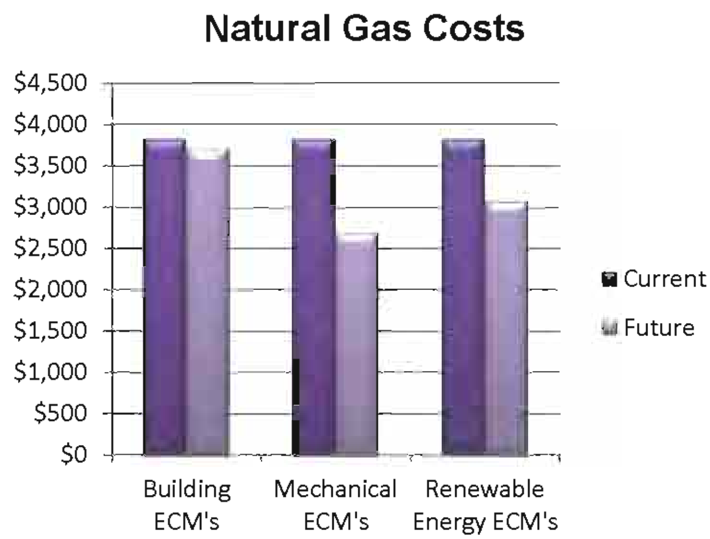
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and electrical utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, and renewable energy conservation measures:





Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	EUI (BTU/sq ft)	ECI (per sq ft/yr)	EUI (BTU/sq ft)
Building	$0.37	42,650	$0.36	41,411
Mechanical	$0.37	42,650	$0.26	29,884
Renewable Energy	$0.37	42,650	$0.30	34,154

Electrical Systems

The installation of low ballast factor fluorescent ballasts and premium T8 lamps could provide about $150 per year of electrical savings. Additionally, replacing CFL track heads with LED type should save approximately $150 per year.

The installation of approximately 3kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $500

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in exterior walls.

Exterior windows and doors have typical heat loss, particularly areas with double doors and at edges of overhead door. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

There is considerable amount of un-insulated copper heating water piping that should be insulated.

References
Existing wall U-value: 0.37 Btu/hr/sq ft/deg F
Existing roof U-value: 0.066 Btu/hr/sq ft/deg F
Existing window U-value: 0.45 Btu/hr/sq ft/deg F
Existing ACH: 0.5

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #11 Northern Hosp

Project Name. S10-12262 #11 Norther Hospitality — 02/15/2013
Prepared by. UPEA — 08.41AM

Air System Information

Air System Name	**#11 Northern Hosp**		Number of zones	**1**	
Equipment Class	**UNDEF**		Floor Area	**10201.0**	ft²
Air System Type	**SZCAV**		Location	**Sault Ste Marie, Michigan**	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**19.4**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**232.7**	MBH	OA DB / WB	**83.0 / 69.0**	°F
Sensible coil load	**209.2**	MBH	Entering DB / WB	**77.3 / 64.6**	°F
Coil CFM at Jul 1500	**10477**	CFM	Leaving DB / WB	**58.3 / 57.1**	°F
Max block CFM	**10477**	CFM	Coil ADP	**56.2**	°F
Sum of peak zone CFM	**10477**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.899**		Resulting RH	**51**	%
ft²/Ton	**526.1**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**22.8**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**46.56**	gpm	Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**345.6**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**10477**	CFM	BTU/(hr-ft²)	**33.9**	
Max coil CFM	**10477**	CFM	Ent. DB / Lvg DB	**57.0 / 88.4**	°F
Water flow @ 20.0 °F drop	**34.58**	gpm			

Supply Fan Sizing Data

Actual max CFM	**10477**	CFM	Fan motor BHP	**5.74**	BHP
Standard CFM	**10206**	CFM	Fan motor kW	**4.55**	kW
Actual max CFM/ft²	**1.03**	CFM/ft²	Fan static	**2.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**1502**	CFM	CFM/person	**40.50**	CFM/person
CFM/ft²	**0.15**	CFM/ft²			

Measurements	°F
Sp1	32.3

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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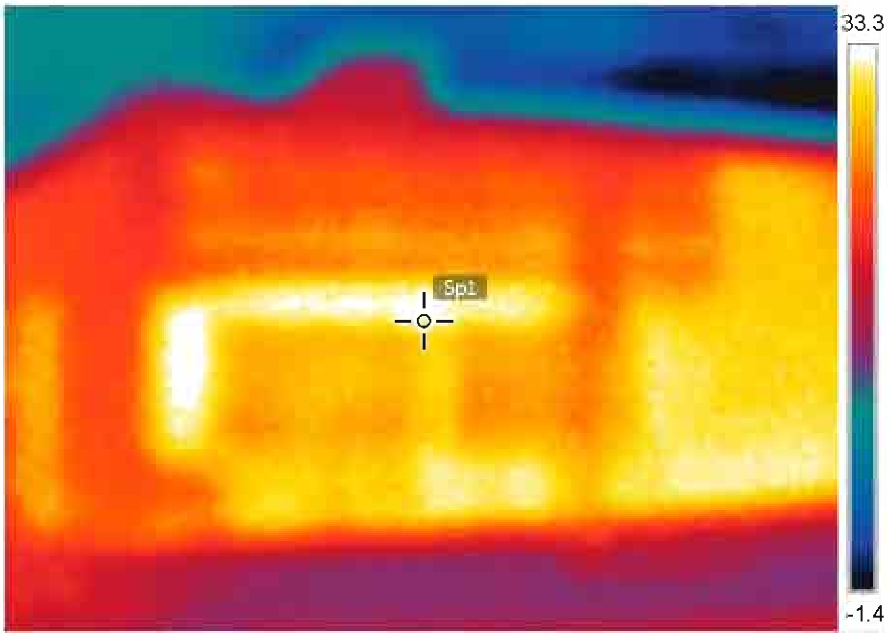

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Energy Audit
Nunns Creek Fishery
E3345 East M-134
Hessel, MI

February 2013

Table of Contents

Attachments:

Summary

The Nunn's Creek Hatchery site consists of several different buildings. The 1-story office (residential style) building was the only heated structure on the site at the time of the site inspection. This 1-story ranch style building on crawl space is approximately 1,040 square feet. The Hatchery building is approximately 1,800 square feet. There are also two other garages on the site that are approximately 600 and 768 square feet respectively.

Existing Building Envelope Profile

Office: Wood Frame walls, concrete block foundation walls, wood truss roof, shingle roofing.

Hatchery: Concrete slab on grade with wood frame walls, vertical metal siding, metal roofing, and wood roof trusses with fiberglass insulation at bottom cord.

30' x 20' garage: concrete slab, metal siding and roofing, 1 overhead door and 1 personnel door.

32' x 24' garage: concrete slab with 2 courses of block at perimeter, metal siding and roofing, 1 overhead door and 1 personnel door.

Existing Mechanical Systems Profile

HVAC

Hatchery: The heating system is served by forced air furnace, Clare model HEM-1. The furnace is in poor condition. The building is currently being changed over to electric heat.

Residential House: The heating system is served by electric baseboard and an electric furnace.

Plumbing

Hatchery: The domestic hot water system is served by a storage tank type water heater, Bradford White model M2TW, power vented. The water heater is in excellent condition. The water piping is copper and is not insulated.

Residential House: The domestic hot water system is served by an electric storage tank type water heater, Service Star model 06422, 40 gallon capacity.

Temperature Control Systems

Hatchery: The furnace is controlled by a wall mounted non-programmable thermostat.

House: Heating system is controlled by wall mounted non-programmable thermostats.

Existing Electrical Systems Profile

Lighting Systems: The Hatchery building has older T12 fluorescent light fixtures and (2) incandescent fixtures in the mechanical room.

Power Systems: Power at the site is 240/120-volt, single-phase from Cloverland Electric. The site has 3 different electrical meters. One meter is for the office, the second is for the Hatchery building, and the 3rd meter is across Nunns Creek to the west (may feed a water pump or other seldom used equipment).

It is recommended to remove the electrical service and meter on west side of Nunns Creek and run a feeder from one of the electrical panels at the office or in the hatchery. This meter only had 9 kW-hrs of use in a 1-year time period but with the monthly meter/service charges and other fees cost $154 ($17 per kW-hr).

Existing Energy Consumption and Energy Cost Analysis

The following graphical data represents a monthly weighted average of usage and costs for a building of this construction type and use group for the September 2011 to August 2012 heating season:

Water and Sewer Usage

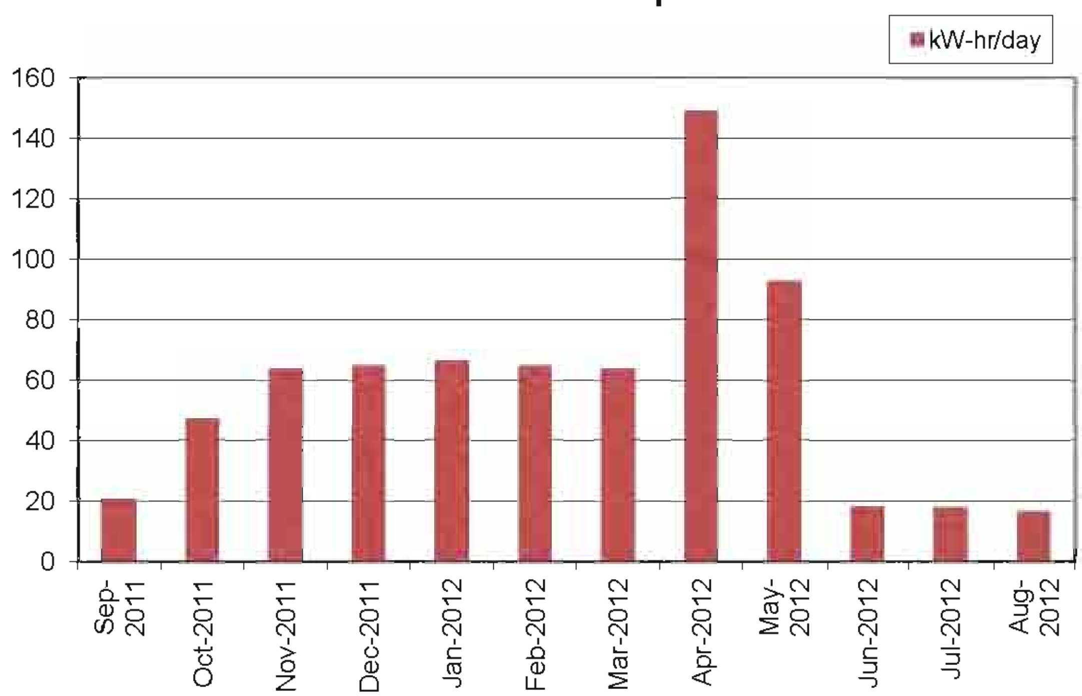
The water is served by a well and septic system.

Electrical Usage: The following is a summary of electric use for the past year:
Note: Electrical Use information is a combination of the electric meters for the house and the hatchery only:

		Period	Cost	Usage		
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**	
30	21	Sep-2011	$93	617	$3	
29	47	Oct-2011	$183	1,365	$6	
32	64	Nov-2011	$242	2,045	$8	
30	65	Dec-2011	$228	1,940	$8	
35	66	Jan-2012	$272	2,325	$8	
28	65	Feb-2012	$242	1,812	$9	
33	64	Mar-2012	$280	2,102	$8	
28	149	Apr-2012	$538	4,171	$19	
30	93	May-2012	$366	2,778	$12	
30	18	Jun-2012	$88	540	$3	
28	18	Jul-2012	$83	494	$3	
34	17	Aug-2012	$91	562	$3	
average:	57	Totals	$2,706	20,746	$7	average
		Square Footage		2,840		
		kW-hr per sq ft per year =		7.3		

Electrical ECI:	$0.95	per sq ft/yr
Electrical ECU:	25,114	BTU/sq ft
Average Cost per kWh:	$0.13	$/kWh

Electrical Consumption



Total Energy Use Summary
Note: Total energy use includes the house and the hatchery and does not include the 2 garage buildings.

Summary		
Total Gross Area of Building:	2,840	sq ft
Annual Energy Costs	$2,706	dollars
Total Energy Cost Index (ECI):	$0.95	per sq ft/yr
Total Energy Utilization Index (EUI):	25,114	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	100.00%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Hatchery and House: Replace windows and doors with high efficiency type windows and doors.	Reduce infiltration, reduce gas usage.
B2	Hatchery: Add insulation to exposed metal exterior walls.	Reduce heat loss through walls, reduce gas usage.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Hatchery and House: Install programmable thermostats.	Reduce energy usage during unoccupied hours.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Hatchery: Insulate hot water piping.	Reduce heat loss through piping.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace lighting with new fixtures with 28-watt premium T8 lamps and program start electronic ballasts.	Reduce electrical energy costs and extend life of bulbs.
E2	Install motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.
E3	Eliminate west side electric meter	Eliminate excess meter charges.

Renewable Energy Opportunities

ECM #	Energy Conservation Measure	Benefit
R1	Hatchery and House: Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.
R2	Hatchery and House: Install wind energy system for electrical usage.	Reduce electrical usage and costs.

Potential Energy Cost Savings

Electrical Systems

The installation of program start fluorescent ballasts and premium 28-watt T8 lamps is recommend and could provide about $100 per year of electrical savings, compared to what the existing lights would be using if the building was occupied.

The installation of motion sensors to control interior lighting could result in approximately $50 per year of electrical savings.

The elimination of the electric meter on west side of Nunns Creek would save $150 per year.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. Since the hatchery building has very little or no heat, the infrared photos do very little to detect areas of heat loss. It is recommended to do further evaluation at a later time when the heat is turned back on.

References

Existing wall U-value: 0.06 Btu/hr/sq ft/deg F
Existing roof U-value: 0.121 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 1.0

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #26 Nunns Creek

Project Name: S10-12262 #26 Nunns Creek	02/15/2013
Prepared by: UPEA	09:57AM

Air System Information

Air System Name	#26 Nunns Creek	Number of zones	1
Equipment Class	UNDEF	Floor Area	3306.0 ft²
Air System Type	SZCAV	Location	Sault Ste Marie, Michigan

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	5.8	Tons	Load occurs at	Jul 1500	
Total coil load	69.6	MBH	OA DB / WB	83.0 / 69.0	°F
Sensible coil load	64.2	MBH	Entering DB / WB	76.8 / 64.0	°F
Coil CFM at Jul 1500	3244	CFM	Leaving DB / WB	57.9 / 56.7	°F
Max block CFM	3244	CFM	Coil ADP	55.8	°F
Sum of peak zone CFM	3244	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.923		Resulting RH	50	%
ft²/Ton	570.0		Design supply temp.	58.0	°F
BTU/(hr-ft²)	21.1		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	13.93	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	76.6	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	3244	CFM	BTU/(hr-ft²)	23.2	
Max coil CFM	3244	CFM	Ent. DB / Lvg DB	62.7 / 85.1	°F
Water flow @ 20.0 °F drop	7.67	gpm			

Supply Fan Sizing Data

Actual max CFM	3244	CFM	Fan motor BHP	1.78	BHP
Standard CFM	3159	CFM	Fan motor kW	1.41	kW
Actual max CFM/ft²	0.98	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	258	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	26.2

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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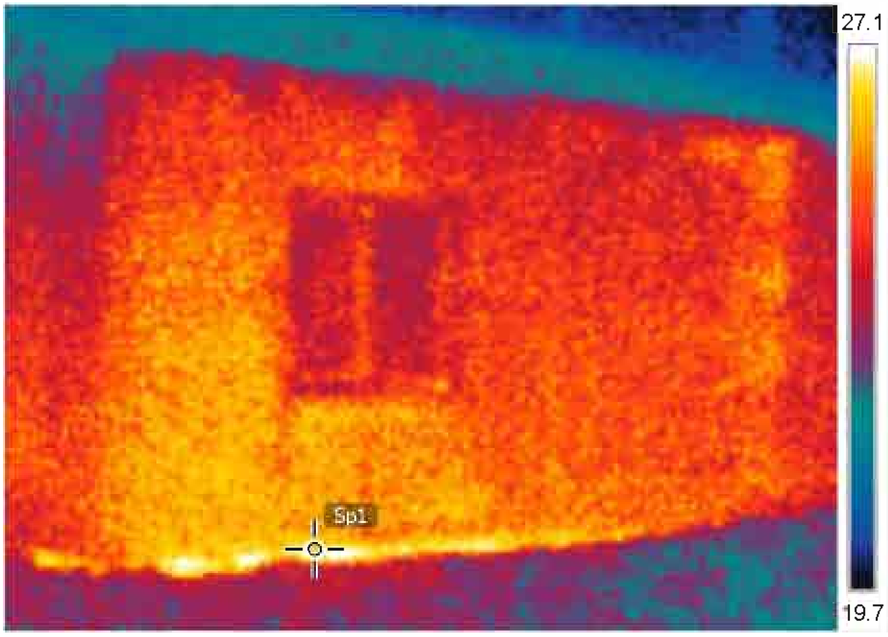

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Energy Audit
Rental House
1857 East 16th Street
Sault Ste. Marie, MI

February 2013

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Attachments:

Thermal Images

Floor Plans

Summary

The rental house located 1857 East 16th Street, Sault Ste. Marie, MI, is a 3-bedroom 1-story ranch style house with full basement with 1008 square feet per floor. The house was built in 1976, is located on north side of 16th Street, and includes a detached garage.

Existing Building Envelope Profile

Wall Construction: Basement walls are concrete block with interior rigid insulation. Main floor walls are wood framed with wood siding exterior.

Roof Construction: The roof is wood trusses with single roofing.

Floor Construction: The basement floor is concrete slab. The main floor is wood joists, wood decking, and floor coverings. The basement is not heated.

Window and Door Construction: Exterior windows and doors are residential grade.

Existing Mechanical Systems Profile

HVAC

The heating system is served by a single natural gas fired furnace, Rheem model, located in the basement. The furnace is in excellent condition. Air distribution is through floor mounted supply air grilles and a common return grille. The ductwork in the basement is not insulated.

Plumbing

The domestic water heating system is served by a natural gas fired, storage tank water heater, Bradford White, model M150, 50 gallon capacity. The water heater is in excellent condition. The water piping is copper and is not insulated.

The average hot water delivery time to plumbing fixtures is 5 seconds.

The plumbing fixtures are floor mounted tank type water closets, countertop lavatories with dual handle manual faucets and stainless steel kitchen sink.

Temperature Control Systems

The heating system is controlled by a wall mounted non-programmable thermostat.

Existing Electrical Systems Profile

Lighting Systems: The existing interior lighting consists of approximately 17 fixtures with incandescent lamps. It is recommended to replace incandescent lamps with self-ballasted compact fluorescent lamps.

Power Systems: Electrical service is from Cloverland Electric (formerly Edison Sault). The main panel is located in the basement under the stairs and is 200-amp, 240/120-volt, single-phase.

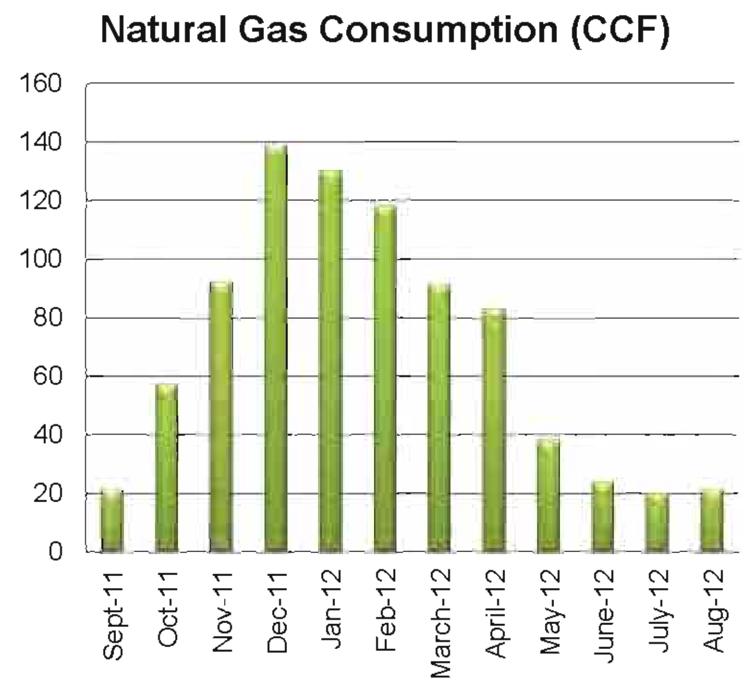
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$29	21
Oct-11	$89	57
Nov-11	$91	92
Dec-11	$127	139
Jan-12	$113	130
Feb-12	$102	118
March-12	$81	91
April-12	$76	83
May-12	$41	38
June-12	$28	24
July-12	$26	20
Aug-12	$27	21
Totals	$830	834

Natural Gas ECI:	$0.82	per sq ft/yr
Natural Gas ECU:	82,738	BTU/sq ft
Average Cost per CCF:	$1.00	$/CCF

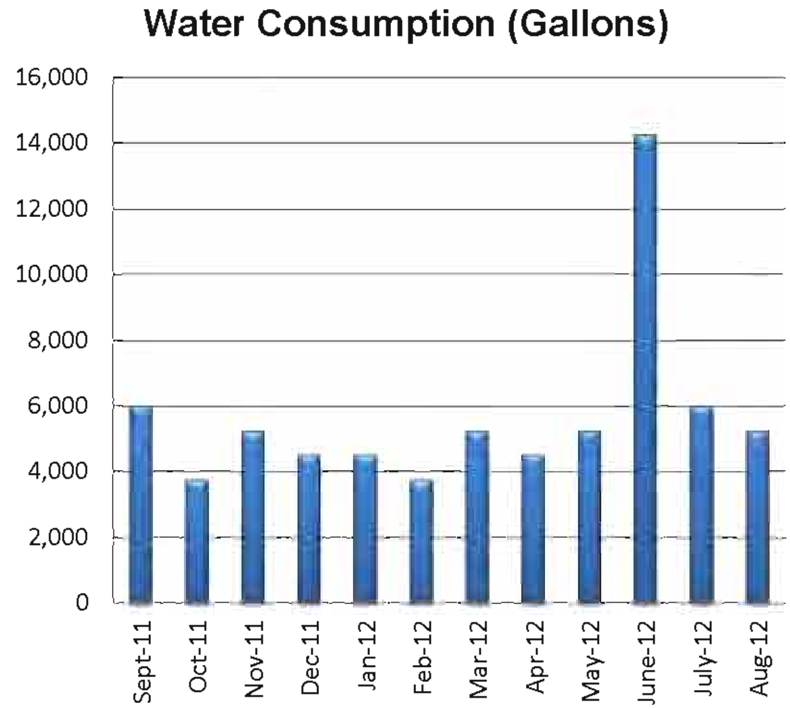


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$48	6,000
Oct-11	$30	3,750
Nov-11	$42	5,250
Dec-11	$36	4,500
Jan-12	$36	4,500
Feb-12	$30	3,750
Mar-12	$42	5,250
Apr-12	$36	4,500
May-12	$42	5,250
June-12	$111	14,250
July-12	$48	6,000
Aug-12	$42	5,250
Totals	$543	68,250

Cost per sq ft:	$0.54	per sq ft/yr
Average Usage per Fixture:	11,375	gallons/fix
Average Usage Cost per Fixture:	$0.008	$/gallon

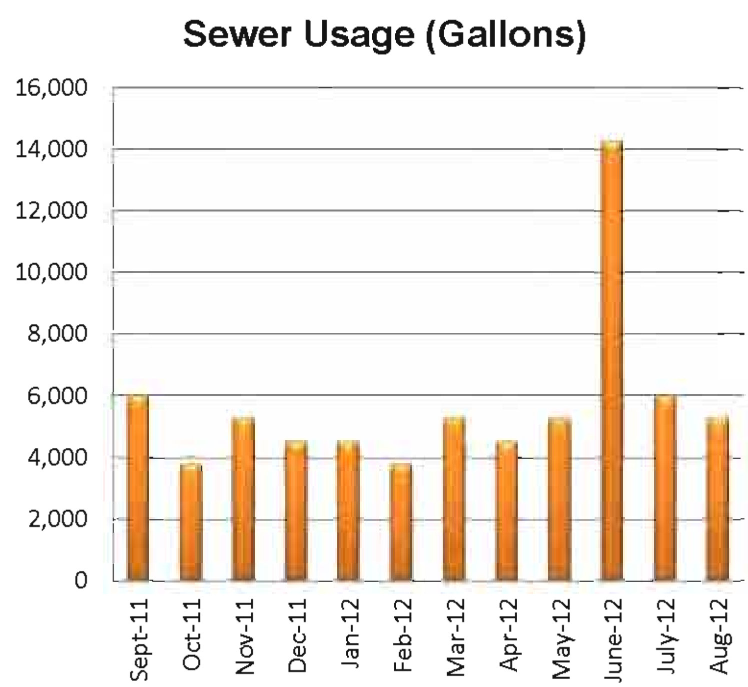


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$53	6,000
Oct-11	$34	3,750
Nov-11	$46	5,250
Dec-11	$40	4,500
Jan-12	$40	4,500
Feb-12	$34	3,750
Mar-12	$46	5,250
Apr-12	$40	4,500
May-12	$46	5,250
June-12	$127	14,250
July-12	$55	6,000
Aug-12	$48	5,250
Totals	$609	68,250

Cost per sq ft:	$0.60	per sq ft/yr
Average Usage per Fixture:	11,375	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon

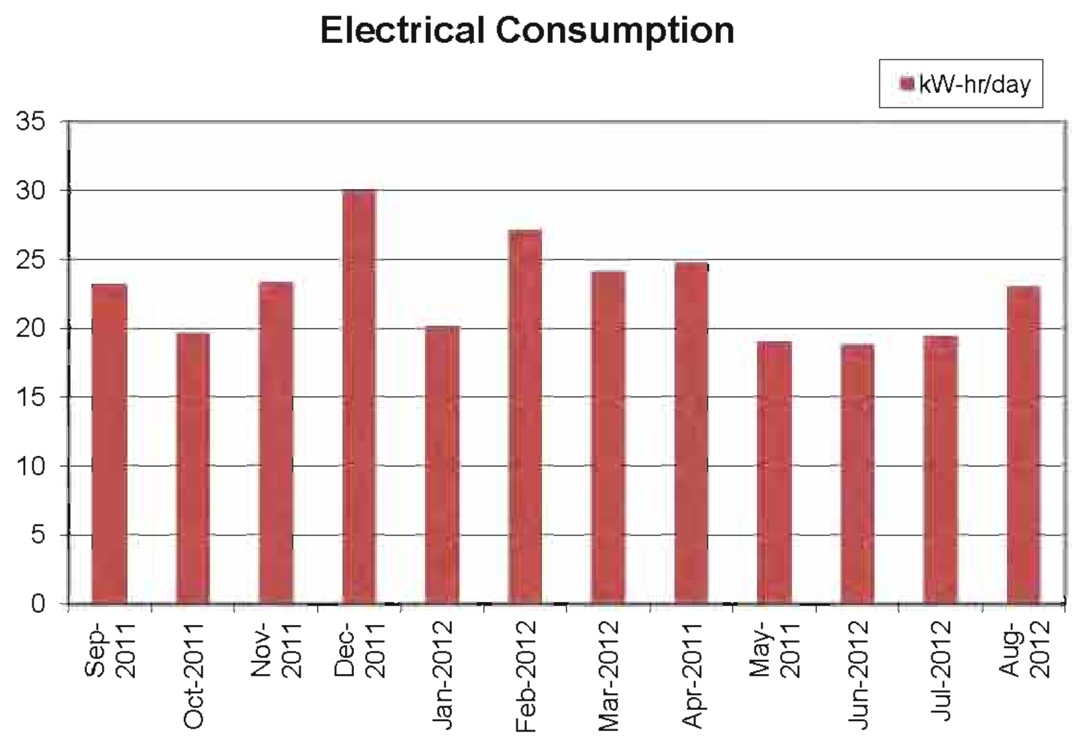


Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Month (Period)	Cost (Cost)	kWh (Usage)	cost/day	
33	23	Sep-2011	$77	766	$2.34	
30	20	Oct-2011	$60	590	$2.01	
29	23	Nov-2011	$69	676	$2.37	
30	30	Dec-2011	$90	898	$3.00	
34	20	Jan-2012	$71	685	$2.10	
31	27	Feb-2012	$87	841	$2.80	
28	24	Mar-2012	$70	674	$2.51	
31	25	Apr-2011	$76	767	$2.44	
27	19	May-2011	$53	513	$1.96	
30	19	Jun-2012	$59	563	$1.97	
30	19	Jul-2012	$60	582	$2.01	
33	23	Aug-2012	$78	759	$2.36	
average:	23	Totals	$850	8,314	$2.32	average

Square Footage		1008
kW-hr per sq ft per year =		8.2

Electrical ECI:	$0.84	per sq ft/yr
Electrical ECU:	28,357	BTU/sq ft
Average Cost per kWh:	$0.10	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	1,008	sq ft
Annual Energy Costs	$1,680	dollars
Total Energy Cost Index (ECI):	$1.67	per sq ft/yr
Total Energy Utilization Index (EUI):	111,095	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	50.60%	percentage
Percentage of Annual Energy Costs for Gas	49.40%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Add insulation to basement walls.	Reduce heat loss through basement walls.
B2	Add insulation between floor joists.	Reduce heat loss through floor to unheated basement.
B3	Add insulation above ceiling.	Reduce heat loss through ceiling.
B4	Install Energy Star rated appliances.	Reduce electrical usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Insulate supply air ductwork.	Reduce heat loss through ductwork.
M2	Future: 5-10 years, update furnace to higher efficiency, condensing type furnace.	Reduce energy usage.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install non-programmable thermostat.	Reduce energy usage during unoccupied periods.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install sensor or timed operators for faucets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace incandescent lamps with CFL	Reduce electrical energy cost

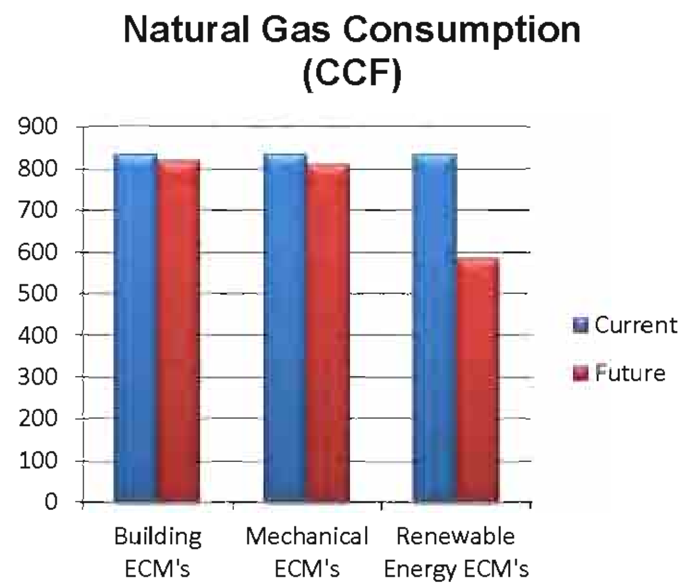
Renewable Energy Opportunities

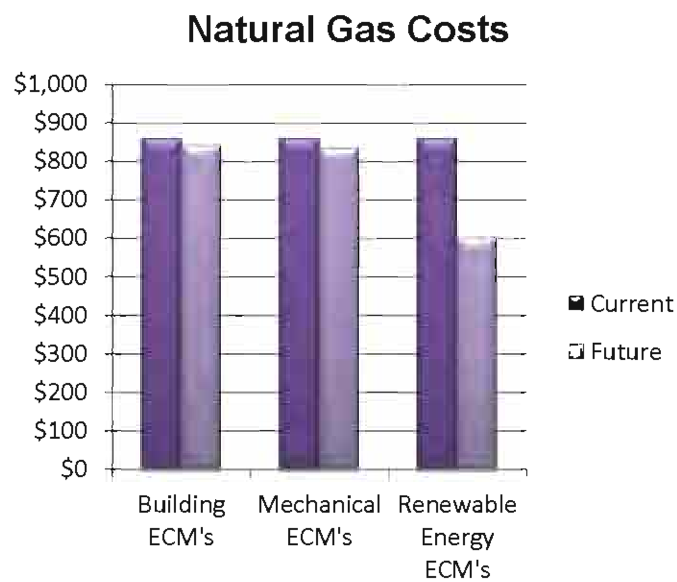
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:

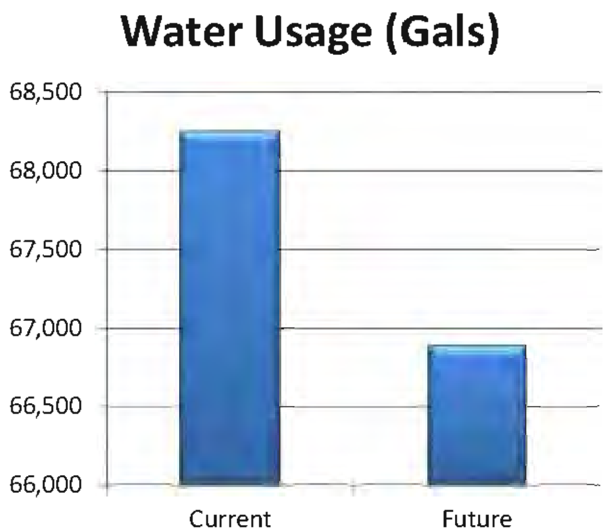




Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.82	82,738	$0.83	81,083
Mechanical	$0.82	82,738	$0.83	80,256
Renewable Energy	$0.82	82,738	$0.60	57,917

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:



Electrical Systems

Replacing incandescent lamps with compact fluorescent should provide approximately $75 in annual electrical savings.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few areas of the basement walls where rigid insulation was missing or removed. These areas should have insulation replaced. In addition, the rigid insulation should be covered with drywall to protect it from damage.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.55 Btu/hr/sq ft/deg F
Existing ACH: 0.6

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #35 Rental

Project Name: S10-12262 #35 Rental — 02/15/2013
Prepared by: UPEA — 11:05AM

Air System Information

Air System Name	#35 Rental		Number of zones	1	
Equipment Class	UNDEF		Floor Area	1024.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	2.5	Tons	Load occurs at	Jul 1500	
Total coil load	29.8	MBH	OA DB / WB	83.0 / 69.0	°F
Sensible coil load	28.2	MBH	Entering DB / WB	76.7 / 63.9	°F
Coil CFM at Jul 1500	1441	CFM	Leaving DB / WB	58.2 / 56.9	°F
Max block CFM	1441	CFM	Coil ADP	56.1	°F
Sum of peak zone CFM	1441	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.945		Resulting RH	50	%
ft²/Ton	412.1		Design supply temp.	58.0	°F
BTU/(hr-ft²)	29.1		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	5.97	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	36.9	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	1441	CFM	BTU/(hr-ft²)	36.1	
Max coil CFM	1441	CFM	Ent. DB / Lvg DB	64.2 / 88.6	°F
Water flow @ 20.0 °F drop	3.70	gpm			

Supply Fan Sizing Data

Actual max CFM	1441	CFM	Fan motor BHP	0.79	BHP
Standard CFM	1403	CFM	Fan motor kW	0.63	kW
Actual max CFM/ft²	1.41	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	80	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	25.5

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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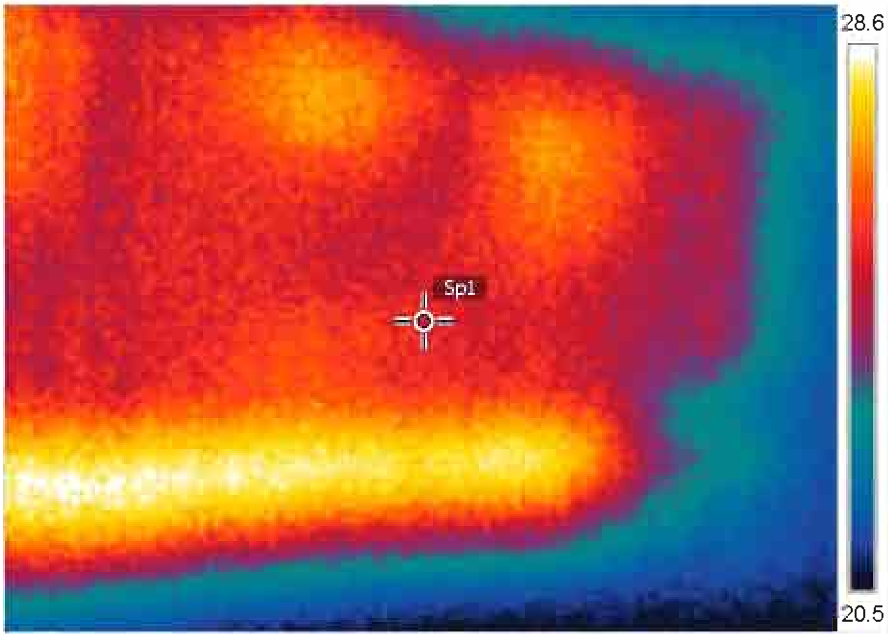

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Energy Audit
Shedawin Building
2154 Shunk Road
Sault Ste. Marie, MI

February 2013

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Attachments:

Summary

The Shedawin Building located at 2154 Shunk Road is a 1 story 1138 square foot building used for special activities and group meetings. The building was constructed in 1979 and includes offices, storage, bathroom, meeting space, and a small kitchenette.

Existing Building Envelope Profile

Wall Construction: The exterior walls are concrete block for the bottom ½ and wood frame for the top ½. The top ½ is vinyl siding on exterior and drywall on interior.

Roof Construction: The roof has wood trusses and shingles.

Floor Construction: Floors are concrete slab on grade with mixture of tile and carpet.

Window and Door Construction: Windows and doors are commercial type. Several windows have plastic winterizing installed.

Existing Mechanical Systems Profile

HVAC

The heating system is served by a single natural gas fired atmospheric boiler, Slant Fin model with perimeter baseboard radiation. The boiler is in poor condition. The heating piping runs below the slab and is not insulated.

Several window mounted air conditioning units are installed in the office areas.

Plumbing

The domestic hot water system is served by a single natural gas fired storage tank type water heater, Ruud, model P30-6, 30 gallon capacity. The water heater is in good condition. Water piping is copper and is not insulated. There is not a hot water return system.

The average time for hot water delivery to plumbing fixtures is 7 seconds.

The bathroom exhaust fan is switched with the lights.

The plumbing fixtures are floor mounted tank type water closets, countertop mounted lavatories with dual handle manual faucets and a stainless steel kitchen sink with dual handle manual faucet. Low flow aerators have not been installed on the faucets.

Temperature Control Systems

The heating system is controlled by a single wall mounted programmable thermostat.

Existing Electrical Systems Profile

Lighting Systems: Interior lights are older T12 fluorescent and should be upgraded.

Power Systems: Electrical service is 200-amp, 240/120-volt, single phase.

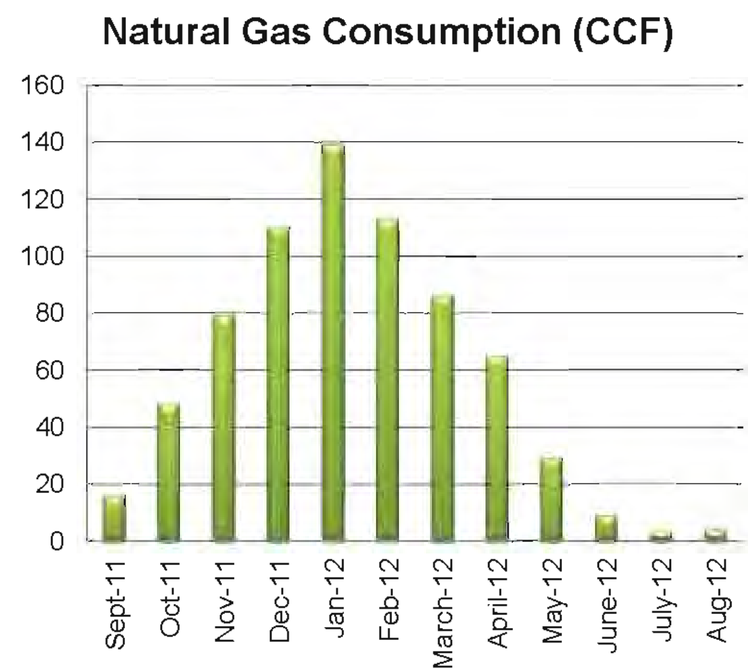
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$10	16
Oct-11	$30	48
Nov-11	$49	79
Dec-11	$67	110
Jan-12	$83	139
Feb-12	$68	113
March-12	$53	86
April-12	$40	65
May-12	$27	29
June-12	$3	9
July-12	$1	3
Aug-12	$2	4
Totals	$433	701

Natural Gas ECI:	$0.38	per sq ft/yr
Natural Gas EUI:	61,599	BTU/sq ft
Average Cost per CCF:	$0.62	$/CCF

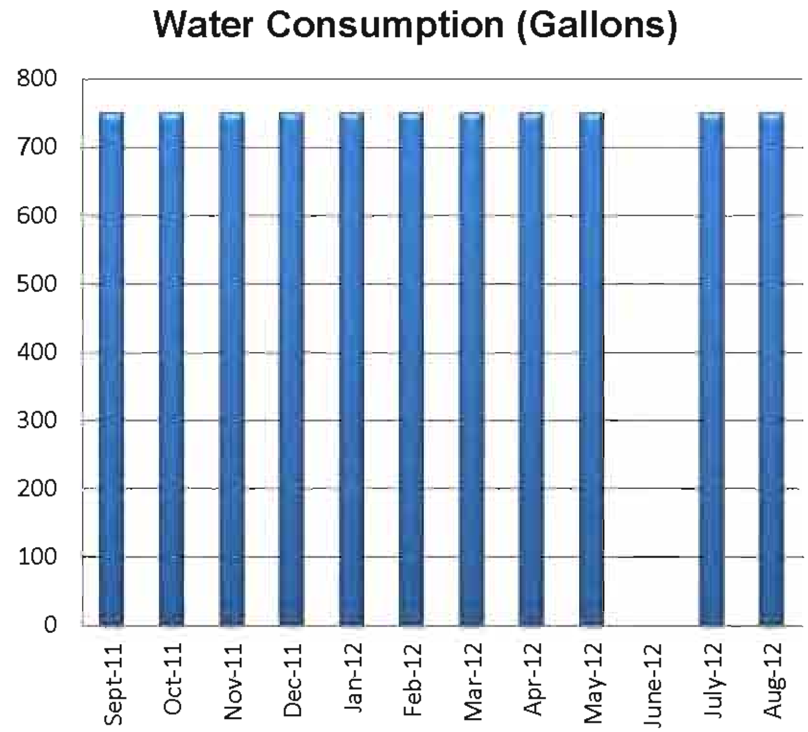


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$7	750
Oct-11	$7	750
Nov-11	$7	750
Dec-11	$7	750
Jan-12	$7	750
Feb-12	$7	750
Mar-12	$7	750
Apr-12	$7	750
May-12	$7	750
June-12	$1	0
July-12	$7	750
Aug-12	$7	750
Totals	$78	8,250

Cost per sq ft:	$0.07	per sq ft/yr
Average Usage per Fixture:	1,375	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon

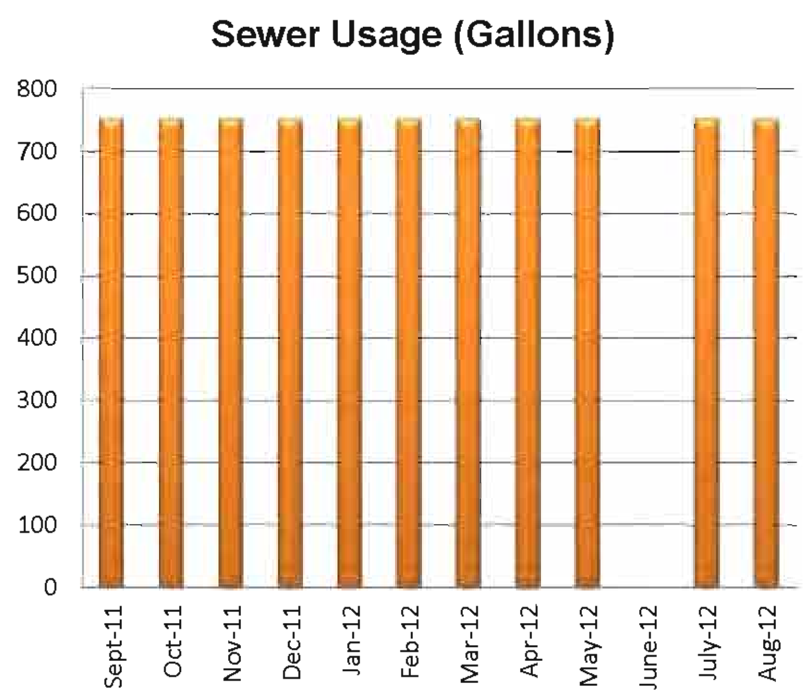


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$9	750
Oct-11	$9	750
Nov-11	$9	750
Dec-11	$9	750
Jan-12	$9	750
Feb-12	$9	750
Mar-12	$9	750
Apr-12	$9	750
May-12	$9	750
June-12	$3	0
July-12	$9	750
Aug-12	$9	750
Totals	$102	8,250

Cost per sq ft:	$0.09	per sq ft/yr
Average Usage per	1,375	gallons/fix
Average Usage Cost per Fixture:	$0.012	$/gallon



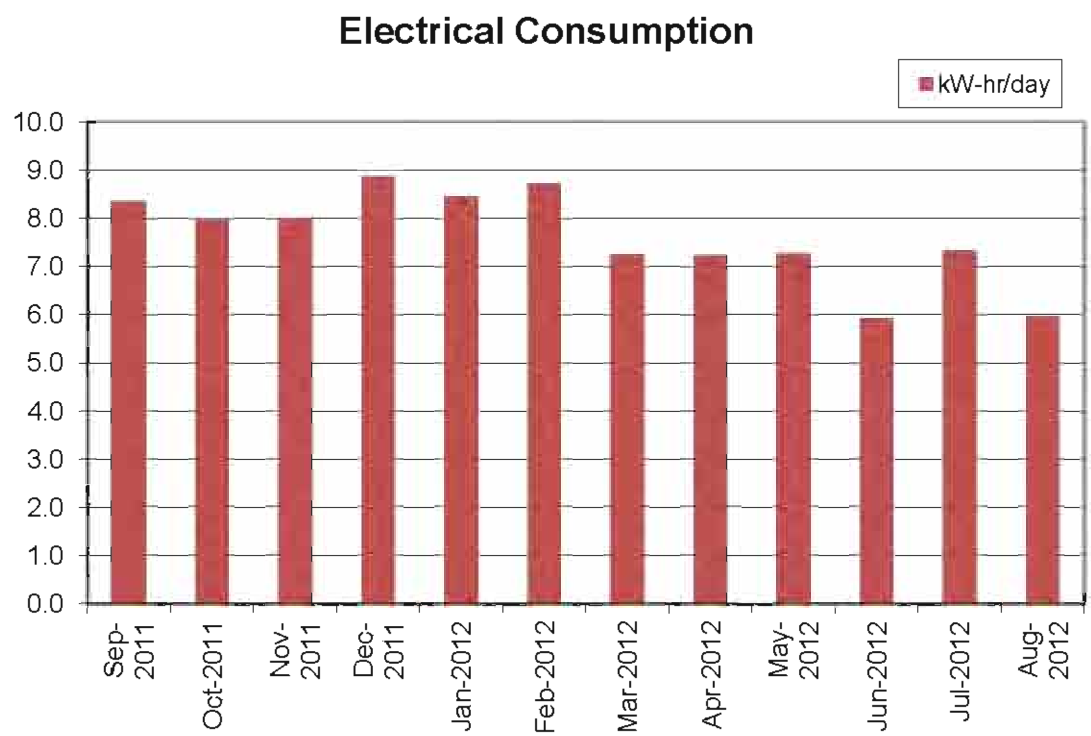
Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Month (Period)	Cost (Cost)	kWh (Usage)	cost/day	
29	8.3	Sep-2011	$37	242	$1.28	
28	8.0	Oct-2011	$35	223	$1.25	
29	8.0	Nov-2011	$36	232	$1.24	
35	8.9	Dec-2011	$45	310	$1.28	
29	8.4	Jan-2012	$38	245	$1.30	
32	8.7	Feb-2012	$41	279	$1.30	
28	7.3	Mar-2012	$33	203	$1.18	
30	7.2	Apr-2012	$35	217	$1.16	
33	7.3	May-2012	$37	240	$1.13	
30	5.9	Jun-2012	$30	178	$1.01	
33	7.3	Jul-2012	$37	242	$1.13	
29	6.0	Aug-2012	$29	173	$1.00	
average:	7.6	Totals	$433	2,784	$1.19	average

Square Footage 1138

kW-hr per sq ft per year = 2.4

Electrical ECI:	$0.38	per sq ft/yr
Electrical ECU:	8,411	BTU/sq ft
Average Cost per kWh:	$0.16	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	1,138	sq ft
Annual Energy Costs	$866	dollars
Total Energy Cost Index (ECI):	$0.76	per sq ft/yr
Total Energy Utilization Index (EUI):	69,902	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	50.03%	percentage
Percentage of Annual Energy Costs for Gas	49.97%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace windows and doors with high efficiency type windows and doors.	Reduce infiltration, reduce gas usage.
B2	Install added insulation above ceiling space.	Reduce heat loss through ceiling, reduce gas usage.
B3	Install Energy Star rated appliances.	Reduce electrical usage.
B4	Add interior wall to exposed block wall, to include batt or blown-in insulation and drywall.	Increase R value of wall, reduce gas usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace boiler, pump and accessories.	Reduce gas usage.
M2	Implement comprehensive preventative maintenance program on all mechanical equipment.	Extend life of equipment, improve equipment performance.
M3	Insulate hot water piping.	Reduce heat loss through piping, reduce gas usage.
M4	Add baseboard radiation to exterior walls.	Reduce heat loss through walls not covered by baseboard.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install low flow aerators on faucets.	Reduce water usage.
P2	Install motion or timed sensor control on faucets and water closets.	Reduce water usage.
P3	Insulate domestic hot water piping.	Reduce heat loss through piping, improve hot water delivery.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Upgrade fluorescent lights to T8 with electronic ballasts	Reduce electrical energy use
E2	Install motion sensors to automatically turn off lights	Reduce electrical energy use

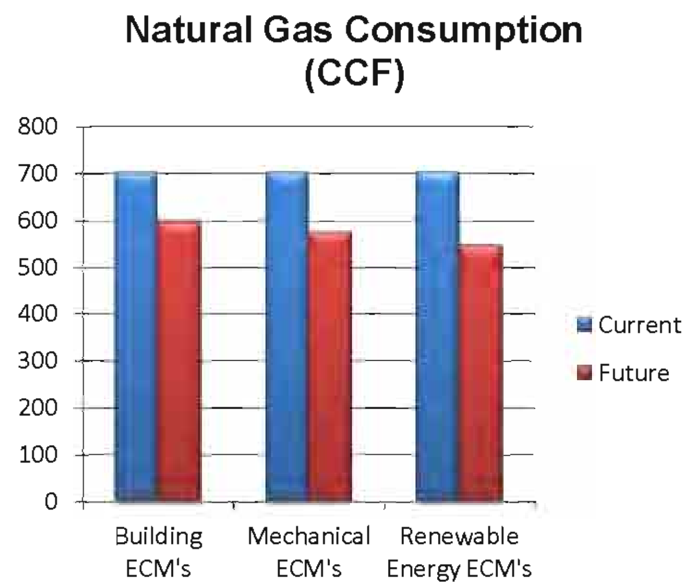
Renewable Energy Opportunities

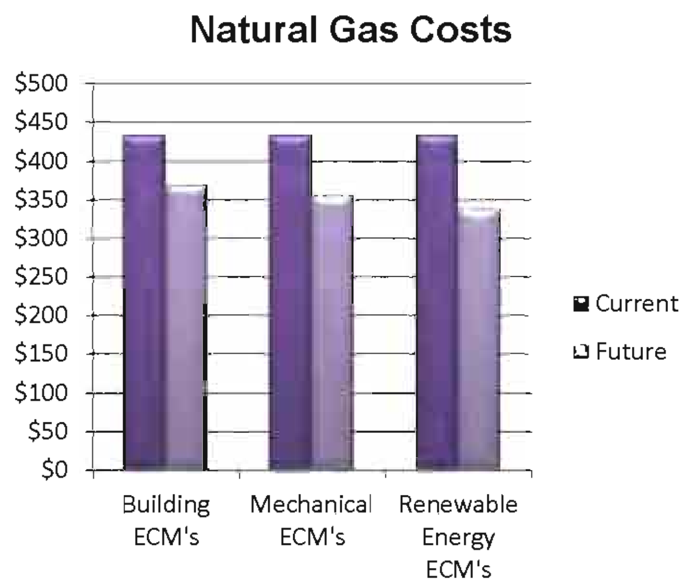
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:

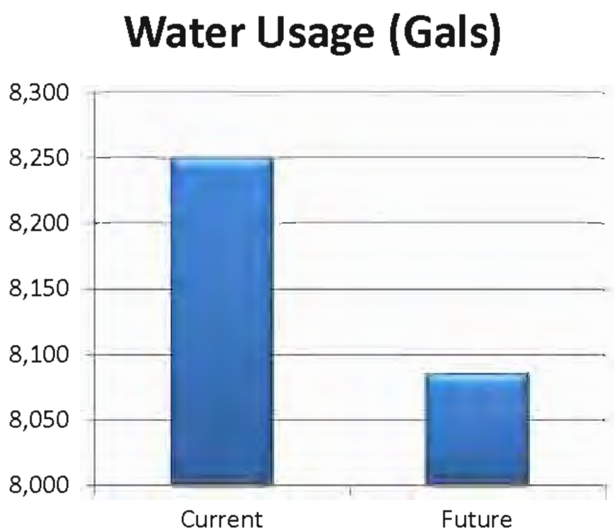


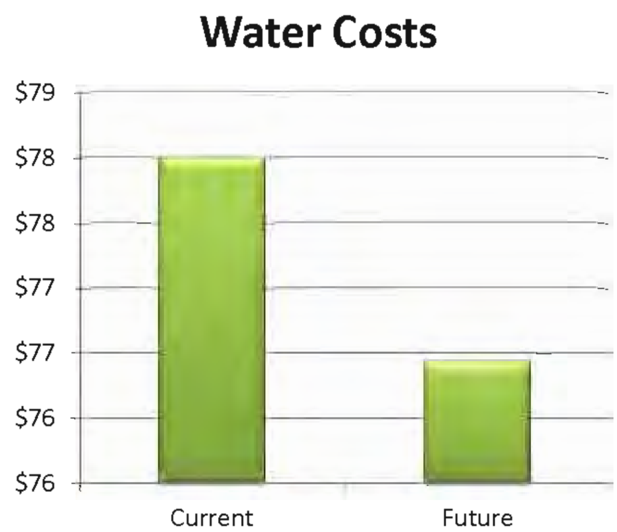


Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.38	61,599	$0.32	52,359
Mechanical	$0.38	61,599	$0.31	50,511
Renewable Energy	$0.38	61,599	$0.30	48,047

Water

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:





Electrical Systems

The installation of program start fluorescent ballasts and premium 28-watt T8 lamps is recommend and could provide about $75 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $50 per year of electrical savings.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References
Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.55 Btu/hr/sq ft/deg F
Existing ACH: 0.6

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #34 Shedawin

Project Name. S10-12262 #34 Shedawin — 02/15/2013
Prepared by. UPEA — 11.05AM

Air System Information

Air System Name	#34 Shedawin		Number of zones	1	
Equipment Class	UNDEF		Floor Area	1138.0	ft²
Air System Type	SZCAV		Location	Chicago IAP, Illinois	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	3.5	Tons	Load occurs at	Jul 1500	
Total coil load	42.3	MBH	OA DB / WB	91.0 / 74.0	°F
Sensible coil load	39.4	MBH	Entering DB / WB	77.0 / 63.8	°F
Coil CFM at Jul 1500	1933	CFM	Leaving DB / WB	57.6 / 56.4	°F
Max block CFM	1933	CFM	Coil ADP	55.5	°F
Sum of peak zone CFM	1933	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.932		Resulting RH	49	%
ft²/Ton	323.0		Design supply temp.	58.0	°F
BTU/(hr-ft²)	37.2		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	8.46	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	42.8	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	1933	CFM	BTU/(hr-ft²)	37.6	
Max coil CFM	1933	CFM	Ent. DB / Lvg DB	65.4 / 86.4	°F
Water flow @ 20.0 °F drop	4.29	gpm			

Supply Fan Sizing Data

Actual max CFM	1933	CFM	Fan motor BHP	1.06	BHP
Standard CFM	1886	CFM	Fan motor kW	0.84	kW
Actual max CFM/ft²	1.70	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	89	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	19.2

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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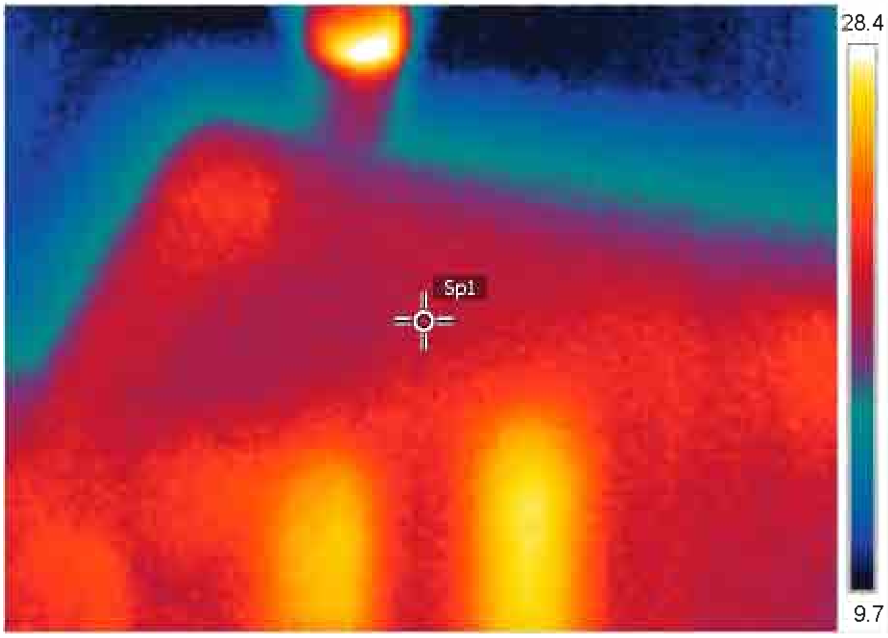

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Energy Audit
Somes Office Building
1022 E. Portage Ave.
Sault Ste. Marie, MI

February 2013

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Attachments:

Summary

The former 7,650 square foot 1 story Somes building was built in 1978. Since its purchase by the Tribe it has had many uses such as a Construction Company, Social Services offices and the Purchasing Department storage facility. The building is presently not occupied, however it is being used as storage space.

Existing Building Envelope Profile

Wall Construction: Interior wall finishes include painted drywall and paneling in the office areas.

Roof Construction: Traditional shingle roof on the office portion, metal roof on the warehouse.

Floor Construction: Floors are concrete on grade with a mixture of carpet and tile floor coverings.

Window and Door Construction: Commercial type personnel doors, windows, and overhead “garage” doors are in good condition.

Existing Mechanical Systems Profile

HVAC

Office: The heating system is served by electric baseboard on the exterior walls. There are several window mounted air conditioning units. There is not a central air system for ventilation.

Garage: The heating system is served by ceiling hung natural gas fired unit heaters. The unit heaters are in poor condition and are outdated.

Plumbing

The domestic hot water system is served by a single electric storage tank type water heater, Reliance, model 606. The water heater is in good condition. A hot water return system is not installed. The water piping is copper and is not insulated.

At the time of inspection, the main water was shut-off.

Plumbing fixtures are floor mounted tank type water closets and wall mounted lavatories with dual handle manual faucets.

Temperature Control Systems

The heating terminal units for the garage and office are controlled by wall mounted non-programmable thermostats.

Existing Electrical Systems Profile

Lighting Systems: The interior building lighting is a mixture of older T12 linear fluorescent, some decorative recessed cans, and some “utility” type fixtures in the cold storage areas. Lighting control is via standard manual wall-box switches. The exterior lighting consists of 2 175W MH wall packs and about 20 recessed cans in soffits.

Power Systems: Electrical service from Cloverland Electric (formerly Edison Sault) is on the NW wall of the building. Several older electrical panels are located near the service point.

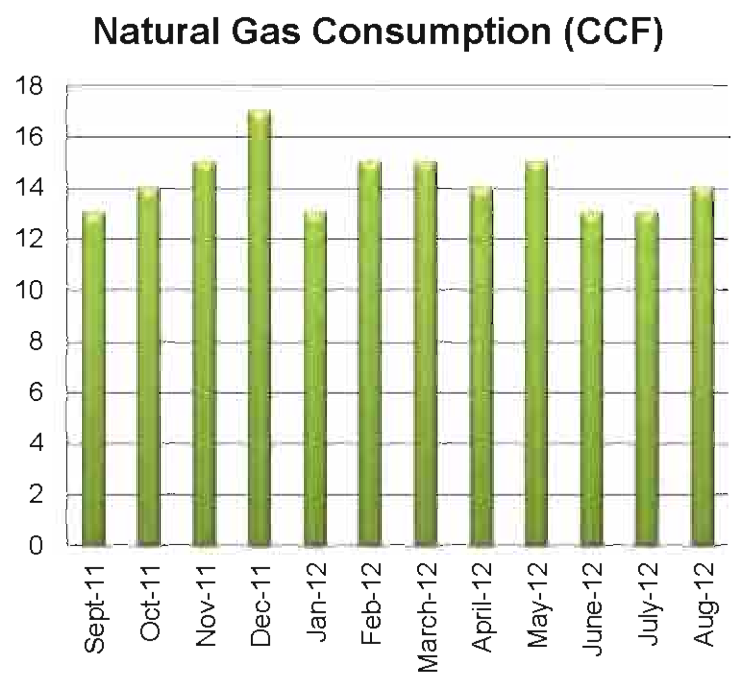
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$36	13
Oct-11	$37	14
Nov-11	$37	15
Dec-11	$39	17
Jan-12	$35	13
Feb-12	$37	15
March-12	$36	15
April-12	$36	14
May-12	$27	15
June-12	$62	13
July-12	$34	13
Aug-12	$35	14
Totals	$451	171

Natural Gas ECI:	$0.06	per sq ft/yr
Natural Gas ECU:	2,235	BTU/sq ft
Average Cost per CCF:	$2.64	$/CCF

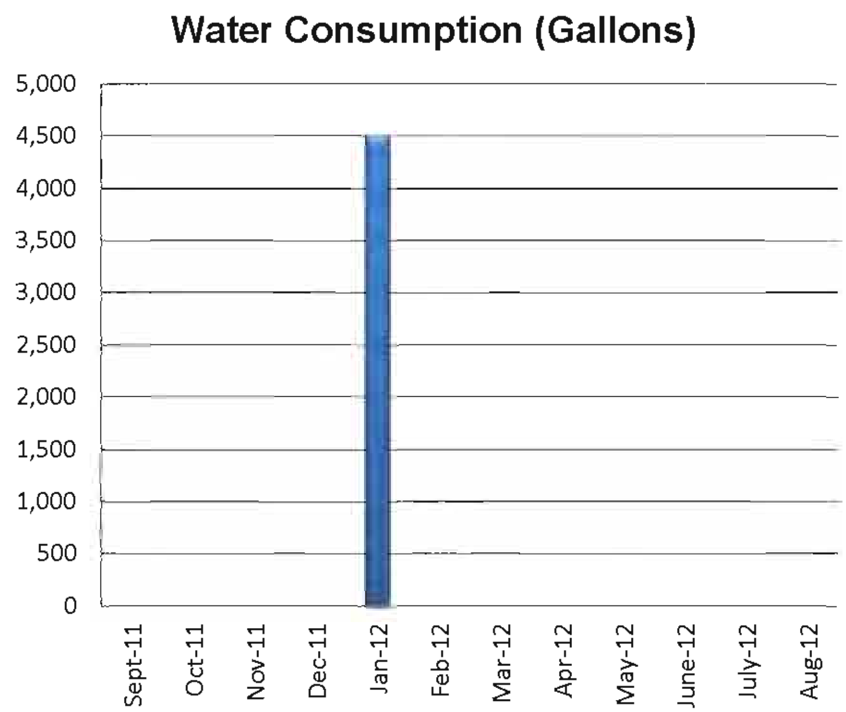


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$1	0
Oct-11	$1	0
Nov-11	$1	0
Dec-11	$1	0
Jan-12	$36	4,500
Feb-12	$1	0
Mar-12	$1	0
Apr-12	$1	0
May-12	$1	0
June-12	$1	0
July-12	$1	0
Aug-12	$1	0
Totals	$47	4,500

Cost per sq ft:	$0.01	per sq ft/yr
Average Usage per Fixture:	450	gallons/fix
Average Usage Cost per Fixture:	$0.010	$/gallon

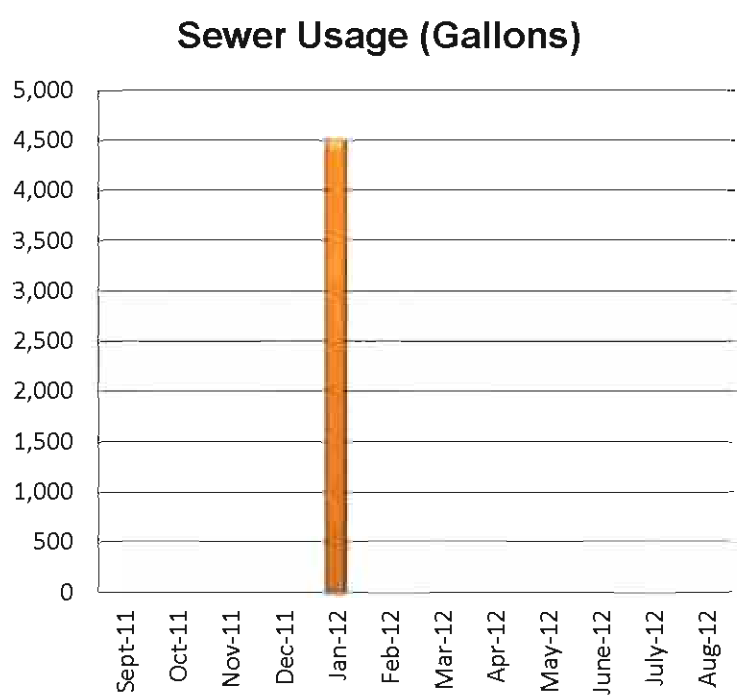


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$3	0
Oct-11	$3	0
Nov-11	$3	0
Dec-11	$3	0
Jan-12	$40	4,500
Feb-12	$3	0
Mar-12	$3	0
Apr-12	$3	0
May-12	$3	0
June-12	$3	0
July-12	$3	0
Aug-12	$3	0
Totals	$73	4,500

Cost per sq ft:	$0.01	per sq ft/yr
Average Usage per	450	gallons/fix
Average Usage Cost per Fixture:	$0.016	$/gallon

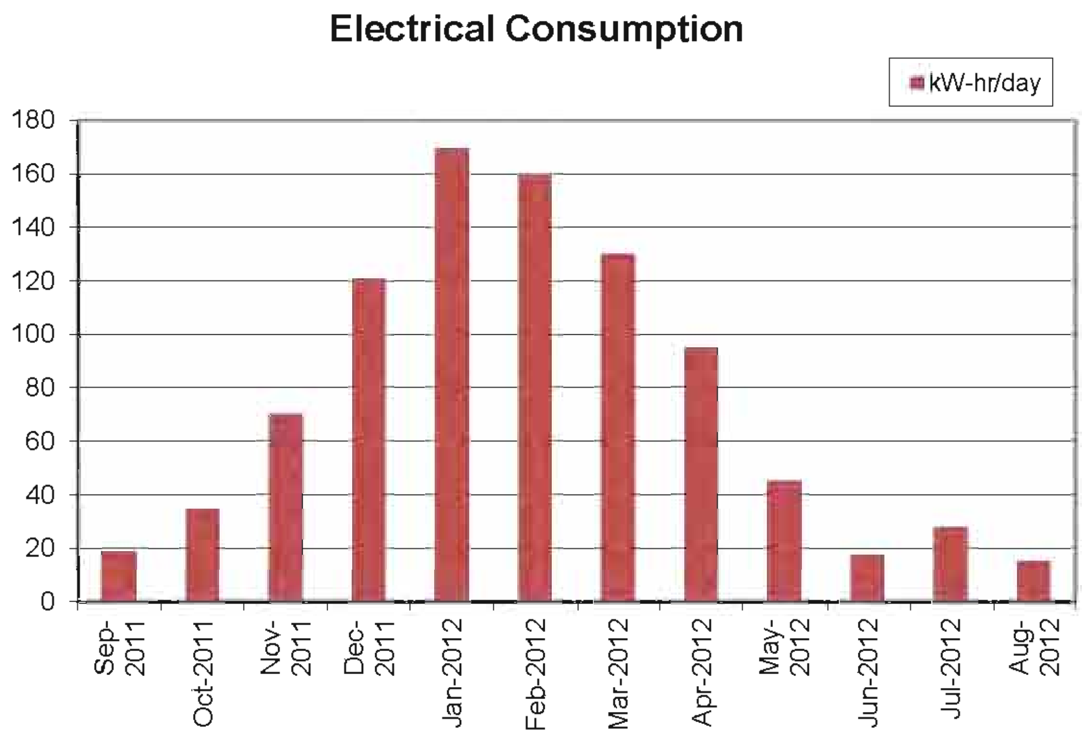


Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day	
30	19	Sep-2011	$78	560	S3	
31	34	Oct-2011	$129	1,068	S4	
29	70	Nov-2011	$227	2,038	S8	
30	121	Dec-2011	$389	3,623	$13	
35	169	Jan-2012	$634	5,931	$18	
28	160	Feb-2012	$485	4,473	$17	
30	130	Mar-2012	$425	3,897	$14	
28	95	Apr-2012	$296	2,659	$11	
30	45	May-2012	$160	1,353	S5	
30	17	Jun-2012	$75	520	S2	
31	28	Jul-2012	$111	861	S4	
30	15	Aug-2012	$68	460	S2	
average:	75	Totals	$3,075	27,443	S8	average

Square Footage	7650
kW-hr per sq ft per year =	3.6

Electrical ECI:	$0.40	per sq ft/yr
Electrical ECU:	12,333	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	7,650	sq ft
Annual Energy Costs	$3,526	dollars
Total Energy Cost Index (ECI):	$0.46	per sq ft/yr
Total Energy Utilization Index (EUI):	14,569	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	87.21%	percentage
Percentage of Annual Energy Costs for Gas	12.79%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Office: Add additional insulation above ceiling.	Reduce heat loss through ceiling, reduce electrical usage.
B2	Office: Replace windows and doors with high efficiency, Low-E types.	Reduce infiltration, reduce electrical usage.
B3	Garage: Install continuous insulation on exterior walls.	Reduce heat loss through walls, reduce gas usage.
B4	Garage: Replace overhead doors with insulated doors.	Reduce infiltration, reduce gas usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Office: Install a complete ventilation system in lieu of using open windows for ventilation.	Improve indoor air quality, reduce electrical usage.
M2	Garage: Replace unit heaters with high efficiency type units.	Reduce gas usage.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce electrical and gas usage.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Insulate plumbing water piping.	Reduce heat loss through piping, improve water heater efficiency.
P2	Install sensor or timed controls on faucets.	Reduce water usage.
P3	Install low flow water closets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace lighting with new fixtures with 28-watt premium T8 lamps and program start electronic ballasts.	Reduce electrical energy costs and extend life of bulbs.
E2	Replace exterior lights with LED type fixtures	Reduce electrical energy costs.
E3	Install wall-box motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.

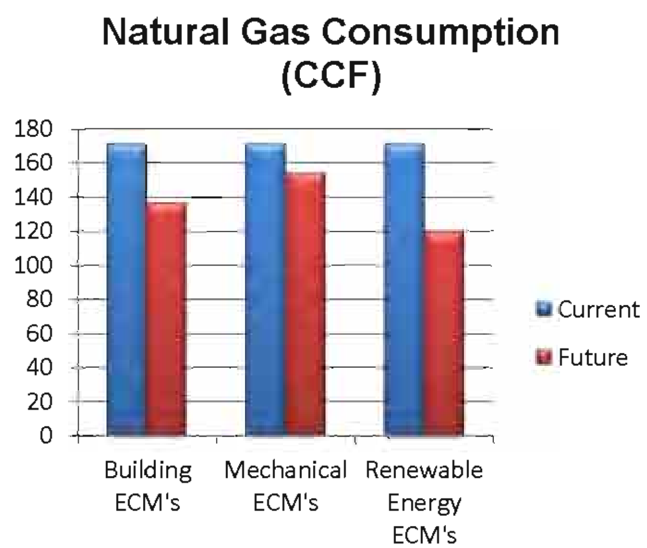
Renewable Energy Opportunities

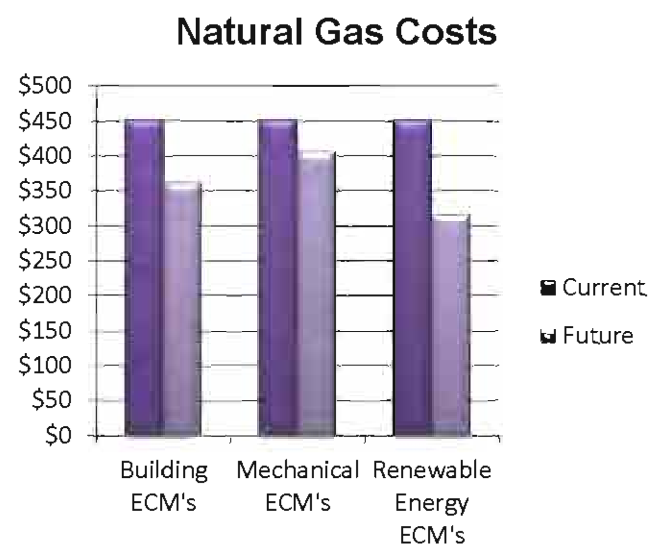
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Natural Gas (Garage Only):

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:

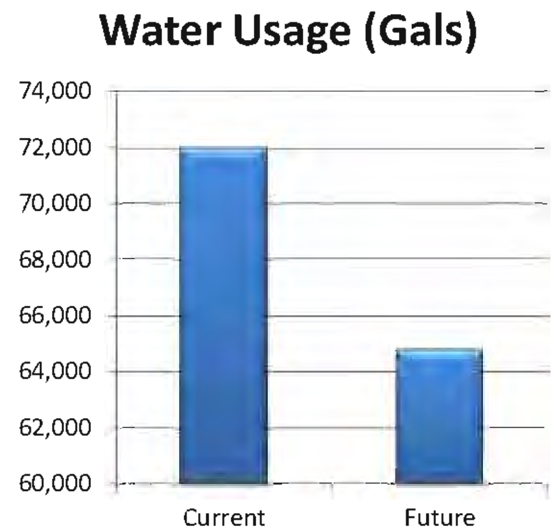


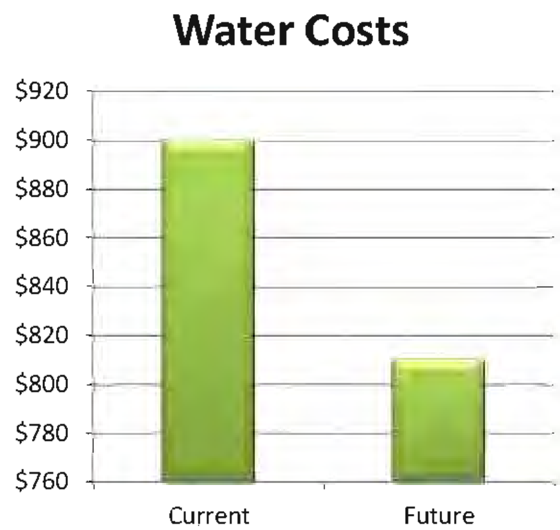


Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.06	2,235	$0.05	1,788
Mechanical	$0.06	2,235	$0.05	2,012
Renewable Energy	$0.06	2,235	$0.04	1,565

Water and Sewer

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures. Due to the low usage, a weighted average annual usage factor for this type of building and use group was incorporated in the analysis:





Electrical Systems

With the current use of the building primarily as storage space, there is very few hours where lighting is turned on. Based on electric bills provided, this building has very low power usage compared to other commercial buildings of this size. The winter time power bills are considerably higher than summer bills. It is unknown if that use is due to longer hours of the exterior lights, if some minimal heating equipment is active, or a combination of these.

The installation of program start fluorescent ballasts and premium 28-watt T8 lamps is recommend and could provide about $1500 per year of electrical savings, compared to what the existing lights would be using if the building was occupied.

The installation of motion sensors to control interior lighting could result in approximately $200 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $400 per year.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. Since the building has very little or no heat, the infrared photos do very little to detect areas of heat loss. It is recommended to do further evaluation at a later time when the heat is turned back on.

References
Existing wall U-value: 0.044 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 1.0

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #22 Somes

Project Name: S10-12262 #22 Somes — 02/15/2013
Prepared by: UPEA — 09:44AM

Air System Information

Air System Name	#22 Somes		Number of zones	1	
Equipment Class	UNDEF		Floor Area	7569.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	14.5	Tons	Load occurs at	Jul 1600	
Total coil load	174.6	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	162.2	MBH	Entering DB / WB	76.6 / 63.9	°F
Coil CFM at Jul 1600	8199	CFM	Leaving DB / WB	57.8 / 56.6	°F
Max block CFM	8199	CFM	Coil ADP	55.8	°F
Sum of peak zone CFM	8199	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.929		Resulting RH	50	%
ft²/Ton	520.3		Design supply temp.	58.0	°F
BTU/(hr-ft²)	23.1		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	34.93	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	184.2	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	8199	CFM	BTU/(hr-ft²)	24.3	
Max coil CFM	8199	CFM	Ent. DB / Lvg DB	63.1 / 84.5	°F
Water flow @ 20.0 °F drop	18.43	gpm			

Supply Fan Sizing Data

Actual max CFM	8199	CFM	Fan motor BHP	4.49	BHP
Standard CFM	7986	CFM	Fan motor kW	3.56	kW
Actual max CFM/ft²	1.08	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	592	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	30.5

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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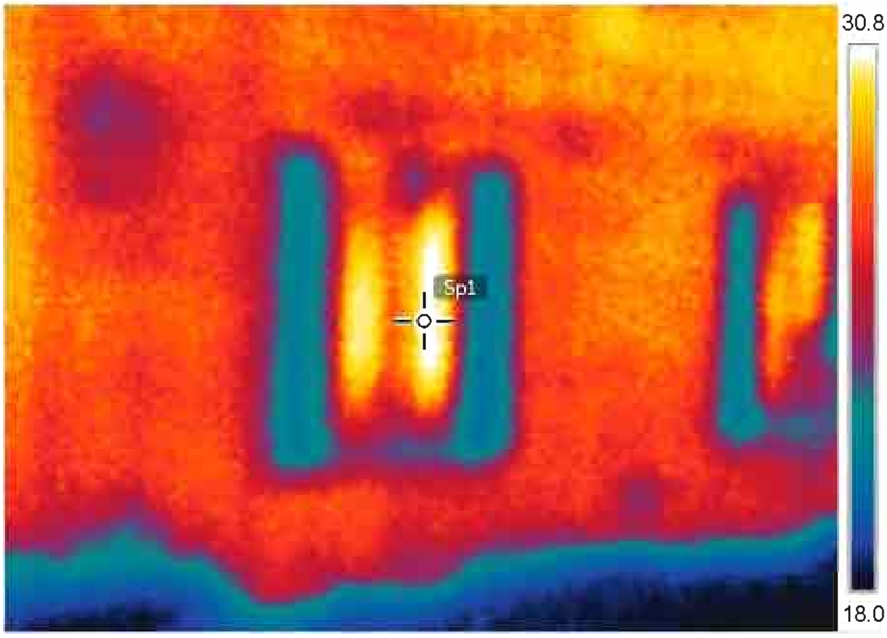

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Energy Audit
Sault Tribe Construction
3375 M-129
Sault Ste. Marie, MI

February 2013

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Attachments:

Thermal Images

Floor Plans

Summary

The Sault Tribe Construction office is a 1 story building (approx 2400 square feet) that includes offices, work shop and storage area. A large vehicle shop building (approx 60' x 100') and several smaller buildings are also located on the site.

Existing Building Envelope Profile

Wall Construction: The exterior wall construction is metal siding with wood framing, batt insulation and gypsum board interior finish.

Roof Construction: The roof construction is metal with wood trusses. The attic space is not ventilated. The ceiling is gypsum board without insulation above the ceiling.

Floor Construction: Concrete slab on grade with tile and concrete floors.

Window and Door Construction: Commercial type windows and doors.

Existing Mechanical Systems Profile

HVAC

Office building: The office is heated with electric baseboard and cooled with window mounted air conditioning units. The shop is heated with a propane fired ceiling hung unit heater, Reznor, model UDAS.

Garage: Office areas are heated with electric baseboard and unit heaters. The garage area is heated by ceiling hung propane fired unit heaters. The unit heaters are in poor condition.

Plumbing

Office building: Domestic hot water is provided by a point of use electric water heater wall mounted in the shop. Water piping is copper and not insulated.

The average hot water delivery time to plumbing fixtures is 7 seconds.

The plumbing fixtures are floor mounted tank type water closets and wall mounted lavatories with dual faucet controls.

Garage: Domestic hot water is provided by an electric storage tank type water heater, Bradford White model. Water piping is copper and is not insulated.

Temperature Control Systems

Thermostats for office and garage areas are wall mounted non-programmable types.

Existing Electrical Systems Profile

Lighting Systems: The office lighting is primarily recessed lensed "troffer" 4-lamp T12 fluorescent. Fixtures have a "crinkle" type acrylic lens that is very inefficient for light output. The back wood shop has a mixture of old, in-efficient fluorescent fixtures. Office lighting control is via standard manual wall-box switches.

The vehicle shop has many 8' T12 HO fluorescent lights, and some 4' T12 fixtures.

There are a few outdoor HID "barn" lights. All lighting at both buildings should be upgraded to newer energy efficient type.

Power Systems: Electrical power is provided overhead from Cloverland Electric (formerly Edison Sault). Service is single phase, 240/120-volt. The office and vehicle shop each have their own meter.

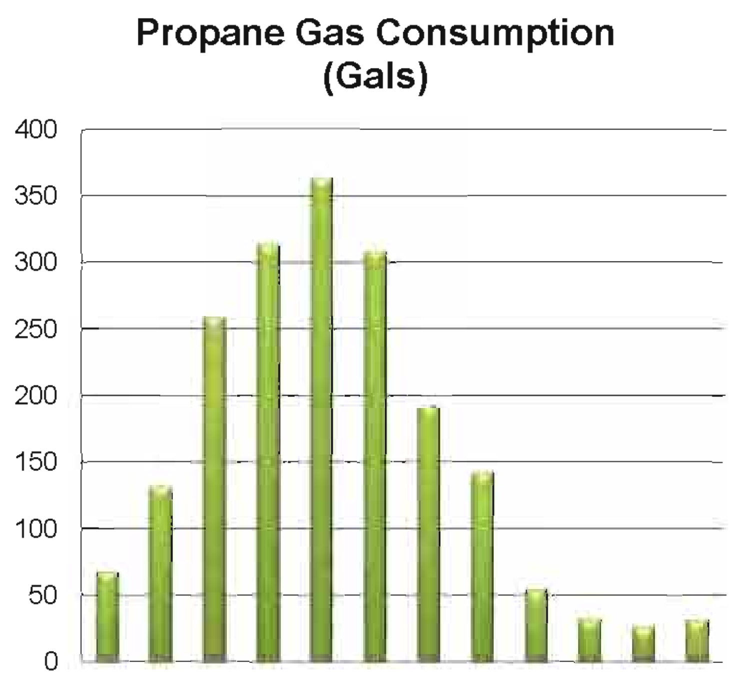
Existing Energy Consumption and Energy Cost Analysis

Propane Usage

The following graphical data represents a monthly weighted average of usage and costs for a building of this construction type and use group for the September 2011 to August 2012 heating season:

Month	Cost	Gals
Sept-11	$164	67
Oct-11	$311	131
Nov-11	$587	259
Dec-11	$691	313
Jan-12	$749	363
Feb-12	$640	308
March-12	$422	192
April-12	$309	141
May-12	$125	54
June-12	$91	31
July-12	$82	26
Aug-12	$94	31
Totals	$4,266	1,916

Propane Gas ECI:	$0.52	per sq ft/yr
Propane Gas ECU:	23,224	BTU/sq ft
Average Cost per Gal:	$2.23	$/CCF



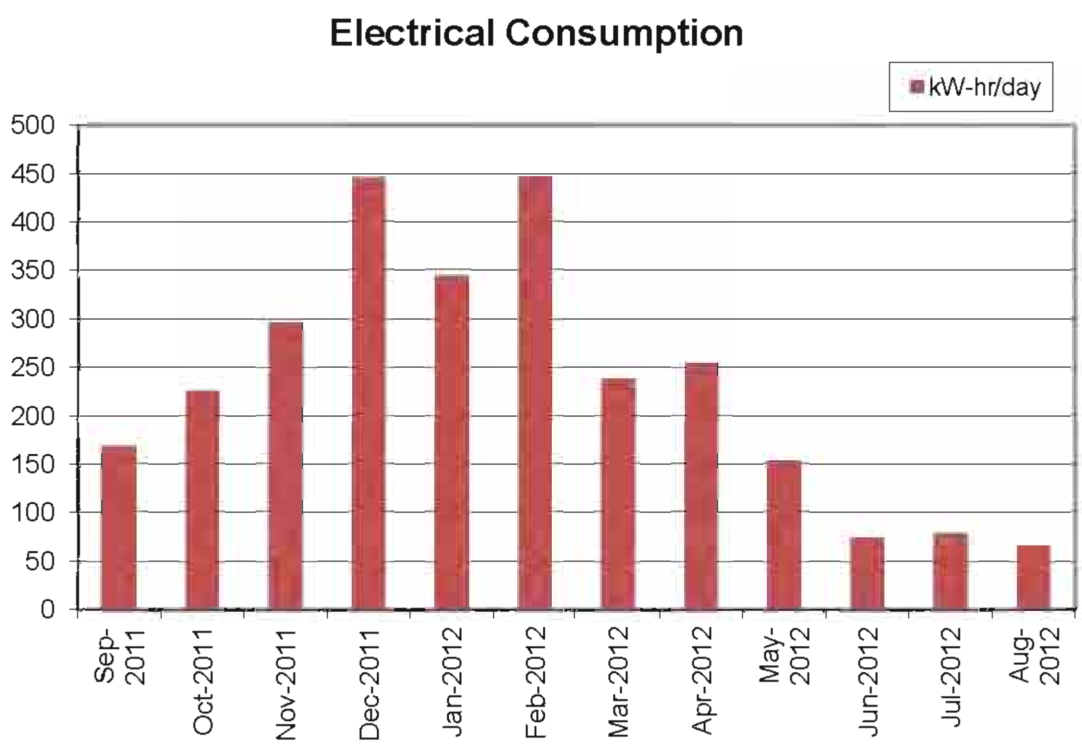
Water and Sewer Usage

Water is served by a well and septic system.

__Electrical Usage:__ The following is a summary of electric use for the past year:
Note: The site has (2) electric meters, which have been combined for this report:

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day	
30	168	Sep-2011	$566	5,027	$19	
29	226	Oct-2011	$730	6,544	$25	
32	296	Nov-2011	$1,044	9,480	$33	
30	445	Dec-2011	$1,494	13,356	$50	
35	344	Jan-2012	$1,348	12,044	$39	
28	446	Feb-2012	$1,398	12,494	$50	
33	238	Mar-2012	$888	7,870	$27	
28	255	Apr-2012	$806	7,127	$29	
30	153	May-2012	$528	4,603	$18	
30	73	Jun-2012	$261	2,199	S9	
28	79	Jul-2012	$263	2,216	S9	
34	66	Aug-2012	$259	2,241	S8	
average:	232	Totals	$9,586	85,201	$26	average
		Square Footage		8246		
		kW-hr per sq ft per year =		10.3		

Electrical ECI:	$1.16	per sq ft/yr
Electrical ECU:	35,523	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	8,246	sq ft
Annual Energy Costs	$13,852	dollars
Total Energy Cost Index (ECI):	$1.68	per sq ft/yr
Total Energy Utilization Index (EUI):	58,747	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	69.20%	percentage
Percentage of Annual Energy Costs for Gas	30.80%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Install insulation above the ceiling (Office Building)	Reduce heat loss through ceiling, reduce gas usage.
B2	Repair or replace door and window seals and weatherstripping.	Reduce infiltration, reduce gas usage.
B3	Replace windows and doors with thermally insulated, Low-E (windows) types.	Reduce infiltration, reduce electrical usage.
B4	Replace garage doors.	Reduce infiltration, reduce gas usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace unit heaters with high efficiency, condensing type (Garage).	Reduce gas usage.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce gas and electrical usage.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install sensor or timed controls on faucets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace office lighting with new fixtures with 28-watt premium T8 lamps and program start electronic ballasts.	Reduce electrical energy costs and extend life of bulbs.
E2	Replace exterior lights with LED type fixtures	Reduce electrical energy costs.
E3	Install wall-box motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.
E4	Replace vehicle shop lighting with new fixtures with 28-watt premium T8 lamps and high-ballast factor program start electronic ballasts.	Reduce electrical energy costs and extend life of bulbs.

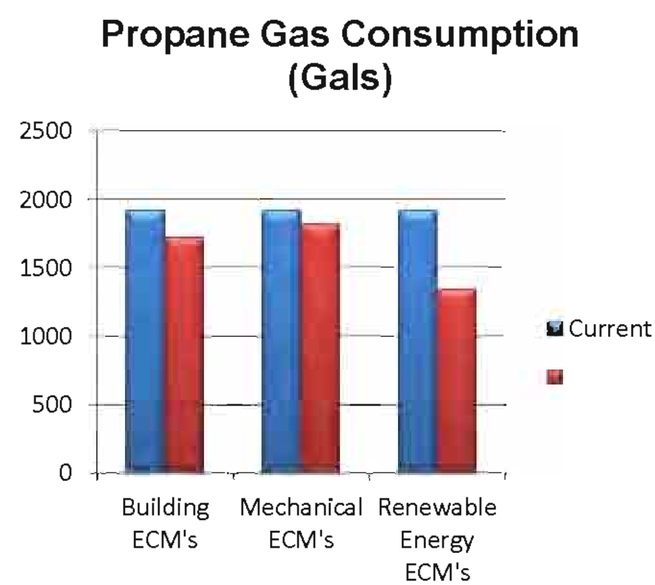
Renewable Energy Opportunities

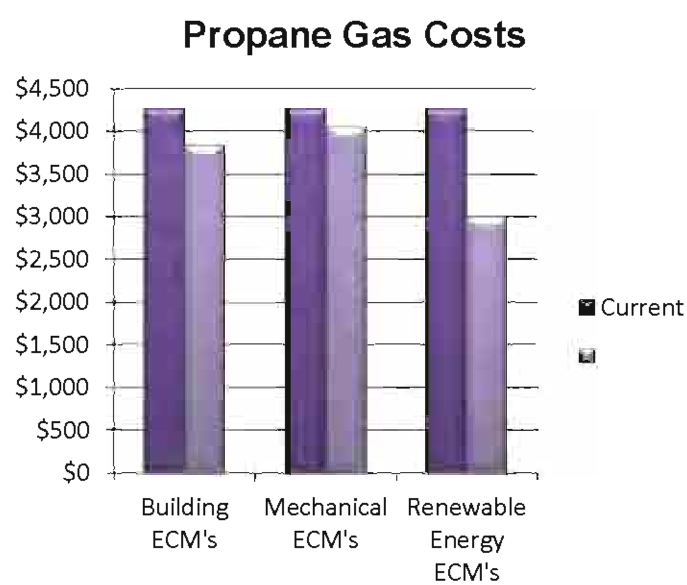
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Propane Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:





Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.52	23,224	$0.47	20,902
Mechanical	$0.52	23,224	$0.49	22,063
Renewable Energy	$0.52	23,224	$0.36	16,257

Water and Sewer

The recommended plumbing ECM's will result in an electrical energy savings by limiting usage of well pump.

Electrical Systems

The installation of program start fluorescent ballasts and premium 28-watt T8 lamps could provide about $1500 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $100 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $100 per year.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation. A few locations were in exterior walls and some in the ceiling.

Exterior windows and doors have typical heat loss, particularly at the overhead garage type doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value: 0.046 Btu/hr/sq ft/deg F
Existing roof U-value: 0.12 Btu/hr/sq ft/deg F
Existing window U-value: 1.0 Btu/hr/sq ft/deg F
Existing ACH: 0.3

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #21 Sault Tribe Const

Project Name. S10-12262 #21 Sault Tribe Constr 02/15/2013
Prepared by. UPEA 09.34AM

Air System Information

Air System Name	#21 Sault Tribe Const		Number of zones	1	
Equipment Class	UNDEF		Floor Area	8320.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	15.0	Tons	Load occurs at	Jul 1600	
Total coil load	179.4	MBH	OA DB / WB	82.3 / 68.8	°F
Sensible coil load	165.1	MBH	Entering DB / WB	76.7 / 63.6	°F
Coil CFM at Jul 1600	8051	CFM	Leaving DB / WB	57.2 / 55.9	°F
Max block CFM	8051	CFM	Coil ADP	55.0	°F
Sum of peak zone CFM	8051	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.920		Resulting RH	49	%
ft²/Ton	556.4		Design supply temp.	58.0	°F
BTU/(hr-ft²)	21.6		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	35.91	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	171.4	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	8051	CFM	BTU/(hr-ft²)	20.6	
Max coil CFM	8051	CFM	Ent. DB / Lvg DB	62.7 / 82.9	°F
Water flow @ 20.0 °F drop	17.15	gpm			

Supply Fan Sizing Data

Actual max CFM	8051	CFM	Fan motor BHP	4.41	BHP
Standard CFM	7843	CFM	Fan motor kW	3.50	kW
Actual max CFM/ft²	0.97	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	650	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	25.1

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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Energy Audit
Stallman Building
302 Watertower Drive.
Kincheloe, MI

May 2014

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Summary

This building, formerly part of the Kincheloe Air Force base, was purchased by the Sault Tribe in 1997. It is a one story building on a crawl space and consists of approximately 4,680 square feet of space. The building currently houses a Dentist in one half of the building and the other half is vacant. The building is located next to an auto parts store, Kinross Coop grocery and across from the Kinross Correctional Facility.

Existing Building Envelope Profile

Wall Construction: The exterior walls are wood frame construction with vinyl cladding on the outer layer. The interior layer is textured drywall with wainscoting in the hallways and several rooms. The R-value for this wall assembly is R-14.

Roof Construction: The roof is a newer metal roof and is in good condition. The roof framing is wood construction. The insulation layer above the ceiling is degraded and in poor condition. There is no insulation installed on the interior layer of the roof. The R-value of the roof is R-13.

Floor Construction: The floor treatment is mostly carpet with VCT in the entryways and bathrooms.

Window and Door Construction: The windows are operable, double hung and sliding type with wood framing, single glazed. The frames are in good condition. The window tightness is average. The doors are metal and wood with approximately 50% fenestration on entry and side doors. The rear door is solid.

Existing Mechanical Systems Profile

Heating, Ventilation and Air Conditioning Systems: The heating system is an older gas fired steam boiler. The boiler provides low pressure steam to convectors throughout the building. The boiler and components are in poor condition. The intake air louver to the boiler room is blocked off with plywood. A natural gas fired furnace with air conditioning was installed in early 2000 and provides supplemental heating and cooling. The duct distribution is above ceiling and is a combination of duct board and metal duct. There are several ceiling fans that have been disconnected.

Plumbing Systems: The domestic hot water is supplied by an 82 gallon natural gas fired hot water heater located in the boiler room. The water heater is in good condition. There is not a hot water recirculation loop. The hot water piping is not insulated. The plumbing fixtures are wall mounted and counter top sinks and lavatories, floor mounted water closets and single walk-in shower. The average delivery time for hot water from the water heater to the farthest plumbing fixture is 5.5 seconds. There is a single service sink in the unoccupied area of the building.

Temperature Controls Systems: The temperature controls are pneumatic for the hot water heating system and electronic for the cooling system. The terminal units have temperature control valves on the units. The cooling system has a centrally located non-programmable thermostat.

Existing Electrical Systems Profile

Lighting Systems: The interior lighting is primarily surface mounted fluorescent tube, two and three lamp fixtures with T12-34W bulbs used for area lighting. There is under cabinet and task lighting in certain areas. Lighting is controlled by a manual switch. The exterior lighting consists of incandescent wall mount enclosed fixtures at three locations (north, south, and west). The exterior lights are located over exterior entrance doors. It is recommended to replace the existing lamps with energy efficient LED type (approx. 10 watt).

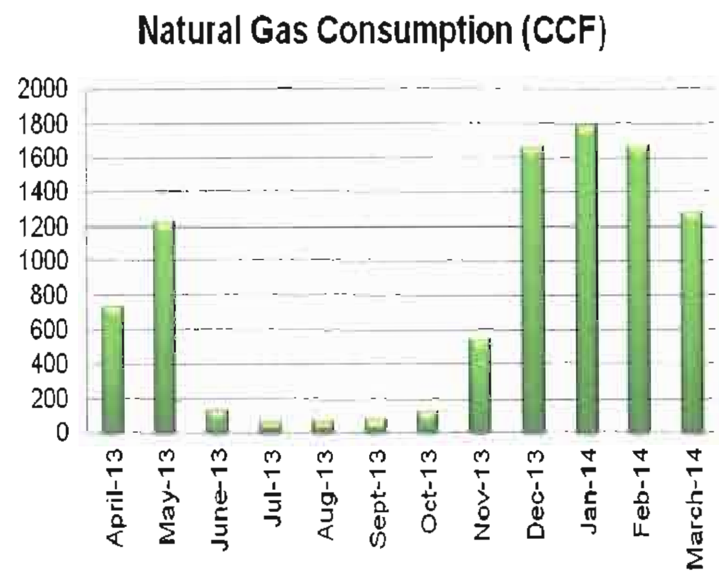
Power Systems: Dental office: The dental office has three X-Ray machines, fax machine, an Energy Star rated scanner and a dental grinder rated at ¼ hp. There are also several computers and portable radios.

Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly gas usage and costs for the April 2013 through March 2014 billing period:

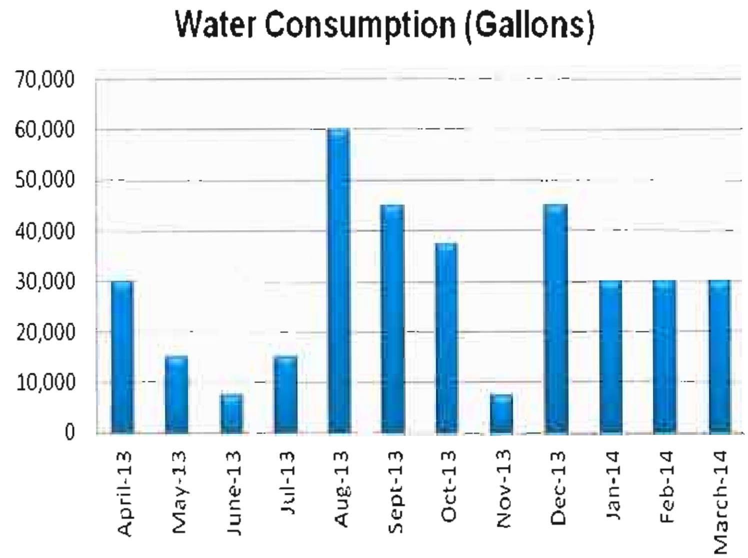
Month	Cost	CCF
April-13	$622	741
May-13	$1,016	1,225
June-13	$135	132
Jul-13	$81	65
Aug-13	$80	66
Sept-13	$89	77
Oct-13	$123	122
Nov-13	$430	543
Dec-13	$1,328	1,661
Jan-14	$1,418	1,782
Feb-14	$1,333	1,666
March-14	$1,043	1,285
Totals	$7,698	9,365



Natural Gas ECI:	$1.64	per sq ft/yr
Natural Gas EUI:	200,107	BTU/sq ft
Average Cost per CCF:	$0.82	$/CCF

Water Usage
The following graphical data represents the monthly water usage and costs for the April 2013 through March 2014 billing period:

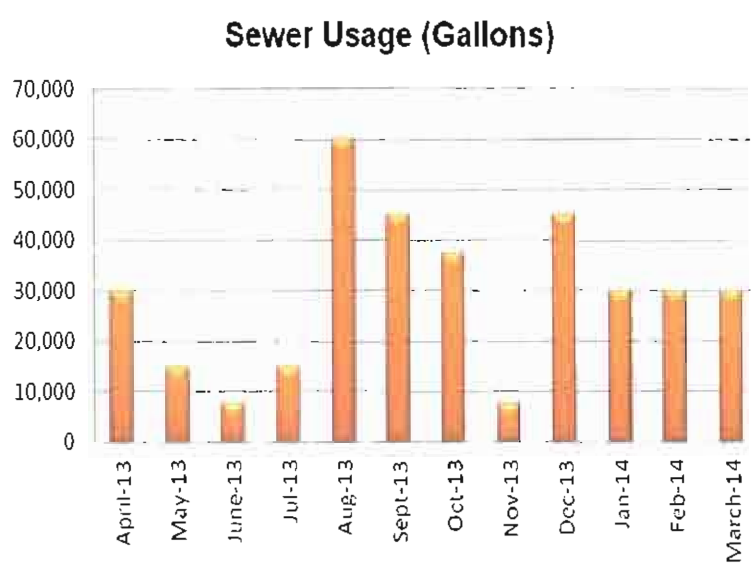
Month	Cost	Gallons
April-13	$7.12	30,000
May-13	$7.12	15,000
June-13	$5.26	7,500
Jul-13	$5.26	15,000
Aug-13	$5.26	60,000
Sept-13	$5.26	45,000
Oct-13	$5.26	37,500
Nov-13	$5.26	7,500
Dec-13	$5.26	45,000
Jan-14	$5.26	30,000
Feb-14	$5.26	30,000
March-14	$5.26	30,000
Totals	$66.84	352,500



Cost per sq ft:	$0.014	per sq ft/yr
Average Usage per Fixture:	18,553	gallons/fix
Average Usage Cost per Fixture:	$0.0002	$/gallon

Sewer Usage
The following data is a graphical representation of monthly and annual sewer usage and costs for the April 2013 to March 2014 billing period:

Month	Cost	Gallons
April-13	$21.38	30,000
May-13	$21.38	15,000
June-13	$23.95	7,500
Jul-13	$23.95	15,000
Aug-13	$23.95	60,000
Sept-13	$25.48	45,000
Oct-13	$23.95	37,500
Nov-13	$23.95	7,500
Dec-13	$23.95	45,000
Jan-14	$25.48	30,000
Feb-14	$25.48	30,000
March-14	$23.95	30,000
Totals	$286.85	352,500



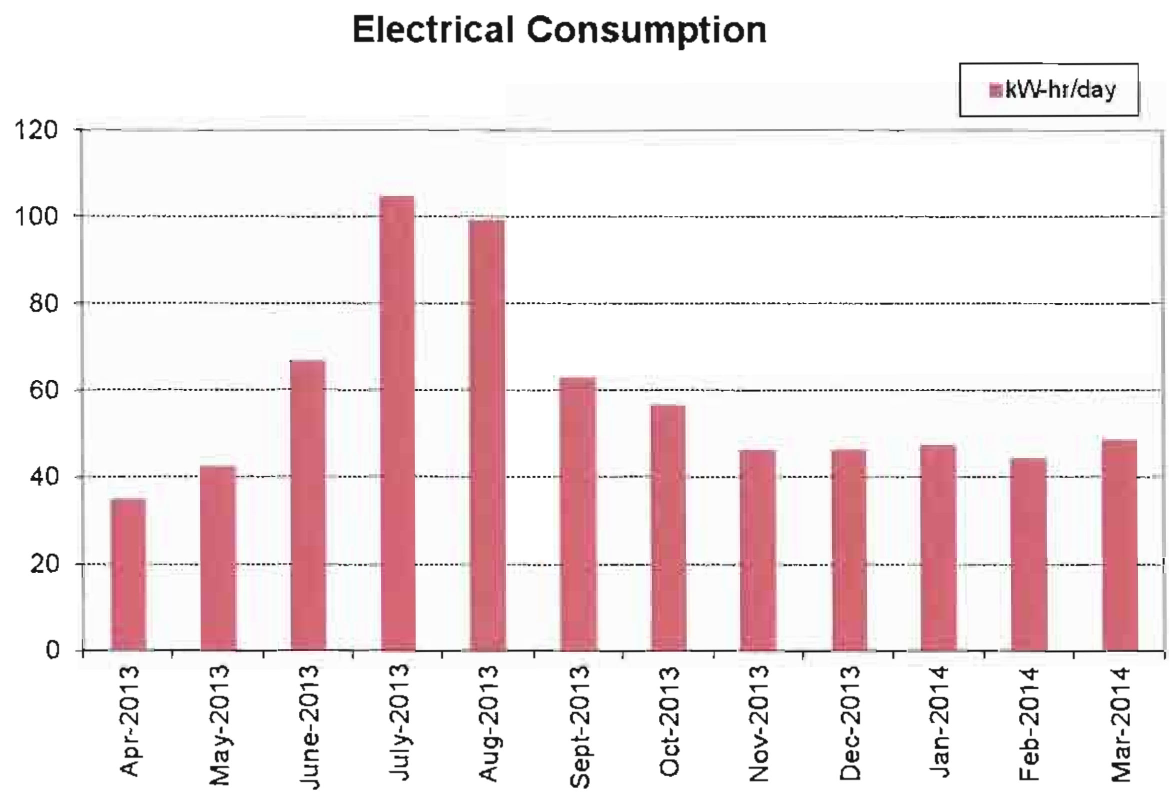
Cost per sq ft:	$0.061	per sq ft/yr
Average Usage per	18,553	gallons/fix
Average Usage Cost per Fixture:	$0.001	$/gallon

Electrical Usage:

The following data is a graphical representation of monthly and annual electrical usage and costs for the April 2013 to March 2014 billing period:

# days	kW-hr/day	Month	Cost	kWh	Cost/day
33	35	Apr-2013	$136	1,160	$4
30	43	May-2013	$149	1,280	$5
31	67	June-2013	$245	2,080	$8
32	105	July-2013	$389	3,360	$12
29	99	Aug-2013	$335	2,880	$12
31	63	Sept-2013	$211	1,960	$7
31	57	Oct-2013	$172	1,760	$6
31	46	Nov-2013	$143	1,440	$5
31	46	Dec-2013	$173	1,440	$6
31	48	Jan-2014	$174	1,480	$6
27	44	Feb-2014	$144	1,200	$5
32	49	Mar-2014	$183	1,560	$6
average:	59	Totals	$2,454	21,600	$7

Electrical ECI:	$0.52	per sq ft/yr
Electrical EUI:	15,868	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	4,680	sq ft
Annual Energy Costs	$10,152	dollars
Total Energy Cost Index (ECI):	$2.17	per sq ft/yr
Total Energy Utilization Index (EUI):	215,975	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	24.17%	percentage
Percentage of Annual Energy Costs for Gas	75.83%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Add continuous insulation above ceiling.	Reduce heat loss through ceiling, reduce energy costs, reduce ice damming.
B2	Add foam insulation to exterior walls.	Reduce heat loss through walls, reduce energy costs.
B3	Add rigid or batt insulation to roof.	Reduce heat loss through roof, reduce energy costs.
B4	Replace doors and windows with high efficiency type doors and windows.	Reduce infiltration, reduce energy costs.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace lower efficient steam boiler with high efficiency boiler, either steam or hot water.	Reduce energy costs and usage.
M2	Replace steam convectors with hot water convectors.	Reduce energy costs, provide higher space temperature controllability.
M3	Unblock outdoor air louver for boiler room.	Increase efficiency of heating system, reduce energy costs.
M4	Add cooling zone to air system to include unoccupied offices.	Reduce energy costs, improve comfort level.
M5	Add outdoor air ventilation to air system instead of natural ventilation through windows.	Reduce energy costs, improve IAQ.
M6	Implement a comprehensive preventative maintenance program.	Extend life of equipment, improve equipment performance.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install a building management system to control the hot water and air systems.	Improve comfort level, reduce energy costs and usage.
T2	Install programmable thermostats.	Reduce energy usage during unoccupied hours.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Install low flow aerators on faucets.	Reduce water usage.
P2	Install sensor or timed controls on lavatory faucets and water closets.	Reduce water usage.
P3	Insulate hot water piping.	Eliminate heat loss through piping, reduce hot water delivery time, reduce hot water usage.
P4	Install hot water return system.	Reduce hot water delivery time, reduce hot water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace interior lighting with 28-watt premium T8 lamps and low ballast factor program start electronic ballasts. Also recommend dual-level switching	Reduce electrical energy costs and extend life of bulbs.
E2	Replace exterior lights with LED type fixtures	Reduce electrical energy costs.
E3	Install motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.

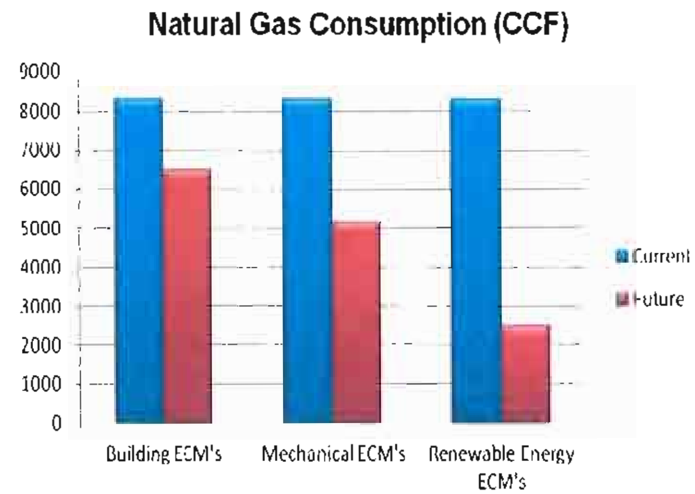
Renewable Energy Opportunities

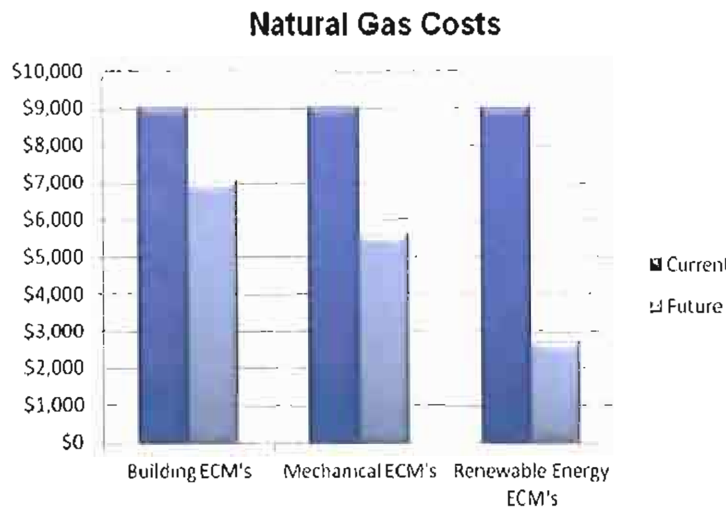
ECM #	Energy Conservation Measure	Benefit
R1	Install geothermal heat pump system.	Reduce electrical and gas energy costs.
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and electrical utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures.





Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	EUI (BTU/sq ft)	ECI (per sq ft/yr)	EUI (BTU/sq ft)
Building	$1.64	200,107	$1.28	156,083
Mechanical	$1.64	200,107	$1.02	124,066
Renewable Energy	$1.64	200,107	$0.49	60,032

Water

Due to the occupancy of the building, the recommended energy conservation measures for water and sewer usage are not significant enough to provide a realistic payback on investment. In the event that the building is fully occupied in the future, a full energy analysis should be considered.

Electrical Systems

The installation of program start fluorescent ballasts and premium 28-watt T8 lamps could provide about $325 per year of electrical savings.

The installation of motion sensors to control interior lighting could result in approximately $75 per year of electrical savings.

The installation of approximately 6kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $375

Thermal Imaging Data

The exterior of the building was scanned with UPEA's infrared camera (FLIR model E40) on the morning of May 1, 2014. The ambient outside air temperature was approximately 35 degrees F. The infrared photos are

References
Existing wall U-value: 0.071 Btu/hr/sq ft/deg F
Existing roof U-value: 0.077 Btu/hr/sq ft/deg F
Existing window U-value: 0.70 Btu/hr/sq ft/deg F
Existing ACH: 0.3

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2014: Computer Aided Design Software
AutoCAD MEP 2013: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for Default System

Project Name: S10-12262 #24 Stallman
Prepared by: UPEA

06/01/2014
11:56AM

Air System Information

Air System Name	Default System		Number of zones	1	
Equipment Class	UNDEF		Floor Area	4660.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates		Calculation Months	Jan to Dec	
Space CFM	Individual peak space loads		Sizing Data	Calculated	

Central Cooling Coil Sizing Data

Total coil load	9.9	Tons	Load occurs at	Jul 1600	
Total coil load	118.4	MBH	OA DB / WB	83.0 / 69.0	°F
Sensible coil load	110.9	MBH	Entering DB / WB	76.7 / 64.0	°F
Coil CFM at Jul 1600	5704	CFM	Leaving DB / WB	58.2 / 57.0	°F
Max block CFM	5704	CFM	Coil ADP	56.1	°F
Sum of peak zone CFM	5704	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.937		Resulting RH	51	%
ft²/Ton	474.3		Design supply temp.	58.0	°F
BTU/(hr-ft²)	25.3		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	23.69	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	151.9	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	5704	CFM	BTU/(hr-ft²)	32.4	
Max coil CFM	5704	CFM	Ent. DB / Lvg DB	63.5 / 88.9	°F
Water flow @ 20.0 °F drop	15.19	gpm			

Supply Fan Sizing Data

Actual max CFM	5704	CFM	Fan motor BHP	1.56	BHP
Standard CFM	5556	CFM	Fan motor kW	1.24	kW
Actual max CFM/ft²	1.22	CFM/ft²	Fan static	1.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	366	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements °F

Sp1	47.6

Parameters

Emissivity	0.95
Refl. temp.	68 °F

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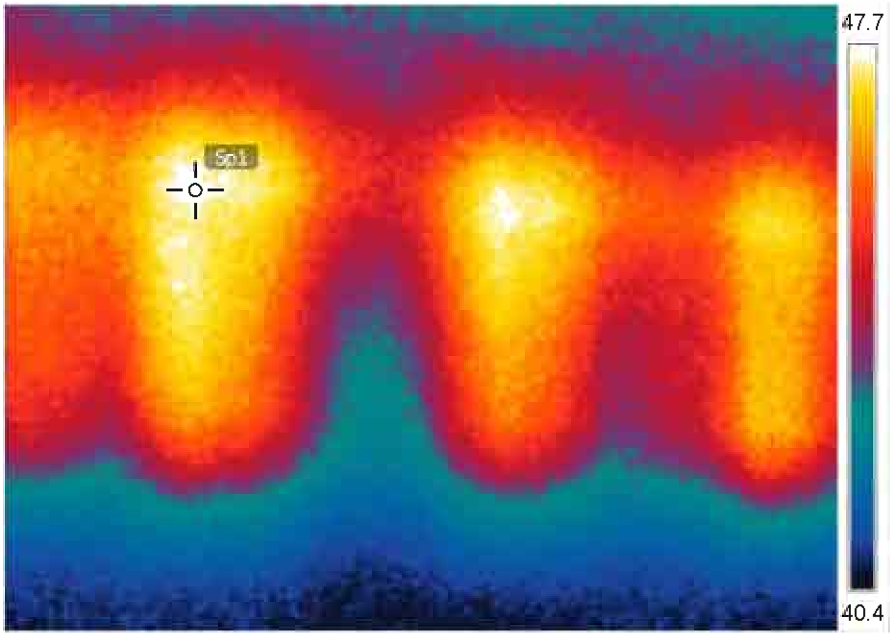

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Energy Audit
USDA Food Distribution
3601 Mackinaw Trail
Sault Ste. Marie, MI 49783

February 2013

Table of Contents

Attachments:

Summary

This 2 story building was built in 1981. It consists of approximately 7,914 square feet of office and warehouse space. The building is occupied by the Sault Tribe USDA Food Distribution program which stores and distributes food to its members.

Existing Building Envelope Profile

Wall Construction: The food distribution warehouse is a typical metal building with rigid frame metal wall/roof truss members, perlins, and exterior metal panels.

Roof Construction: membrane, shallow (approx 1/12) slope.

Floor Construction: The first floor or main level is concrete slab on grade. Floor coverings consist of a mixture of carpet and tile in the office and kitchen areas. Upper level is wood framed, wood decking with carpet and tile floor coverings.

Window and Door Construction: Overhead doors in good condition for access to warehouse area. Personnel doors are wood frame with metal door. Window are vinyl, with some fixed and some operable (sliding).

Existing Mechanical Systems Profile

The first floor office area heating and cooling system is served by perimeter electric baseboard and a vertical, natural gas fired, up flow furnace, Rheem model, located on the mechanical mezzanine in the warehouse. The furnace has a matching condensing unit located outside. The furnace and condensing unit are outdated and in fair condition. The ductwork is fiberboard duct. The duct distribution is through ceiling with ceiling grilles for supply and return air. There is not outdoor air ventilation in the air system.

The second floor office area heating is served by perimeter electric baseboard and a natural gas fired ceiling hung furnace. Several sections of baseboard have been disassembled. Several offices have window mounted air conditioners.

The warehouse heating and ventilation is served by a ceiling hung, horizontal, natural gas fired air handler with insulated outdoor air duct and common return off bottom of unit. The supply air ductwork is not insulated. The unit is in fair condition and appears to have extensive maintenance done to it. Air distribution is through duct mounted supply air grilles. The ventilation and cooling for the office areas in the warehouse are served by the existing air handler in the warehouse and window mounted air conditioners. There is a secondary exhaust system for the warehouse consisting of wall mounted exhaust fans and sidewall intake louvers with motorized dampers.

Plumbing

The domestic hot water system is served by an electric storage tank water heater, Reliance model 640 DORS, 40 gallon capacity, located on the second floor. The water heater is in good condition. The location of the unit does not have a proper floor drain and could cause water damage in the event of a leak. The water piping is copper and is insulated.

The average hot water delivery time to plumbing fixtures is 5 seconds.

The plumbing fixtures are floor mounted tank type water closets, countertop lavatories with single manual faucets and a stainless steel kitchen sink with a dual manual faucet.

Temperature Control Systems

The office area is served by a wall mounted programmable thermostat.

Special Systems

There are two walk in coolers with condensing unit located outside, two beverage coolers and three self-contained large refrigerators.

Existing Electrical Systems Profile

Lighting Systems: Most of the interior lighting has been recently upgraded and is energy efficient T8 linear lamps and electronic ballasts. The office areas have 25-watt lamps and the food distribution warehouse area has 32-watt lamps in 6-lamp "high-bay" fixtures. The back cold storage area has (15) 150-watt incandescent fixtures. There are (2) decorative exterior lights at the front entrance and wall pack HID at the overhead doors.

Power Systems: Electrical service is from Cloverland (formerly Edison Sault) pad-mount transformer and is 600-amp, 208Y/120-volt, 3-phase, 4-wire. There is one main panel and several single-phase and three-phase sub-panels.

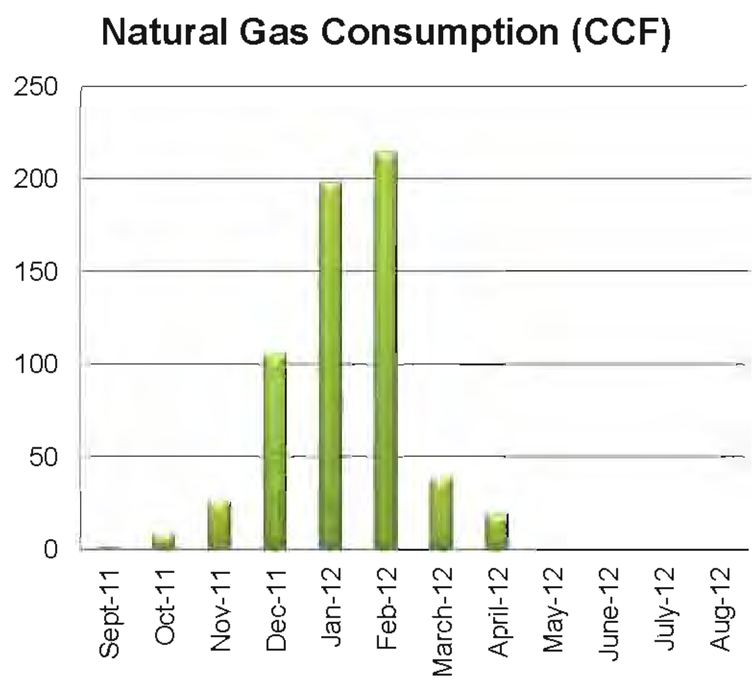
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$51	1
Oct-11	$33	8
Nov-11	$46	26
Dec-11	$110	105
Jan-12	$179	198
Feb-12	$191	214
March-12	$56	39
April-12	$40	19
May-12	$15	0
June-12	$40	0
July-12	$30	0
Aug-12	$32	0
Totals	$823	610

Natural Gas ECI:	$0.10	per sq ft/yr
Natural Gas EUI:	7,712	BTU/sq ft
Average Cost per CCF:	$1.35	$/CCF



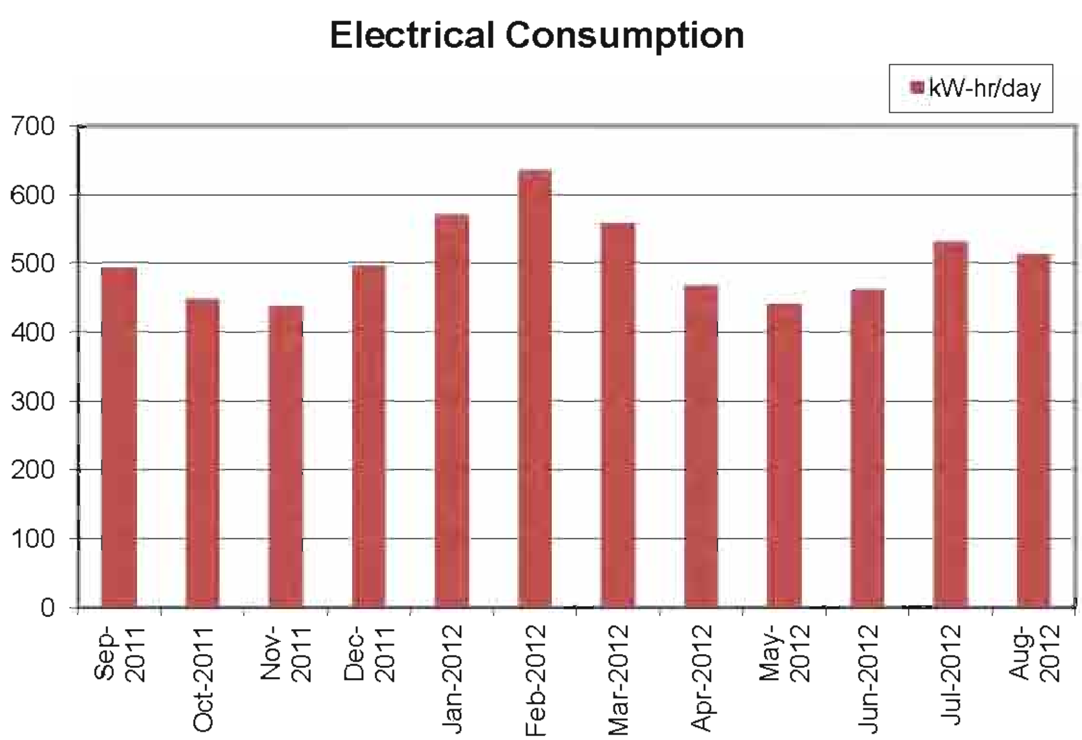
Water and Sewer Usage

The water is served by a well and septic system.

Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day	
33	493	Sep-2011	$1,790	16,280	$54	
29	448	Oct-2011	$1,434	13,000	$49	
28	439	Nov-2011	$1,356	12,280	$48	
28	497	Dec-2011	$2,918	13,920	$104	
36	571	Jan-2012	$2,291	20,560	$64	
29	634	Feb-2012	$2,053	18,400	$71	
32	558	Mar-2012	$1,992	17,840	$62	
28	467	Apr-2012	$1,467	13,080	$52	
30	441	May-2012	$1,485	13,240	$50	
34	461	Jun-2012	$1,754	15,680	$52	
29	531	Jul-2012	$1,705	15,400	$59	
32	514	Aug-2012	$1,818	16,440	$57	
average:	505	Totals	$22,063	186,120	$60	average
		Square Footage		7914		
		kW-hr per sq ft per year =		23.5		

Electrical ECI:	$2.79	per sq ft/yr
Electrical ECU:	80,854	BTU/sq ft
Average Cost per kWh:	$0.12	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	7,914	sq ft
Annual Energy Costs	$22,864	dollars
Total Energy Cost Index (ECI):	$2.89	per sq ft/yr
Total Energy Utilization Index (EUI):	88,566	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	96.50%	percentage
Percentage of Annual Energy Costs for Gas	3.50%	percentage

Energy Improvement Recommendations
Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace older windows with low-e high efficiency type windows.	Reduce infiltration, reduce energy costs.
B2	Warehouse: Repair or replace existing wall insulation, replace missing panels. Install continuous insulation on exterior walls. Add insulation to bottom of roof deck.	Reduce heat loss through roof and walls, reduce gas usage.
B3	Add continuous insulation above second floor ceiling.	Reduce heat loss through ceiling, reduce energy usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace furnace serving office area with sealed combustion high efficiency type furnace.	Reduce gas usage, reduce gas utility costs..
M2	Replace electric baseboard on second floor.	Reduce heat loss through exterior walls.
M3	Replace fiber board ductwork with steel, exterior insulated duct.	Reduce potential for moisture in ductwork, improve indoor air quality.
M4	Install energy recovery ventilator for furnace to provide outdoor air ventilation for office areas.	Improve indoor air quality, reduce energy use during heating season by not using natural openings for ventilation.
M5	Replace air handler in warehouse with high efficiency type air handler.	Reduce gas usage, improve equipment efficiency.
M6	Implement a comprehensive maintenance program for all mechanical equipment.	Extend life of equipment, improve equipment efficiency.
M7	Insulate supply air ductwork on warehouse air handler.	Reduce heat loss through ductwork, improve equipment efficiency.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats for warehouse HVAC equipment.	Reduce energy usage during unoccupied periods.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P2	Install low flow aerators on faucets.	Reduce water usage.
P3	Install sensor or timed usage control on faucets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install motion sensors to control lights automatically in individual spaces	Reduce electrical energy cost
E2	Replace exterior wall pack lights with LED type	Reduce electrical energy cost
E3	Change out cold storage area incandescent lights to LED type	Reduce electrical energy cost

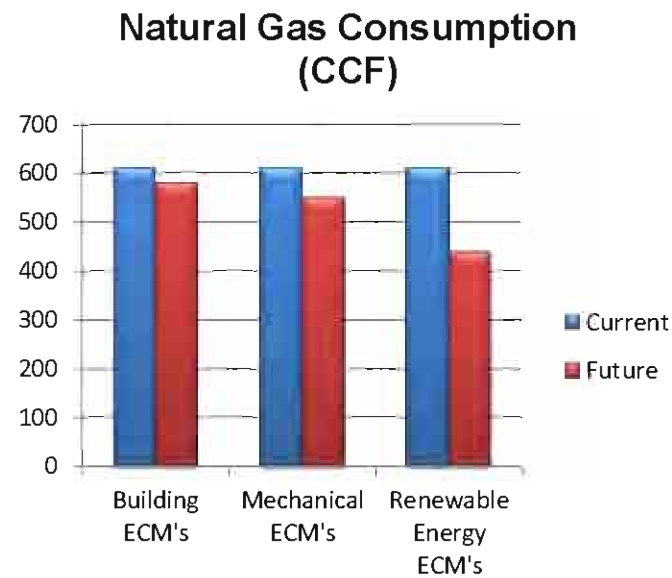
Renewable Energy Opportunities

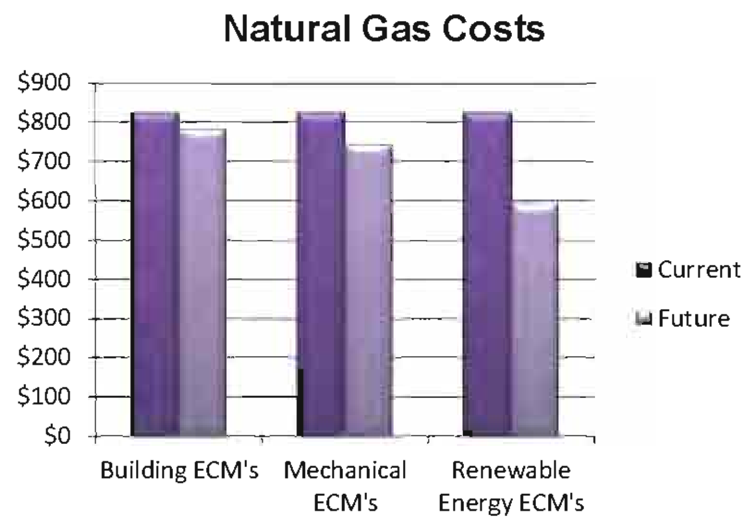
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.
R2	Install wind energy system for electrical usage.	Reduce electrical energy costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:





Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	EUI (BTU/sq ft)	ECI (per sq ft/yr)	EUI (BTU/sq ft)
Building	$0.10	7,712	$0.10	7,326
Mechanical	$0.10	7,712	$0.09	6,941
Renewable Energy	$0.10	7,712	$0.07	5,552

Electrical Systems

The installation of motion sensors to control interior lighting could result in approximately $1000 per year of electrical savings. Additionally, upgrading exterior light fixtures to LED type could save another $100 per year.

Upgrading the cold storage area lights to LED type will provide savings of about $300 per year.

The installation of approximately 5kW of rooftop solar (PV) electric panels & associated equipment (inverters, charge controllers, etc.) is estimated to reduce the building's annual electric bill by approximately $1,000.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There were a few small areas detected that may be lacking insulation or has gaps in the insulation.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value: 0.046 Btu/hr/sq ft/deg F
Existing roof U-value: 0.121 Btu/hr/sq ft/deg F
Existing window U-value: 0.70 Btu/hr/sq ft/deg F
Existing ACH: 0.8

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #14 USDA Food Distr

Project Name. S10-12262 #14 USDA Food Distr	02/15/2013
Prepared by. UPEA	08.53AM

Air System Information

Air System Name	**#14 USDA Food Distr**	Number of zones	**1**
Equipment Class	**UNDEF**	Floor Area	**7921.0** ft²
Air System Type	**SZCAV**	Location	**Sault Ste Marie, Michigan**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**12.3**	Tons	Load occurs at	**Jul 1600**	
Total coil load	**148.2**	MBH	OA DB / WB	**82.3 / 68.8**	°F
Sensible coil load	**135.1**	MBH	Entering DB / WB	**76.8 / 63.9**	°F
Coil CFM at Jul 1600	**6672**	CFM	Leaving DB / WB	**57.6 / 56.4**	°F
Max block CFM	**6672**	CFM	Coil ADP	**55.4**	°F
Sum of peak zone CFM	**6672**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.912**		Resulting RH	**50**	%
ft²/Ton	**641.4**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**18.7**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**29.65**	gpm	Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**165.2**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**6672**	CFM	BTU/(hr-ft²)	**20.9**	
Max coil CFM	**6672**	CFM	Ent. DB / Lvg DB	**61.4 / 85.0**	°F
Water flow @ 20.0 °F drop	**16.53**	gpm			

Supply Fan Sizing Data

Actual max CFM	**6672**	CFM	Fan motor BHP	**3.65**	BHP
Standard CFM	**6499**	CFM	Fan motor kW	**2.90**	kW
Actual max CFM/ft²	**0.84**	CFM/ft²	Fan static	**2.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**619**	CFM	CFM/person	**21.50**	CFM/person
CFM/ft²	**0.08**	CFM/ft²			

Measurements	°F
Sp1	35.2

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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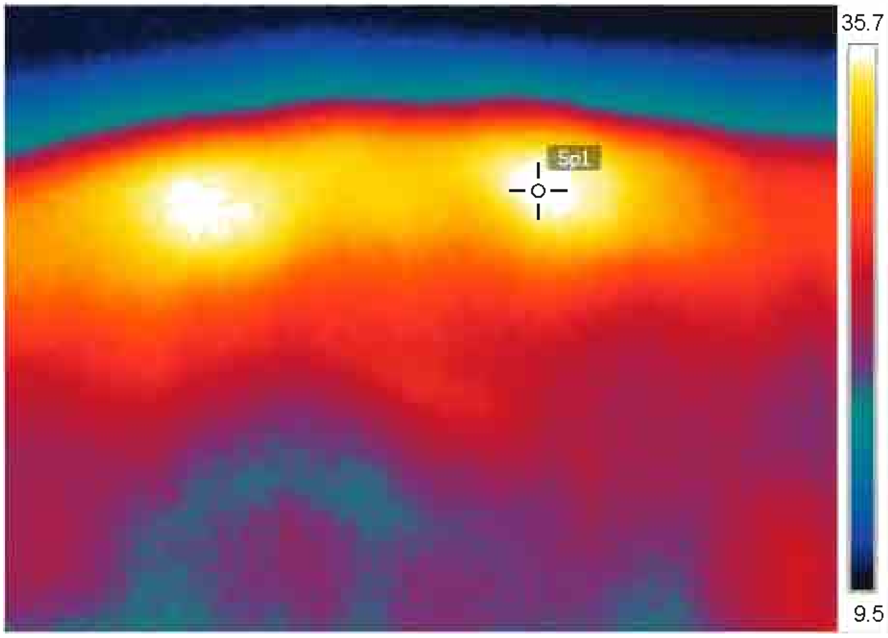

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Energy Audit
USDA Vehicle Garage
3601 Mackinaw Trail
Sault Sainte Marie, MI

May 2013

Table of Contents

Attachments:

Summary

The USDA Vehicle Garage Building located at 3601 Mackinaw Trail is a 1,152 square foot 3-car garage facility adjacent to the USDA Food Distribution Office and Warehouse. Exterior building dimensions are 32' x 36'. The building was constructed in 2008 and is in excellent condition.

Existing Building Envelope Profile

Wall Construction: Exterior walls consist of three (3) courses of un-insulated concrete block with 2x6 wood frame insulated wall above. The wood frame walls and gable ends have horizontal vinyl siding.

Roof Construction: Roof is wood frame with composition shingle roofing. The attic has blown-in insulation above the drywall ceiling in truss space.

Floor Construction: Floor is a concrete slab on grade.

Window and Door Construction: The building does not have any windows. There is one personnel door and 3 overhead doors.

Existing Mechanical Systems Profile

HVAC

Heating in the garage is served by two (2) electric unit heaters suspended in opposite corners near the ceiling. The unit heaters are in good condition.

Plumbing

There is one floor drain in the garage. No other plumbing fixtures are in this building.

Temperature Control Systems

Thermostats are wall mounted non-programmable type.

Existing Electrical Systems Profile

Lighting Systems: Garage interior lights are 4' T8 high-efficiency fluorescent surface "channel" type fixtures. Lights are controlled via manual wall-box switches located near the personnel door. The building exterior has "wall-pack" type light fixtures.

Power Systems: Electrical service is 200-amp, single-phase, 240/120-volt and is fed from a panel in the main USDA Food Distribution Warehouse located to the North on the same site.

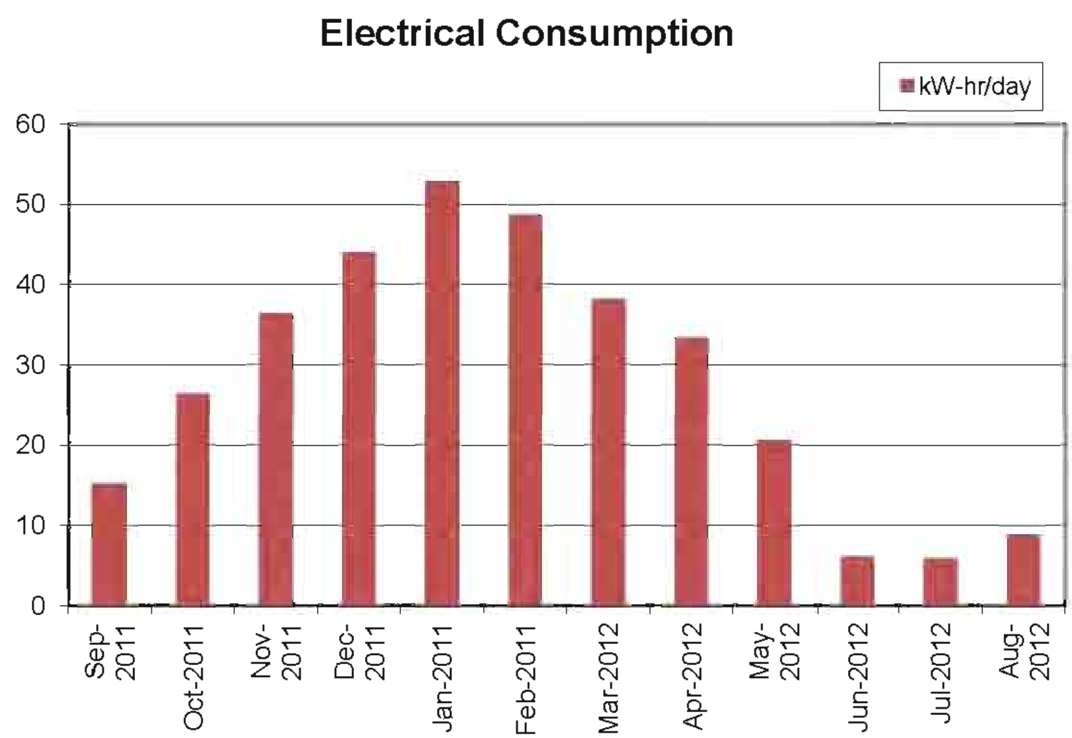
Since the building does not have its own electric meter and one year of actual electrical consumption data was not available, an estimate was performed using the known electrical loads and a prediction of hours of use to come up with the expected annual energy use.

Existing Energy Consumption and Energy Cost Analysis

Electrical Usage: The following is an estimated summary of electric use for the past year:

		Period	Cost	Usage		
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**	
30	15	Sep-2011	$50	455	S2	
31	26	Oct-2011	$90	818	S3	
30	36	Nov-2011	$120	1,091	S4	
31	44	Dec-2011	$150	1,364	S5	
31	53	Jan-2011	$180	1,636	S6	
28	49	Feb-2011	$150	1,364	S5	
31	38	Mar-2012	$130	1,182	S4	
30	33	Apr-2012	$110	1,000	S4	
31	21	May-2012	$70	636	S2	
30	6	Jun-2012	$20	182	S1	
31	6	Jul-2012	$20	182	S1	
31	9	Aug-2012	$30	273	S1	
average:	28	Totals	$1,120	10,182	S3	average
		Square Footage		1152		
		kW-hr per sq ft per year =		8.8		

Electrical ECI:	$0.97	per sq ft/yr
Electrical ECU:	30,386	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh



Total Energy Use Summary

Summary		
Total Gross Area of Building:	1,152	sq ft
Annual Energy Costs	$1,120	dollars
Total Energy Cost Index (ECI):	$0.97	per sq ft/yr
Total Energy Utilization Index (EUI):	30,386	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	100.00%	percentage
Percentage of Annual Energy Costs for Gas	0.00%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Adjust Overhead Garage Doors.	Reduce infiltration, reduce energy usage.
B2	Install rigid insulation and EIFS over exterior block foundation wall.	Reduce heat loss, reduce energy use.
B3	Replace garage doors seals/gaskets.	Reduce infiltration, reduce energy usage.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce energy usage during unoccupied hours.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Upgrade/replace garage interior lighting with LED	Reduce electrical energy costs.
E2	Install motion sensors to automatically control lights during unoccupied times	Reduce energy use/cost
E3	Upgrade/replace exterior wall packs with LED	Reduce electrical energy costs

Renewable Energy Opportunities

ECM #	Energy Conservation Measure	Benefit
R1	Install solar energy system for electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Building

Adjusting overhead garage doors and replacement of door seals/gaskets would reduce infiltration heat loss and could provide about $100 in energy savings per year.

Installing rigid insulation and EIFS over the existing un-insulated block foundation wall would reduce heat loss and could provide approximately $80 in energy savings per year.

Temperature Control System

Upgrading unit heater thermostats to programmable type with setback would reduce energy used for heating and could provide about $200 in energy savings per year.

Electrical Systems

Upgrading the garage area lighting to premium 28-watt T8 lamps and program start electronic ballast could provide about $20 in electrical savings per year.

Installation of motion sensors to automatically turn lights off during periods of time that the building is not occupied could provide approximately $40 in electrical savings per year.

Upgrading exterior wall pack lights with LED type will provide electrical energy savings of $50 per year.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected. There are a few locations noted in the report where the overhead door seals have gaps. Adjustment of overhead door and/or new seals would greatly reduce or eliminate air infiltration at these locations.

Exterior doors have typical heat loss, particularly overhead doors. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value: 0.046 Btu/hr/sq ft/deg F
Existing roof U-value: 0.036 Btu/hr/sq ft/deg F
Existing ACH: 0.8

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Measurements	°F
Sp1	46.4

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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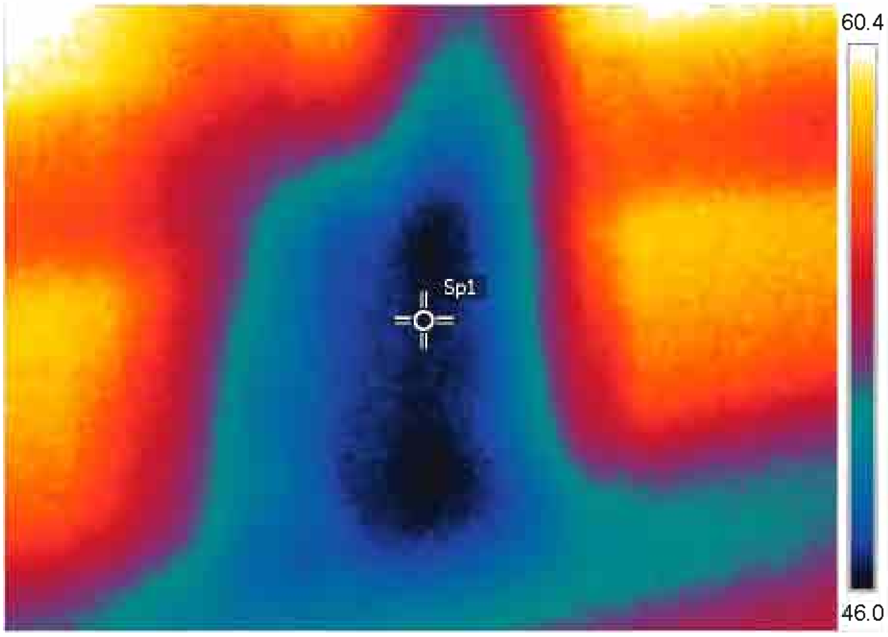

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Energy Audit
Wetmore Office
M-28
Munising, MI

February 2013

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Attachments:

Summary

This vacant log building was built in 1987 and formerly served as Tribal Health offices. The building is located on US M-28 and consists of approximately 3,874 square feet of meeting and office space, including finished space in the lower level or basement area of the facility.

Existing Building Envelope Profile

Wall Construction: The building basement has poured concrete walls with “Z-furring” and rigid insulation and drywall on the inside. The main floor exterior walls are log construction. Interior partition walls are wood framed with drywall.

Roof Construction: Roof is wood trusses with blown-in cellulose insulation and shingle roofing. Insulation is in poor condition.

Floor Construction: Basement floor is concrete slab with carpet and tile floor coverings. Main floor is wood framed, wood decking and carpet and tile floor coverings.

Window and Door Construction: Exterior windows are wood frame. Doors are also wood frame with commercial doors. All are in good condition. There is visible condensation on the lower floor windows.

Existing Mechanical Systems Profile

HVAC

Heating and cooling system is served by a single propane gas fired forced air furnace, Trane model TUX120m with matching condensing unit, furnace is located in basement mechanical room. Duct distribution is supplied with floor grilles for first floor and ceiling grilles for basement and returned with common return grilles. The furnace is in poor condition. The ductwork is not insulated.

Plumbing

The domestic hot water system is served by single electric storage type water heater, Reliance, model 502, 30 gallon storage capacity. Water piping is copper, not insulated. The water heater is in poor condition, jacket and base are rusted.

The building domestic water and sewer is served by a well and septic system.

There is an iron filtration system installed on the main water line.

Temperature Control Systems

The air system is controlled by a single wall mounted non-programmable dial type thermostat.

Existing Electrical Systems Profile

Lighting Systems: Interior lighting is primarily older T12 linear fluorescent. The interior lighting should be upgraded to energy efficient T8 lamps and electronic ballasts. The long ramp to basement has 12 can lights with 65-watt BR lamps – these should be upgraded to LED type.

Power Systems: The building has (2) electric meters from UPPCO, but only 1 indicates any load. The second meter may have been for an electric water heater in the past. Electrical service is 240/120-volt, 1-phase.

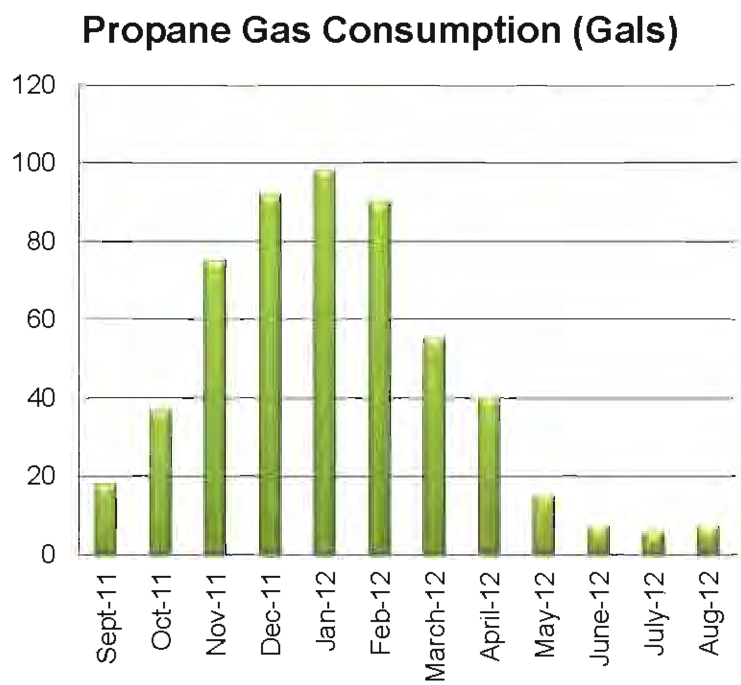
Existing Energy Consumption and Energy Cost Analysis

Propane Gas Usage

The following graphical data represents an estimate of the propane gas usage for this building construction type and use group:

Month	Cost	Gallons
Sept-11	$50	18
Oct-11	$95	37
Nov-11	$180	75
Dec-11	$200	92
Jan-12	$215	98
Feb-12	$180	90
March-12	$120	55
April-12	$90	40
May-12	$35	15
June-12	$25	7
July-12	$25	6
Aug-12	$27	7
Totals	$1,242	540

Propane Gas ECI:	$0.32	per sq ft/yr
Propane Gas ECU:	13,846	BTU/sq ft
Average Cost per Gal:	$2.30	$/CCF



Water and Sewer Usage

The water is served by a well and septic system.

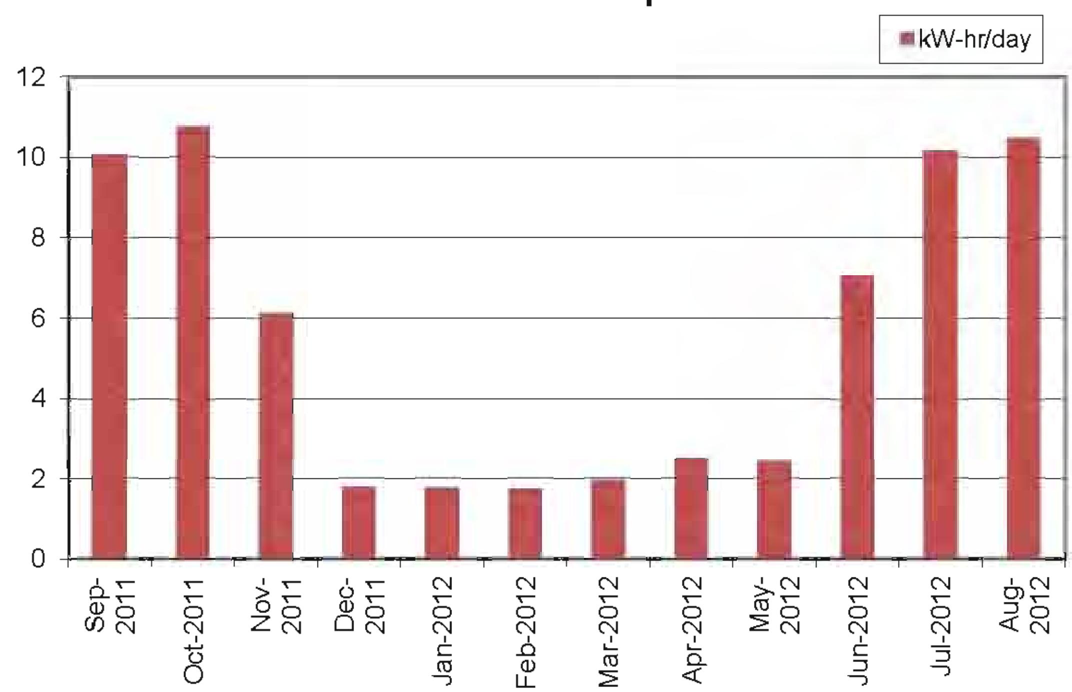
Electrical Usage: The following is a summary of electric use for the past year:

# days	kW-hr/day	Period Month	Cost Cost	Usage kWh	cost/day	
29	10	Sep-2011	$64	292	S2	
32	11	Oct-2011	$74	344	S2	
31	6	Nov-2011	$48	190	S2	
33	2	Dec-2011	$29	59	S1	
33	2	Jan-2012	$31	58	S1	
28	2	Feb-2012	$26	49	S1	
29	2	Mar-2012	$28	57	S1	
30	3	Apr-2012	$31	75	S1	
27	2	May-2012	$32	66	S1	
33	7	Jun-2012	$56	233	S2	
32	10	Jul-2012	$75	325	S2	
32	10	Aug-2012	$77	335	S2	
average:	6	Totals	$571	2,083	S2	average

Square Footage	3874
kW-hr per sq ft per year =	0.5

Electrical ECI:	$0.15	per sq ft/yr
Electrical ECU:	1,849	BTU/sq ft
Average Cost per kWh:	$0.27	$/kWh

Electrical Consumption



Total Energy Use Summary (Estimate used for propane usage)

Summary		
Total Gross Area of Building:	3,874	sq ft
Annual Energy Costs	$1,813	dollars
Total Energy Cost Index (ECI):	$0.47	per sq ft/yr
Total Energy Utilization Index (EUI):	15,695	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	31.48%	percentage
Percentage of Annual Energy Costs for Gas	68.52%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Install continuous insulation above ceiling.	Reduce heat loss through ceiling, reduce gas usage.
B2	Replace windows and doors with high efficiency type windows and doors.	Reduce infiltration, reduce gas usage.
B3	Add insulation to basement walls.	Reduce heat loss through walls, reduce gas usage.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace furnace with high efficiency condensing type furnace.	Reduce gas usage.
M2	Add separate high efficiency condensing furnace for basement, create separate heating cooling zones.	Reduce gas usage, provide better building heating/cooling zone controls.
M3	Insulate all ductwork.	Reduce heat loss through ductwork, reduce gas usage, improve heating/cooling efficiency.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce energy usage during unoccupied hours.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Replace water heater with either propane gas fired tank type or instantaneous type water heater.	Reduce energy usage, improve hot water demand performance.
P2	Insulate all hot water piping.	Reduce heat loss through pipe, reduce energy usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Replace lighting with new fixtures with 28-watt premium T8 lamps and program start electronic ballasts.	Reduce electrical energy costs and extend life of bulbs.
E2	Install wall-box motion sensors to automatically turn off lights for interior spaces.	Reduce electrical energy costs.

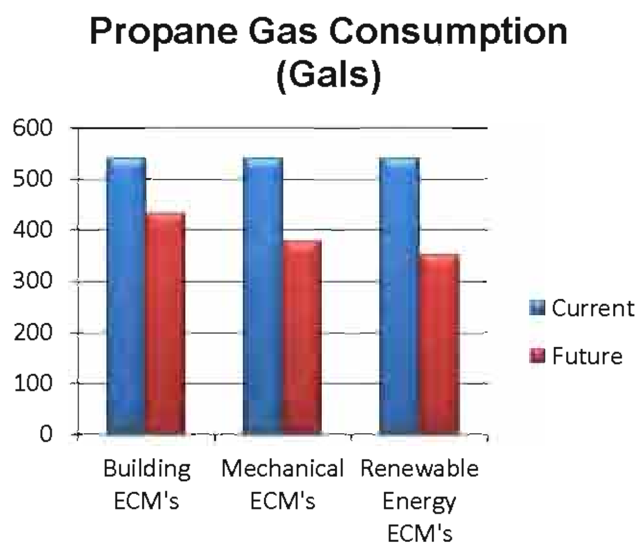
Renewable Energy Opportunities

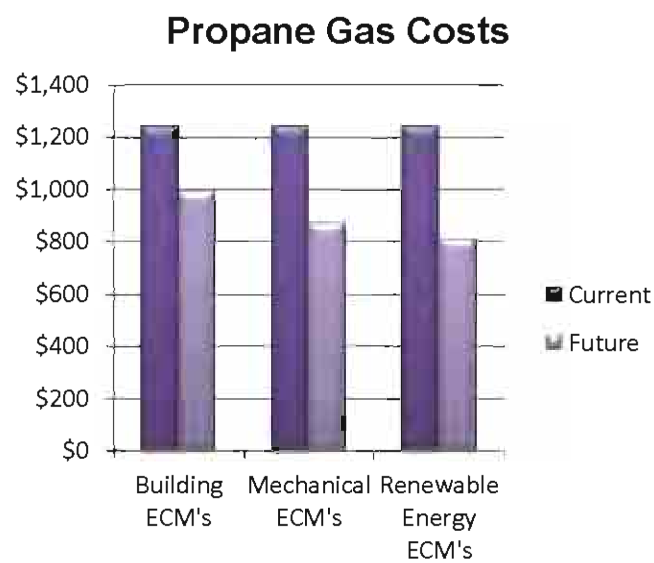
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Propane Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:





Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.32	13,846	$0.25	11,077
Mechanical	$0.32	13,846	$0.22	9,692
Renewable Energy	$0.32	13,846	$0.21	9,000

Electrical Systems

With the current use of the building (un-occupied), there is very few hours where lighting is turned on. Based on electric bills provided, this building has very low power usage compared to other commercial buildings of this size.

The installation of program start fluorescent ballasts and premium 28-watt T8 lamps is recommend and could provide about $1500 per year of electrical savings, compared to what the existing lights would be using if the building was occupied.

The installation of motion sensors to control interior lighting could result in approximately $200 per year of electrical savings.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References

Existing wall U-value: 0.056 Btu/hr/sq ft/deg F
Existing roof U-value: 0.040 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 0.8

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software

HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #25 Wetmore Office

Project Name: S10-12262 #25 Wetmore Office — 02/15/2013
Prepared by: UPEA — 09:50AM

Air System Information

Air System Name	#25 Wetmore Office		Number of zones	1	
Equipment Class	UNDEF		Floor Area	3906.0	ft²
Air System Type	SZCAV		Location	Sault Ste Marie, Michigan	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	Sum of space airflow rates	Calculation Months	Jan to Dec
Space CFM	Individual peak space loads	Sizing Data	Calculated

Central Cooling Coil Sizing Data

Total coil load	8.0	Tons	Load occurs at	Jul 1500	
Total coil load	96.4	MBH	OA DB / WB	83.0 / 69.0	°F
Sensible coil load	89.9	MBH	Entering DB / WB	76.7 / 63.8	°F
Coil CFM at Jul 1500	4523	CFM	Leaving DB / WB	57.8 / 56.6	°F
Max block CFM	4523	CFM	Coil ADP	55.7	°F
Sum of peak zone CFM	4523	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.933		Resulting RH	50	%
ft²/Ton	486.3		Design supply temp.	58.0	°F
BTU/(hr-ft²)	24.7		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	19.29	gpm	Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	106.6	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	4523	CFM	BTU/(hr-ft²)	27.3	
Max coil CFM	4523	CFM	Ent. DB / Lvg DB	63.5 / 85.9	°F
Water flow @ 20.0 °F drop	10.67	gpm			

Supply Fan Sizing Data

Actual max CFM	4523	CFM	Fan motor BHP	2.48	BHP
Standard CFM	4405	CFM	Fan motor kW	1.97	kW
Actual max CFM/ft²	1.16	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	305	CFM	CFM/person	21.50	CFM/person
CFM/ft²	0.08	CFM/ft²			

Measurements	°F
Sp1	54.2

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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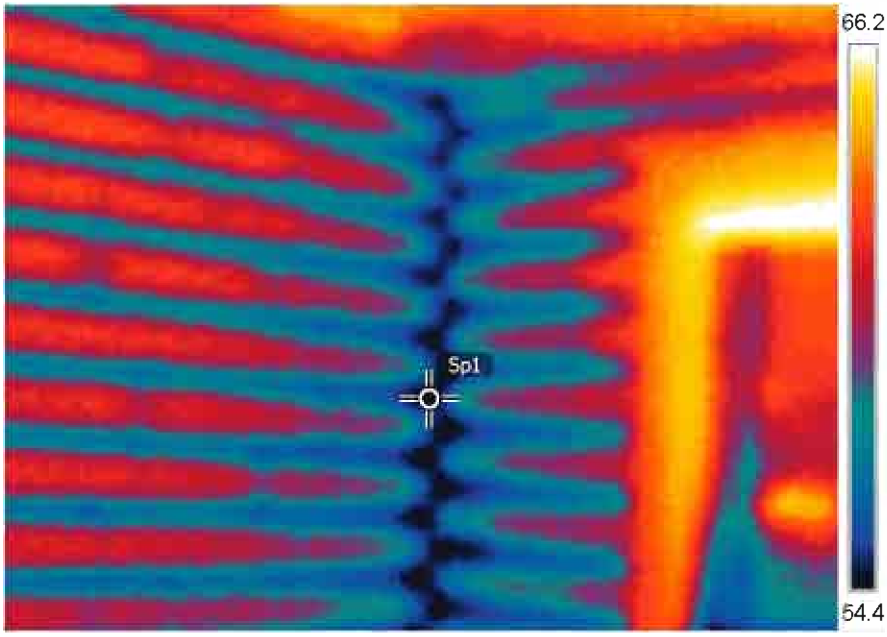

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Energy Audit
Youth Education & Activities Building
2428 Shunk Road
Sault Ste. Marie, MI

February 2013

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Summary

The Youth Education and Activities Building is a former residence that has been converted to office/commercial use. The building is 2 levels which total 1690 square feet and was constructed in 1974.

Existing Building Envelope Profile

Wall Construction: Basement walls are concrete block with rigid insulation on the inside. The upper floor has wood frame walls with drywall interior and conventional exterior siding.

Roof Construction: The roof is wood truss with wood sheathing and shingle roofing.

Floor Construction: Basement floor is concrete. Upper floor is wood frame, wood sheathing, with carpet.

Window and Door Construction: Exterior windows and doors are residential grade.

Existing Mechanical Systems Profile

HVAC

The heating system is served by a single natural gas fired atmospheric furnace located in the basement, Heil, model VF130. The furnace is in poor condition and is outdated. The furnace has a humidity control unit mounted on the return side of the furnace, Rumatic, model 455 H with distribution to the main supply air ductwork. The air distribution is provided by supply air floor grills and a common return grille. The floor grilles are in poor condition. The ductwork is not insulated. There is not a central air conditioning system.

There is a window mounted air conditioning unit installed in the computer room.

Plumbing

The domestic hot water heating system is served by a single storage tank, natural gas fired hot water heater, Reliance Model BFG1F, 40 gallon capacity, installed in 2002. The water heater is in excellent condition. The water piping is copper and is not insulated. There is not a hot water return system.

The average time for hot water delivery to the plumbing fixtures is 7 seconds.

The plumbing fixtures are floor mounted tank type water closets and counter top mounted lavatories with single manual faucets.

Temperature Control Systems

The air system is controlled by wall mounted, non-programmable thermostat. The humidity system is controlled by humidistat mounted above the thermostat.

Existing Electrical Systems Profile

Lighting Systems: The upper floor interior lighting is fairly new energy efficient 25-watt T8 lamps and electronic ballasts. The basement has several compact fluorescent lights. All interior lighting control is via standard manual wall-box switches.

Power Systems: Electrical service is from Cloverland Electric (formerly Edison Sault) and is 200-amp, single-phase, 240/120-volt.General description. The panel includes a 100-amp sub-feed to the Enrollment building that is located on the same site.

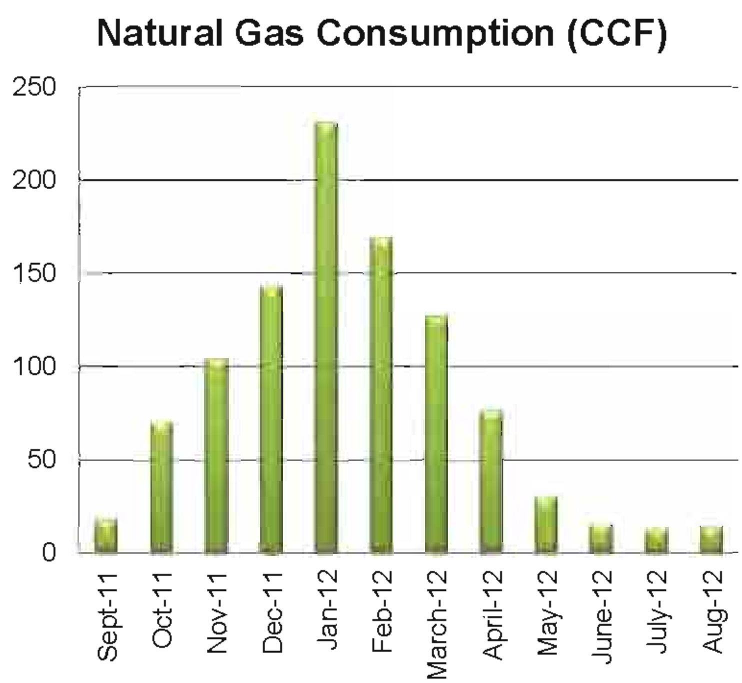
Existing Energy Consumption and Energy Cost Analysis

Natural Gas Usage

The following graphical data represents the monthly natural gas usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	CCF
Sept-11	$12	18
Oct-11	$44	70
Nov-11	$64	104
Dec-11	$87	143
Jan-12	$138	231
Feb-12	$102	169
March-12	$79	127
April-12	$47	76
May-12	$28	30
June-12	$6	15
July-12	$5	13
Aug-12	$6	14
Totals	$618	1,010

Natural Gas ECI:	$0.36	per sq ft/yr
Natural Gas ECU:	59,412	BTU/sq ft
Average Cost per CCF:	$0.61	$/CCF

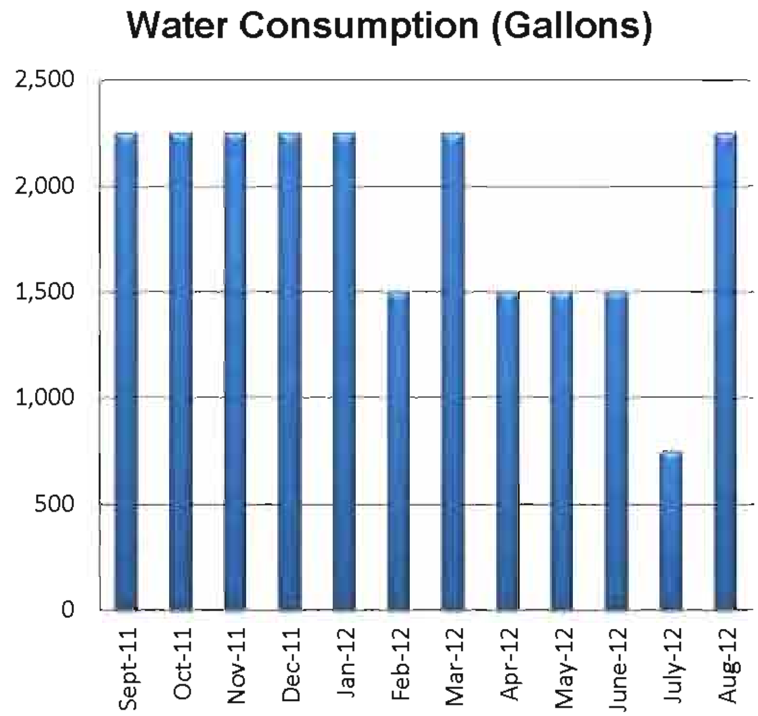


Water Usage

The following graphical data represents the monthly water usage and costs for the September 2011 through August 2012 billing period:

Month	Cost	Gallons
Sept-11	$19	2,250
Oct-11	$19	2,250
Nov-11	$19	2,250
Dec-11	$19	2,250
Jan-12	$19	2,250
Feb-12	$13	1,500
Mar-12	$19	2,250
Apr-12	$13	1,500
May-12	$13	1,500
June-12	$13	1,500
July-12	$7	750
Aug-12	$19	2,250
Totals	$192	22,500

Cost per sq ft:	$0.10	per sq ft/yr
Average Usage per Fixture:	3,750	gallons/fix
Average Usage Cost per Fixture:	$0.009	$/gallon

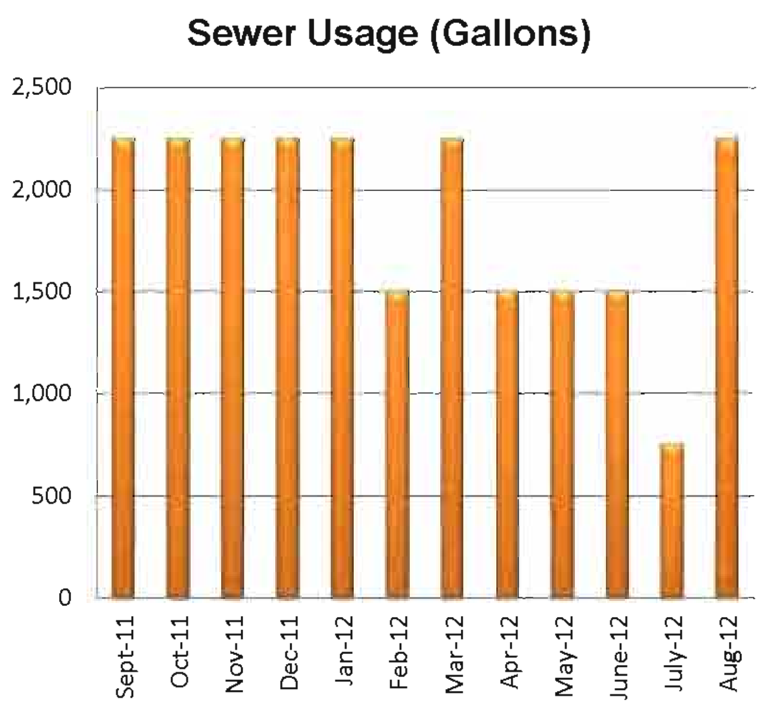


Sewer Usage

The following data is a graphical representation of monthly and annual sewer usage and costs for the September 2011 to August 2012 billing period:

Month	Cost	Gallons
Sept-11	$22	2,250
Oct-11	$22	2,250
Nov-11	$22	2,250
Dec-11	$22	2,250
Jan-12	$22	2,250
Feb-12	$16	1,500
Mar-12	$22	2,250
Apr-12	$16	1,500
May-12	$16	1,500
June-12	$16	1,500
July-12	$9	750
Aug-12	$22	2,250
Totals	$227	22,500

Cost per sq ft:	$0.12	per sq ft/yr
Average Usage per	3,750	gallons/fix
Average Usage Cost per Fixture:	$0.010	$/gallon

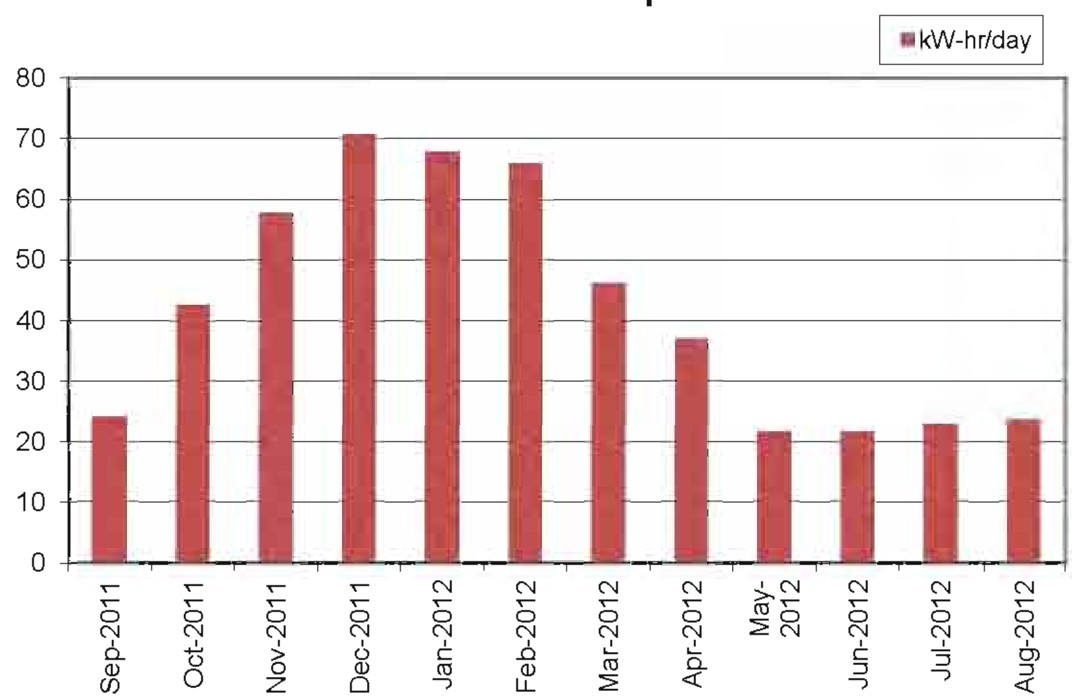


Electrical Usage: The following is a summary of electric use for the past year:
(Actual meter use and bills are twice these amounts, but electric costs are allocated 50/50 with the Enrollment Building located on the same site)

		Period	Cost	Usage		
# days	kW-hr/day	**Month**	**Cost**	**kWh**	**cost/day**	
29	24	Sep-2011	$81	702	S3	
28	43	Oct-2011	$134	1,192	S5	
29	58	Nov-2011	$186	1,672	S6	
35	71	Dec-2011	$278	2,476	S8	
29	68	Jan-2012	$222	1,968	S8	
32	66	Feb-2012	$238	2,110	S7	
28	46	Mar-2012	$148	1,294	S5	
34	37	Apr-2012	$144	1,260	S4	
30	22	May-2012	$77	647	S3	
30	22	Jun-2012	$76	648	S3	
33	23	Jul-2012	$88	757	S3	
29	24	Aug-2012	$78	689	S3	
average:	42	Totals	$1,751	15,413	S5	average
		Square Footage		1690		
		kW-hr per sq ft per year =		9.1		

Electrical ECI:	$1.04	per sq ft/yr
Electrical ECU:	31,354	BTU/sq ft
Average Cost per kWh:	$0.11	$/kWh

Electrical Consumption



Total Energy Use Summary

Summary		
Total Gross Area of Building:	1,690	sq ft
Annual Energy Costs	$2,368	dollars
Total Energy Cost Index (ECI):	$1.40	per sq ft/yr
Total Energy Utilization Index (EUI):	90,766	BTU/sq ft
Percentage of Annual Energy Costs for Electricity	73.90%	percentage
Percentage of Annual Energy Costs for Gas	26.10%	percentage

Energy Improvement Recommendations

Building

ECM #	Energy Conservation Measure	Benefit
B1	Replace windows and door with high efficiency type windows and doors	Reduce infiltration, reduce gas usage.
B2	Add continuous insulation above ceiling. Seal the cavity above the ceiling, at the far end of the roof.	Reduce heat loss through ceiling.

Mechanical

ECM #	Energy Conservation Measure	Benefit
M1	Replace furnace and humidifier with high efficiency sealed combustion type furnace and high efficiency humidifier.	Reduce gas usage.
M2	Insulate supply air ductwork.	Reduce heat loss through ductwork.
M3	Replace supply air and return air grilles.	Improve equipment efficiency, reduce gas usage.

Temperature Controls

ECM #	Energy Conservation Measure	Benefit
T1	Install programmable thermostats.	Reduce energy usage during non-occupied periods.

Plumbing

ECM #	Energy Conservation Measure	Benefit
P1	Insulate hot water piping.	Reduce heat loss through piping.
P2	Install low flow aerators on faucets.	Reduce water usage.
P3	Install sensor or timed controls on faucets and water closets.	Reduce water usage.

Electrical Systems

ECM #	Energy Conservation Measure	Benefit
E1	Install motion sensors to automatically turn off interior lighting.	Reduce electrical energy cost

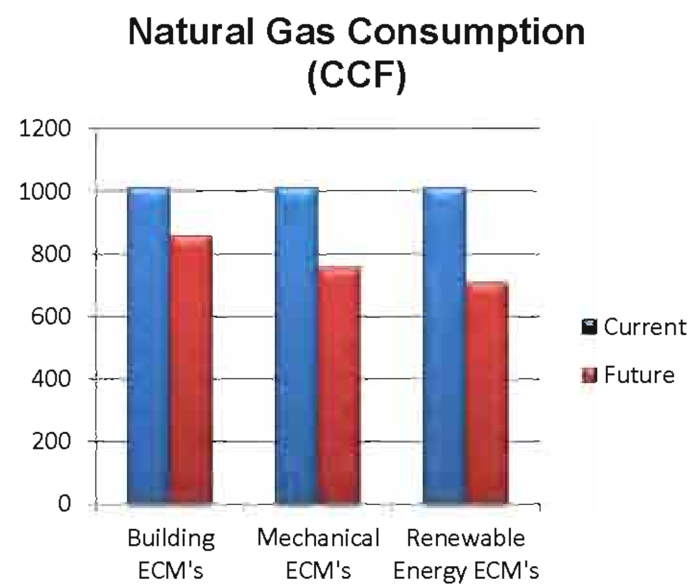
Renewable Energy Opportunities

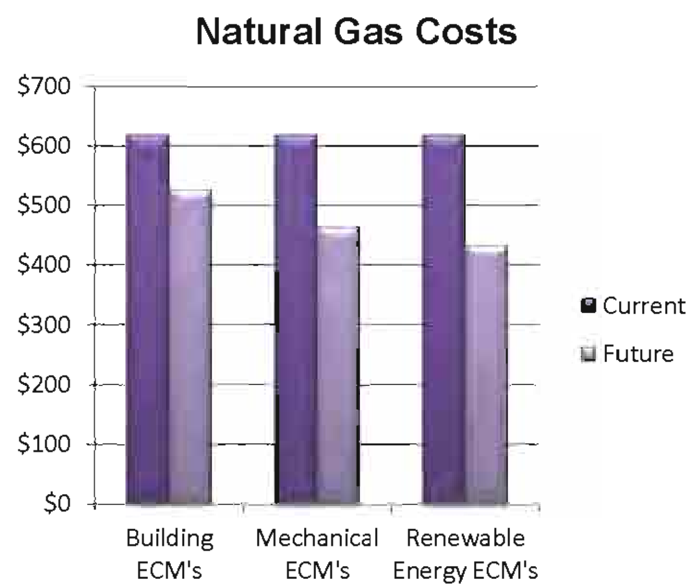
ECM #	Energy Conservation Measure	Benefit
R1	Install passive solar energy system for either hot water heating or electrical usage.	Reduce carbon footprint, reduce gas and utility costs.

Potential Energy Cost Savings

Natural Gas

The following natural gas energy usage and cost savings is an estimate based on the building, mechanical, temperature control and renewable energy conservation measures:

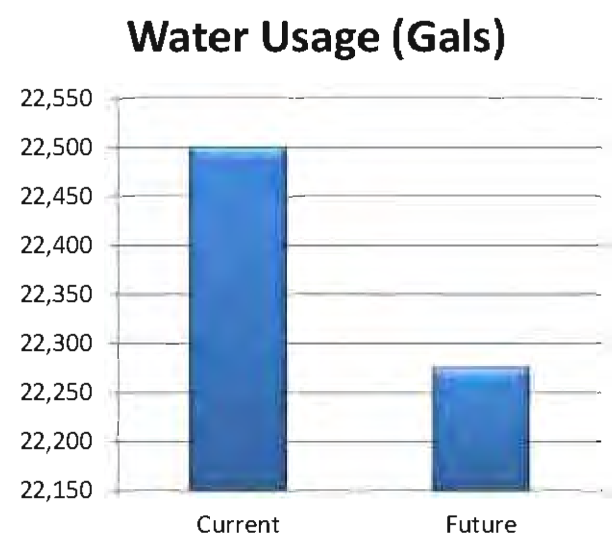


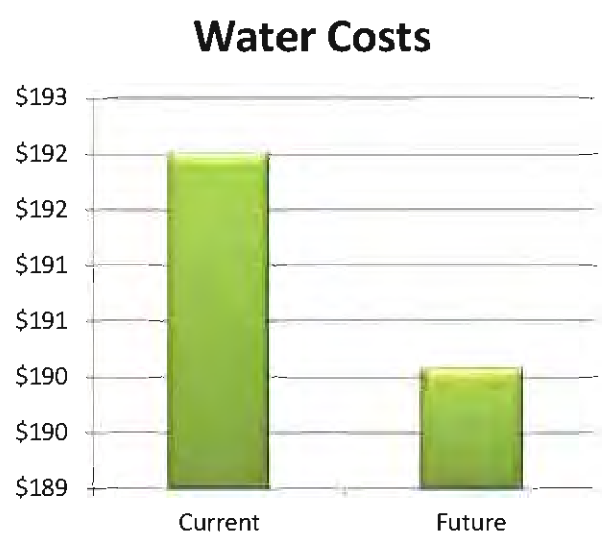


Energy Conservation Measures (ECM)	Current		Future	
	ECI (per sq ft/yr)	ECU (BTU/sq ft)	ECI (per sq ft/yr)	ECU (BTU/sq ft)
Building	$0.36	59,412	$0.31	50,500
Mechanical	$0.36	59,412	$0.27	44,559
Renewable Energy	$0.36	59,412	$0.25	41,588

Water and Sewer

The following water usage and cost savings is an estimate based on the plumbing energy conservation measures:





Electrical Systems

The installation of motion sensors could provide about $150 in electrical savings per year.

Thermal Imaging Data

Infrared and corresponding digital photos taken with FLIR E40 thermal imaging camera are attached to this report. This building had very little unexpected heat loss detected.

Exterior windows and doors have typical heat loss. Weather stripping and door sweeps should be examined periodically and replaced when excessive wear and/or damage is found.

References
Existing wall U-value:0.044 Btu/hr/sq ft/deg F
Existing roof U-value:0.036 Btu/hr/sq ft/deg F
Existing window U-value: 0.99 Btu/hr/sq ft/deg F
Existing ACH: 1.0

Standards

ASHRAE Std 62.1-2007: Ventilation standard used for analysis.
ASHRAE Std 90.1-2007: Energy standard used for analysis.
LEED 2009: LEED rating system used for analysis.

Software
HAP 4.06: Hourly Analysis Program, Carrier, Inc.
REVIT 2011: Computer Aided Design Software
AutoCAD MEP 2011: Computer Aided Design Software
FLIR Tools, Version 2.2: FLIR E40 Infrared Camera analysis software

Air System Sizing Summary for #32 Youth Education

Project Name: S10-12262 #32 Youth Education — 02/15/2013
Prepared by: UPEA — 11:03AM

Air System Information

Air System Name	**#32 Youth Education**		Number of zones	**1**	
Equipment Class	**UNDEF**		Floor Area	**1521.0**	ft²
Air System Type	**SZCAV**		Location	**Sault Ste Marie, Michigan**	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**3.5**	Tons	Load occurs at	**Jul 1600**	
Total coil load	**41.8**	MBH	OA DB / WB	**82.3 / 68.8**	°F
Sensible coil load	**39.3**	MBH	Entering DB / WB	**76.5 / 63.7**	°F
Coil CFM at Jul 1600	**1987**	CFM	Leaving DB / WB	**57.7 / 56.5**	°F
Max block CFM	**1987**	CFM	Coil ADP	**55.7**	°F
Sum of peak zone CFM	**1987**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.940**		Resulting RH	**50**	%
ft²/Ton	**436.4**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**27.5**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**8.37**	gpm	Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**50.7**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**1987**	CFM	BTU/(hr-ft²)	**33.3**	
Max coil CFM	**1987**	CFM	Ent. DB / Lvg DB	**64.1 / 88.4**	°F
Water flow @ 20.0 °F drop	**5.07**	gpm			

Supply Fan Sizing Data

Actual max CFM	**1987**	CFM	Fan motor BHP	**1.09**	BHP
Standard CFM	**1936**	CFM	Fan motor kW	**0.86**	kW
Actual max CFM/ft²	**1.31**	CFM/ft²	Fan static	**2.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**119**	CFM	CFM/person	**21.50**	CFM/person
CFM/ft²	**0.08**	CFM/ft²			

Measurements	°F
Sp1	19.6

Parameters	
Emissivity	0.95
Refl. temp.	68 °F

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IR_0720.jpg

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DC_0721.jpg

Conclusions and Recommendations

The value of utilizing energy audit findings and recommendations to prioritize energy efficiency improvements for the Tribe's 39 governmental buildings has become very evident following implementation of the two DOE energy audits grants.

The combined findings from these grants provide the Tribal Facilities Management Department with a comprehensive assessment of the governmental buildings' energy deficiencies and cost-effective strategies to improve energy efficient operations.

Planned use of the energy audit findings and recommendations include the following:

1) The project team will synopsize findings and recommendations from the two energy audits grants by building, type of retrofit or renewable improvement, type of trade needed to perform retrofit or installation, and estimated energy savings into a report for prioritizing funding acquisition or implementation utilizing existing resources.

2) The report described above will facilitate contractor procurement by trade to work at multiple locations or on multiple systems, maximizing competitive and economy of scale pricing.

3) The project team will also synopsize utility usage from the energy audits from the two energy audits grants by building, type of utility and estimated energy savings into a report to serve as a benchmark for future monitoring following implementation of recommended energy improvements.

Another use of the energy audit reports will be as an integral part of potential grant applications. The energy audit reports, prepared by an independent engineering firm, will add credible technical justification to the Tribe's grant proposals requesting funding assistance for recommended energy efficiency improvements.

One of the unexpected benefits of applying for and receiving award of the two energy audits grants was the energy efficiency and conservation awareness that evolved Tribal-wide due to presentations and communications regarding these energy grants with the Tribal Board of Directors, Tribal departments and programs, discussions with co-workers and at Tribal community gatherings. As a result of raised awareness, the Facilities Management Department and building operations managers began to install a variety of energy saving measures and to change how building systems were controlled to minimize energy usage. The energy audit reports funded by the DOE grant have reinforced the energy savings potential of the Tribe's continued energy conservation efforts.

Lessons Learned

Lessons learned during the course of completing this energy audit project included overcoming unexpected challenges in acquiring utility usage data and being prepared for surprising findings in the energy audit reports.

Within the rural counties of the Upper Peninsula of Michigan, some of the utility companies are still operating metering equipment that does not have the capacity to provide computerized utility usage data, are periodically estimating meter readings, have seasonal gaps in data and are therefore unable to provide computerized usage reporting. The available utility usage data with corresponding rates and costs was compiled from gathering and inputting monthly paper invoicing. The process was time consuming for assigned personnel. While the Tribe will continue to use monthly invoicing to monitor energy usage from the utility companies with limited systems, periodically the Tribe will contact the applicable utility companies to check if systems have been upgraded to enable computerized energy usage reporting.

Another lesson learned involved thermal-imaging photographs revealing unexpected findings. Energy inefficiencies due to gaps around doors and windows were anticipated. However, finding unknown window openings buried in walls causing heat loss was surprising. While thermal imaging has been instrumental in uncovering invisible causes of energy inefficiencies, the Tribe has also found thermal-imaging photographs to be effective visual aids for presentations to feature and clarify energy deficiencies.

Perhaps the most important lesson learned and recommendation to be made is that conducting energy audits is a vital first step in developing a comprehensive facilities management energy conservation program and prioritizing strategies for moving forward with energy efficiency improvements. The Sault Ste. Marie Tribe of Chippewa Indians appreciates the funding and technical assistance from the U. S. Department of Energy, which has enabled the Tribe to achieve tangible progress launching the Tribe’s energy conservation program.