FlexTech Study

Town of Hamburg
Hamburg, NY
August 2010
Wendel Project No. 3008-09NFT

New York State Department and
Development Authority
17 Columbia Circle
Albany, New York 12203-6399

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Section 1

Executive Summary

EXECUTIVE SUMMARY

The Town of Hamburg, created in 1812, is located south of Buffalo on the shores of Lake Erie. The Town employs approximately 210 employees, and is home to approximately 59,259 residents including a number of small and large businesses. The Town is interested in improving the energy efficiency of their facilities. The Town occupies approximately 200,317 square feet of multi-functional facilities that allow the Town of Hamburg to serve their community. These facilities typically operate from 7am to 5pm, Monday through Friday, with some facilities having hours separate from this.

The Town has been allocated funds under the American Recovery and Reinvestment Act's (ARRA) Energy Efficiency and Conservation Block Grant (EECBG) program for the purpose of reducing the Town's energy consumption and operating expenses, improving building conditions for Town employees and residents, and making a positive impact on the environment. An energy efficiency study of potential energy conservation measures (ECMs) would allow Town Officials to make informed implementation decisions based on energy savings and associated operational and maintenance savings. The Town is currently interested in evaluating opportunities at their facilities that will reduce energy and operational costs.

Based on the walk-through by the Town, Wendel and the New York State Energy Research and Development Authority (NYSERDA) personnel, the following facilities were identified for this study.

Building Number	Building Name	Area (Sq. Ft.)
1	Town Ice Arena	55,550
2	Town Hall	35,763
3	Hamburg Public Library	20,000
4	Buildings and Grounds	20,000
5	Golf Course Pro Shop	6,570
6	Golf Course Maintenance Garage	3,270
7	Highway Department Office	7,656
8	Highway Department Garage	19,360
9	Nike Site/ Buildings and Grounds	4,168
10	Recreation Building	4,620
11	Town Park Fitness Center	5,000

12	Lakeview Community Center	3,060
13	Senior Adult Day Care	4,500
14	Lake Shore Public Library	5,600
15	Blasdell Village Library	5,200

During initial walk-through sessions, opportunities were identified for possible energy savings. Energy conservation measures (ECMs) that were evaluated in this study include:

ECM-1	Lighting and Lighting Controls
ECM-2	Energy Management System Upgrades
ECM-3	Domestic Hot Water System Improvements
ECM-4	Building Envelope Improvements
ECM-5	Ice Rink Improvements
ECM-6	Demand controlled ventilation on exhaust
ECM-7	Low flow shower heads
ECM-8	Compressed Air System Upgrades
ECM-9	Overhead Door Controls/Replacement
ECM-10	Traffic Signal Upgrades
ECM-11	Street Lighting Upgrades
ECM-12	PV System

During the course of the audit process, meetings and site visits were conducted to develop a proposed scope of work that could be implemented using an energy performance contract or capital improvement project. As the Audit progressed and more information became available, portions of the study scope had changed. The buildings to be included in the study were adjusted. The following is a list of the buildings audited under this study:

Building Number	Building Name	Area (Sq. Ft.)
1	Town Ice Arena	55,550
2	Town Hall	35,763
3	Buildings and Grounds	20,000
4	Golf Course Pro Shop	6,570
5	Golf Course Maintenance Garage	3,270
6	Highway Department Office	7,656
7	Highway Department Garage	19,360
8	Nike Site/ Buildings and Grounds	4,168
9	Recreation Building	4,620
10	Town Park Fitness Center	5,000
11	Senior Adult Day Care	4,500
12	Senior Garage	5,000

Wendel and the Town worked together to discuss various concerns and opportunities for many of the Town's buildings. The type of ECMs studied during the course of this audit remained nearly the same to those proposed in the Task Work Order Plan. However the scope of study, for some of the measures, had increased. The measures studied during the audit are listed below:

ECM-1	Lighting and Lighting Controls
ECM-2	Energy Management System Upgrades
ECM-3	Domestic Hot Water System Improvements
ECM-4	Building Envelope Improvements
ECM-5	Ice Rink Improvements
ECM-6	Destratification Fans
ECM-7	Low flow shower heads
ECM-8	Compressed Air System Upgrades
ECM-9	Overhead Door Controls/Replacement
ECM-10	Traffic Signal Upgrades
ECM-11	Street Lighting Upgrades
ECM-12	PV System

Details of the analysis for each measure can be found in sections 4 through 15 of this report.

The following table summarizes the specific recommended project economics and results of the study by facility. Table (1-1) "Total Project Summary" details the estimated overall project economics for implementing the recommended measures.

For questions regarding this report or other programs offered by NYSERDA, please contact Stacey Sabo at 866-697-3732 extension 3037 or by email at sls@nyserda.org.

We hope the finding of this report will assist you in making decisions about energy efficiency improvements in your facility. Thank you for your participation in this program.

NOTICE

This report was prepared pursuant to the Flexible Technical Assistance Program (hereafter "FlexTech") administered by the New York State Energy Research and Development Authority (hereafter the "NYSERDA"). The opinions expressed in this report do not necessarily reflect those of NYSERDA or the State of New York, and reference to any specific product, service, process, or method does not constitute an implied or expressed recommendation or endorsement of it. Further, NYSERDA and the State of New York make no warranties or representations, expressed or implied, as to the fitness for particular purpose or merchantability of any product, apparatus, or service, or the usefulness, completeness, or accuracy of any processes, methods, energy savings, or other information contained, described, disclosed, or referred to in this report. NYSERDA and the State of New York make no representation that the use of any product, apparatus, process, method, or other information will not infringe privately owned rights and will assume no responsibility for any loss, injury, or damage resulting from, or occurring in connection with, the use of information contained, described, disclosed, or referred to in this report.

State of New York
David Paterson, Governor

New York State Energy Research and Development Authority
Vincent A. Deloria, Esq., Chairman

Town of Hamburg
TOTAL PROJECT SUMMARY
8/20/2010
FINAL

Recommended (Y)es / (N)o or (O)ption	Line No.	Measure No.	FACILITY	FACILITY IMPROVEMENT MEASURE	TOTAL MEASURE COST[1]	ANNUAL ELECTRIC SAVINGS (kWh)	ANNUAL DEMAND SAVINGS (kW)	ANNUAL FUEL SAVINGS (mmBtu)	ANNUAL WATER SAVINGS (Gallons)	ANNUAL OPERATING SAVINGS	ANNUAL ENERGY SAVINGS	TOTAL ANNUAL SAVINGS	EMISSIONS REDUCTION (Lbs. CO_2)[3]	SIMPLE PAYBACK	ESTIMATED TOTAL INCENTIVE[2]
Y	1	ECM-1	Town Ice Arena	Lighting and Lighting Controls	$24,494	59,399	236.8	-51	0	$49	$7,164	$7,212	43,523	3.4	$7,128
Y	2	ECM-1	Town Hall	Lighting and Lighting Controls	$23,919	8,826	50.6	-8	0	$33	$922	$955	6,467	25.0	$1,059
Y	3	ECM-1	Buildings and Grounds	Lighting and Lighting Controls	$26,876	35,067	144.2	-30	0	$150	$3,517	$3,667	25,694	7.3	$4,208
N	4	ECM-1	Golf Course Pro Shop	Lighting and Lighting Controls	$0	0	0.0	0	0	$0	$0	$0	0	0.0	$0
Y	5	ECM-1	Golf Course Maintenance Garage	Lighting and Lighting Controls	$80	82	0.6	0	0	$0	$11	$11	60	7.5	$10
N	6	ECM-1	Highway Department Office	Lighting and Lighting Controls	$0	0	0.0	0	0	$0	$0	$0	0	0.0	$0
Y	7	ECM-1	Highway Department Garage	Lighting and Lighting Controls	$26,816	37,543	149.7	-32	0	$173	$3,794	$3,967	27,509	6.8	$4,505
N	8	ECM-1	Nike Site / Buildings and Grounds	Lighting and Lighting Controls	$0	0	0.0	0	0	$0	$0	$0	0	0.0	$0
N	9	ECM-1	Recreation Building	Lighting and Lighting Controls	$0	0	0.0	0	0	$0	$0	$0	0	0.0	$0
Y	10	ECM-1	Town Park Fitness Center	Lighting and Lighting Controls	$166	335	2.1	0	0	$0	$37	$37	245	4.5	$40
Y	11	ECM-1	Senior Adult Day Care	Lighting and Lighting Controls	$3,824	1,870	12.0	-2	0	$22	$213	$235	1,370	16.2	$224
Y	12	ECM-1	Senior Garage	Lighting and Lighting Controls	$3,754	2,133	12.9	-2	0	$17	$295	$312	1,563	12.0	$256
Y	13	ECM-2	Town Hall	Energy Management System Improvements	$28,503	0	0.0	261	0	$0	$2,649	$2,649	30,344	10.8	$0
Y	14	ECM-2	Buildings and Grounds	Energy Management System Improvements	$37,026	0	0.0	156	0	$0	$1,626	$1,626	18,112	22.8	$0
Y	15	ECM-2	Highway Department Office	Energy Management System Improvements	$31,944	0	0.0	116	0	$0	$1,411	$1,411	13,451	22.6	$0
Y	16	ECM-2	Highway Department Garage	Energy Management System Improvements	$37,026	0	0.0	212	0	$0	$2,102	$2,102	24,667	17.6	$0
N	17	ECM-2	Senior Adult Day Care	Energy Management System Improvements	$68,607	0	0.0	105	0	$0	$1,125	$1,125	12,266	61.0	$0
Y	18	ECM-2	Senior Garage	Energy Management System Improvements	$13,068	0	0.0	85	0	$0	$903	$903	9,847	14.5	$0
N	19	ECM-3	Town Hall	Domestic Hot Water Improvements - Option A	$4,675	0	0.0	6	0	$0	$62	$62	6	75.8	$0
O	20	ECM-3	Town Hall	Domestic Hot Water Improvements - Option B	$3,949	0	0.0	6	0	$0	$62	$62	6	64.0	$0
N	21	ECM-3	Highway Garage	Domestic Hot Water Improvements	$6,273	1,954	0.0	-7	0	$0	$68	$68	784	92.9	$0
Y	22	ECM-4	Town Ice Arena	Building Envelope Improvements	$19,466	0	0.0	131	0	$0	$1,374	$1,374	15,276	14.2	$0
Y	23	ECM-4	Town Hall	Building Envelope Improvements	$23,649	0	0.0	124	0	$0	$1,413	$1,413	14,460	16.7	$0
N	24	ECM-4	Buildings and Grounds	Building Envelope Improvements	$31,444	0	0.0	98	0	$0	$1,020	$1,020	11,355	30.8	$0
Y	25	ECM-4	Highway Department Office	Building Envelope Improvements	$14,502	0	0.0	107	0	$0	$1,305	$1,305	15,276	11.1	$0
N	26	ECM-4	Highway Department Garage	Building Envelope Improvements	$15,416	0	0.0	71	0	$0	$708	$708	8,305	21.8	$0
N	27	ECM-4	Nike Site / Buildings and Grounds	Building Envelope Improvements	$6,828	0	0.0	32	0	$0	$361	$361	3,745	18.9	$0
N	28	ECM-4	Recreation Building	Building Envelope Improvements	$7,799	0	0.0	26	0	$0	$296	$296	3,077	26.3	$0
Y	29	ECM-4	Town Park Fitness Center	Building Envelope Improvements	$34,481	0	0.0	233	0	$0	$2,440	$2,440	27,131	14.1	$0
Y	30	ECM-4	Senior Adult Day Care	Building Envelope Improvements	$19,960	0	0.0	148	0	$0	$1,576	$1,576	17,185	12.7	$0
Y	31	ECM-5	Town Ice Arena	Ice Rink Improvements - Brine Header Insulation	$32,670	19,191	0.0	0	0	$0	$1,615	$1,615	15,967	20.2	$0
Y	32	ECM-5	Town Ice Arena	Ice Rink Improvements - Low Emissivity Ceiling	$59,035	45,882	0.0	0	0	$0	$3,862	$3,862	38,174	15.3	$0
Y	33	ECM-5	Town Ice Arena	Ice Rink Improvements - Brine Pump VSD	$23,159	24,948	0.0	0	0	$0	$2,100	$2,100	20,757	11.0	$0
N	34	ECM-5	Town Ice Arena	Ice Rink Improvements - Water Treatment	$64,295	6,413	0.0	127	0	$0	$1,873	$1,873	12,439	34.3	$0
Y	35	ECM-6	Buildings and Grounds	Destratification Fans	$11,471	-3,526	0.0	115	0	$0	$1,161	$1,161	10,501	9.9	$0
N	36	ECM-6	Highway Department Garage	Destratification Fans	$21,490	-3,526	0.0	90	0	$0	$841	$841	7,520	25.6	$0
Y	37	ECM-7	Town Ice Arena	Low Flow Shower Heads	$1,699	0	0.0	5	27	$79	$56	$135	643	12.6	$0
Y	38	ECM-8	Buildings and Grounds	Compressed Air Improvements	$17,388	12,964	0.0	0	0	$0	$1,245	$1,245	10,786	14.0	$1,556
Y	39	ECM-8	Highway Department Garage	Compressed Air Improvements	$18,840	20,077	0.0	0	0	$0	$1,927	$1,927	16,704	9.8	$2,409
N	40	ECM-9	Highway Department Garage	Overhead Door Controls/Replacement	$273,920	0	0.0	312	0	$0	$3,096	$3,096	36,325	88.5	$0
N	41	ECM-10	Town Wide	Traffic Signals	$1,568	4,310	17.4	0	0	$7	$448	$454	3,586	3.5	$0
N	42	ECM-11	Town Wide	Street Lighting (NYSEG)	$2,226,606	558,207	0.0	0	0	$8,742	$30,893	$39,635	464,428	56.2	$0
N	43	ECM-11	Town Wide	Street Lighting (National Grid)	$3,143,507	473,382	0.0	0	0	$12,033	$51,086	$63,119	393,854	49.8	$0
N	44	ECM-12	Town Hall	Photovoltaic System (5kW)	$72,080	6,555	0.0	0	0	$0	$413	$413	5,454	174.5	$10,080
O	45	ECM-12	Town Hall	Photovoltaic System (25kW)	$260,838	28,254	0.0	0	0	$0	$1,780	$1,780	23,508	146.5	$43,750
				PROGRAM TOTALS - Recommended Measures	$533,815	264,790	608.8	1,569	27	$523	$44,719	$45,242	405,711	11.8	$21,395
				PROGRAM TOTALS - All Measures (w/o Options)	$6,478,322	1,312,086	626.2	2,430	27	$21,305	$137,006	$158,311	1,368,855	40.9	$31,475

NOTES:

1. TOTAL MEASURE COST includes direct construction costs (subcontractor material and labor) and DOES include fees for services described below:
   Energy, Electrical and Mechanical engineering, Construction documents, Financing assistance services, Subcontractor coordination and administration
2. Estimated Total Incentive is based on NYSERDA Existing Facilities Program (PON 1219) Performance Based Incentive at a rate of $0.12/kWh and NYSERDA Solar PV Program (PON 2112) and is subject to NYSERDA approval, program rules and modifications, and eligibility. This incentive rate does not account for customer-secured third party firms or their costs to provide program deliverables, such as measurement and verification.
3. EMISSIONS REDUCTION Calculated using conversions as dictated by the American Recovery and Reinvestment Act.

Section 2

Facility Descriptions

FACILITY DESCRIPTION

The Town's facilities vary in size, construction, and use. The table below summarizes information about each of the Owner's facilities included in the scope of this study.

Building Number	Building Name	Area (Sq. Ft.)
1	Town Ice Arena	55,550
2	Town Hall	35,763
3	Buildings and Grounds	20,000
4	Golf Course Pro Shop	6,570
5	Golf Course Maintenance Garage	3,270
6	Highway Department Office	7,656
7	Highway Department Garage	19,360
8	Nike Site/ Buildings and Grounds	4,168
9	Recreation Building	4,620
10	Town Park Fitness Center	5,000
11	Senior Adult Day Care	4,500
12	Senior Garage	5,000

TOWN ICE ARENA

The Hamburg ice rink, originally a base for housing Nike missiles, specializes in ice skating & hockey events as well as instruction. This facility is located at 2718 Lakeview Road, Lakeview, NY 14085.

The Nike base was converted into an ice rink in the 1970s. The original building was renovated to accommodate locker rooms, offices and a skate rental area. The original building consists of a concrete slab with concrete masonry unit (CMU) walls. A low sloped roof is located over the skate rental area and a flat roof over the locker rooms.

An addition was built on the north side to house an ice rink area and mechanical rooms. The

ice rink area is constructed with a concrete slab, a steel rigid frame structure, CMU walls infill the lower half of the steel structure, metal cladding with spray foam insulation wrap around the upper half, and a gable roof. The mechanical rooms are constructed with a concrete slab, CMU walls and a flat roof.

The building is used as an ice rink from roughly the beginning of October to mid April, depending on schedules and demand. In the summer a rubberized athletic floor is installed for various sporting events. The rink is typically available from 7am to 11pm, with some of the hours subject to change based on ice rentals.

Since the addition there have been some minor improvements made, such as;

1998 – The ice rink area was re-roofed with a rubber membrane and the cavities of the CMU walls were filled with spray foam insulation.

2000 – An energy audit was completed, which influenced the updating of the lighting, windows and electrical panels.

2009 – The boiler serving the addition and locker rooms was rebuilt.

TOWN HALL

The Town Hall is a 35,763 square foot facility located on South Park Ave. in the Town of Hamburg. This building acts as the municipal center for the Town government. The building has a split level design with a partially below grade ground floor and a first floor. Several renovations of this building have taken place since its construction.

In recent years the building's HVAC system has been upgraded with the addition of roof top air handling units (RTUs). The police dispatch was moved to an adjacent structure and the building department has undergone a complete renovation. It was also found that the windows and lighting were replaced under an energy performance contract in 2002.

This building serves many different functions. Portions of this building are utilized as office space while others serve as court rooms and conference rooms. The typical operation schedule for this building is from 7am to 5pm with some functions periodically occurring after 5pm.

GOLF COURSE PRO SHOP & MAINTENANCE FACILITY

The Hamburg Town Golf Course facility is a 6,169 yard course that opened in 1976. The course is maintained by a team of employees who operate out of the 3,270 square foot maintenance garage. Patrons start out at the course's pro shop which includes a kitchen and dining area, cashier and public restrooms. There are also offices and a conference room that are not open to the public. This facility operates during the summer from 6am to 9pm.

HIGHWAY AND BUILDINGS & GROUNDS FACILITIES

The Town of Hamburg Highway Garage, Office, Buildings and Grounds and Senior Garage are all located at 2720 Lakeview Rd in Lakeview NY. With the exception of the Highway office, the buildings at this location are large metal framed structures. They feature large open areas suitable for vehicle maintenance and storage. The office building is a CMU constructed building with a sloped roof. The building has a variety of uses including offices, locker room, and dining area. The buildings on this site are typically operated from 7am to 3pm, however

during the winter these buildings are often occupied over night to support snow clearing operations.

SENIOR ADULT DAY CARE

The Senior Adult Day Care facility provides activities and services for seniors in the community. The building is occupied from 9am to 5pm, Monday through Friday. The building is a unique facility which has gone through many retrofits. Prior to the Town acquiring the building it was used as a restaurant for many years. One of the iconic features of this building is the train car that has been incorporated into the building structure.

Section 3

Utility Description

UTILITY DESCRIPTION

Wendel analyzed historical utility information from the Town of Hamburg for the purposes of identifying usage trends and determining average utility rates for use in the analysis of energy conservation measures. This section describes each utility and how the rates were determined by Wendel.

Electric Utility

The Town of Hamburg's electric utility is provided by National Grid and NYSEG. The Town has many accounts that serve various buildings and street lights throughout the Town. The unit kWh cost for the facilities was calculated by adding the annual supply and delivery costs minus the annual demand costs (including delivery and transition charges) from the bills provided by the Owner, and dividing this total by the annual kWh consumption. Depending on which building and utility is being viewed, there are two different demand rates that are shown as a cost per kW. A summary of electric utility rates can be seen in the tables below. A summary of the usage by building has been provided in Appendix A of this report.

The Town of Hamburg's street lighting utility is provided by National Grid and NYSEG. The street lighting utility includes electrical usage and maintenance of the street lighting equipment. Street lighting equipment is not metered; it uses a pre determined tariff for electric usage. There is no demand charge associated with the street lighting utilities. Each utility bill was separated into maintenance costs, usage costs and customer costs. The usage costs were divided by the kWh consumption and this value was used as the electrical rate.

Natural Gas Utility

The Town's natural gas utility is delivered by National Fuel. Natural gas unit costs were originally calculated by dividing the total annual natural gas costs by the total annual consumption in mmBtu. Natural gas usage is reported in hundred cubic feet or (CCF). The thermal content of 1 CCF is assumed to be 100,000 Btu throughout this report. Savings are reported in mmBtu. Therefore, 10 CCF is equal to 1 mmBtu. A summary of natural gas utility rates can be seen in the tables below. A summary of the usage by building has been provided in Appendix A of this report.

Town Ice Arena	Unit Cost ($)	Units
Electric Usage	$0.08	/kWh
Electric Demand	$10.40	/kW
Natural Gas (Combined)	$10.47	/mmBtu
Natural Gas (1)	$11.20	/mmBtu
Natural Gas (2)	$10.33	/mmBtu

Town Hall	Unit Cost ($)	Units
Electric Usage	$0.06	/kWh
Electric Demand	$8.00	/kW
Natural Gas	$11.37	/mmBtu

Buildings & Grounds	Unit Cost ($)	Units
Electric Usage	$0.07	/kWh
Electric Demand	$10.42	/kW
Natural Gas	$10.40	/mmBtu

Pro Shop	Unit Cost ($)	Units
Electric Usage	$0.07	/kWh
Electric Demand	$8.00	/kW
Natural Gas	$10.80	/mmBtu

Golf Maintenance	Unit Cost ($)	Units
Electric Usage	$0.35	/kWh
Electric Demand	N/A	/kW
Natural Gas	$10.80	/mmBtu

Highway Dept. Office	Unit Cost ($)	Units
Electric Usage	$.072	/kWh
Electric Demand	$10.42	/kW
Natural Gas	$12.21	/mmBtu

Highway Dept. Garage	Unit Cost ($)	Units
Electric Usage	$.072	/kWh
Electric Demand	$10.42	/kW
Natural Gas	$9.92	/mmBtu

Nike B&G	Unit Cost ($)	Units
Electric Usage	$0.08	/kWh
Electric Demand	$10.40	/kW
Natural Gas	$11.20	/mmBtu

Recreation Bldg.	Unit Cost ($)	Units
Electric Usage	$0.08	/kWh
Electric Demand	$10.40	/kW
Natural Gas	$10.45	/mmBtu

Fitness Center	Unit Cost ($)	Units
Electric Usage	$0.08	/kWh
Electric Demand	$8.00	/kW
Natural Gas	$10.47	/mmBtu

Senior Adult Day Care	Unit Cost ($)	Units
Electric Usage	$0.08	/kWh
Electric Demand	$8.00	/kW
Natural Gas	$10.67	/mmBtu

Senior Garage	Unit Cost ($)	Units
Electric Usage	$0.07	/kWh
Electric Demand	$10.42	/kW
Natural Gas	$10.40	/mmBtu

Street Lighting	Unit Cost ($)	Units
Electric Usage (NYSEG)	$0.08	/kWh
Electric Usage (National Grid)	$0.11	/kWh

Legion and Division	Unit Cost ($)	Units
Electric Usage	$0.10	/kWh

Carbon Emissions

While not a utility, the reduction in carbon emissions represents an important goal for this project. These rates are based on the rates used by the U.S. Department of Energy and NYSERDA for various ARRA funded programs. A summary of these rates can be found below:

Utility	Rate	Units
Electricity	.8320	Lbs. CO_2 / kWh
Natural Gas	116.38	Lbs. CO_2 / mmBtu

WEATHER NORMALIZATION

Some calculations in this report use 30 year weather data for Buffalo, NY to predict the energy savings likely to result in a given measure. The normal number of heating degree-days (HDD) for this area is 6,692 HDD. The normal number of cooling degree days (CDD) is 548 CDD. Some calculations in this report required the use of BIN weather data. BIN weather data provides the average number of hours a location will observe a temperature during a typical year. The temperature intervals are based on 30 year averages and grouped in blocks of 2.5°F temperature range. For these calculations the weather information was used from the closest available location, Niagara Falls, NY. Weather information was obtained from the National Weather Service/NYSERDA's website.

Niagara Falls					
Dry Bulb Temp (°F)	Wet Bulb Temp (°F)	Enthalpy (Ho)	Total 0-800 Bin Hours	900-1600 Bin Hours	1700-2400 Bin Hours
-17.5	-16	-4.0	0	0	0
-12.5	-13	-3.0	1	0	0
-7.5	-8	-1.5	0	0	1
-2.5	-2	-0.3	3	0	1
2.5	2	1.3	12	5	6
7.5	7	2.8	39	13	20

12.5	11	4.0	71	40	61
17.5	16	5.8	106	60	81
22.5	21	7.5	152	117	133
27.5	25	9.0	227	185	213
32.5	30	11.0	352	277	308
37.5	35	13.1	279	240	261
42.5	39	15.0	245	191	215
47.5	44	17.3	243	181	231
52.5	48	19.2	249	184	223
57.5	53	22.1	257	193	225
62.5	57	24.5	258	217	243
67.5	61	27.2	248	240	267
72.5	65	30.0	139	266	222
77.5	67	31.7	39	244	131
82.5	70	34.0	4	172	61
87.5	72	36.5	0	81	17
92.5	75	38.4	0	18	1
97.5	76	38.3	0	1	0

Section 4

Lighting and Lighting Controls

LIGHTING AND LIGHTING CONTROLS

ECM - 1

INVESTIGATION

Wendel visited Town of Hamburg facilities to evaluate lighting systems and determine opportunities to save energy and improve lighting conditions. A survey of all interior lighting was performed to identify the type of lighting fixtures, lamps, and lighting controls used at each building. The Town's buildings were constructed at different times, resulting in a variety of lighting designs and fixture types in use for general lighting in offices, hallways and other areas. In 2002, a lighting retrofit project was completed that upgraded most of the Town's lighting fixtures to 32 watt T8 lamps and electronic ballasts. Since then, improvements in lighting technology have resulted in more energy efficient lamp and ballast combinations. The modern technology includes 28 watt T8 lamps and electronic ballasts. Some of the Town's buildings utilize High Intensity Discharge (HID) lighting fixtures to provide general space lighting. Advances in florescent lighting technology have made it possible to replace the existing HID fixtures with more energy efficient fluorescent fixtures.

For this measure Wendel did an investigation into the types of lighting used by the facilities and the number of lights. There are a number of savings associated with this measure in order to ensure the most accurate results to aid the Town of Hamburg in making informed decisions about improving the existing lighting technology. Wendel was able to evaluate the current level of energy efficiency and identify upgrades. These upgrades will result in direct energy savings by decreasing the overall energy usage necessary to provide general lighting. Since some areas were identified for new lighting fixtures and fluorescent lamps and ballasts, maintenance savings will result from the decreased cost of the replacements. The overall energy usage is calculated by taking into consideration each positive and negative result from

implementing the suggested improvements. A reduction in fixture wattage in turn reduces the amount of heat from each fixture. This reduction in heat output is compensated for by the building's heating system. Wendel's calculation accounts for this "heating penalty" as a part of our calculations to provide the owner with a complete understanding of the full impact of the measure. From the investigation, Wendel was able to determine the energy savings and financial payback for this measure. Cost estimates were developed using pricing from previous projects. Refer to the following calculations and cost estimates for details.

Town Ice Arena

Existing System

This facility can be viewed as two separate sections; the ice rink and the support areas. In the support areas, which include the locker rooms, restrooms, hallways and concession stands, single (1) lamp 32 watt T-8 fixtures with electronic ballasts are utilized. The ice rink is illuminated by 1,000 watt metal halide fixtures over the ice surface and 400 watt metal halide fixtures over the observation bleachers.

Figure 4.1 Existing Ice Rink Lighting

Proposed System

The focus of this measure will be to upgrade the following fixture applications:

- Replace 1,000 watt metal halide fixtures with eight lamp T-5HO fluorescent fixtures with electronic ballasts.
- Replace 400 watt metal halide fixtures with four lamp T-5HO fluorescent fixtures with electronic ballasts.

Town Hall

Existing System

The Town Hall is currently illuminated by a variety of fixtures and different lighting technologies. The majority of the fixtures are three (3) lamp 32 watt T-8 fixtures with electronic ballasts. In some areas four (4) lamp and two (2) lamp U-tube fixtures are utilized. In the renovated area T-5HO lighting fixtures are used. In accordance with IES standards, it was found that some areas were over lit for the types of activities being performed.

Proposed System

The focus of this measure will be to upgrade the following fixture applications:

- Retrofit the 2'x2' two (2) lamp U-tube fixtures with three (3) 2' lamps, new electronic ballast and a reflector kit.
- Retrofit the four (4) lamp fixtures with three (3) 28 watt T-8 lamps, electronic ballasts and a reflector kit.

Buildings and Grounds

Existing System

This facility can be viewed as two (2) separate sections; the garage area and the office / shop areas. The garage area is illuminated by 400 watt metal halide fixtures. Several metal halide fixtures also provide lighting for an elevated storage area. The storage area was found to have excessive illumination for the types of activities that are preformed here. The office and shop areas were found to have a variety of troffer and industrial fixtures all of which utilize 32 watt T-8 lamps with electronic ballasts.

Figure 4.2 Existing Buildings and Grounds Lighting

Proposed System

The focus of this measure will be to upgrade the following fixture applications:

- Relocate one (1) row of HID lighting from over the elevated storage area to the garage area.
- Replace four (4) rows of 400 watt metal halide fixtures with six lamp T-8 fluorescent fixtures with electronic ballasts.
- Replace one (1) row of 400 watt metal halide fixtures with 4 lamp T-8 fluorescent fixtures with electronic ballasts.

Golf Course Pro Shop

Existing System

The Pro Shop is illuminated by a variety of fixtures with similar lighting technologies and efficiencies. The majority of the fixtures are two (2) lamp 32 watt T-8 fixtures with electronic ballasts.

Proposed System

Based on the operating hours and current technology no changes are recommended for implementation by an outside contractor.

Golf Course Maintenance Department

Existing System

The Maintenance building is illuminated by a variety of fixtures with similar lighting technologies and efficiencies. The majority of the fixtures are two (2) lamp 32 watt T-8 fixtures with electronic ballasts.

Proposed System

Retrofit the two 40 watt T-12 (2) lamp fixtures with two (2) 32 watt T-8 lamps, electronic ballasts and a reflector kit.

Highway Department Office

Existing System

The Highway Department Office is illuminated by a variety of fixtures with similar lighting technologies and efficiencies. The majority of the fixtures are either single (1) lamp or two (2) lamp 32 watt T-8 fixtures with electronic ballasts.

Proposed System

Based on the operating hours and current technology no changes are recommended for implementation by an outside contractor.

Highway Department Garage

Existing System

This facility can be viewed as two separate sections; the garage area and the office/shop areas. The garage area is illuminated by 400 watt metal halide fixtures. Several metal halide fixtures also provide lighting for an elevated storage area. The storage area was found to have excessive illumination for the types of activities that are preformed here. The office and shop areas were found to have a variety of troffer and industrial fixtures all of which utilize 32 watt T-8 lamps with electronic ballasts.

Figure 4.3 Existing Highway Garage Lighting

Proposed System

The focus of this measure will be to upgrade the following fixture applications:

- Replacement of 400 watt metal halide fixtures with six lamp T-8 fluorescent fixtures with electronic ballasts.

Nike Site / Buildings and Grounds

Existing System

This building has a variety of fixtures with similar lighting technologies and efficiencies. The majority of the fixtures are single (1) lamp and four (4) lamp 32 watt T-8 fixtures with electronic ballasts. The application of the four (4) lamp fixtures are in work areas that require a large amount of illumination.

Proposed System

Based on the operating hours and current technology no changes are recommended for implementation.

Recreation Building

Existing System

This building has a variety of fixtures with similar lighting technologies and efficiencies. The majority of the fixtures are two (2) lamp 32 watt T-8 fixtures with electronic ballasts.

Proposed System

Based on the operating hours and current technology no changes are recommended for implementation.

Town Fitness Center

Existing System

This building is illuminated by a variety of fixtures with similar lighting technologies and efficiencies. The majority of the fixtures are single (1) lamp and four (4) lamp 32 watt T-8 fixtures with electronic ballasts. The application of the four lamp fixtures are in work areas that require a large amount of illumination.

Proposed System

- Retrofit the two 40 watt (2) lamp fixtures with two (2) 28 watt T-8 lamps, electronic ballasts and a reflector kit.
- Replace 100 watt incandescent lamp with a 20 watt screw in compact fluorescent lamp.

Senior Adult Daycare

Existing System

This building has a variety of fixtures with similar lighting technologies and efficiencies. The majority of the fixtures are four (4) lamp 32 watt T-8 2' x 4' fixtures with electronic ballasts, and two (2) lamp 32 watt T-8 2' x 2' fixtures with electronic ballasts.

Proposed System

Retrofit the existing four (4) lamp 32W T8 fixtures with a reflector kit and three (3) 28W T8 lamps and electronic ballasts.

Senior Garage

Existing System

The garage area is illuminated by 250 watt metal halide fixtures. The fixtures are controlled by a switch located near the main entrance. Facility personnel informed Wendel that these fixtures are typically illuminated from 7am to 5pm, Monday through Friday. During this time there are long periods where this building remains unoccupied.

Figure 4.4 Existing Senior Garage Lighting

Proposed System

The focus of this measure will be to upgrade the following fixture applications:

- Replace 250 watt metal halide fixtures with four lamp T-8 fluorescent fixtures with electronic ballasts. Install three occupancy sensors to activate the fixtures during occupied periods.

RECOMMENDATIONS

Wendel recommends the implementation of the proposed lighting measures. The replacement of HID fixtures with fluorescent fixtures will result in direct energy savings to the Town. The Town will also realize maintenance savings due to a lower lamp and ballast

replacement cost of the new fixtures. These fixtures will also not experience as significant of a lumen depreciation or light output loss as their HID counterparts, nor will these fixtures have the "hum" associated with HID ballasts.

Wendel has also provided an optional analysis that shows the energy savings that the Town would realize by replacing the existing 32 watt T8 lamps with 28 watt T8 lamps. It has been determined that the savings associated with this type of direct replacement does not justify the expense of a systematic re-lamping by an electrical contractor. As such Wendel is not recommending this measure to be included as part of an energy project. However, during the course of normal maintenance, should the Town choose to replace the existing components with the 28 watt T8 components, energy savings will be achieved as documented in the optional analysis in this section.

Town of Hamburg
Lighting Retrofit
Town Ice Arena

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

19-Aug-10

Savings		
Annual Demand Savings	236.8	kW/Year
Electrical Energy Savings	59,399	kWh/Year
Fossil Fuel Savings	(51)	mmBtu/Year
Environmental CO_2 Gas Savings(1)	43,523	Lbs./Year
Operational & Maintenance Savings	$49	Per Year
Energy Savings ($)	$7,164	Per Year
Total Energy & O&M Savings	$7,212	Per Year
Project Costs		
Total Measure Cost	$24,494	
Payback		
Simple Payback	3.4	Year(s)
Potential Incentives	$7,128	
Simple Payback with Incentives	2.4	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

89,099 lbs of coal (Saved)
126 lbs of Nox gas reduced
365 lbs of SO2 gas reduced

Equivalent Savings (1 year)

7.97 passenger cars (Reduced)
101.22 barrels of oil (Saved)
3.96 houses energy use for 1 year
1115.98 number of trees planted

Town of Hamburg

Town Ice Arena

	Description	
Fixture Code	Existing	Proposed
CT8-RFLB	3, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Retrofit and Delamp 2, 28W T8 Fluorescent Lamps 1 New Electronic Ballast Low Bay + Reflector Kit
CT8-RFLB-2T	3, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Retrofit and Delamp 2, 28W T8 Fluorescent Lamps Sharing Half of a New Electronic Ballast Low Bay + Reflector Kit
MH1000-HT5	1, 1000W Metal Halide 1 Electronic Ballast	Refixture 8, 54W High Output T5 Fluorescent Lamps 2 New Electronic Ballast
MH400-DT5	1, 400 W Metal Halide 1 Electronic Ballast	Refixture 4, 54W High Output T5 Fluorescent Lamps 2 New Electronic Ballast
Z-AT8W	1, 32W T8 Fluorescent Lamp 1 Electronic Ballast	Leave as is
Z-BT8	2, 32W T8 Fluorescent Lamp 1 Electronic Ballast Wrap	Leave as is
Z-BT8WL	2, 32W T8 Fluorescent Lamp 1 Electronic Ballast Wet Location	Leave as is
Z-DT8I	4, 32W T8 Fluorescent Lamp 1 Electronic Ballast	Leave as is

Town Ice Arena

	LIGHTING DESCRIPTION	Activity # 1	Activity # 2	Activity # 3	Activity # 4	Activity # 5	Activity # 6	Activity # 7
1	Existing Equipment	3-F32T8/1-EB	3-F32T8/1-EB	1-MH1000/1-EMB	1-MH400/1-EMB	1-F32T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB
2	Replacement Equipment	2-F28T8/1-NEB/RETRO/REFL	2-F28T8/0.5-NEB/RETRO/REFL	8-F54HOT5/2-NEB/REFIX/P	4-F54HOT5/1-NEB/REFIX/P	Leave as is	Leave as is	Leave as is
3	fixture code	CT8-RFLB	CT8-RFLB-2T	MH1000-HT5	MH400-DT5	Z-AT8W	Z-BT8	Z-BT8WL
4	Floor/Room	0	0	0	0	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0	0	0	0	0
6	Min. Required Lighting Level for Task							
7	Total Annual Hours	3,010	3,010	3,010	3,010	2,572	3,010	3,010
CONNECTED KW/LUMINAIRE								
8	Existing Luminaire kW	0.088	0.088	1.080	0.460	0.032	0.058	0.058
9	New Luminaire kW	0.049	0.046	0.468	0.226	0.032	0.058	0.058
KW/KWH SAVINGS								
10	# of Existing Units	3	2	30	5	97	2	1
11	# of New Units	3	2	30	5	97	2	1
12	Total Existing Connected kW	0.264	0.176	32.400	2.300	3.104	0.116	0.058
13	Total New Connected kW	0.147	0.092	14.040	1.130	3.104	0.116	0.058
14	Total Customer Monthly kW Savings	0.117	0.084	18.360	1.170	0.000	0.000	0.000
15	Total Existing Annual kWh	794.757	529.838	97538.416	6924.023	7981.980	349.212	174.606
16	Total New Annual kWh	442.535	276.961	42266.647	3401.803	7981.980	349.212	174.606
17	Total Customer Annual kWh Savings	352	253	55272	3522	0	0	0
MEASURE INSTALLATION COST								
18	Material Cost Each	$50.21	$44.40	$282.00	$179.00	$0.00	$0.00	$0.00
19	Installation Cost Each	$54.98	$54.98	$200.00	$200.00	$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each	$105.19	$99.38	$482.00	$379.00	$0.00	$0.00	$0.00
21	Total Material Cost	$150.64	$88.81	$8,460.00	$895.00	$0.00	$0.00	$0.00
22	Total Installation Cost	$164.94	$109.96	$6,000.00	$1,000.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$315.58	$198.77	$14,460.00	$1,895.00	$0.00	$0.00	$0.00
HAZARDOUS MATERIAL DISPOSAL COST								
24	Total # Haz.Mat. Ballasts To Be Disposed	3	2	30	5	0	0	0
25	Total # Lamps	9	6	30	5	0	0	0
26	Total Cost for Disposal	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
PROJECT COST								
27	Including Costs - Before Rebates	$416.57	$262.38	$19,087.20	$2,501.40	$0.00	$0.00	$0.00
28	Total Rebates	$42.27	$30.35	$6,632.61	$422.67	$0.00	$0.00	$0.00
29	Including Costs - After Rebates	$374.30	$232.03	$12,454.59	$2,078.73	$0.00	$0.00	$0.00
ANNUAL BILL SAVINGS								
30	Calculated Bill Savings	$42.79	$30.72	$6,714.84	$427.91	$0.00	$0.00	$0.00
31	Payback Before Rebates (Years)	9.7	8.5	2.8	5.8	0.0	0.0	0.0
32	Payback After Rebates (Years)	8.7	7.6	1.9	4.9	0.0	0.0	0.0

Town Ice Arena

	LIGHTING DESCRIPTION	Activity # 8	Activity # 9
1	Existing Equipment	4-F32T8/1-EB	SENSORS
2	Replacement Equipment	Leave as is	
3	fixture code	Z-DT8I	0
4	Floor/Room	0	0
5	Lowest Recorded Lighting Level @Task	0	0
6	Min. Required Lighting Level for Task		
7	Total Annual Hours	860	0
CONNECTED KW/LUMINAIRE			
8	Existing Luminaire kW	0.114	
9	New Luminaire kW	0.114	
KW/KWH SAVINGS			
10	# of Existing Units	8	0
11	# of New Units	8	0
12	Total Existing Connected kW	0.912	0.000
13	Total New Connected kW	0.912	0.000
14	Total Customer Monthly kW Savings	0.000	0.000
15	Total Existing Annual kWh	784.436	0.000
16	Total New Annual kWh	784.436	0.000
17	Total Customer Annual kWh Savings	0	0
MEASURE INSTALLATION COST			
18	Material Cost Each	$0.00	
19	Installation Cost Each	$0.00	
20	Total Material & Installation Cost Each	$0.00	$0.00
21	Total Material Cost	$0.00	$0.00
22	Total Installation Cost	$0.00	$0.00
23	Total Material & Installation Cost	$0.00	$0.00
HAZARDOUS MATERIAL DISPOSAL COST			
24	Total # Haz.Mat. Ballasts To Be Disposed	0	
25	Total # Lamps	0	
26	Total Cost for Disposal	$0.00	$0.00
PROJECT COST			
27	Including Costs - Before Rebates	$0.00	$0.00
28	Total Rebates	$0.00	$0.00
29	Including Costs - After Rebates	$0.00	$0.00
ANNUAL BILL SAVINGS			
30	Calculated Bill Savings	$0.00	$0.00
31	Payback Before Rebates (Years)	0.0	0.0
32	Payback After Rebates (Years)	0.0	0.0

Town Ice Arena

	Town Ice Arena ***Operation & Maintenance***	Activity # 1	Activity # 2	Activity # 3	Activity # 4	Activity # 5	Activity # 6	Activity # 7
1	Existing Equipment	3-F32T8/1-EB	3-F32T8/1-EB	1-MH1000/1-EMB	1-MH400/1-EMB	1-F32T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB
2	Replacement Equipment	2-F28T8/1-NEB/RETRO/REFL	2-F28T8/0.5-NEB/RETRO/REFL	8-F54HOT5/2-NEB/REFIX/P	4-F54HOT5/1-NEB/REFIX/P	Leave as is	Leave as is	Leave as is
3	fixture code	CT8-RFLB	CT8-RFLB-2T	MH1000-HT5	MH400-DT5	Z-AT8W	Z-BT8	Z-BT8WL
	Current Lamps							
4	Lamps Per Fixture	3	3	1	1	0	0	0
5	Annual Run Hours	3,010	3,010	3,010	3,010	2,572	3,010	3,010
6	Cost Per Lamp	$2.10	$2.10	$24.00	$24.00	$0.00	$0.00	$0.00
7	Lamp Life (hours)	20000	20000	24000	24000	0	0	0
8	Number of fixtures	3	2	30	5	97	2	1
9	Maintenance Cost Per Year	$2.84	$1.90	$90.31	$15.05	$0.00	$0.00	$0.00
	Proposed Lamps							
10	Lamps Per Fixture	2	2	8	4	0	0	0
11	Annual Run Hours	3,010	3,010	3,010	3,010	2,572	3,010	3,010
12	Cost Per Lamp	$2.10	$2.10	$4.00	$4.00	0	0	0
13	Lamp Life (hours)	20000	20000	24000	24000	0	0	0
14	Number of fixtures	3	2	30	5	97	2	1
15	Maintenance Cost Per Year	$1.90	$1.26	$120.42	$10.03	$0.00	$0.00	$0.00
	Total Savings							
16	Maintenance Savings	$0.95	$0.63	-$30.10	$5.02	$0.00	$0.00	$0.00

	Current Ballasts							
17	Ballasts Per Fixture	1	1	1	1	0	0	0
18	Annual Run Hours	3,010	3,010	3,010	3,010	2,572	3,010	3,010
19	Cost Per Ballast	$15.80	$15.80	$65.00	$65.00	$0.00	$0.00	$0.00
20	Ballast Life (hours)	50000	50000	50000	50000	0	0	0
21	Number of fixtures	3	2	30	5	97	2	1
22	Maintenance Cost Per Year	$2.85	$1.90	$117.41	$19.57	$0.00	$0.00	$0.00
	Proposed Ballasts							
23	Ballasts Per Fixture	1	0.5	2	1	0	0	0
24	Annual Run Hours	3,010	3,010	3,010	3,010	2,572	3,010	3,010
25	Cost Per Ballast	$14.25	$16.88	$16.88	$16.88	$0.00	$0.00	$0.00
26	Ballast Life (hours)	50000	50000	50000	50000	0	0	0
27	Number of fixtures	3	2	30	5	97	2	1
28	Maintenance Cost Per Year	$2.57	$1.02	$60.98	$5.08	$0.00	$0.00	$0.00
	Total Savings							
29	Maintenance Savings	$0.28	$0.89	$56.43	$14.49	$0.00	$0.00	$0.00

Town Ice Arena

Town Ice Arena ***Operation & Maintenance***		Activity # 8	Activity # 9
1	Existing Equipment	4-F32T8/1-EB	SENSORS
2	Replacement Equipment	Leave as is	
3	fixture code	Z-DT8I	0
Current Lamps			
4	Lamps Per Fixture	0	
5	Annual Run Hours	860	
6	Cost Per Lamp	$0.00	
7	Lamp Life (hours)	0	
8	Number of fixtures	8	
9	Maintenance Cost Per Year	$0.00	
Proposed Lamps			
10	Lamps Per Fixture	0	
11	Annual Run Hours	860	
12	Cost Per Lamp	0	
13	Lamp Life (hours)	0	
14	Number of fixtures	8	
15	Maintenance Cost Per Year	$0.00	
Total Savings			
16	Maintenance Savings	$0.00	

Current Ballasts			
17	Ballasts Per Fixture	0	
18	Annual Run Hours	860	
19	Cost Per Ballast	$0.00	
20	Ballast Life (hours)	0	
21	Number of fixtures	8	
22	Maintenance Cost Per Year	$0.00	
Proposed Ballasts			
23	Ballasts Per Fixture	0	
24	Annual Run Hours	860	
25	Cost Per Ballast	$0.00	
26	Ballast Life (hours)	0	
27	Number of fixtures	8	
28	Maintenance Cost Per Year	$0.00	
Total Savings			
29	Maintenance Savings	$0.00	

Town of Hamburg
Lighting Retrofit
Town Hall

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

19-Aug-10

Savings		
Annual Demand Savings	50.6	kW/Year
Electrical Energy Savings	8,826	kWh/Year
Fossil Fuel Savings	(8)	mmBtu/Year
Environmental CO_2 Gas Savings(1)	6,467	Lbs./Year
Operational & Maintenance Savings	$33	Per Year
Energy Savings ($)	$922	Per Year
Total Energy & O&M Savings	$955	Per Year
Project Costs		
Total Measure Cost	$23,919	
Payback		
Simple Payback	25.0	Year(s)
Potential Incentives	$1,059	
Simple Payback with Incentives	22.5	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

13,239 lbs of coal (Saved)
19 lbs of Nox gas reduced
54 lbs of SO2 gas reduced

Equivalent Savings (1 year)

1.18 passenger cars (Reduced)
15.04 barrels of oil (Saved)
0.59 houses energy use for 1 year
165.82 number of trees planted

Town of Hamburg

Town Hall

	Description	
Fixture Code	Existing	Proposed
BU-RFL(CCC)	2, U-shaped 32W T8 Fluorescent Lamps 1 Electronic Ballast	Retrofit with 3, 15W T8 Fluorescent Lamps 1 New Electronic Ballast + Reflector Kit
DT8-RFL(C)	4, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Retrofit and Delamp 3, 28W T8 Fluorescent Lamps 1 New Electronic Ballast + Reflector Kit
Z-B(CFDRM)	2, 17W Compact Fluorescent Lamps Drum Surface	Leave as is
ZBBBT8	2, 20W T12 Fluorescent Lamps 1 Standard Magnetic Ballast	Leave as is
ZBT8	2, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
ZCT8	3, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
ZDT8	4, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is

Town Hall

	LIGHTING DESCRIPTION	Activity # 1	Activity # 2	Activity # 3	Activity # 4	Activity # 5	Activity # 6	Activity # 7	Activity # 8	Activity # 9
1	Existing Equipment	2-F32T8/1-EB	4-F32T8/1-EB	2-CF17W/DRM	2-F20T12/1-SMB	2-F32T8/1-EB	3-F32T8/1-EB	4-F32T8/1-EB	SENSORS	
2	Replacement Equipment	3-F15T8/1-EB/RETRO/REFL	3-F28T8/1-EB/RETRO/REFL	Leave as is	Leave as is	Leave as is	Leave as is	Leave as is		
3	fixture code	BU-RFL(CCC)	DT8-RFL(C)	Z-B(CFDRM)	ZBBBT8	ZBT8	ZCT8	ZDT8	0	0
4	Floor/Room	0	0	0	0	0	0	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0	0	0	0	0	0	0
6	Min. Required Lighting Level for Task									
7	Total Annual Hours	1,955	2,212	936	3,276	2,303	1,805	936	0	
CONNECTED KW/LUMINAIRE										
8	Existing Luminaire kW	0.058	0.112	0.037	0.047	0.074	0.088	0.114		
9	New Luminaire kW	0.039	0.075	0.037	0.047	0.074	0.088	0.114		
KW/KWH SAVINGS										
10	# of Existing Units	101	62	1	11	64	28	1	0	
11	# of New Units	101	62	1	11	64	28	1	0	
12	Total Existing Connected kW	5.858	6.944	0.037	0.514	4.728	2.464	0.114	0.000	
13	Total New Connected kW	3.939	4.650	0.037	0.514	4.728	2.464	0.114	0.000	
14	Total Customer Monthly kW Savings	1.919	2.294	0.000	0.000	0.000	0.000	0.000	0.000	
15	Total Existing Annual kWh	11454.768	15357.888	35.006	1684.683	10890.653	4447.872	106.704	0.000	
16	Total New Annual kWh	7702.344	10284.300	35.006	1684.683	10890.653	4447.872	106.704	0.000	
17	Total Customer Annual kWh Savings	3752	5074	0	0	0	0	0	0	
MEASURE INSTALLATION COST										
18	Material Cost Each	$50.47	$49.72	$0.00	$0.00	$0.00	$0.00	$0.00		
19	Installation Cost Each	$47.81	$55.87	$0.00	$0.00	$0.00	$0.00	$0.00		$0.00
20	Total Material & Installation Cost Each	$98.28	$105.59	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
21	Total Material Cost	$5,097.47	$3,082.64	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
22	Total Installation Cost	$4,828.81	$3,463.94	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$9,926.28	$6,546.58	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
HAZARDOUS MATERIAL DISPOSAL COST										
24	Total # Haz.Mat. Ballasts To Be Disposed	101	62	0	0	0	0	0		
25	Total # Lamps	202	248	0	0	0	0	0		
26	Total Cost for Disposal	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
PROJECT COST										
27	Including Costs - Before Rebates	$13,102.69	$8,641.49	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
28	Total Rebates	$1,515.00	$930.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
29	Including Costs - After Rebates	$11,587.69	$7,711.49	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
ANNUAL BILL SAVINGS										
30	Calculated Bill Savings	$403.24	$519.24	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
31	Payback Before Rebates (Years)	32.5	16.6	0.0	0.0	0.0	0.0	0.0	0.0	
32	Payback After Rebates (Years)	28.7	14.9	0.0	0.0	0.0	0.0	0.0	0.0	

Town Hall

	Town Hall ***Operation & Maintenance***	Activity # 1	Activity # 2	Activity # 3	Activity # 4	Activity # 5	Activity # 6	Activity # 7	Activity # 8	Activity # 9
1	Existing Equipment	2-F32T8/1-EB	4-F32T8/1-EB	2-CF17W/DRM	2-F20T12/1-SMB	2-F32T8/1-EB	3-F32T8/1-EB	4-F32T8/1-EB	SENSORS	
2	Replacement Equipment	3-F15T8/1-EB/RETRO/REFL	3-F28T8/1-EB/RETRO/REFL	Leave as is	Leave as is	Leave as is	Leave as is	Leave as is		
3	fixture code	BU-RFL(CCC)	DT8-RFL(C)	Z-B(CFDRM)	ZBBBT8	ZBT8	ZCT8	ZDT8	0	0
	Current Lamps									
4	Lamps Per Fixture	2	4	0	0	0	0	0		
5	Annual Run Hours	1,955	2,212	936	3,276	2,303	1,805	936		
6	Cost Per Lamp	$2.10	$2.10	$0.00	$0.00	$0.00	$0.00	$0.00		
7	Lamp Life (hours)	20000	20000	0	0	0	0	0		
8	Number of fixtures	101	62	1	11	64	28	1		
9	Maintenance Cost Per Year	$41.47	$57.59	$0.00	$0.00	$0.00	$0.00	$0.00		
	Proposed Lamps									
10	Lamps Per Fixture	3	3	0	0	0	0	0		
11	Annual Run Hours	1,955	2,212	936	3,276	2,303	1,805	936		
12	Cost Per Lamp	$2.35	$2.10	0	0	0	0	0		
13	Lamp Life (hours)	20000	20000	0	0	0	0	0		
14	Number of fixtures	101	62	1	11	64	28	1		
15	Maintenance Cost Per Year	$69.62	$43.19	$0.00	$0.00	$0.00	$0.00	$0.00		
	Total Savings									
16	Maintenance Savings	-$28.14	$14.40	$0.00	$0.00	$0.00	$0.00	$0.00		

	Current Ballasts									
17	Ballasts Per Fixture	1	1	0	0	0	0	0		
18	Annual Run Hours	1,955	2,212	936	3,276	2,303	1,805	936		
19	Cost Per Ballast	$14.25	$16.88	$0.00	$0.00	$0.00	$0.00	$0.00		
20	Ballast Life (hours)	50000	50000	0	0	0	0	0		
21	Number of fixtures	101	62	1	11	64	28	1		
22	Maintenance Cost Per Year	$56.29	$46.29	$0.00	$0.00	$0.00	$0.00	$0.00		
	Proposed Ballasts									
23	Ballasts Per Fixture	1	1	0	0	0	0	0		
24	Annual Run Hours	1,955	2,212	936	3,276	2,303	1,805	936		
25	Cost Per Ballast	$14.25	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00		
26	Ballast Life (hours)	50000	50000	0	0	0	0	0		
27	Number of fixtures	101	62	1	11	64	28	1		
28	Maintenance Cost Per Year	$56.29	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00		
	Total Savings									
29	Maintenance Savings	$0.00	$46.29	$0.00	$0.00	$0.00	$0.00	$0.00		

Town of Hamburg
Lighting Retrofit
Buildings & Grounds

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

18-Aug-10

Savings		
Annual Demand Savings	144.2	kW/Year
Electrical Energy Savings	35,067	kWh/Year
Fossil Fuel Savings	(30)	mmBtu/Year
Environmental CO_2 Gas Savings(1)	25,694	Lbs./Year
Operational & Maintenance Savings	$150	Per Year
Energy Savings ($)	$3,517	Per Year
Total Energy & O&M Savings	$3,667	Per Year
Project Costs		
Total Measure Cost	$26,876	
Payback		
Simple Payback	7.3	Year(s)
Potential Incentives	$4,208	
Simple Payback with Incentives	6.2	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

52,600 lbs of coal (Saved)
74 lbs of Nox gas reduced
215 lbs of SO2 gas reduced

Equivalent Savings (1 year)

4.71 passenger cars (Reduced)
59.75 barrels of oil (Saved)
2.34 houses energy use for 1 year
658.83 number of trees planted

Town of Hamburg

Buildings and Grounds

	Description	
Fixture Code	Existing	Proposed
B8	2 96W T12 Fluorescent Lamps 1 Standard Magnetic Ballast	Retrofit with 4, 28W T8 Fluorescent Lamps 1 New Electronic Ballast
DT8TR-RFLC	4 32W T8 Fluorescent Lamps 1 Electronic Ballast 2x4 Troffer	Retrofit and Delamp 3, 28W T8 Fluorescent Lamps 1 New Electronic Ballast + Reflector Kit
I60FLD	60W Incandescent Lamps Flood	20 W
MH400-B8I	1, 400W Metal Halide 1 Electronic Ballast	Refixture 2, 32W T8 Fluorescent Lamps 1 New Electronic Ballast
MH400-FT8	1, 400W Metal Halide 1 Electronic Ballast	Refixture 6, 32W T8 Fluorescent Lamps 1 New Electronic Ballast
MH400-Remove	1, 400W Metal Halide 1 Electronic Ballast	Remove Fixture
Z-B(A)T8I	1, 32W T8 Fluorescent Lamp 1 Electronic Ballast	Leave as is
Z-BBBT8	2, 17W T8 Fluorescent Lamp 1 Electronic Ballast	Leave as is
Z-BT8I	2, 32W T8 Fluorescent Lamp 1 Electronic Ballast	Leave as is
Z-BT8I8	2 96W T12 Fluorescent Lamps 1 Standard Magnetic Ballast	Leave as is
Z-CF	20W Compact Fluorescent Lamps	Leave as is
Z-DT8I8	4, 32W T8 Fluorescent Lamp 1 Electronic Ballast	Leave as is

Buildings & Grounds

	LIGHTING DESCRIPTION	Activity # 1	Activity # 2	Activity # 3	Activity # 4	Activity # 5	Activity # 6	Activity # 7	Activity # 8
1	Existing Equipment	2-F96T12/1-SMB	4-F32T8/1-EB	INC 60W	1-MH400/1-EMB	1-MH400/1-EMB	1-MH400/1-EMB	1-F32T8/1-EB	2-F17T8/1-EB
2	Replacement Equipment	4-F28T8/1-NEB/RETRO	3-F28T8/1-NEB/RETRO/REFL	1-R40-20W	2-F32T8/1-NEB/REFIX/8'IND	6-F32T8/1-NEB/REFIX	Remove	Leave as is	Leave as is
3	fixture code	B8	DT8TR-RFLC	I60FLD	MH400-B8I	MH400-FT8	MH400-Remove	Z-B(A)T8I	Z-BBBT8
4	Floor/Room	0	0	0	0	0	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0	0	0	0	0	0
6	Min. Required Lighting Level for Task								
7	Total Annual Hours	1,720	1,720	1,720	3,010	3,010	3,010	1,720	1,720
CONNECTED KW/LUMINAIRE									
8	Existing Luminaire kW	0.136	0.114	0.060	0.460	0.460	0.460	0.032	0.033
9	New Luminaire kW	0.098	0.072	0.023	0.054	0.221	0.000	0.032	0.033
KW/KWH SAVINGS									
10	# of Existing Units	2	16	3	6	34	2	1	29
11	# of New Units	2	16	3	12	34	0	1	29
12	Total Existing Connected kW	0.271	1.824	0.180	2.760	15.640	0.920	0.032	0.957
13	Total New Connected kW	0.196	1.152	0.069	0.648	7.514	0.000	0.032	0.957
14	Total Customer Monthly kW Savings	0.075	0.672	0.111	2.112	8.126	0.920	0.000	0.000
15	Total Existing Annual kWh	466.189	3137.744	309.646	8308.828	47083.359	2769.609	55.048	1646.283
16	Total New Annual kWh	337.170	1981.733	118.698	1950.768	22620.483	0.000	55.048	1646.283
17	Total Customer Annual kWh Savings	129	1156	191	6358	24463	2770	0	0
MEASURE INSTALLATION COST									
18	Material Cost Each	$25.28	$53.86	$18.00	$135.89	$212.60	$0.00	$0.00	$0.00
19	Installation Cost Each	$54.98	$54.98	$20.00	$105.71	$200.00	$100.00	$0.00	$0.00
20	Total Material & Installation Cost Each	$80.26	$108.84	$38.00	$241.59	$412.60	$0.00	$0.00	$0.00
21	Total Material Cost	$50.56	$861.81	$54.00	$1,630.64	$7,228.40	$0.00	$0.00	$0.00
22	Total Installation Cost	$109.96	$879.70	$60.00	$634.25	$6,800.00	$200.00	$0.00	$0.00
23	Total Material & Installation Cost	$160.52	$1,741.51	$114.00	$2,264.89	$14,028.40	$200.00	$0.00	$0.00
HAZARDOUS MATERIAL DISPOSAL COST									
24	Total # Haz.Mat. Ballasts To Be Disposed	2	16	0	6	34	2	0	0
25	Total # Lamps	4	64	3	6	34	2	0	0
26	Total Cost for Disposal	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
PROJECT COST									
27	Including Costs - Before Rebates	$211.89	$2,298.80	$150.48	$2,989.65	$18,517.49	$264.00	$0.00	$0.00
28	Total Rebates	$30.00	$240.00	$0.00	$120.00	$2,550.00	$0.00	$0.00	$0.00
29	Including Costs - After Rebates	$181.89	$2,058.80	$150.48	$2,869.65	$15,967.49	$264.00	$0.00	$0.00
ANNUAL BILL SAVINGS									
30	Calculated Bill Savings	$17.75	$159.01	$26.27	$696.38	$2,679.36	$303.35	$0.00	$0.00
31	Payback Before Rebates (Years)	11.9	14.5	5.7	4.3	6.9	0.9	0.0	0.0
32	Payback After Rebates (Years)	10.2	12.9	5.7	4.1	6.0	0.9	0.0	0.0

Buildings & Grounds

	LIGHTING DESCRIPTION	Activity # 9	Activity # 10	Activity # 11	Activity # 12
1	Existing Equipment	2-F32T8/1-EB	2-F96T12/1-SMB	CF 20W	4-F32T8/1-EB
2	Replacement Equipment	Leave as is	Leave as is	Leave as is	Leave as is
3	fixture code	Z-BT8I	Z-BT8I8	Z-CF	Z-DT8I8
4	Floor/Room	0	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0	0
6	Min. Required Lighting Level for Task				
7	Total Annual Hours	1,720	1,720	2,365	1,630
CONNECTED KW/LUMINAIRE					
8	Existing Luminaire kW	0.058	0.118	0.023	0.236
9	New Luminaire kW	0.058	0.118	0.023	0.236
KW/KWH SAVINGS					
10	# of Existing Units	2	6	6	19
11	# of New Units	2	6	6	19
12	Total Existing Connected kW	0.116	0.708	0.138	4.484
13	Total New Connected kW	0.116	0.708	0.138	4.484
14	Total Customer Monthly kW Savings	0.000	0.000	0.000	0.000
15	Total Existing Annual kWh	199.549	1217.940	326.418	7307.640
16	Total New Annual kWh	199.549	1217.940	326.418	7307.640
17	Total Customer Annual kWh Savings	0	0	0	0
MEASURE INSTALLATION COST					
18	Material Cost Each		$0.00	$0.00	$0.00
19	Installation Cost Each		$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each	$0.00	$0.00	$0.00	$0.00
21	Total Material Cost	$0.00	$0.00	$0.00	$0.00
22	Total Installation Cost	$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$0.00	$0.00	$0.00	$0.00
HAZARDOUS MATERIAL DISPOSAL COST					
24	Total # Haz.Mat. Ballasts To Be Disposed	0	0	0	0
25	Total # Lamps	0	0	0	0
26	Total Cost for Disposal	$0.00	$0.00	$0.00	$0.00
PROJECT COST					
27	Including Costs - Before Rebates	$0.00	$0.00	$0.00	$0.00
28	Total Rebates	$0.00	$0.00	$0.00	$0.00
29	Including Costs - After Rebates	$0.00	$0.00	$0.00	$0.00
ANNUAL BILL SAVINGS					
30	Calculated Bill Savings	$0.00	$0.00	$0.00	$0.00
31	Payback Before Rebates (Years)	0.0	0.0	0.0	0.0
32	Payback After Rebates (Years)	0.0	0.0	0.0	0.0

Buildings & Grounds

	Buildings & Grounds ***Operation & Maintenance***	Activity # 1	Activity # 2	Activity # 3	Activity # 4	Activity # 5	Activity # 6	Activity # 7	Activity # 8
1	Existing Equipment	2-F96T12/1-SMB	4-F32T8/1-EB	INC 60W	1-MH400/1-EMB	1-MH400/1-EMB	1-MH400/1-EMB	1-F32T8/1-EB	2-F17T8/1-EB
2	Replacement Equipment	4-F28T8/1-NEB/RETRO	3-F28T8/1-NEB/RETRO/REFL	1-R40-20W	2-F32T8/1-NEB/REFIX/8'IND	6-F32T8/1-NEB/REFIX	Remove	Leave as is	Leave as is
3	fixture code	B8	DT8TR-RFLC	I60FLD	MH400-B8I	MH400-FT8	MH400-Remove	Z-B(A)T8I	Z-BBBT8
	Current Lamps								
4	Lamps Per Fixture	2	4	1	1	1	1	0	0
5	Annual Run Hours	1,720	1,720	1,720	3,010	3,010	3,010	1,720	1,720
6	Cost Per Lamp	$4.20	$2.10	$1.00	$24.00	$24.00	$24.00	$0.00	$0.00
7	Lamp Life (hours)	12000	20000	1000	24000	24000	24000	0	0
8	Number of fixtures	2	16	3	6	34	2	1	29
9	Maintenance Cost Per Year	$2.41	$11.56	$5.16	$18.06	$102.36	$6.02	$0.00	$0.00
	Proposed Lamps								
10	Lamps Per Fixture	4	3	1	2	6	0	0	0
11	Annual Run Hours	1,720	1,720	1,720	3,010	3,010	3,010	1,720	1,720
12	Cost Per Lamp	$2.10	$2.10	$18.00	$2.10	$2.10	0	0	0
13	Lamp Life (hours)	20000	20000	10000	24000	24000	0	0	0
14	Number of fixtures	2	16	3	12	34	0	1	29
15	Maintenance Cost Per Year	$1.45	$8.67	$9.29	$6.32	$53.74	$0.00	$0.00	$0.00
	Total Savings								
16	Maintenance Savings	$0.96	$2.89	-$4.13	$11.74	$48.62	$6.02	$0.00	$0.00

	Current Ballasts								
17	Ballasts Per Fixture	1	1	0	1	1	1	0	0
18	Annual Run Hours	1,720	1,720	1,720	3,010	3,010	3,010	1,720	1,720
19	Cost Per Ballast	$15.00	$16.88	$0.00	$65.00	$65.00	$65.00	$0.00	$0.00
20	Ballast Life (hours)	50000	50000	0	50000	50000	50000	0	0
21	Number of fixtures	2	16	3	6	34	2	1	29
22	Maintenance Cost Per Year	$1.03	$9.29	$0.00	$23.48	$133.06	$7.83	$0.00	$0.00
	Proposed Ballasts								
23	Ballasts Per Fixture	1	1	0	1	2	0	0	0
24	Annual Run Hours	1,720	1,720	1,720	3,010	3,010	3,010	1,720	1,720
25	Cost Per Ballast	$16.88	$14.25	$0.00	$16.88	$16.88	$0.00	$0.00	$0.00
26	Ballast Life (hours)	50000	50000	0	50000	50000	0	0	0
27	Number of fixtures	2	16	3	12	34	0	1	29
28	Maintenance Cost Per Year	$1.16	$7.84	$0.00	$12.20	$69.11	$0.00	$0.00	$0.00
	Total Savings								
29	Maintenance Savings	-$0.13	$1.45	$0.00	$11.29	$63.95	$7.83	$0.00	$0.00

Buildings & Grounds

	Buildings & Grounds ***Operation & Maintenance***	Activity # 9	Activity # 10	Activity # 11	Activity # 12
1	Existing Equipment	2-F32T8/1-EB	2-F96T12/1-SMB	CF 20W	4-F32T8/1-EB
2	Replacement Equipment	Leave as is	Leave as is	Leave as is	Leave as is
3	fixture code	Z-BT8I	Z-BT8I8	Z-CF	Z-DT8I8
	Current Lamps				
4	Lamps Per Fixture	0	0	0	0
5	Annual Run Hours	1,720	1,720	2,365	1,630
6	Cost Per Lamp	$0.00	$0.00	$0.00	$0.00
7	Lamp Life (hours)	0	0	0	0
8	Number of fixtures	2	6	6	19
9	Maintenance Cost Per Year	$0.00	$0.00	$0.00	$0.00
	Proposed Lamps				
10	Lamps Per Fixture	0	0	0	0
11	Annual Run Hours	1,720	1,720	2,365	1,630
12	Cost Per Lamp	0	0	0	0
13	Lamp Life (hours)	0	0	0	0
14	Number of fixtures	2	6	6	19
15	Maintenance Cost Per Year	$0.00	$0.00	$0.00	$0.00
	Total Savings				
16	Maintenance Savings	$0.00	$0.00	$0.00	$0.00

	Current Ballasts				
17	Ballasts Per Fixture	0	0	0	0
18	Annual Run Hours	1,720	1,720	2,365	1,630
19	Cost Per Ballast	$0.00	$0.00	$0.00	$0.00
20	Ballast Life (hours)	0	0	0	0
21	Number of fixtures	2	6	6	19
22	Maintenance Cost Per Year	$0.00	$0.00	$0.00	$0.00
	Proposed Ballasts				
23	Ballasts Per Fixture	0	0	0	0
24	Annual Run Hours	1,720	1,720	2,365	1,630
25	Cost Per Ballast	$0.00	$0.00	$0.00	$0.00
26	Ballast Life (hours)	0	0	0	0
27	Number of fixtures	2	6	6	19
28	Maintenance Cost Per Year	$0.00	$0.00	$0.00	$0.00
	Total Savings				
29	Maintenance Savings	$0.00	$0.00	$0.00	$0.00

Town of Hamburg
Lighting Retrofit
Golf Course Pro Shop

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

19-Aug-10

Savings		
Annual Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	0	mmBtu/Year
Environmental CO_2 Gas Savings(1)	0	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$0	Per Year
Total Energy & O&M Savings	$0	Per Year
Project Costs		
Total Measure Cost	$0	
Payback		
Simple Payback	-	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	0.0	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

0.00 passenger cars (Reduced)
0.00 barrels of oil (Saved)
0.00 houses energy use for 1 year
0.00 number of trees planted

Town of Hamburg

Golf Course Pro Shop

	Description	
Fixture Code	Existing	Proposed
Z-AT8W	1 32W T8 Fluorescent Lamps 1 Electronic Ballast Wrap	Leave as is
Z-BBBT8TR	2, 17W T8 Fluorescent Lamp 1 Electronic Ballast 2x4 Troffer	Leave as is
Z-BT8TR	2 32W T8 Fluorescent Lamps 1 Electronic Ballast 2x4 Troffer	Leave as is
Z-BT8TR1	2, 32W T8 Fluorescent Lamps 1 Electronic Ballast 1x4 Troffer	Leave as is
Z-BT8W	2, 32W T8 Fluorescent Lamps 1 Electronic Ballast Wrap	Leave as is
Z-CF	20W Compact Fluorescent Lamps	Leave as is

Town of Hamburg
Lighting Retrofit
Golf Course Maintenance Garage

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

18-Aug-10

Savings		
Annual Demand Savings	0.6	kW/Year
Electrical Energy Savings	82	kWh/Year
Fossil Fuel Savings	(0)	mmBtu/Year
Environmental CO_2 Gas Savings(1)	60	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$10	Per Year
Total Energy & O&M Savings	$10	Per Year
Project Costs		
Total Measure Cost	$80	
Payback		
Simple Payback	8.4	Year(s)
Potential Incentives	$15	
Simple Payback with Incentives	6.9	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

123 lbs of coal (Saved)
0 lbs of Nox gas reduced
1 lbs of SO2 gas reduced

Equivalent Savings (1 year)

0.01 passenger cars (Reduced)
0.14 barrels of oil (Saved)
0.01 houses energy use for 1 year
1.54 number of trees planted

Town of Hamburg

Golf Course Maintenance Garage

	Description	
Fixture Code	Existing	Proposed
BI	2 40W T12 Fluorescent Lamps 1 Standard Magnetic Ballast	Retrofit with 2, 32W T8 Fluorescent Lamps 1 New Electronic Ballast
Z-BT8I	2 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
Z-DT8TI	4 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is

Golf Course Maintenance Garage

	LIGHTING DESCRIPTION	Activity # 1	Activity # 2	Activity # 3
1	Existing Equipment	2-F40T12/1-SMB	2-F32T8/1-EB	4-F32T8/1-EB
2	Replacement Equipment	2-F32T8/1-EB/RETRO	Leave as is	Leave as is
3	fixture code	BI	Z-BT8I	Z-DT8TI
4	Floor/Room	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0
6	Min. Required Lighting Level for Task			
7	Total Annual Hours	1,720	1,720	1,720
CONNECTED KW/LUMINAIRE				
8	Existing Luminaire kW	0.074	0.058	0.114
9	New Luminaire kW	0.058	0.058	0.114
KW/KWH SAVINGS				
10	# of Existing Units	3	4	8
11	# of New Units	3	4	8
12	Total Existing Connected kW	0.222	0.232	0.912
13	Total New Connected kW	0.174	0.232	0.912
14	Total Customer Monthly kW Savings	0.048	0.000	0.000
15	Total Existing Annual kWh	381.251	399.099	1568.872
16	Total New Annual kWh	299.324	399.099	1568.872
17	Total Customer Annual kWh Savings	82	0	0
MEASURE INSTALLATION COST				
18	Material Cost Each	$18.45	$0.00	$0.00
19	Installation Cost Each	$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each	$0.00	$0.00	$0.00
21	Total Material Cost	$55.35	$0.00	$0.00
22	Total Installation Cost	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$55.35	$0.00	$0.00
HAZARDOUS MATERIAL DISPOSAL COST				
24	Total # Haz.Mat. Ballasts To Be Disposed	3	0	0
25	Total # Lamps	6	0	0
26	Total Cost for Disposal	$0.00	$0.00	$0.00
PROJECT COST				
27	Including Costs - Before Rebates	$73.06	$0.00	$0.00
28	Total Rebates	$0.00	$0.00	$0.00
29	Including Costs - After Rebates	$73.06	$0.00	$0.00
ANNUAL BILL SAVINGS				
30	Calculated Bill Savings	$9.60	$0.00	$0.00
31	Payback Before Rebates (Years)	7.6	0.0	0.0
32	Payback After Rebates (Years)	7.6	0.0	0.0

Golf Course Maintenance Garage

Golf Course Maintenance Garage ***Operation & Maintenance***		Activity # 1	Activity # 2	Activity # 3
1	Existing Equipment	2-F40T12/1-SMB	2-F32T8/1-EB	4-F32T8/1-EB
2	Replacement Equipment	2-F32T8/1-EB/RETRO	Leave as is	Leave as is
3	fixture code	BI	Z-BT8I	Z-DT8TI
Current Lamps				
4	Lamps Per Fixture	2	0	0
5	Annual Run Hours	1,720	1,720	1,720
6	Cost Per Lamp	$2.10	$0.00	$0.00
7	Lamp Life (hours)	20000	0	0
8	Number of fixtures	3	4	8
9	Maintenance Cost Per Year	$1.08	$0.00	$0.00
Proposed Lamps				
10	Lamps Per Fixture	2	0	0
11	Annual Run Hours	1,720	1,720	1,720
12	Cost Per Lamp	$2.10	0	0
13	Lamp Life (hours)	20000	0	0
14	Number of fixtures	3	4	8
15	Maintenance Cost Per Year	$1.08	$0.00	$0.00
Total Savings				
16	Maintenance Savings	$0.00	$0.00	$0.00

Current Ballasts				
17	Ballasts Per Fixture	1	0	0
18	Annual Run Hours	1,720	1,720	1,720
19	Cost Per Ballast	$14.25	$0.00	$0.00
20	Ballast Life (hours)	50000	0	0
21	Number of fixtures	3	4	8
22	Maintenance Cost Per Year	$1.47	$0.00	$0.00
Proposed Ballasts				
23	Ballasts Per Fixture	1	0	0
24	Annual Run Hours	1,720	1,720	1,720
25	Cost Per Ballast	$14.25	$0.00	$0.00
26	Ballast Life (hours)	50000	0	0
27	Number of fixtures	3	4	8
28	Maintenance Cost Per Year	$1.47	$0.00	$0.00
Total Savings				
29	Maintenance Savings	$0.00	$0.00	$0.00

Town of Hamburg
Lighting Retrofit
Highway Offices

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

19-Aug-10

Savings		
Annual Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	0	mmBtu/Year
Environmental CO_2 Gas Savings(1)	0	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$0	Per Year
Total Energy & O&M Savings	$0	Per Year
Project Costs		
Total Measure Cost	$0	
Payback		
Simple Payback	-	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	0.0	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

0.00 passenger cars (Reduced)
0.00 barrels of oil (Saved)
0.00 houses energy use for 1 year
0.00 number of trees planted

Town of Hamburg

Highway Department Office

	Description	
Fixture Code	Existing	Proposed
Z-AAAT8BA	1 20W T12 Fluorescent Lamp 1 Standard Magnetic Ballast	Leave as is
Z-AT8W	1 32W T8 Fluorescent Lamps 1 Electronic Ballast Wrap	Leave as is
Z-BBBT8TR	2, 17W T8 Fluorescent Lamp 1 Electronic Ballast 2x4 Troffer	Leave as is
Z-BT8TR	2 32W T8 Fluorescent Lamps 1 Electronic Ballast 2x4 Troffer	Leave as is
Z-BT8VAB	2 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is

Town of Hamburg
Lighting Retrofit
Highway Garage

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

19-Aug-10

Savings		
Annual Demand Savings	149.7	kW/Year
Electrical Energy Savings	37,543	kWh/Year
Fossil Fuel Savings	(32)	mmBtu/Year
Environmental CO_2 Gas Savings(1)	27,509	Lbs./Year
Operational & Maintenance Savings	$173	Per Year
Energy Savings ($)	$3,794	Per Year
Total Energy & O&M Savings	$3,967	Per Year
Project Costs		
Total Measure Cost	$26,816	
Payback		
Simple Payback	6.8	Year(s)
Potential Incentives	$4,505	
Simple Payback with Incentives	5.6	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

56,315 lbs of coal (Saved)
79 lbs of Nox gas reduced
231 lbs of SO2 gas reduced

Equivalent Savings (1 year)

5.04 passenger cars (Reduced)
63.97 barrels of oil (Saved)
2.50 houses energy use for 1 year
705.36 number of trees planted

Town of Hamburg

Highway Garage

	Description	
Fixture Code	Existing	Proposed
MH400-DI8	1, 400W Metal Halide 1 Electronic Ballast	Refixture 4, 32W T8 Fluorescent Lamps 1 New Electronic Ballast
MH400-FT8	1, 400W Metal Halide 1 Electronic Ballast	Refixture 6, 32W T8 Fluorescent Lamps 1 New Electronic Ballast
Z-BBBT8	2, 17W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
Z-BT8I	2, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
Z-BT8VAP	2, 32W T8 Fluorescent Lamps 1 Electronic Ballast Vapor Sealed	Leave as is
Z-CF	20W Compact Fluorescent Lamp	Leave as is
Z-DT8I8	4, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is

Highway Garage

	LIGHTING DESCRIPTION	Acivity # 1	Acivity # 2	Acivity # 3	Acivity # 4	Acivity # 5	Acivity # 6	Acivity # 7	Acivity # 8
1	Existing Equipment	1-MH400/1-EMB	1-MH400/1-EMB	2-F17T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB	CF 20W	4-F32T8/1-EB	SENSORS
2	Replacement Equipment	4-F32T8/1-NEB/REFIX/IND	6-F32T8/1-NEB/REFIX	Leave as is	Leave as is	Leave as is	Leave as is	Leave as is	
3	fixture code	MH400-DI8	MH400-FT8	Z-BBBT8	Z-BT8I	Z-BT8VAP	Z-CF	Z-DT8I8	0
4	Floor/Room	0	0	0	0	0	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0	0	0	0	0	0
6	Min. Required Lighting Level for Task								
7	Total Annual Hours	3,010	3,010	1,456	2,064	860	1,720	3,010	0
CONNECTED KW/LUMINAIRE									
8	Existing Luminaire kW	0.460	0.460	0.033	0.058	0.058	0.023	0.236	
9	New Luminaire kW	0.110	0.221	0.033	0.058	0.058	0.023	0.236	
KW/KWH SAVINGS									
10	# of Existing Units	9	39	13	10	2	4	15	0
11	# of New Units	9	39	13	10	2	4	15	0
12	Total Existing Connected kW	4.140	17.940	0.429	0.580	0.116	0.092	3.540	0.000
13	Total New Connected kW	0.990	8.619	0.429	0.580	0.116	0.092	3.540	0.000
14	Total Customer Monthly kW Savings	3.150	9.321	0.000	0.000	0.000	0.000	0.000	0.000
15	Total Existing Annual kWh	12463.242	54007.382	624.452	1197.297	99.775	158.263	10656.975	0.000
16	Total New Annual kWh	2980.340	25947.025	624.452	1197.297	99.775	158.263	10656.975	0.000
17	Total Customer Annual kWh Savings	9483	28060	0	0	0	0	0	0
MEASURE INSTALLATION COST									
18	Material Cost Each	$158.40	$212.60	$0.00	$0.00	$0.00	$0.00	$0.00	
19	Installation Cost Each	$105.71	$200.00	$0.00	$0.00	$0.00	$0.00	$0.00	
20	Total Material & Installation Cost Each	$264.11	$412.60	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
21	Total Material Cost	$1,425.60	$8,291.40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
22	Total Installation Cost	$951.37	$7,800.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$2,376.97	$16,091.40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
HAZARDOUS MATERIAL DISPOSAL COST									
24	Total # Haz.Mat. Ballasts To Be Disposed	9	39	0	0	0	0	0	
25	Total # Lamps	9	39	0	0	0	0	0	
26	Total Cost for Disposal	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
PROJECT COST									
27	Including Costs - Before Rebates	$3,137.60	$21,240.65	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
28	Total Rebates	$1,137.95	$3,367.24	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
29	Including Costs - After Rebates	$1,999.65	$17,873.41	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
ANNUAL BILL SAVINGS									
30	Calculated Bill Savings	$1,038.64	$3,073.38	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
31	Payback Before Rebates (Years)	3.0	6.9	0.0	0.0	0.0	0.0	0.0	0.0
32	Payback After Rebates (Years)	1.9	5.8	0.0	0.0	0.0	0.0	0.0	0.0

Highway Garage

	Highway Garage ***Operation & Maintenance***	Acivity # 1	Acivity # 2	Acivity # 3	Acivity # 4	Acivity # 5	Acivity # 6	Acivity # 7	Acivity # 8
1	Existing Equipment	1-MH400/1-EMB	1-MH400/1-EMB	2-F17T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB	CF 20W	4-F32T8/1-EB	SENSORS
2	Replacement Equipment	4-F32T8/1-NEB/REFIX/IND	6-F32T8/1-NEB/REFIX	Leave as is	Leave as is	Leave as is	Leave as is	Leave as is	
3	fixture code	MH400-DI8	MH400-FT8	Z-BBBT8	Z-BT8I	Z-BT8VAP	Z-CF	Z-DT8I8	0
	Current Lamps								
4	Lamps Per Fixture	1	1	0	0	0	0	0	
5	Annual Run Hours	3,010	3,010	1,456	2,064	860	1,720	3,010	
6	Cost Per Lamp	$24.00	$24.00	$0.00	$0.00	$0.00	$0.00	$0.00	
7	Lamp Life (hours)	24000	24000	0	0	0	0	0	
8	Number of fixtures	9	39	13	10	2	4	15	
9	Maintenance Cost Per Year	$27.09	$117.41	$0.00	$0.00	$0.00	$0.00	$0.00	
	Proposed Lamps								
10	Lamps Per Fixture	4	6	0	0	0	0	0	
11	Annual Run Hours	3,010	3,010	1,456	2,064	860	1,720	3,010	
12	Cost Per Lamp	$2.10	$2.10	0	0	0	0	0	
13	Lamp Life (hours)	24000	24000	0	0	0	0	0	
14	Number of fixtures	9	39	13	10	2	4	15	
15	Maintenance Cost Per Year	$9.48	$61.64	$0.00	$0.00	$0.00	$0.00	$0.00	
	Total Savings								
16	Maintenance Savings	$17.61	$55.77	$0.00	$0.00	$0.00	$0.00	$0.00	

	Current Ballasts								
17	Ballasts Per Fixture	1	1	0	0	0	0	0	
18	Annual Run Hours	3,010	3,010	1,456	2,064	860	1,720	3,010	
19	Cost Per Ballast	$65.00	$65.00	$0.00	$0.00	$0.00	$0.00	$0.00	
20	Ballast Life (hours)	50000	50000	0	0	0	0	0	
21	Number of fixtures	9	39	13	10	2	4	15	
22	Maintenance Cost Per Year	$35.22	$152.63	$0.00	$0.00	$0.00	$0.00	$0.00	
	Proposed Ballasts								
23	Ballasts Per Fixture	1	2	0	0	0	0	0	
24	Annual Run Hours	3,010	3,010	1,456	2,064	860	1,720	3,010	
25	Cost Per Ballast	$16.88	$16.88	$0.00	$0.00	$0.00	$0.00	$0.00	
26	Ballast Life (hours)	50000	50000	0	0	0	0	0	
27	Number of fixtures	9	39	13	10	2	4	15	
28	Maintenance Cost Per Year	$9.15	$79.27	$0.00	$0.00	$0.00	$0.00	$0.00	
	Total Savings								
29	Maintenance Savings	$26.08	$73.36	$0.00	$0.00	$0.00	$0.00	$0.00	

Town of Hamburg
Lighting Retrofit
Nike Base B&G

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

19-Aug-10

Savings		
Annual Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	0	mmBtu/Year
Environmental CO_2 Gas Savings(1)	0	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$0	Per Year
Total Energy & O&M Savings	$0	Per Year
Project Costs		
Total Measure Cost	$0	
Payback		
Simple Payback	-	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	0.0	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

0.00 passenger cars (Reduced)
0.00 barrels of oil (Saved)
0.00 houses energy use for 1 year
0.00 number of trees planted

Town of Hamburg

Nike Site / Buildings and Grounds

	Description	
Fixture Code	Existing	Proposed
Z-AT8W	1, 32W T8 Fluorescent Lamps 1 Electronic Ballast Wrap	Leave as is
Z-BBBT8	2, 17W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
Z-BT8	2, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
Z-BT8I8	2, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
Z-DT8I8	4, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is

Town of Hamburg
Lighting Retrofit
Recreation Buildings

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

19-Aug-10

Savings		
Annual Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	0	mmBtu/Year
Environmental CO_2 Gas Savings(1)	0	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$0	Per Year
Total Energy & O&M Savings	$0	Per Year
Project Costs		
Total Measure Cost	$0	
Payback		
Simple Payback	-	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	0.0	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

0.00 passenger cars (Reduced)
0.00 barrels of oil (Saved)
0.00 houses energy use for 1 year
0.00 number of trees planted

Town of Hamburg
Lighting Retrofit
Town Park Fitness Center

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

19-Aug-10

Savings		
Annual Demand Savings	2.1	kW/Year
Electrical Energy Savings	335	kWh/Year
Fossil Fuel Savings	(0)	mmBtu/Year
Environmental CO_2 Gas Savings(1)	245	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$37	Per Year
Total Energy & O&M Savings	$37	Per Year
Project Costs		
Total Measure Cost	$166	
Payback		
Simple Payback	4.5	Year(s)
Potential Incentives	$20	
Simple Payback with Incentives	4.0	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines

Environmental Savings From Annual Electric Reduction

502 lbs of coal (Saved)
1 lbs of Nox gas reduced
2 lbs of SO2 gas reduced

Equivalent Savings (1 year)

0.04 passenger cars (Reduced)
0.57 barrels of oil (Saved)
0.02 houses energy use for 1 year
6.29 number of trees planted

Town of Hamburg

Town Park Fitness Center

	Description	
Fixture Code	Existing	Proposed
BI	2, 40W T12 Fluorescent Lamps 1 Standard Magnetic Ballast	Retrofit with 2 28W T8 Fluorescent Lamps 1 New Electronic Ballast
I100BB	100W Incandescent Bare Bulbs	Single 20W Lamp
ZAT8W	1, 32W T8 Fluorescent Lamps 1 Electronic Ballast Wrap	Leave as is
ZBBBT8	2, 20W T12 Fluorescent Lamps 1 Standard Magnetic Ballast	Leave as is
ZBT8TR1	2, 32W T8 Fluorescent Lamps 1 Electronic Ballast 1x4 Troffer	Leave as is
Z-CF26	26W Compact Fluorescent Lamps	Leave as is
ZDT8	4, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
ZDT8TR	4, 40W T12 Fluorescent Lamps 2 Standard Magnetic Ballast 2x4 Troffer	Leave as is

Town Park Fitness Center

	LIGHTING DESCRIPTION	Activity # 1	Activity # 2	Activity # 3	Activity # 4	Activity # 5	Activity # 6	Activity # 7	Activity # 8	Activity # 9
1	Existing Equipment	2-F40T12/1-SMB	INC 100W	1-F32T8/1-EB	2-F20T12/1-SMB	2-F32T8/1-EB	CF 26W	4-F32T8/1-EB	4-F40T12/2-SMB	SENSORS
2	Replacement Equipment	2-F28T8/1-EB/RETRO	1-SLS-20W	Leave as is	Leave as is	Leave as is	Leave as is	Leave as is	Leave as is	
3	fixture code	BI	I100BB	ZAT8W	ZBBBT8	ZBT8TR1	Z-CF26	ZDT8	ZDT8TR	0
4	Floor/Room	0	0	0	0	0	0	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0	0	0	0	0	0	0
6	Min. Required Lighting Level for Task									
7	Total Annual Hours	1,872	1,872	1,872	2,574	3,276	3,276	936	2,995	0
	CONNECTED KW/LUMINAIRE									
8	Existing Luminaire kW	0.074	0.100	0.032	0.047	0.058	0.028	0.114	0.148	
9	New Luminaire kW	0.049	0.023	0.032	0.047	0.058	0.028	0.114	0.148	
	KW/KWH SAVINGS									
10	# of Existing Units	1	2	22	18	9	4	1	25	0
11	# of New Units	1	2	22	18	9	4	1	25	0
12	Total Existing Connected kW	0.074	0.200	0.704	0.842	0.522	0.112	0.114	3.694	0.000
13	Total New Connected kW	0.049	0.046	0.704	0.842	0.522	0.112	0.114	3.694	0.000
14	Total Customer Monthly kW Savings	0.025	0.154	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15	Total Existing Annual kWh	138.294	374.400	1317.888	2166.021	1710.072	366.912	106.704	11063.520	0.000
16	Total New Annual kWh	91.728	86.112	1317.888	2166.021	1710.072	366.912	106.704	11063.520	0.000
17	Total Customer Annual kWh Savings	47	288	0	0	0	0	0	0	0
	MEASURE INSTALLATION COST									
18	Material Cost Each	$18.45	$9.07	$0.00	$0.00	$0.00	$0.00	$0.00		
19	Installation Cost Each	$48.00	$15.00	$0.00	$0.00	$0.00	$0.00	$0.00		
20	Total Material & Installation Cost Each	$66.45	$24.07	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
21	Total Material Cost	$18.45	$18.14	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
22	Total Installation Cost	$48.00	$30.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$66.45	$48.14	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	HAZARDOUS MATERIAL DISPOSAL COST									
24	Total # Haz.Mat. Ballasts To Be Disposed	1	0	0	0	0	0	0	0	
25	Total # Lamps	2	2	0	0	0	0	0	0	
26	Total Cost for Disposal	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	PROJECT COST									
27	Including Costs - Before Rebates	$87.71	$63.54	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
28	Total Rebates	$20.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
29	Including Costs - After Rebates	$67.71	$63.54	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	ANNUAL BILL SAVINGS									
30	Calculated Bill Savings	$5.10	$31.55	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
31	Payback Before Rebates (Years)	17.2	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	Payback After Rebates (Years)	13.3	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Town Park Fitness Center

	Town Park Fitness Center ***Operation & Maintenance***	Activity # 1	Activity # 2	Activity # 3	Activity # 4	Activity # 5	Activity # 6	Activity # 7	Activity # 8	Activity # 9
1	Existing Equipment	2-F40T12/1-SMB	INC 100W	1-F32T8/1-EB	2-F20T12/1-SMB	2-F32T8/1-EB	CF 26W	4-F32T8/1-EB	4-F40T12/2-SMB	SENSORS
2	Replacement Equipment	2-F28T8/1-EB/RETRO	1-SLS-20W	Leave as is	Leave as is	Leave as is	Leave as is	Leave as is	Leave as is	
3	fixture code	BI	I100BB	ZAT8W	ZBBBT8	ZBT8TR1	Z-CF26	ZDT8	ZDT8TR	0
	Current Lamps									
4	Lamps Per Fixture	2	1	0	0	0	0	0	0	
5	Annual Run Hours	1,872	1,872	1,872	2,574	3,276	3,276	936	2,995	
6	Cost Per Lamp	$2.10	$1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
7	Lamp Life (hours)	20000	1000	0	0	0	0	0	0	
8	Number of fixtures	1	2	22	18	9	4	1	25	
9	Maintenance Cost Per Year	$0.39	$3.74	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
	Proposed Lamps									
10	Lamps Per Fixture	2	1	0	0	0	0	0	0	
11	Annual Run Hours	1,872	1,872	1,872	2,574	3,276	3,276	936	2,995	
12	Cost Per Lamp	$2.10	$9.07	0	0	0	0	0	0	
13	Lamp Life (hours)	20000	10000	0	0	0	0	0	0	
14	Number of fixtures	1	2	22	18	9	4	1	25	
15	Maintenance Cost Per Year	$0.39	$3.40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
	Total Savings									
16	Maintenance Savings	$0.00	$0.35	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	

	Current Ballasts									
17	Ballasts Per Fixture	1	0	0	0	0	0	0	0	
18	Annual Run Hours	1,872	1,872	1,872	2,574	3,276	3,276	936	2,995	
19	Cost Per Ballast	$14.25	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
20	Ballast Life (hours)	50000	0	0	0	0	0	0	0	
21	Number of fixtures	1	2	22	18	9	4	1	25	
22	Maintenance Cost Per Year	$0.53	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
	Proposed Ballasts									
23	Ballasts Per Fixture	1	0	0	0	0	0	0	0	
24	Annual Run Hours	1,872	1,872	1,872	2,574	3,276	3,276	936	2,995	
25	Cost Per Ballast	$14.25	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
26	Ballast Life (hours)	50000	0	0	0	0	0	0	0	
27	Number of fixtures	1	2	22	18	9	4	1	25	
28	Maintenance Cost Per Year	$0.53	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
	Total Savings									
29	Maintenance Savings	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	

Town of Hamburg
Lighting Retrofit
Senior Adult Day Care

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

19-Aug-10

Savings		
Annual Demand Savings	12.0	kW/Year
Electrical Energy Savings	1,870	kWh/Year
Fossil Fuel Savings	(2)	mmBtu/Year
Environmental CO_2 Gas Savings(1)	1,370	Lbs./Year
Operational & Maintenance Savings	$22	Per Year
Energy Savings ($)	$213	Per Year
Total Energy & O&M Savings	$235	Per Year
Project Costs		
Total Measure Cost	$3,824	
Payback		
Simple Payback	16.2	Year(s)
Potential Incentives	$405	
Simple Payback with Incentives	14.5	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

2,805 lbs of coal (Saved)
4 lbs of Nox gas reduced
11 lbs of SO2 gas reduced

Equivalent Savings (1 year)

0.25 passenger cars (Reduced)
3.19 barrels of oil (Saved)
0.12 houses energy use for 1 year
35.14 number of trees planted

Town of Hamburg

Senior Adult Day Care

	Description	
Fixture Code	Existing	Proposed
DT8-RFL(C)	4, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Retrofit and Delamp 3, 28W T8 Fluorescent Lamps 1 New Electronic Ballast + Reflector Kit
ZAT8	1, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
ZBBBT8	2, 20W T12 Fluorescent Lamps 1 Standard Magnetic Ballast	Leave as is
ZBT8	2, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is
ZDT8	4, 32W T8 Fluorescent Lamps 1 Electronic Ballast	Leave as is

Senior Adult Day Care

	LIGHTING DESCRIPTION	Activity # 1	Activity # 2	Activity # 3	Activity # 4	Activity # 5	Activity # 6
1	Existing Equipment	4-F32T8/1-EB	1-F32T8/1-EB	2-F20T12/1-SMB	2-F32T8/1-EB	4-F32T8/1-EB	SENSORS
2	Replacement Equipment	3-F28T8/1-EB/RETRO/REFL	Leave as is	Leave as is	Leave as is	Leave as is	
3	fixture code	DT8-RFL(C)	ZAT8	ZBBBT8	ZBT8	ZDT8	0
4	Floor/Room	0	0	0	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0	0	0	0
6	Min. Required Lighting Level for Task						
7	Total Annual Hours	1,872	1,872	1,872	1,872	1,872	0
CONNECTED KW/LUMINAIRE							
8	Existing Luminaire kW	0.112	0.032	0.047	0.074	0.114	
9	New Luminaire kW	0.075	0.032	0.047	0.074	0.114	
KW/KWH SAVINGS							
10	# of Existing Units	27	3	24	19	3	0
11	# of New Units	27	3	24	19	3	0
12	Total Existing Connected kW	3.024	0.096	1.122	1.404	0.342	0.000
13	Total New Connected kW	2.025	0.096	1.122	1.404	0.342	0.000
14	Total Customer Monthly kW Savings	0.999	0.000	0.000	0.000	0.000	0.000
15	Total Existing Annual kWh	5660.928	179.712	2100.384	2627.586	640.224	0.000
16	Total New Annual kWh	3790.800	179.712	2100.384	2627.586	640.224	0.000
17	Total Customer Annual kWh Savings	1870	0	0	0	0	0
MEASURE INSTALLATION COST							
18	Material Cost Each	$49.72	$0.00	$0.00	$0.00	$0.00	
19	Installation Cost Each	$47.81	$0.00	$0.00	$0.00	$0.00	
20	Total Material & Installation Cost Each	$97.53	$0.00	$0.00	$0.00	$0.00	$0.00
21	Total Material Cost	$1,342.44	$0.00	$0.00	$0.00	$0.00	$0.00
22	Total Installation Cost	$1,290.87	$0.00	$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$2,633.31	$0.00	$0.00	$0.00	$0.00	$0.00
HAZARDOUS MATERIAL DISPOSAL COST							
24	Total # Haz.Mat. Ballasts To Be Disposed	27	0	0	0	0	
25	Total # Lamps	108	0	0	0	0	
26	Total Cost for Disposal	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
PROJECT COST							
27	Including Costs - Before Rebates	$3,475.97	$0.00	$0.00	$0.00	$0.00	$0.00
28	Total Rebates	$405.00	$0.00	$0.00	$0.00	$0.00	$0.00
29	Including Costs - After Rebates	$3,070.97	$0.00	$0.00	$0.00	$0.00	$0.00
ANNUAL BILL SAVINGS							
30	Calculated Bill Savings	$230.00	$0.00	$0.00	$0.00	$0.00	$0.00
31	Payback Before Rebates (Years)	15.1	0.0	0.0	0.0	0.0	0.0
32	Payback After Rebates (Years)	13.4	0.0	0.0	0.0	0.0	0.0

Senior Adult Day Care

	Senior Adult Day Care ***Operation & Maintenance***	Activity # 1	Activity # 2	Activity # 3	Activity # 4	Activity # 5	Activity # 6
1	Existing Equipment	4-F32T8/1-EB	1-F32T8/1-EB	2-F20T12/1-SMB	2-F32T8/1-EB	4-F32T8/1-EB	SENSORS
2	Replacement Equipment	3-F28T8/1-EB/RETRO/REFL	Leave as is	Leave as is	Leave as is	Leave as is	
3	fixture code	DT8-RFL(C)	ZAT8	ZBBBT8	ZBT8	ZDT8	0
	Current Lamps						
4	Lamps Per Fixture	4	0	0	0	0	
5	Annual Run Hours	1,872	1,872	1,872	1,872	1,872	
6	Cost Per Lamp	$2.10	$0.00	$0.00	$0.00	$0.00	
7	Lamp Life (hours)	20000	0	0	0	0	
8	Number of fixtures	27	3	24	19	3	
9	Maintenance Cost Per Year	$21.23	$0.00	$0.00	$0.00	$0.00	
	Proposed Lamps						
10	Lamps Per Fixture	3	0	0	0	0	
11	Annual Run Hours	1,872	1,872	1,872	1,872	1,872	
12	Cost Per Lamp	$2.10	0	0	0	0	
13	Lamp Life (hours)	20000	0	0	0	0	
14	Number of fixtures	27	3	24	19	3	
15	Maintenance Cost Per Year	$15.92	$0.00	$0.00	$0.00	$0.00	
	Total Savings						
16	Maintenance Savings	$5.31	$0.00	$0.00	$0.00	$0.00	

	Current Ballasts						
17	Ballasts Per Fixture	1	0	0	0	0	
18	Annual Run Hours	1,872	1,872	1,872	1,872	1,872	
19	Cost Per Ballast	$16.88	$0.00	$0.00	$0.00	$0.00	
20	Ballast Life (hours)	50000	0	0	0	0	
21	Number of fixtures	27	3	24	19	3	
22	Maintenance Cost Per Year	$17.06	$0.00	$0.00	$0.00	$0.00	
	Proposed Ballasts						
23	Ballasts Per Fixture	1	0	0	0	0	
24	Annual Run Hours	1,872	1,872	1,872	1,872	1,872	
25	Cost Per Ballast	$0.00	$0.00	$0.00	$0.00	$0.00	
26	Ballast Life (hours)	50000	0	0	0	0	
27	Number of fixtures	27	3	24	19	3	
28	Maintenance Cost Per Year	$0.00	$0.00	$0.00	$0.00	$0.00	
	Total Savings						
29	Maintenance Savings	$17.06	$0.00	$0.00	$0.00	$0.00	

Town of Hamburg
Lighting Retrofit
Senior Garage

Project #: 3008-09NFT
ECM #: 1

Measure Summary Table

19-Aug-10

Savings		
Annual Demand Savings	12.9	kW/Year
Electrical Energy Savings	2,133	kWh/Year
Fossil Fuel Savings	(2)	mmBtu/Year
Environmental CO_2 Gas Savings(1)	1,563	Lbs./Year
Operational & Maintenance Savings	$17	Per Year
Energy Savings ($)	$295	Per Year
Total Energy & O&M Savings	$312	Per Year
Project Costs		
Total Measure Cost	$3,754	
Payback		
Simple Payback	12.0	Year(s)
Potential Incentives	$120	
Simple Payback with Incentives	11.7	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

3,199 lbs of coal (Saved)
5 lbs of Nox gas reduced
13 lbs of SO2 gas reduced

Equivalent Savings (1 year)

0.29 passenger cars (Reduced)
3.63 barrels of oil (Saved)
0.14 houses energy use for 1 year
40.07 number of trees planted

Town of Hamburg

Senior Garage

	Description	
Fixture Code	Existing	Proposed
HID250MH-RDP	1, 250W Metal Halide 1 Electronic Ballast	Refixture 4, 28W T8 Fluorescent Lamps 1 New Electronic Ballast Pendent

Senior Garage

	LIGHTING DESCRIPTION	Activity # 1	Activity # 2
1	Existing Equipment	MH250/1-EMB	SENSORS
2	Replacement Equipment	4-F28T8/1-EB/REFIX/PEN	
3	fixture code	HID250MH-RDP	0
4	Floor/Room	0	0
5	Lowest Recorded Lighting Level @Task	0	0
6	Min. Required Lighting Level for Task		
7	Total Annual Hours	1,872	1,872
CONNECTED KW/LUMINAIRE			
8	Existing Luminaire kW	0.280	
9	New Luminaire kW	0.106	
KW/KWH SAVINGS			
10	# of Existing Units	6	0
11	# of New Units	6	1
12	Total Existing Connected kW	1.680	0.000
13	Total New Connected kW	0.636	0.000
14	Total Customer Monthly kW Savings	1.044	0.032
15	Total Existing Annual kWh	3144.960	0.000
16	Total New Annual kWh	1190.592	0.000
17	Total Customer Annual kWh Savings	1954	179
MEASURE INSTALLATION COST			
18	Material Cost Each	$188.28	$103.25
19	Installation Cost Each	$200.00	$152.50
20	Total Material & Installation Cost Each	$388.28	$255.75
21	Total Material Cost	$1,129.68	$103.25
22	Total Installation Cost	$1,200.00	$152.50
23	Total Material & Installation Cost	$2,329.68	$255.75
HAZARDOUS MATERIAL DISPOSAL COST			
24	Total # Haz.Mat. Ballasts To Be Disposed	6	
25	Total # Lamps	6	
26	Total Cost for Disposal	$0.00	$0.00
PROJECT COST			
27	Including Costs - Before Rebates	$3,075.18	$337.59
28	Total Rebates	$120.00	$0.00
29	Including Costs - After Rebates	$2,955.18	$337.59
ANNUAL BILL SAVINGS			
30	Calculated Bill Savings	$293.16	$19.64
31	Payback Before Rebates (Years)	10.5	17.2
32	Payback After Rebates (Years)	10.1	17.2

Senior Garage

Senior Garage ***Operation & Maintenance***		Activity # 1	Activity # 2
1	Existing Equipment	MH250/1-EMB	SENSORS
2	Replacement Equipment	4-F28T8/1-EB/REFIX/PEN	
3	fixture code	HID250MH-RDP	0
Current Lamps			
4	Lamps Per Fixture	1	
5	Annual Run Hours	1,872	
6	Cost Per Lamp	$24.00	
7	Lamp Life (hours)	24000	
8	Number of fixtures	6	
9	Maintenance Cost Per Year	$11.23	
Proposed Lamps			
10	Lamps Per Fixture	4	
11	Annual Run Hours	1,872	
12	Cost Per Lamp	$2.10	
13	Lamp Life (hours)	24000	
14	Number of fixtures	6	
15	Maintenance Cost Per Year	$3.93	
Total Savings			
16	Maintenance Savings	$7.30	

Current Ballasts			
17	Ballasts Per Fixture	1	
18	Annual Run Hours	1,872	
19	Cost Per Ballast	$60.00	
20	Ballast Life (hours)	50000	
21	Number of fixtures	6	
22	Maintenance Cost Per Year	$13.48	
Proposed Ballasts			
23	Ballasts Per Fixture	1	
24	Annual Run Hours	1,872	
25	Cost Per Ballast	$16.88	
26	Ballast Life (hours)	50000	
27	Number of fixtures	6	
28	Maintenance Cost Per Year	$3.79	
Total Savings			
29	Maintenance Savings	$9.69	

LIGHTING RETROFIT

Ice Rink

Project No.: 3008-09NFT

Measure Summary Table

20-Aug-10

Savings		
Annual Demand Savings	10.8	kW/Year
Electrical Energy Savings	2,103	kWh/Year
Fossil Fuel Savings	(2)	mmBtu/Year
Operational & Maintenance Savings	$8	Per Year
Energy Savings ($)	$269	Per Year
Total Energy & O&M Savings	$277	Per Year
Project Costs		
Total Measure Cost	$1,844	
Payback		
Simple Payback	6.7	Year(s)
Potential Incentives	$1,620	
Simple Payback with Incentives	0.8	Year(s)

OPTIONAL
Self Implemented Option for Long Payback Measures
Costs do not include Labor Costs or Design Fees

Ice Rink

	LIGHTING DESCRIPTION	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5
1	Existing Equipment	3-F32T8/1-EB	3-F32T8/1-EB	1-MH1000/1-EMB	1-MH400/1-EMB	1-F32T8/1-EB
2	Replacement Equipment	Included in Recommended Proj.	Included in Recommended Proj.	Included in Recommended Proj.	Included in Recommended Proj.	1-F28T8/1-NEB/RETRO/WRAP
3	fixture code	CT8-RFLB	CT8-RFLB-2T	MH1000-HT5	MH400-DT5	Z-AT8W
4	Floor/Room					0
5	Lowest Recorded Lighting Level @Task					0
6	Min. Required Lighting Level for Task					
7	Total Annual Hours					2,572
CONNECTED KW/LUMINAIRE						
8	Existing Luminaire kW					0.032
9	New Luminaire kW					0.024
KW/KWH SAVINGS						
10	# of Existing Units					97
11	# of New Units					97
12	Total Existing Connected kW					3.104
13	Total New Connected kW					2.363
14	Total Customer Monthly kW Savings					0.741
15	Total Existing Annual kWh					7981.980
16	Total New Annual kWh					6076.282
17	Total Customer Annual kWh Savings					1906
MEASURE INSTALLATION COST						
18	Material Cost Each					$16.35
19	Installation Cost Each					$0.00
20	Total Material & Installation Cost Each					$0.00
21	Total Material Cost					$1,585.95
22	Total Installation Cost					$0.00
23	Total Material & Installation Cost					$1,585.95
HAZARDOUS MATERIAL DISPOSAL COST						
24	Total # Haz.Mat. Ballasts To Be Disposed					97
25	Total # Lamps					97
26	Total Cost for Disposal					$0.00
PROJECT COST						
27	Including Costs - Before Rebates					$1,585.95
28	Total Rebates					$1,455.00
29	Including Costs - After Rebates					$130.95
ANNUAL BILL SAVINGS						
30	Calculated Bill Savings					$239.19
31	Payback Before Rebates (Years)					6.6
32	Payback After Rebates (Years)					0.5

Ice Rink

	LIGHTING DESCRIPTION	Measure # 6	Measure # 7	Measure # 8
1	Existing Equipment	2-F32T8/1-EB	2-F32T8/1-EB	4-F32T8/1-EB
2	Replacement Equipment	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	4-F28T8/1-NEB/RETRO
3	fixture code	Z-BT8	Z-BT8WL	Z-DT8I
4	Floor/Room	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0
6	Min. Required Lighting Level for Task			
7	Total Annual Hours	3,010	3,010	860
CONNECTED KW/LUMINAIRE				
8	Existing Luminaire kW	0.058	0.058	0.114
9	New Luminaire kW	0.049	0.049	0.097
KW/KWH SAVINGS				
10	# of Existing Units	2	1	8
11	# of New Units	2	1	8
12	Total Existing Connected kW	0.116	0.058	0.912
13	Total New Connected kW	0.097	0.049	0.780
14	Total Customer Monthly kW Savings	0.019	0.009	0.132
15	Total Existing Annual kWh	349.212	174.606	784.436
16	Total New Annual kWh	293.338	147.512	670.486
17	Total Customer Annual kWh Savings	56	27	114
MEASURE INSTALLATION COST				
18	Material Cost Each	$18.45	$18.45	$25.28
19	Installation Cost Each	$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each	$0.00	$0.00	$0.00
21	Total Material Cost	$36.90	$18.45	$202.24
22	Total Installation Cost	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$36.90	$18.45	$202.24
HAZARDOUS MATERIAL DISPOSAL COST				
24	Total # Haz.Mat. Ballasts To Be Disposed	2	1	8
25	Total # Lamps	4	2	32
26	Total Cost for Disposal	$0.00	$0.00	$0.00
PROJECT COST				
27	Including Costs - Before Rebates	$36.90	$18.45	$202.24
28	Total Rebates	$30.00	$15.00	$120.00
29	Including Costs - After Rebates	$6.90	$3.45	$82.24
ANNUAL BILL SAVINGS				
30	Calculated Bill Savings	$6.74	$3.27	$21.92
31	Payback Before Rebates (Years)	5.5	5.6	9.2
32	Payback After Rebates (Years)	1.0	1.1	3.8

Ice Rink

Ice Rink ***Operation & Maintenance***		Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5
1	Existing Equipment					1-F32T8/1-EB
2	Replacement Equipment					1-F28T8/1-NEB/RETRO/WRAP
3	fixture code					Z-AT8W
Current Lamps						
4	Lamps Per Fixture					1
5	Annual Run Hours					2,572
6	Cost Per Lamp					$2.10
7	Lamp Life (hours)					20000
8	Number of fixtures					97
9	Maintenance Cost Per Year					$26.19
Proposed Lamps						
10	Lamps Per Fixture					1
11	Annual Run Hours					2,572
12	Cost Per Lamp					$2.10
13	Lamp Life (hours)					20000
14	Number of fixtures					97
15	Maintenance Cost Per Year					$26.19
Total Savings						
16	Maintenance Savings					$0.00

Current Ballasts						
17	Ballasts Per Fixture					1
18	Annual Run Hours					2,572
19	Cost Per Ballast					$15.80
20	Ballast Life (hours)					50000
21	Number of fixtures					97
22	Maintenance Cost Per Year					$78.82
Proposed Ballasts						
23	Ballasts Per Fixture					1
24	Annual Run Hours					2,572
25	Cost Per Ballast					$14.25
26	Ballast Life (hours)					50000
27	Number of fixtures					97
28	Maintenance Cost Per Year					$71.09
Total Savings						
29	Maintenance Savings					$7.73

Ice Rink

Ice Rink ***Operation & Maintenance***		Measure # 6	Measure # 7	Measure # 8
1	Existing Equipment	2-F32T8/1-EB	2-F32T8/1-EB	4-F32T8/1-EB
2	Replacement Equipment	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	4-F28T8/1-NEB/RETRO
3	fixture code	Z-BT8	Z-BT8WL	Z-DT8I
Current Lamps				
4	Lamps Per Fixture	2	2	4
5	Annual Run Hours	3,010	3,010	860
6	Cost Per Lamp	$2.10	$2.10	$2.10
7	Lamp Life (hours)	20000	20000	20000
8	Number of fixtures	2	1	8
9	Maintenance Cost Per Year	$1.26	$0.63	$2.89
Proposed Lamps				
10	Lamps Per Fixture	2	2	4
11	Annual Run Hours	3,010	3,010	860
12	Cost Per Lamp	$2.10	$2.10	$2.10
13	Lamp Life (hours)	20000	20000	20000
14	Number of fixtures	2	1	8
15	Maintenance Cost Per Year	$1.26	$0.63	$2.89
Total Savings				
16	Maintenance Savings	$0.00	$0.00	$0.00

Current Ballasts				
17	Ballasts Per Fixture	1	1	1
18	Annual Run Hours	3,010	3,010	860
19	Cost Per Ballast	$15.80	$15.80	$15.80
20	Ballast Life (hours)	50000	50000	50000
21	Number of fixtures	2	1	8
22	Maintenance Cost Per Year	$1.90	$0.95	$2.17
Proposed Ballasts				
23	Ballasts Per Fixture	1	1	1
24	Annual Run Hours	3,010	3,010	860
25	Cost Per Ballast	$14.25	$14.25	$16.88
26	Ballast Life (hours)	50000	50000	50000
27	Number of fixtures	2	1	8
28	Maintenance Cost Per Year	$1.72	$0.86	$2.32
Total Savings				
29	Maintenance Savings	$0.19	$0.09	-$0.15

LIGHTING RETROFIT

Town Hall

Project No.: 3008-09NFT

Measure Summary Table

20-Aug-10

Savings		
Annual Demand Savings	11.2	kW/Year
Electrical Energy Savings	2,022	kWh/Year
Fossil Fuel Savings	(2)	mmBtu/Year
Operational & Maintenance Savings	($124)	Per Year
Energy Savings ($)	$209	Per Year
Total Energy & O&M Savings	$85	Per Year
Project Costs		
Total Measure Cost	$1,877	
Payback		
Simple Payback	22.2	Year(s)
Potential Incentives	$1,395	
Simple Payback with Incentives	5.7	Year(s)

OPTIONAL
Set Implemented Option for Long Payback Measures
Costs do not include Labor Costs or Design Fees

Town Hall

	LIGHTING DESCRIPTION	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5	Measure # 6
1	Existing Equipment	2-F32T8/1-EB	4-F32T8/1-EB	2-CF17W/DRM	2-F20T12/1-SMB	2-F32T8/1-EB	3-F32T8/1-EB
2	Replacement Equipment	Included in Recommended Proj.	Included in Recommended Proj.	Leave as is	2-F15T8/1-EB/RETRO	2-F28T8/1-EB/RETRO	3-F28T8/1-EB/RETRO
3	fixture code	BU-RFL(CCC)	DT8-RFL(C)	Z-B(CFDRM)	ZBBBT8	ZBT8	ZCT8
4	Floor/Room			0	0	0	0
5	Lowest Recorded Lighting Level @Task			0	0	0	0
6	Min. Required Lighting Level for Task						
7	Total Annual Hours			936	3,276	2,303	1,805
CONNECTED KW/LUMINAIRE							
8	Existing Luminaire kW			0.037	0.030	0.058	0.086
9	New Luminaire kW			0.037	0.026	0.049	0.075
KW/KWH SAVINGS							
10	# of Existing Units			1	11	64	28
11	# of New Units			1	11	64	28
12	Total Existing Connected kW			0.037	0.325	3.712	2.408
13	Total New Connected kW			0.037	0.287	3.136	2.100
14	Total Customer Monthly kW Savings			0.000	0.038	0.576	0.308
15	Total Existing Annual kWh			35.006	1065.945	8550.360	4346.784
16	Total New Annual kWh			35.006	940.540	7223.580	3790.800
17	Total Customer Annual kWh Savings			0	125	1327	556
MEASURE INSTALLATION COST							
18	Material Cost Each			$0.00	$4.70	$18.45	$22.10
19	Installation Cost Each			$0.00	$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each			$0.00	$0.00	$0.00	$0.00
21	Total Material Cost			$0.00	$51.70	$1,180.80	$618.80
22	Total Installation Cost			$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost			$0.00	$51.70	$1,180.80	$618.80
HAZARDOUS MATERIAL DISPOSAL COST							
24	Total # Haz.Mat. Ballasts To Be Disposed			0	0	0	0
25	Total # Lamps			0	0	0	0
26	Total Cost for Disposal			$0.00	$0.00	$0.00	$0.00
PROJECT COST							
27	Including Costs - Before Rebates			$0.00	$51.70	$1,180.80	$618.80
28	Total Rebates			$0.00	$0.00	$960.00	$420.00
29	Including Costs - After Rebates			$0.00	$51.70	$220.80	$198.80
ANNUAL BILL SAVINGS							
30	Calculated Bill Savings			$0.00	$11.24	$133.72	$61.79
31	Payback Before Rebates (Years)			0.0	4.6	8.8	10.0
32	Payback After Rebates (Years)			0.0	4.6	1.7	3.2

Town Hall

	LIGHTING DESCRIPTION	Measure # 7
1	Existing Equipment	4-F32T8/1-EB
2	Replacement Equipment	4-F28T8/1-EB/RETRO
3	fixture code	ZDT8
4	Floor/Room	0
5	Lowest Recorded Lighting Level @Task	0
6	Min. Required Lighting Level for Task	
7	Total Annual Hours	936
CONNECTED KW/LUMINAIRE		
8	Existing Luminaire kW	0.112
9	New Luminaire kW	0.097
KW/KWH SAVINGS		
10	# of Existing Units	1
11	# of New Units	1
12	Total Existing Connected kW	0.112
13	Total New Connected kW	0.097
14	Total Customer Monthly kW Savings	0.015
15	Total Existing Annual kWh	104.832
16	Total New Annual kWh	90.792
17	Total Customer Annual kWh Savings	14
MEASURE INSTALLATION COST		
18	Material Cost Each	$25.28
19	Installation Cost Each	$0.00
20	Total Material & Installation Cost Each	$0.00
21	Total Material Cost	$25.28
22	Total Installation Cost	$0.00
23	Total Material & Installation Cost	$25.28
HAZARDOUS MATERIAL DISPOSAL COST		
24	Total # Haz.Mat. Ballasts To Be Disposed	0
25	Total # Lamps	0
26	Total Cost for Disposal	$0.00
PROJECT COST		
27	Including Costs - Before Rebates	$25.28
28	Total Rebates	$15.00
29	Including Costs - After Rebates	$10.28
ANNUAL BILL SAVINGS		
30	Calculated Bill Savings	$2.18
31	Payback Before Rebates (Years)	11.6
32	Payback After Rebates (Years)	4.7

Town Hall

	Town Hall ***Operation & Maintenance***	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5	Measure # 6
1	Existing Equipment	2-F32T8/1-EB	4-F32T8/1-EB	2-CF17W/DRM	2-F20T12/1-SMB	2-F32T8/1-EB	3-F32T8/1-EB
2	Replacement Equipment	Included in Recommended Proj.	Included in Recommended Proj.	Leave as is	2-F15T8/1-EB/RETRO	2-F28T8/1-EB/RETRO	3-F28T8/1-EB/RETRO
3	fixture code	BU-RFL(CCC)	DT8-RFL(C)	Z-B(CFDRM)	ZBBBT8	ZBT8	ZCT8
	Current Lamps						
4	Lamps Per Fixture			0	0	0	0
5	Annual Run Hours			936	3,276	2,303	1,805
6	Cost Per Lamp			$0.00	$2.10	$2.10	$2.10
7	Lamp Life (hours)			0	20000	20000	20000
8	Number of fixtures			1	11	64	28
9	Maintenance Cost Per Year			$0.00	$0.00	$0.00	$0.00
	Proposed Lamps						
10	Lamps Per Fixture			0	2	2	3
11	Annual Run Hours			936	3,276	2,303	1,805
12	Cost Per Lamp			0	$2.35	$2.10	$2.10
13	Lamp Life (hours)			0	20000	20000	20000
14	Number of fixtures			1	11	64	28
15	Maintenance Cost Per Year			$0.00	$8.47	$30.96	$15.92
	Total Savings						
16	Maintenance Savings			$0.00	-$8.47	-$30.96	-$15.92

	Current Ballasts						
17	Ballasts Per Fixture			0	0	0	0
18	Annual Run Hours			936	3,276	2,303	1,805
19	Cost Per Ballast			$0.00	$14.25	$14.25	$15.80
20	Ballast Life (hours)			0	50000	50000	50000
21	Number of fixtures			1	11	64	28
22	Maintenance Cost Per Year			$0.00	$0.00	$0.00	$0.00
	Proposed Ballasts						
23	Ballasts Per Fixture			0	1	1	1
24	Annual Run Hours			936	3,276	2,303	1,805
25	Cost Per Ballast			$0.00	$14.25	$14.25	$15.80
26	Ballast Life (hours)			0	50000	50000	50000
27	Number of fixtures			1	11	64	28
28	Maintenance Cost Per Year			$0.00	$10.27	$42.01	$15.97
	Total Savings						
29	Maintenance Savings			$0.00	-$10.27	-$42.01	-$15.97

Town Hall

Town Hall ***Operation & Maintenance***		Measure # 7
1	Existing Equipment	4-F32T8/1-EB
2	Replacement Equipment	4-F28T8/1-EB/RETRO
3	fixture code	ZDT8
Current Lamps		
4	Lamps Per Fixture	0
5	Annual Run Hours	936
6	Cost Per Lamp	$2.10
7	Lamp Life (hours)	20000
8	Number of fixtures	1
9	Maintenance Cost Per Year	$0.00
Proposed Lamps		
10	Lamps Per Fixture	4
11	Annual Run Hours	936
12	Cost Per Lamp	$2.10
13	Lamp Life (hours)	20000
14	Number of fixtures	1
15	Maintenance Cost Per Year	$0.39
Total Savings		
16	Maintenance Savings	-$0.39

Current Ballasts		
17	Ballasts Per Fixture	0
18	Annual Run Hours	936
19	Cost Per Ballast	$16.88
20	Ballast Life (hours)	50000
21	Number of fixtures	1
22	Maintenance Cost Per Year	$0.00
Proposed Ballasts		
23	Ballasts Per Fixture	1
24	Annual Run Hours	936
25	Cost Per Ballast	$16.88
26	Ballast Life (hours)	50000
27	Number of fixtures	1
28	Maintenance Cost Per Year	$0.32
Total Savings		
29	Maintenance Savings	-$0.32

LIGHTING RETROFIT

Buildings & Grounds

Project No.: 3008-09NFT

Measure Summary Table

20-Aug-10

OPTIONAL
Self Implemente Option for Long Payback Measures
Costs do not include Labor Costs or Design Fees

Savings		
Annual Demand Savings	39.2	kW/Year
Electrical Energy Savings	5,388	kWh/Year
Fossil Fuel Savings	(5)	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$711	Per Year
Total Energy & O&M Savings	$711	Per Year
Project Costs		
Total Measure Cost	$1,157	
Payback		
Simple Payback	1.6	Year(s)
Potential Incentives	$855	
Simple Payback with Incentives	0.4	Year(s)

Buildings & Grounds

	LIGHTING DESCRIPTION	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5
1	Existing Equipment	2-F96T12/1-SMB	4-F32T8/1-EB	INC 60W	1-MH400/1-EMB	1-MH400/1-EMB
2	Replacement Equipment	Included in Recommended Proj.	Included in Recommended Proj.	Included in Recommended Proj.	Included in Recommended Proj.	Included in Recommended Proj.
3	fixture code	B8	DT8TR-RFLC	I60FLD	MH400-B8I	MH400-FT8
4	Floor/Room					
5	Lowest Recorded Lighting Level @Task					
6	Min. Required Lighting Level for Task					
7	Total Annual Hours					
	CONNECTED KW/LUMINAIRE					
8	Existing Luminaire kW					
9	New Luminaire kW					
	KW/KWH SAVINGS					
10	# of Existing Units					
11	# of New Units					
12	Total Existing Connected kW					
13	Total New Connected kW					
14	Total Customer Monthly kW Savings					
15	Total Existing Annual kWh					
16	Total New Annual kWh					
17	Total Customer Annual kWh Savings					
	MEASURE INSTALLATION COST					
18	Material Cost Each					
19	Installation Cost Each					
20	Total Material & Installation Cost Each					
21	Total Material Cost					
22	Total Installation Cost					
23	Total Material & Installation Cost					
	HAZARDOUS MATERIAL DISPOSAL COST					
24	Total # Haz.Mat. Ballasts To Be Disposed					
25	Total # Lamps					
26	Total Cost for Disposal					
	PROJECT COST					
27	Including Costs - Before Rebates					
28	Total Rebates					
29	Including Costs - After Rebates					
	ANNUAL BILL SAVINGS					
30	Calculated Bill Savings					
31	Payback Before Rebates (Years)					
32	Payback After Rebates (Years)					

Buildings & Grounds

	LIGHTING DESCRIPTION	Measure # 6	Measure # 7	Measure # 8	Measure # 9	Measure # 10	Measure # 11	Measure # 12
1	Existing Equipment	1-MH400/1-EMB	1-F32T8/1-EB	2-F17T8/1-EB	2-F32T8/1-EB	2-F96T12/1-SMB	CF 20W	4-F32T8/1-EB
2	Replacement Equipment	Included in Recommended Proj.	1-F28T8/1-NEB/RETRO	2-F15T8/1-EB/RETRO	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	Leave as is	4-F28T8/1-NEB/RETRO
3	fixture code	MH400-Remove	Z-B(A)T8I	Z-BBBT8	Z-BT8I	Z-BT8I8	Z-CF	Z-DT8I8
4	Floor/Room		0	0	0	0	0	0
5	Lowest Recorded Lighting Level @Task		0	0	0	0	0	0
6	Min. Required Lighting Level for Task							
7	Total Annual Hours		1,720	1,720	1,720	1,720	2,365	1,630
	CONNECTED KW/LUMINAIRE							
8	Existing Luminaire kW		0.029	0.033	0.058	0.118	0.023	0.236
9	New Luminaire kW		0.024	0.026	0.049	0.049	0.023	0.097
	KW/KWH SAVINGS							
10	# of Existing Units		1	29	2	6	6	19
11	# of New Units		1	29	2	6	6	19
12	Total Existing Connected kW		0.029	0.957	0.116	0.708	0.138	4.484
13	Total New Connected kW		0.024	0.757	0.098	0.292	0.138	1.851
14	Total Customer Monthly kW Savings		0.004	0.200	0.018	0.416	0.000	2.633
15	Total Existing Annual kWh		49.027	1646.283	199.549	1217.940	326.418	7307.640
16	Total New Annual kWh		41.905	1302.060	168.819	502.865	326.418	3017.188
17	Total Customer Annual kWh Savings		7	344	31	715	0	4290
	MEASURE INSTALLATION COST							
18	Material Cost Each		$16.35	$18.95		$18.45	$0.00	$25.28
19	Installation Cost Each		$0.00	$0.00		$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
21	Total Material Cost		$16.35	$549.55	$0.00	$110.70	$0.00	$480.32
22	Total Installation Cost		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost		$16.35	$549.55	$0.00	$110.70	$0.00	$480.32
	HAZARDOUS MATERIAL DISPOSAL COST							
24	Total # Haz.Mat. Ballasts To Be Disposed		1	29	2	6	0	19
25	Total # Lamps		1	58	4	12	0	76
26	Total Cost for Disposal		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	PROJECT COST							
27	Including Costs - Before Rebates		$16.35	$549.55	$0.00	$110.70	$0.00	$480.32
28	Total Rebates		$15.00	$435.00	$30.00	$90.00	$0.00	$285.00
29	Including Costs - After Rebates		$1.35	$114.55	($30.00)	$20.70	$0.00	$195.32
	ANNUAL BILL SAVINGS							
30	Calculated Bill Savings		$0.98	$47.35	$4.23	$98.36	$0.00	$605.76
31	Payback Before Rebates (Years)		16.7	11.6	0.0	1.1	0.0	0.8
32	Payback After Rebates (Years)		1.4	2.4	-7.1	0.2	0.0	0.3

Buildings & Grounds

Buildings & Grounds ***Operation & Maintenance***		Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5
1	Existing Equipment	2-F96T12/1-SMB	4-F32T8/1-EB	INC 60W	1-MH400/1-EMB	1-MH400/1-EMB
2	Replacement Equipment	Included in Recommended Proj.	Included in Recommended Proj.	Included in Recommended Proj.	Included in Recommended Proj.	Included in Recommended Proj.
3	fixture code	B8	DT8TR-RFLC	I60FLD	MH400-B8I	MH400-FT8
Current Lamps						
4	Lamps Per Fixture					
5	Annual Run Hours					
6	Cost Per Lamp					
7	Lamp Life (hours)					
8	Number of fixtures					
9	Maintenance Cost Per Year					
Proposed Lamps						
10	Lamps Per Fixture					
11	Annual Run Hours					
12	Cost Per Lamp					
13	Lamp Life (hours)					
14	Number of fixtures					
15	Maintenance Cost Per Year					
Total Savings						
16	Maintenance Savings					

Current Ballasts						
17	Ballasts Per Fixture					
18	Annual Run Hours					
19	Cost Per Ballast					
20	Ballast Life (hours)					
21	Number of fixtures					
22	Maintenance Cost Per Year					
Proposed Ballasts						
23	Ballasts Per Fixture					
24	Annual Run Hours					
25	Cost Per Ballast					
26	Ballast Life (hours)					
27	Number of fixtures					
28	Maintenance Cost Per Year					
Total Savings						
29	Maintenance Savings					

Buildings & Grounds

	Buildings & Grounds ***Operation & Maintenance***	Measure # 6	Measure # 7	Measure # 8	Measure # 9	Measure # 10	Measure # 11	Measure # 12
1	Existing Equipment	1-MH400/1-EMB	1-F32T8/1-EB	2-F17T8/1-EB	2-F32T8/1-EB	2-F96T12/1-SMB	CF 20W	4-F32T8/1-EB
2	Replacement Equipment	Included in Recommended Proj.	1-F28T8/1-NEB/RETRO	2-F15T8/1-EB/RETRO	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	Leave as is	4-F28T8/1-NEB/RETRO
3	fixture code	MH400-Remove	Z-B(A)T8I	Z-BBBT8	Z-BT8I	Z-BT8I8	Z-CF	Z-DT8I8
	Current Lamps							
4	Lamps Per Fixture		1	2	2	2	0	4
5	Annual Run Hours		1,720	1,720	1,720	1,720	2,365	1,630
6	Cost Per Lamp		$2.10	$2.35	$2.10	$2.10	$0.00	$2.10
7	Lamp Life (hours)		20000	20000	20000	20000	0	20000
8	Number of fixtures		1	29	2	6	6	19
9	Maintenance Cost Per Year		$0.18	$11.72	$0.72	$2.17	$0.00	$13.01
	Proposed Lamps							
10	Lamps Per Fixture		1	2	2	2	0	4
11	Annual Run Hours		1,720	1,720	1,720	1,720	2,365	1,630
12	Cost Per Lamp		$2.10	$2.35	$2.10	$2.10	0	$2.10
13	Lamp Life (hours)		20000	20000	20000	20000	0	20000
14	Number of fixtures		1	29	2	6	6	19
15	Maintenance Cost Per Year		$0.18	$11.72	$0.72	$2.17	$0.00	$13.01
	Total Savings							
16	Maintenance Savings		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

	Current Ballasts							
17	Ballasts Per Fixture		1	1	1	1	0	1
18	Annual Run Hours		1,720	1,720	1,720	1,720	2,365	1,630
19	Cost Per Ballast		$14.25	$14.25	$14.25	$14.25	$0.00	$14.25
20	Ballast Life (hours)		50000	50000	50000	50000	0	50000
21	Number of fixtures		1	29	2	6	6	19
22	Maintenance Cost Per Year		$0.49	$14.22	$0.98	$2.94	$0.00	$8.82
	Proposed Ballasts							
23	Ballasts Per Fixture		1	1	1	1	0	1
24	Annual Run Hours		1,720	1,720	1,720	1,720	2,365	1,630
25	Cost Per Ballast		$14.25	$14.25	$14.25	$14.25	$0.00	$14.25
26	Ballast Life (hours)		50000	50000	50000	50000	0	50000
27	Number of fixtures		1	29	2	6	6	19
28	Maintenance Cost Per Year		$0.49	$14.22	$0.98	$2.94	$0.00	$8.82
	Total Savings							
29	Maintenance Savings		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

LIGHTING RETROFIT

Pro Shop

Project No.: 3008-09NFT

Measure Summary Table

20-Aug-10

Savings		
Annual Demand Savings	3.1	kW/Year
Electrical Energy Savings	421	kWh/Year
Fossil Fuel Savings	(0)	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$50	Per Year
Total Energy & O&M Savings	$50	Per Year
Project Costs		
Total Measure Cost	$531	
Payback		
Simple Payback	10.6	Year(s)
Potential Incentives	$420	
Simple Payback with Incentives	2.2	Year(s)

OPTIONAL
Self Implemented Option for Long Payback Measures
Costs do not include Labor Costs or Design Fees

Pro Shop

	LIGHTING DESCRIPTION	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5	Measure # 6
1	Existing Equipment	1-F32T8/1-EB	2-F17T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB	CF 20W
2	Replacement Equipment	1-F28T8/1-NEB/RETRO	2-F15T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	Leave as is
3	fixture code	Z-AT8W	Z-BBBT8TR	Z-BT8TR	Z-BT8TR1	Z-BT8W	Z-CF
4	Floor/Room	0	0	0	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0	0	0	0
6	Min. Required Lighting Level for Task						
7	Total Annual Hours	860	1,720	1,720	1,720	1,634	1,720
	CONNECTED KW/LUMINAIRE						
8	Existing Luminaire kW	0.032	0.033	0.058	0.058	0.058	0.023
9	New Luminaire kW	0.024	0.026	0.049	0.049	0.049	0.023
	KW/KWH SAVINGS						
10	# of Existing Units	2	1	4	12	10	1
11	# of New Units	2	1	4	12	10	1
12	Total Existing Connected kW	0.064	0.033	0.232	0.696	0.580	0.023
13	Total New Connected kW	0.048	0.026	0.196	0.588	0.490	0.023
14	Total Customer Monthly kW Savings	0.016	0.007	0.036	0.108	0.090	0.000
15	Total Existing Annual kWh	55.048	56.768	399.099	1197.297	947.860	39.566
16	Total New Annual kWh	41.286	44.727	337.170	1011.510	800.778	39.566
17	Total Customer Annual kWh Savings	14	12	62	186	147	0
	MEASURE INSTALLATION COST						
18	Material Cost Each	$16.35	$18.95	$18.45	$18.45	$18.45	
19	Installation Cost Each	$0.00	$0.00	$0.00	$0.00	$0.00	
20	Total Material & Installation Cost Each	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
21	Total Material Cost	$32.70	$18.95	$73.80	$221.40	$184.50	$0.00
22	Total Installation Cost	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$32.70	$18.95	$73.80	$221.40	$184.50	$0.00
	HAZARDOUS MATERIAL DISPOSAL COST						
24	Total # Haz.Mat. Ballasts To Be Disposed	2	1	4	12	10	0
25	Total # Lamps	2	2	8	24	20	0
26	Total Cost for Disposal	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	PROJECT COST						
27	Including Costs - Before Rebates	$32.70	$18.95	$73.80	$221.40	$184.50	$0.00
28	Total Rebates	$30.00	$0.00	$60.00	$180.00	$150.00	$0.00
29	Including Costs - After Rebates	$2.70	$18.95	$13.80	$41.40	$34.50	$0.00
	ANNUAL BILL SAVINGS						
30	Calculated Bill Savings	$2.30	$1.41	$7.26	$21.78	$17.63	$0.00
31	Payback Before Rebates (Years)	14.2	13.4	10.2	10.2	10.5	0.0
32	Payback After Rebates (Years)	1.2	13.4	1.9	1.9	2.0	0.0

Pro Shop

	Pro Shop ***Operation & Maintenance***	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5	Measure # 6
1	Existing Equipment	1-F32T8/1-EB	2-F17T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB	CF 20W
2	Replacement Equipment	1-F28T8/1-NEB/RETRO	2-F15T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	Leave as is
3	fixture code	Z-AT8W	Z-BBBT8TR	Z-BT8TR	Z-BT8TR1	Z-BT8W	Z-CF
	Current Lamps						
4	Lamps Per Fixture	1	2	2	2	2	0
5	Annual Run Hours	860	1,720	1,720	1,720	1,634	1,720
6	Cost Per Lamp	$2.10	$2.35	$2.10	$2.10	$2.10	$0.00
7	Lamp Life (hours)	20000	20000	20000	20000	20000	0
8	Number of fixtures	2	1	4	12	10	1
9	Maintenance Cost Per Year	$0.18	$0.40	$1.45	$4.34	$3.43	$0.00
	Proposed Lamps						
10	Lamps Per Fixture	1	2	2	2	2	0
11	Annual Run Hours	860	1,720	1,720	1,720	1,634	1,720
12	Cost Per Lamp	$2.10	$2.35	$2.10	$2.10	$2.10	0
13	Lamp Life (hours)	20000	20000	20000	20000	20000	0
14	Number of fixtures	2	1	4	12	10	1
15	Maintenance Cost Per Year	$0.18	$0.40	$1.45	$4.34	$3.43	$0.00
	Total Savings						
16	Maintenance Savings	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

	Current Ballasts						
17	Ballasts Per Fixture	1	1	1	1	1	0
18	Annual Run Hours	860	1,720	1,720	1,720	1,634	1,720
19	Cost Per Ballast	$14.25	$14.25	$14.25	$14.25	$14.25	$0.00
20	Ballast Life (hours)	50000	50000	50000	50000	50000	0
21	Number of fixtures	2	1	4	12	10	1
22	Maintenance Cost Per Year	$0.49	$0.49	$1.96	$5.88	$4.66	$0.00
	Proposed Ballasts						
23	Ballasts Per Fixture	1	1	1	1	1	0
24	Annual Run Hours	860	1,720	1,720	1,720	1,634	1,720
25	Cost Per Ballast	$14.25	$14.25	$14.25	$14.25	$14.25	$0.00
26	Ballast Life (hours)	50000	50000	50000	50000	50000	0
27	Number of fixtures	2	1	4	12	10	1
28	Maintenance Cost Per Year	$0.49	$0.49	$1.96	$5.88	$4.66	$0.00
	Total Savings						
29	Maintenance Savings	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

LIGHTING RETROFIT

Maintenance Building

Project No.: 3008-09NFT

Measure Summary Table

20-Aug-10

Savings		
Annual Demand Savings	2.6	kW/Year
Electrical Energy Savings	378	kWh/Year
Fossil Fuel Savings	(0)	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$44	Per Year
Total Energy & O&M Savings	$44	Per Year
Project Costs		
Total Measure Cost	$331	
Payback		
Simple Payback	7.5	Year(s)
Potential Incentives	$225	
Simple Payback with Incentives	2.4	Year(s)

OPTIONAL
Self Implemented Option for Long Payback Measures
Costs do not include Labor Costs or Design Fees

Maintenance Building

	LIGHTING DESCRIPTION	Measure # 1	Measure # 2	Measure # 3
1	Existing Equipment	2-F40T12/1-SMB	2-F32T8/1-EB	4-F32T8/1-EB
2	Replacement Equipment	2-F32T8/1-EB/RETRO	2-F28T8/1-NEB/RETRO	4-F28T8/1-NEB/RETRO
3	fixture code	BI	Z-BT8I	Z-DT8TI
4	Floor/Room	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0
6	Min. Required Lighting Level for Task			
7	Total Annual Hours	1,720	1,720	1,720
CONNECTED KW/LUMINAIRE				
8	Existing Luminaire kW	0.074	0.058	0.114
9	New Luminaire kW	0.058	0.049	0.097
KW/KWH SAVINGS				
10	# of Existing Units	3	4	8
11	# of New Units	3	4	8
12	Total Existing Connected kW	0.222	0.232	0.912
13	Total New Connected kW	0.174	0.196	0.776
14	Total Customer Monthly kW Savings	0.048	0.036	0.136
15	Total Existing Annual kWh	381.251	399.099	1568.872
16	Total New Annual kWh	299.324	337.170	1334.917
17	Total Customer Annual kWh Savings	82	62	234
MEASURE INSTALLATION COST				
18	Material Cost Each	$18.45	$18.45	$25.28
19	Installation Cost Each	$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each	$0.00	$0.00	$0.00
21	Total Material Cost	$55.35	$73.80	$202.24
22	Total Installation Cost	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$55.35	$73.80	$202.24
HAZARDOUS MATERIAL DISPOSAL COST				
24	Total # Haz.Mat. Ballasts To Be Disposed	3	4	8
25	Total # Lamps	6	8	32
26	Total Cost for Disposal	$0.00	$0.00	$0.00
PROJECT COST				
27	Including Costs - Before Rebates	$55.35	$73.80	$202.24
28	Total Rebates	$45.00	$60.00	$120.00
29	Including Costs - After Rebates	$10.35	$13.80	$82.24
ANNUAL BILL SAVINGS				
30	Calculated Bill Savings	$9.60	$7.26	$27.43
31	Payback Before Rebates (Years)	5.8	10.2	7.4
32	Payback After Rebates (Years)	1.1	1.9	3.0

Maintenance Building

Maintenance Building ***Operation & Maintenance***		Measure # 1	Measure # 2	Measure # 3
1	Existing Equipment	2-F40T12/1-SMB	2-F32T8/1-EB	4-F32T8/1-EB
2	Replacement Equipment	2-F32T8/1-EB/RETRO	2-F28T8/1-NEB/RETRO	4-F28T8/1-NEB/RETRO
3	fixture code	BI	Z-BT8I	Z-DT8TI
Current Lamps				
4	Lamps Per Fixture	2	2	4
5	Annual Run Hours	1,720	1,720	1,720
6	Cost Per Lamp	$2.10	$2.10	$2.10
7	Lamp Life (hours)	20000	20000	20000
8	Number of fixtures	3	4	8
9	Maintenance Cost Per Year	$1.08	$1.45	$5.78
Proposed Lamps				
10	Lamps Per Fixture	2	2	4
11	Annual Run Hours	1,720	1,720	1,720
12	Cost Per Lamp	$2.10	$2.10	$2.10
13	Lamp Life (hours)	20000	20000	20000
14	Number of fixtures	3	4	8
15	Maintenance Cost Per Year	$1.08	$1.45	$5.78
Total Savings				
16	Maintenance Savings	$0.00	$0.00	$0.00

Current Ballasts				
17	Ballasts Per Fixture	1	1	1
18	Annual Run Hours	1,720	1,720	1,720
19	Cost Per Ballast	$14.25	$14.25	$16.88
20	Ballast Life (hours)	50000	50000	50000
21	Number of fixtures	3	4	8
22	Maintenance Cost Per Year	$1.47	$1.96	$4.65
Proposed Ballasts				
23	Ballasts Per Fixture	1	1	1
24	Annual Run Hours	1,720	1,720	1,720
25	Cost Per Ballast	$14.25	$14.25	$16.88
26	Ballast Life (hours)	50000	50000	50000
27	Number of fixtures	3	4	8
28	Maintenance Cost Per Year	$1.47	$1.96	$4.65
Total Savings				
29	Maintenance Savings	$0.00	$0.00	$0.00

LIGHTING RETROFIT

Highway Offices

Project No.: 3008-09NFT

Measure Summary Table

20-Aug-10

OPTIONAL
Self Implemented Option for Long Payback Measures
Costs do not include Labor Costs or Sales Fees

Savings		
Annual Demand Savings	7.7	kW/Year
Electrical Energy Savings	1,090	kWh/Year
Fossil Fuel Savings	(1)	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$139	Per Year
Total Energy & O&M Savings	$139	Per Year
Project Costs		
Total Measure Cost	$1,316	
Payback		
Simple Payback	9.5	Year(s)
Potential Incentives	$1,125	
Simple Payback with Incentives	1.4	Year(s)

Highway Offices

	LIGHTING DESCRIPTION	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5
1	Existing Equipment	1-F20T12/1-SMB	1-F32T8/1-EB	2-F17T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB
2	Replacement Equipment	1-F15T8/1-NEB/RETRO	1-F28T8/1-NEB/RETRO	2-F15T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO
3	fixture code	Z-AAAT8BA	Z-AT8W	Z-BBBT8TR	Z-BT8TR	Z-BT8VAB
4	Floor/Room	0	0	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0	0	0
6	Min. Required Lighting Level for Task					
7	Total Annual Hours	1,720	1,720	1,720	1,697	1,720
CONNECTED KW/LUMINAIRE						
8	Existing Luminaire kW	0.025	0.032	0.033	0.058	0.058
9	New Luminaire kW	0.015	0.024	0.026	0.049	0.049
KW/KWH SAVINGS						
10	# of Existing Units	1	32	3	37	2
11	# of New Units	1	32	3	37	2
12	Total Existing Connected kW	0.025	1.024	0.099	2.146	0.116
13	Total New Connected kW	0.015	0.768	0.078	1.813	0.098
14	Total Customer Monthly kW Savings	0.010	0.256	0.021	0.333	0.018
15	Total Existing Annual kWh	43.436	1761.540	170.305	3641.778	199.549
16	Total New Annual kWh	25.443	1321.155	134.696	3076.675	168.585
17	Total Customer Annual kWh Savings	18	440	36	565	31
MEASURE INSTALLATION COST						
18	Material Cost Each	$16.60	$16.35	$18.95	$18.45	$18.45
19	Installation Cost Each	$0.00	$0.00	$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each	$0.00	$0.00	$0.00	$0.00	$0.00
21	Total Material Cost	$16.60	$523.20	$56.85	$682.65	$36.90
22	Total Installation Cost	$0.00	$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$16.60	$523.20	$56.85	$682.65	$36.90
HAZARDOUS MATERIAL DISPOSAL COST						
24	Total # Haz.Mat. Ballasts To Be Disposed	1	32	3	37	2
25	Total # Lamps	1	32	6	74	4
26	Total Cost for Disposal	$0.00	$0.00	$0.00	$0.00	$0.00
PROJECT COST						
27	Including Costs - Before Rebates	$16.60	$523.20	$56.85	$682.65	$36.90
28	Total Rebates	$15.00	$480.00	$45.00	$555.00	$30.00
29	Including Costs - After Rebates	$1.60	$43.20	$11.85	$127.65	$6.90
ANNUAL BILL SAVINGS						
30	Calculated Bill Savings	$2.48	$60.58	$4.90	$78.24	$4.26
31	Payback Before Rebates (Years)	6.7	8.6	11.6	8.7	8.7
32	Payback After Rebates (Years)	0.6	0.7	2.4	1.6	1.6

Highway Offices

	Highway Offices ***Operation & Maintenance***	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5
1	Existing Equipment	1-F20T12/1-SMB	1-F32T8/1-EB	2-F17T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB
2	Replacement Equipment	1-F15T8/1-NEB/RETRO	1-F28T8/1-NEB/RETRO	2-F15T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO
3	fixture code	Z-AAAT8BA	Z-AT8W	Z-BBBT8TR	Z-BT8TR	Z-BT8VAB
	Current Lamps					
4	Lamps Per Fixture	1	1	2	2	2
5	Annual Run Hours	1,720	1,720	1,720	1,697	1,720
6	Cost Per Lamp	$2.35	$2.10	$2.35	$2.10	$2.10
7	Lamp Life (hours)	20000	20000	20000	20000	20000
8	Number of fixtures	1	32	3	37	2
9	Maintenance Cost Per Year	$0.20	$5.78	$1.21	$13.19	$0.72
	Proposed Lamps					
10	Lamps Per Fixture	1	1	2	2	2
11	Annual Run Hours	1,720	1,720	1,720	1,697	1,720
12	Cost Per Lamp	$2.35	$2.10	$2.35	$2.10	$2.10
13	Lamp Life (hours)	20000	20000	20000	20000	20000
14	Number of fixtures	1	32	3	37	2
15	Maintenance Cost Per Year	$0.20	$5.78	$1.21	$13.19	$0.72
	Total Savings					
16	Maintenance Savings	$0.00	$0.00	$0.00	$0.00	$0.00

	Current Ballasts					
17	Ballasts Per Fixture	1	1	1	1	1
18	Annual Run Hours	1,720	1,720	1,720	1,697	1,720
19	Cost Per Ballast	$14.25	$14.25	$14.25	$14.25	$14.25
20	Ballast Life (hours)	50000	50000	50000	50000	50000
21	Number of fixtures	1	32	3	37	2
22	Maintenance Cost Per Year	$0.49	$15.69	$1.47	$17.89	$0.98
	Proposed Ballasts					
23	Ballasts Per Fixture	1	1	1	1	1
24	Annual Run Hours	1,720	1,720	1,720	1,697	1,720
25	Cost Per Ballast	$14.25	$14.25	$14.25	$14.25	$14.25
26	Ballast Life (hours)	50000	50000	50000	50000	50000
27	Number of fixtures	1	32	3	37	2
28	Maintenance Cost Per Year	$0.49	$15.69	$1.47	$17.89	$0.98
	Total Savings					
29	Maintenance Savings	$0.00	$0.00	$0.00	$0.00	$0.00

LIGHTING RETROFIT

Highway Garage

Project No.: 3008-09NFT

Measure Summary Table

20-Aug-10

Savings		
Annual Demand Savings	4.9	kW/Year
Electrical Energy Savings	961	kWh/Year
Fossil Fuel Savings	(1)	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$107	Per Year
Total Energy & O&M Savings	$107	Per Year
Project Costs		
Total Measure Cost	$847	
Payback		
Simple Payback	7.9	Year(s)
Potential Incentives	$600	
Simple Payback with Incentives	2.3	Year(s)

OPTIONAL
Self Implemented Option for Long Payback Measures
Costs do not include Labor Costs or Design Fees

Highway Garage

	LIGHTING DESCRIPTION	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5	Measure # 6	Measure # 7
1	Existing Equipment	1-MH400/1-EMB	1-MH400/1-EMB	2-F17T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB	CF 20W	4-F32T8/1-EB
2	Replacement Equipment	Included in Recommended Proj.	Included in Recommended Proj.	2-F15T8/1-EB	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO		4-F28T8/1-NEB/RETRO
3	fixture code	MH400-DI8	MH400-FT8	Z-BBBT8	Z-BT8I	Z-BT8VAP	Z-CF	Z-DT8I8
4	Floor/Room			0	0	0	0	0
5	Lowest Recorded Lighting Level @Task			0	0	0	0	0
6	Min. Required Lighting Level for Task							
7	Total Annual Hours			1,456	2,064	860	1,720	3,010
CONNECTED KW/LUMINAIRE								
8	Existing Luminaire kW			0.033	0.058	0.058	0.023	0.111
9	New Luminaire kW			0.026	0.049	0.049	0.023	0.097
KW/KWH SAVINGS								
10	# of Existing Units			13	10	2	4	15
11	# of New Units			13	10	2	4	15
12	Total Existing Connected kW			0.429	0.580	0.116	0.092	1.670
13	Total New Connected kW			0.339	0.490	0.097	0.092	1.462
14	Total Customer Monthly kW Savings			0.090	0.090	0.019	0.000	0.209
15	Total Existing Annual kWh			624.452	1197.297	99.775	158.263	5028.647
16	Total New Annual kWh			493.885	1011.510	83.811	158.263	4400.066
17	Total Customer Annual kWh Savings			131	186	16	0	629
MEASURE INSTALLATION COST								
18	Material Cost Each			$18.95	$18.45	$18.45	$0.00	$25.28
19	Installation Cost Each			$0.00	$0.00	$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each			$0.00	$0.00	$0.00	$0.00	$0.00
21	Total Material Cost			$246.35	$184.50	$36.90	$0.00	$379.20
22	Total Installation Cost			$0.00	$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost			$246.35	$184.50	$36.90	$0.00	$379.20
HAZARDOUS MATERIAL DISPOSAL COST								
24	Total # Haz.Mat. Ballasts To Be Disposed			13	10	2	0	15
25	Total # Lamps			26	20	4	0	60
26	Total Cost for Disposal			$0.00	$0.00	$0.00	$0.00	$0.00
PROJECT COST								
27	Including Costs - Before Rebates			$246.35	$184.50	$36.90	$0.00	$379.20
28	Total Rebates			$195.00	$150.00	$30.00	$0.00	$225.00
29	Including Costs - After Rebates			$51.35	$34.50	$6.90	$0.00	$154.20
ANNUAL BILL SAVINGS								
30	Calculated Bill Savings			$19.51	$23.53	$3.24	$0.00	$68.85
31	Payback Before Rebates (Years)			12.6	7.8	11.4	0.0	5.5
32	Payback After Rebates (Years)			2.6	1.5	2.1	0.0	2.2

Highway Garage

	Highway Garage ***Operation & Maintenance***	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5	Measure # 6	Measure # 7
1	Existing Equipment	1-MH400/1-EMB	1-MH400/1-EMB	2-F17T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB	CF 20W	4-F32T8/1-EB
2	Replacement Equipment	Included in Recommended Proj.	Included in Recommended Proj.	2-F15T8/1-EB	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO		4-F28T8/1-NEB/RETRO
3	fixture code	MH400-DI8	MH400-FT8	Z-BBBT8	Z-BT8I	Z-BT8VAP	Z-CF	Z-DT8I8
	Current Lamps							
4	Lamps Per Fixture			2	2	2	0	4
5	Annual Run Hours			1,456	2,064	860	1,720	3,010
6	Cost Per Lamp			$2.35	$2.10	$2.10	$0.00	$2.10
7	Lamp Life (hours)			20000	20000	20000	0	20000
8	Number of fixtures			13	10	2	4	15
9	Maintenance Cost Per Year			$4.45	$4.34	$0.36	$0.00	$18.97
	Proposed Lamps							
10	Lamps Per Fixture			2	2	2	0	4
11	Annual Run Hours			1,456	2,064	860	1,720	3,010
12	Cost Per Lamp			$2.35	$2.10	$2.10	0	$2.10
13	Lamp Life (hours)			20000	20000	20000	0	20000
14	Number of fixtures			13	10	2	4	15
15	Maintenance Cost Per Year			$4.45	$4.34	$0.36	$0.00	$18.97
	Total Savings							
16	Maintenance Savings			$0.00	$0.00	$0.00	$0.00	$0.00

	Current Ballasts							
17	Ballasts Per Fixture			1	1	1	0	1
18	Annual Run Hours			1,456	2,064	860	1,720	3,010
19	Cost Per Ballast			$14.25	$14.25	$14.25	$0.00	$14.25
20	Ballast Life (hours)			50000	50000	50000	0	50000
21	Number of fixtures			13	10	2	4	15
22	Maintenance Cost Per Year			$5.39	$5.88	$0.49	$0.00	$12.87
	Proposed Ballasts							
23	Ballasts Per Fixture			1	1	1	0	1
24	Annual Run Hours			1,456	2,064	860	1,720	3,010
25	Cost Per Ballast			$14.25	$14.25	$14.25	$0.00	$14.25
26	Ballast Life (hours)			50000	50000	50000	0	50000
27	Number of fixtures			13	10	2	4	15
28	Maintenance Cost Per Year			$5.39	$5.88	$0.49	$0.00	$12.87
	Total Savings							
29	Maintenance Savings			$0.00	$0.00	$0.00	$0.00	$0.00

LIGHTING RETROFIT

Nike Base B&G

Project No.: 3008-09NFT

Measure Summary Table

20-Aug-10

Savings		
Annual Demand Savings	3.7	kW/Year
Electrical Energy Savings	524	kWh/Year
Fossil Fuel Savings	(0)	mmBtu/Year
Operational & Maintenance Savings	($1)	Per Year
Energy Savings ($)	$70	Per Year
Total Energy & O&M Savings	$69	Per Year
Project Costs		
Total Measure Cost	$544	
Payback		
Simple Payback	7.8	Year(s)
Potential Incentives	$405	
Simple Payback with Incentives	2.0	Year(s)

OPTIONAL
Self Implemented Option for Long Payback Measures
Costs do not include Labor Costs or Design Fees

Nike Base B&G

	LIGHTING DESCRIPTION	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5
1	Existing Equipment	1-F32T8/1-EB	2-F17T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB	4-F32T8/1-EB
2	Replacement Equipment	1-F28T8/1-NEB/RETRO	1-F15T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	4-F28T8/1-NEB/RETRO
3	fixture code	Z-AT8W	Z-BBBT8	Z-BT8	Z-BT8I8	Z-DT8I8
4	Floor/Room	0	0	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0	0	0
6	Min. Required Lighting Level for Task					
7	Total Annual Hours	1,720	1,720	1,720	1,720	1,720
	CONNECTED KW/LUMINAIRE					
8	Existing Luminaire kW	0.032	0.033	0.058	0.058	0.114
9	New Luminaire kW	0.024	0.026	0.049	0.049	0.097
	KW/KWH SAVINGS					
10	# of Existing Units	10	1	4	2	10
11	# of New Units	10	1	4	2	10
12	Total Existing Connected kW	0.320	0.033	0.232	0.116	1.140
13	Total New Connected kW	0.244	0.026	0.195	0.097	0.974
14	Total Customer Monthly kW Savings	0.076	0.007	0.037	0.019	0.166
15	Total Existing Annual kWh	550.481	56.768	399.099	199.549	1961.090
16	Total New Annual kWh	419.054	44.899	335.243	167.622	1676.216
17	Total Customer Annual kWh Savings	131	12	64	32	285
	MEASURE INSTALLATION COST					
18	Material Cost Each	$16.35	$16.60	$18.45	$18.45	$25.28
19	Installation Cost Each	$0.00	$0.00	$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each	$0.00	$0.00	$0.00	$0.00	$0.00
21	Total Material Cost	$163.50	$16.60	$73.80	$36.90	$252.80
22	Total Installation Cost	$0.00	$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$163.50	$16.60	$73.80	$36.90	$252.80
	HAZARDOUS MATERIAL DISPOSAL COST					
24	Total # Haz.Mat. Ballasts To Be Disposed	10	1	4	2	10
25	Total # Lamps	10	2	8	4	40
26	Total Cost for Disposal	$0.00	$0.00	$0.00	$0.00	$0.00
	PROJECT COST					
27	Including Costs - Before Rebates	$163.50	$16.60	$73.80	$36.90	$252.80
28	Total Rebates	$150.00	$15.00	$60.00	$30.00	$150.00
29	Including Costs - After Rebates	$13.50	$1.60	$13.80	$6.90	$102.80
	ANNUAL BILL SAVINGS					
30	Calculated Bill Savings	$18.68	$1.69	$9.08	$4.54	$40.49
31	Payback Before Rebates (Years)	8.8	9.8	8.1	8.1	6.2
32	Payback After Rebates (Years)	0.7	0.9	1.5	1.5	2.5

Nike Base B&G

	Nike Base B&G ***Operation & Maintenance***	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5
1	Existing Equipment	1-F32T8/1-EB	2-F17T8/1-EB	2-F32T8/1-EB	2-F32T8/1-EB	4-F32T8/1-EB
2	Replacement Equipment	1-F28T8/1-NEB/RETRO	1-F15T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	2-F28T8/1-NEB/RETRO	4-F28T8/1-NEB/RETRO
3	fixture code	Z-AT8W	Z-BBBT8	Z-BT8	Z-BT8I8	Z-DT8I8
	Current Lamps					
4	Lamps Per Fixture	1	2	2	2	4
5	Annual Run Hours	1,720	1,720	1,720	1,720	1,720
6	Cost Per Lamp	$2.10	$2.35	$2.10	$2.10	$2.10
7	Lamp Life (hours)	20000	20000	20000	20000	20000
8	Number of fixtures	10	1	4	2	10
9	Maintenance Cost Per Year	$1.81	$0.40	$1.45	$0.72	$7.23
	Proposed Lamps					
10	Lamps Per Fixture	1	1	2	2	4
11	Annual Run Hours	1,720	1,720	1,720	1,720	1,720
12	Cost Per Lamp	$2.10	$2.35	$2.10	$2.10	$2.10
13	Lamp Life (hours)	20000	20000	20000	20000	20000
14	Number of fixtures	10	1	4	2	10
15	Maintenance Cost Per Year	$1.81	$0.20	$1.45	$0.72	$7.23
	Total Savings					
16	Maintenance Savings	$0.00	$0.20	$0.00	$0.00	$0.00

	Current Ballasts					
17	Ballasts Per Fixture	1	1	1	1	1
18	Annual Run Hours	1,720	1,720	1,720	1,720	1,720
19	Cost Per Ballast	$14.25	$14.25	$14.25	$14.25	$14.25
20	Ballast Life (hours)	50000	50000	50000	50000	50000
21	Number of fixtures	10	1	4	2	10
22	Maintenance Cost Per Year	$4.90	$0.49	$1.96	$0.98	$4.90
	Proposed Ballasts					
23	Ballasts Per Fixture	1	1	1	1	1
24	Annual Run Hours	1,720	1,720	1,720	1,720	1,720
25	Cost Per Ballast	$14.25	$14.25	$14.25	$14.25	$16.88
26	Ballast Life (hours)	50000	50000	50000	50000	50000
27	Number of fixtures	10	1	4	2	10
28	Maintenance Cost Per Year	$4.90	$0.49	$1.96	$0.98	$5.81
	Total Savings					
29	Maintenance Savings	$0.00	$0.00	$0.00	$0.00	-$0.90

LIGHTING RETROFIT

Fitness Center

Project No.: 3008-09NFT

Measure Summary Table

20-Aug-10

Savings		
Annual Demand Savings	8.6	kW/Year
Electrical Energy Savings	1,963	kWh/Year
Fossil Fuel Savings	(2)	mmBtu/Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$210	Per Year
Total Energy & O&M Savings	$210	Per Year
Project Costs		
Total Measure Cost	$892	
Payback		
Simple Payback	4.2	Year(s)
Potential Incentives	$855	
Simple Payback with Incentives	0.2	Year(s)

OPTIONAL
Self Implemented Option for Long Payback Measures
Costs do not include Labor Costs or Design Fees

Fitness Center

	LIGHTING DESCRIPTION	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5	Measure # 6
1	Existing Equipment	2-F40T12/1-SMB	INC 100W	1-F32T8/1-EB	2-F20T12/1-SMB	2-F32T8/1-EB	CF 26W
2	Replacement Equipment	Included in Recommended Proj.	Included in Recommended Proj.	1-F28T8/1-EB/RETRO	2-F15T8/1-EB/RETRO	2-F28T8/1-EB/RETRO	Leave as is
3	fixture code	BI	I100BB	ZAT8W	ZBBBT8	ZBT8TR1	Z-CF26
4	Floor/Room			0	0	0	0
5	Lowest Recorded Lighting Level @Task			0	0	0	0
6	Min. Required Lighting Level for Task						
7	Total Annual Hours			1,872	2,574	3,276	3,276
CONNECTED KW/LUMINAIRE							
8	Existing Luminaire kW			0.030	0.030	0.058	0.028
9	New Luminaire kW			0.024	0.026	0.049	0.028
KW/KWH SAVINGS							
10	# of Existing Units			22	18	9	4
11	# of New Units			22	18	9	4
12	Total Existing Connected kW			0.660	0.532	0.522	0.112
13	Total New Connected kW			0.528	0.470	0.441	0.112
14	Total Customer Monthly kW Savings			0.132	0.063	0.081	0.000
15	Total Existing Annual kWh			1235.520	1370.501	1710.072	366.912
16	Total New Annual kWh			988.416	1209.265	1444.716	366.912
17	Total Customer Annual kWh Savings			247	161	265	0
MEASURE INSTALLATION COST							
18	Material Cost Each			$16.35	$18.95	$18.45	$0.00
19	Installation Cost Each			$0.00	$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each			$0.00	$0.00	$0.00	$0.00
21	Total Material Cost			$359.70	$341.10	$166.05	$0.00
22	Total Installation Cost			$0.00	$0.00	$0.00	$0.00
23	Total Material & Installation Cost			$359.70	$341.10	$166.05	$0.00
HAZARDOUS MATERIAL DISPOSAL COST							
24	Total # Haz.Mat. Ballasts To Be Disposed			22	18	9	0
25	Total # Lamps			22	36	18	0
26	Total Cost for Disposal			$0.00	$0.00	$0.00	$0.00
PROJECT COST							
27	Including Costs - Before Rebates			$359.70	$341.10	$166.05	$0.00
28	Total Rebates			$330.00	$0.00	$135.00	$0.00
29	Including Costs - After Rebates			$29.70	$341.10	$31.05	$0.00
ANNUAL BILL SAVINGS							
30	Calculated Bill Savings			$32.27	$19.03	$29.41	$0.00
31	Payback Before Rebates (Years)			11.1	17.9	5.6	0.0
32	Payback After Rebates (Years)			0.9	17.9	1.1	0.0

Fitness Center

	LIGHTING DESCRIPTION	Measure # 7	Measure # 8
1	Existing Equipment	4-F32T8/1-EB	4-F32T8/1-EB
2	Replacement Equipment	4-F28T8/1-EB/RETRO	4-F28T8/1-EB/RETRO
3	fixture code	ZDT8	ZDT8TR
4	Floor/Room	0	0
5	Lowest Recorded Lighting Level @Task	0	0
6	Min. Required Lighting Level for Task		
7	Total Annual Hours	936	2,995
CONNECTED KW/LUMINAIRE			
8	Existing Luminaire kW	0.114	0.114
9	New Luminaire kW	0.097	0.097
KW/KWH SAVINGS			
10	# of Existing Units	1	25
11	# of New Units	1	25
12	Total Existing Connected kW	0.114	2.850
13	Total New Connected kW	0.097	2.425
14	Total Customer Monthly kW Savings	0.017	0.425
15	Total Existing Annual kWh	106.704	8536.320
16	Total New Annual kWh	90.792	7263.360
17	Total Customer Annual kWh Savings	16	1273
MEASURE INSTALLATION COST			
18	Material Cost Each	$25.28	
19	Installation Cost Each	$0.00	
20	Total Material & Installation Cost Each	$0.00	$0.00
21	Total Material Cost	$25.28	$0.00
22	Total Installation Cost	$0.00	$0.00
23	Total Material & Installation Cost	$25.28	$0.00
HAZARDOUS MATERIAL DISPOSAL COST			
24	Total # Haz.Mat. Ballasts To Be Disposed	1	25
25	Total # Lamps	4	100
26	Total Cost for Disposal	$0.00	$0.00
PROJECT COST			
27	Including Costs - Before Rebates	$25.28	$0.00
28	Total Rebates	$15.00	$375.00
29	Including Costs - After Rebates	$10.28	($375.00)
ANNUAL BILL SAVINGS			
30	Calculated Bill Savings	$2.81	$144.21
31	Payback Before Rebates (Years)	9.0	0.0
32	Payback After Rebates (Years)	3.7	-2.6

Fitness Center

	Fitness Center ***Operation & Maintenance***	Measure # 1	Measure # 2	Measure # 3	Measure # 4	Measure # 5	Measure # 6
1	Existing Equipment	2-F40T12/1-SMB	INC 100W	1-F32T8/1-EB	2-F20T12/1-SMB	2-F32T8/1-EB	CF 26W
2	Replacement Equipment	Included in Recommended Proj.	Included in Recommended Proj.	1-F28T8/1-EB/RETRO	2-F15T8/1-EB/RETRO	2-F28T8/1-EB/RETRO	Leave as is
3	fixture code	BI	I100BB	ZAT8W	ZBBBT8	ZBT8TR1	Z-CF26
	Current Lamps						
4	Lamps Per Fixture			1	2	2	0
5	Annual Run Hours			1,872	2,574	3,276	3,276
6	Cost Per Lamp			$2.10	$2.35	$2.10	$0.00
7	Lamp Life (hours)			20000	20000	20000	0
8	Number of fixtures			22	18	9	4
9	Maintenance Cost Per Year			$4.32	$10.89	$6.19	$0.00
	Proposed Lamps						
10	Lamps Per Fixture			1	2	2	0
11	Annual Run Hours			1,872	2,574	3,276	3,276
12	Cost Per Lamp			$2.10	$2.35	$2.10	0
13	Lamp Life (hours)			20000	20000	20000	0
14	Number of fixtures			22	18	9	4
15	Maintenance Cost Per Year			$4.32	$10.89	$6.19	$0.00
	Total Savings						
16	Maintenance Savings			$0.00	$0.00	$0.00	$0.00

	Current Ballasts						
17	Ballasts Per Fixture			1	1	1	0
18	Annual Run Hours			1,872	2,574	3,276	3,276
19	Cost Per Ballast			$14.25	$14.25	$14.25	$0.00
20	Ballast Life (hours)			50000	50000	50000	0
21	Number of fixtures			22	18	9	4
22	Maintenance Cost Per Year			$11.74	$13.20	$8.40	$0.00
	Proposed Ballasts						
23	Ballasts Per Fixture			1	1	1	0
24	Annual Run Hours			1,872	2,574	3,276	3,276
25	Cost Per Ballast			$14.25	$14.25	$14.25	$0.00
26	Ballast Life (hours)			50000	50000	50000	0
27	Number of fixtures			22	18	9	4
28	Maintenance Cost Per Year			$11.74	$13.20	$8.40	$0.00
	Total Savings						
29	Maintenance Savings			$0.00	$0.00	$0.00	$0.00

Fitness Center

	Fitness Center ***Operation & Maintenance***	Measure # 7	Measure # 8
1	Existing Equipment	4-F32T8/1-EB	4-F32T8/1-EB
2	Replacement Equipment	4-F28T8/1-EB/RETRO	4-F28T8/1-EB/RETRO
3	fixture code	ZDT8	ZDT8TR
	Current Lamps		
4	Lamps Per Fixture	4	4
5	Annual Run Hours	936	2,995
6	Cost Per Lamp	$2.10	$2.10
7	Lamp Life (hours)	20000	20000
8	Number of fixtures	1	25
9	Maintenance Cost Per Year	$0.39	$31.45
	Proposed Lamps		
10	Lamps Per Fixture	4	4
11	Annual Run Hours	936	2,995
12	Cost Per Lamp	$2.10	$2.10
13	Lamp Life (hours)	20000	20000
14	Number of fixtures	1	25
15	Maintenance Cost Per Year	$0.39	$31.45
	Total Savings		
16	Maintenance Savings	$0.00	$0.00

	Current Ballasts		
17	Ballasts Per Fixture	1	1
18	Annual Run Hours	936	2,995
19	Cost Per Ballast	$16.88	$16.88
20	Ballast Life (hours)	50000	50000
21	Number of fixtures	1	25
22	Maintenance Cost Per Year	$0.32	$25.28
	Proposed Ballasts		
23	Ballasts Per Fixture	1	1
24	Annual Run Hours	936	2,995
25	Cost Per Ballast	$16.88	$16.88
26	Ballast Life (hours)	50000	50000
27	Number of fixtures	1	25
28	Maintenance Cost Per Year	$0.32	$25.28
	Total Savings		
29	Maintenance Savings	$0.00	$0.00

Section 5

Energy Management System Upgrades

ENERGY MANAGEMENT SYSTEM UPGRADES

ECM - 2

INVESTIGATION

Wendel visited several Town facilities to evaluate their existing HVAC controls systems. The buildings have very different constructions, HVAC equipment and levels of control. The range of control varies from a full energy management systems (EMS) with a direct digital controllers and a central computer frontend, to a single wall thermostat. During Wendel's walkthrough facility personnel and occupants noted areas of concern. Wendel worked with representatives from the Town and contract maintenance personnel to identify opportunities where the addition or expansion of the controls system would optimize the building's operation and the overall energy efficiency of the HVAC systems. These opportunities would result in direct energy savings and space comfort improvements.

Town Hall

Existing System

The Town Hall is a two story facility, with a basement/ground floor and a first floor. The building is conditioned by several different system types. Ventilation air is primarily provided by seven (7) roof top single zone, constant volume air handling units with direct expansion (DX) cooling and direct fire natural gas heating. These units are controlled directly by the central EMS system and are scheduled to setback during unoccupied hours. The ventilation air is determined by a CO2 sensor located in the return air plenum of the space. When the CO2 set point is reached the mixed air damper and outdoor air damper modulate to deliver the proper ventilation. It was noted that these units often cycle from cooling to heating within a short period of time. This type of operation implies that the system is over cooling and then overheating the space. Wendel also noted that on the day of our visit that the outdoor air sensor was at 55°F however, mechanical cooling was being utilized rather than economizing with outdoor air. The following figure is trend information for the courtroom RTU for the week of April 9th. As demonstrated in this trend information, the unit appears to cycle between mechanical cooling and heating during a short period of time.

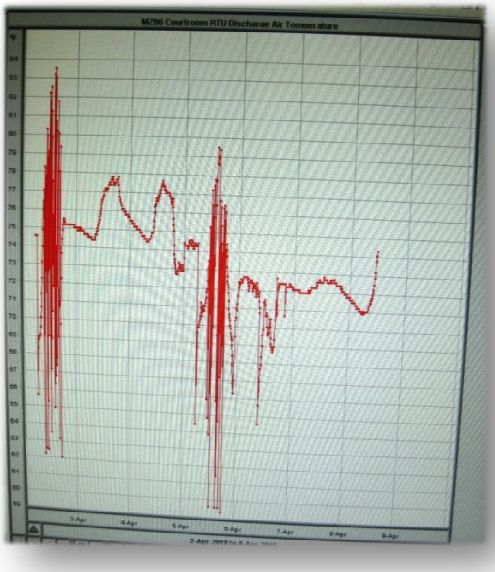


Figure 5.1Courtroom AHU Discharge Air Temperature Trend Information

In some areas console style package terminal air conditioning units (PTAC) are utilized. These units are controlled by local programmable thermostats. These thermostats are independent from the central building control system. While these thermostats have the ability to be set back, facility personnel informed Wendel that the settings are often changed by occupants resulting in higher operation temperatures and no setbacks.

Fin tube radiant units are installed in several areas that are also served by the RTUs. The fin tube units are separated into three (3) zones that are controlled by pneumatic to DCC three way valves in the basement. These valves can adjust the flow rate to the fin tube units while maintaining constant flow through the boilers. Even with this control several occupants often complain of overheating. Facility personnel have tried to account for this by periodically modulating the boiler supply water temperature. The exiting boilers were installed in 2002 and are non-condensing, modulating hot water boilers. The modulation of the supply water temperature is an effective and efficient way to control space heating from fin tube radiant units. However, there is a risk of this type of control on these boilers. By lowering the supply and subsequent return temperature too much, the exhaust vapors may condense resulting in the need for repair or replacement of corroded boiler parts.

Proposed System

Wendel worked with facility personnel and the controls contractor to identify issues and investigate improvement opportunities. In general this facility is well controlled by means of the existing EMS system. An opportunity exists to save energy by connecting the PTAC zone programmable thermostats into the exiting building DDC control system. By connecting these units into this system, facility management personnel can program unit setbacks while still allowing the user to adjust the occupied set point or temporarily override the setback for late meetings or other events that may take place after normal operating hours.

The fin tube radiant system appears to have limited control. During the investigation it was noted that the three way control valves may have failed in an open position. This type of failure limits the facility's ability to control this heating system and can result in overheating. After reviewing the system with the facility and controls contractor, Wendel proposes repairing or replacing the pneumatic actuators.

Additionally, an opportunity exists to utilize outdoor air reset controls on the existing boiler system. These controls will automatically modulate the boiler's temperature based on the outdoor air temperature and the heating needs of the space. This will mitigate the occurrence of overheating as reported by building occupants. This control process already exists, however is currently programmed to operate with a return water temperate between 170°F and 160°F. Additional modulation is available that would allow the return water temperature to be lowered to 140°F during low load conditions. The programming would be upgraded to adjust these setting and incorporate the new control valves. A low limit set point will be programmed to prevent the return water temperature from falling below 140°F which could result in the condensing of the flue gases and damage to the boiler.

In the basement of the Town Hall is a large assembly area that is often unoccupied. This area is served by fin tube radiant heat and two split system AC units. A wide view occupancy sensor would be installed that would have the ability of turning off the space lighting and AC units during unoccupied periods. The fine tube units would not be controlled by this sensor due to the exiting piping layout and control valve location.

The seven (7) roof top units have a local economizer controller that was installed by the RTU manufacturer. As previously described it appears that these controls require adjustment to possibly increase the dead ban period and optimize the economizer. Energy savings would be realized by a reduction in mechanical cooling, and/or overheating. Energy savings for this could not be quantified due to the periodic and cyclic nature of this issue. The cost for these improvements was included in the overall EMS cost for this building.

Buildings and Grounds

Existing System

The Buildings and Grounds building is served by several heating system types. The offices are served by a small boiler and air handling unit located in a utility closet. Several of the work areas are heated by direct fired unit heaters with independent thermostats. The majority of the space heating is done by infrared radiant heating units in the garage area. These units are controlled by zone thermostats.

Proposed System

After an investigation of the existing system, it appears that an opportunity for energy savings exists by installing or connecting programmable thermostats that control the aforementioned system into a central control system. The central control system will have the ability to create set back periods during unoccupied hours. Energy savings will be achieved by reducing the space temperature when the building is unoccupied. The current Town EMS system has the ability to connect multiple buildings using controllers and IP internet connections. This system will allow this facility's set points to be controlled by the existing EMS system remotely from the Town Hall.

Highway Department Office

Existing System

The Highway Department Office is a multipurpose office building that is served by a combination of RTUs and fin tube radiant heaters. The fin tube units are served by two hot water boilers. These units are individually controlled by zone thermostats that do not have the ability to be programmed.

Figure E-5.2 Existing Boiler in Highway Office

Proposed System

After review of the operation of the existing equipment, it was discovered that an opportunity for energy savings exists by installing programmable thermostats to control the fin tube radiant heating system and connecting these thermostats to a central control system. The central control system will have the ability to create set back periods during unoccupied hours. Energy savings will be achieved by reducing the space temperature when the building is unoccupied. The current Town EMS system has the ability to connect multiple buildings using controllers and IP internet connections. This system will allow this facility's set points to be controlled by the existing EMS system remotely from the Town Hall.

Highway Department Garage

Existing System

The Highway Department Garage is served by several types of heating systems. The offices are served by a small boiler located in a utility closet and an air handling unit. The majority of the space heating is done by infrared radiant heating units in the garage area. These units are controlled by zone thermostats.

Proposed System

After an investigation of the existing system, it appears that an opportunity for energy savings exists by installing or connecting programmable thermostats that control the aforementioned

system into a central control system. The central control system will have the ability to create set back periods during unoccupied hours. Energy savings will be achieved by reducing the space temperature when the building is unoccupied. The current Town EMS system has the ability to connect multiple buildings using controllers and IP internet connection. This system will allow this facility's set points to be controlled by the existing EMS system remotely from the Town Hall.

Senior Adult Day Care

Existing System

The Adult Day Care building has multiple zones served by a combination of RTUs and fin tube radiant heating. The fin tube units are broken up into five (5) zones. Each zone is controlled by a local thermostat. In some areas the thermostat has the ability to be programmed for night set-back, in other areas the thermostats do not have this capability.

Three (3) RTUs provide heating, cooling and ventilation to the space. Two (2) of the RTUs use natural gas as there heating source, the newest RTU uses electricity. Each of these units are independently controlled by a zone programmable thermostat. Facility personnel noted that these set back settings on the thermostats are often not utilized by the occupants.

Proposed System

After an investigation of the existing system, it appears that an opportunity for energy savings existing by installing or connecting programmable thermostats that control the aforementioned system into a central control system. The central control system will have the ability to create set back periods during unoccupied hours. Energy savings will be achieved by reducing the space temperature when the building is unoccupied. The current Town EMS system has the ability to connect multiple buildings using controllers and IP internet connection. This system will allow this facility's set points to be controlled by the existing EMS system remotely from the Town Hall. In order to properly control the building's systems control points and valves will need to be installed on both the fin tube system and the RTUs. Since the RTU's have the ability to heat the space both the fin tube and the RTUs will need to be set back at the same time to achieve savings.

Senior Garage

Existing System

The Senior Garage is served by two (2) gas fired unit heaters. During Wendel's site visit it was noted that the thermostat temperature was at 64°F, however the space temperature was 73°F. This difference in temperature implies a failure in the control system.

Figure E-5.3 Existing Unit Heater in Senior Garage

Proposed System

The senior garage is utilized by Town staff to store and clean vehicles. The sparse use of this facility allows a large opportunity for energy savings. The proposed system would replace the existing control system with a new programmable thermostat and set-back schedule.

RECOMMENDATIONS

Wendel recommends the proposed improvements to the Town Hall, Buildings and Grounds, Highway Garage, Highway Office, and Senior Garage. These systems will reduce the Town's energy cost in a cost effective manner that meets the payback requirements as outlined by the customer and space comfort improvement.

Wendel does not recommend the proposed improvements to the Senior Adult Day Care. The cost associated with installing the required controls equipment on the building's HVAC system far exceeds the anticipated annual energy savings from reducing the space temperature during unoccupied periods.

Town of Hamburg
Energy Management System Improvements
Town Hall

Project #: 3008-09NFT

ECM #: 2

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	261	MMBtu/Year
Environmental CO_2 Gas Savings(1)	30,344	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$2,649	Per Year
Total Energy & O&M Savings	$2,649	Per Year
Project Costs		
Total Measure Cost	$28,503	
Payback		
Simple Payback	10.8	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	10.8	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

5.56 passenger cars (Reduced)
70.57 barrels of oil (Saved)
2.76 houses energy use for 1 year
778.05 number of trees planted

Estimate of Project Economics
Utility Billing History for Fossil Fuel Consumption
Town Hall

Month	Existing Facility Usage(CCF)	Existing Facility Usage(Dollars)	Existing Facility Usage(Gallons)	Existing Facility Usage(Dollars)	Existing Facility Usage (mmBtu)	Existing Facility Usage(Dollars)	Existing Estimated Boiler Usage(mmBtu)
January	2,843.00	$3,406.32	0.00	$0.00	284.30	$3,406.32	259.81
February	1,762.00	$2,051.29	0.00	$0.00	176.20	$2,051.29	161.02
March	1,285.00	$1,260.95	0.00	$0.00	128.50	$1,260.95	117.43
April	509.00	$495.02	0.00	$0.00	50.90	$495.02	46.51
May	6.00	$23.33	0.00	$0.00	0.60	$23.33	0.55
June	12.00	$28.94	0.00	$0.00	1.20	$28.94	1.10
July	11.00	$27.76	0.00	$0.00	1.10	$27.76	1.01
August	296.00	$285.15	0.00	$0.00	29.60	$285.15	27.05
September	648.00	$655.19	0.00	$0.00	64.80	$655.19	59.22
October	1,623.00	$1,575.29	0.00	$0.00	162.30	$1,575.29	148.32
November	3,302.00	$2,890.09	0.00	$0.00	330.20	$2,890.09	301.75
December	2,792.00	$2,631.44	0.00	$0.00	279.20	$2,631.44	255.15
Totals	15,089.00	$15,330.77	0.00	$0.00	1,508.90	$15,330.77	1,378.90

Assumptions:
Summer = June, July, August, September
operating hours are unchanged.

82%	Existing Boiler Efficiency		
82%	Proposed Boiler Efficiency		
91.38%	Estimated consumption due to boilers		
$1.02	Cost per CCF	$10.16	Cost per mmBtu(gas)
$0.00	Cost per Gallon	$0.00	Cost per mmBtu(oil)
		$10.16	Cost per mmBtu(average)

Total Base Load	
Consumption	130.00
% of total	8.62%
Total Heating Load	
Consumption	1,378.90
% of total	91.38%
Load from Calcs	715

Town Hall
PTAC Units - Temperature Setback Savings - Heating

Assumptions:

			Model	Capacity	Quantity
Occ. Indoor Temp.	73		P1 009C	13.3	3
Reduced Occ Temp,	72		P1 012C	13.3	6
Unocc. Indoor Temp.	62		P1 014C	15.5	5
Peak Heating Load	148	MBH			

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	8	8	8
Unoccupied	0	0	0
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	100.00%	100.00%	100.00%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	1	8	1
Unoccupied	7	0	7
Weekends			
Occupied	0	4	0
Unoccupied	8	4	8
% Occupied	8.93%	85.71%	8.93%

Bin Temperature Data (Heating Only)				Occ	Red. Occ	Unocc	Existing Conditions					Proposed Condiitions					Total	Total
	Hours/Bin			% Load	% Load	% Load	Occupied		Unoccupied		Total	Occupied		Unoccupied		Total	Reduced	Reduced
				at IAT =	at IAT =	at IAT =	Load	Usage	Load	Usage	Usage	Load	Usage	Load	Usage	Usage	Usage	Cost
Bin Temp	0 - 8	8 - 16	16 - 24	73	72	62	(MBH)	(mmBtu)	(MBH)	(mmBtu)	(mmBtu)	(MBH)	(mmBtu)	(MBH)	(mmBtu)	(mmBtu)	(mmBtu)	($)
-17.5	0	0	0	100%	100%	88%	148	0.0	130	0.0	0.0	148	0.0	130	0.0	0.0	0.0	$0.00
-12.5	1	0	0	94%	94%	82%	140	0.1	122	0.0	0.1	140	0.0	122	0.1	0.1	0.0	$0.17
-7.5	0	0	1	89%	89%	77%	132	0.1	114	0.0	0.1	131	0.0	114	0.1	0.1	0.0	$0.17
-2.5	3	0	1	83%	83%	71%	123	0.5	105	0.0	0.5	123	0.0	105	0.4	0.4	0.1	$0.67
2.5	12	5	6	78%	78%	66%	115	2.6	97	0.0	2.6	115	0.7	97	1.7	2.3	0.3	$3.15
7.5	39	13	20	72%	72%	60%	107	7.7	89	0.0	7.7	107	1.7	89	5.0	6.7	1.0	$10.23
12.5	71	40	61	67%	66%	55%	99	17.0	81	0.0	17.0	98	4.5	81	10.2	14.7	2.3	$23.26
17.5	106	60	81	61%	61%	49%	91	22.4	73	0.0	22.4	90	6.1	73	13.0	19.1	3.3	$33.11
22.5	152	117	133	56%	55%	44%	83	33.2	65	0.0	33.2	82	10.3	65	17.8	28.1	5.1	$51.39
27.5	227	185	213	50%	50%	38%	74	46.5	56	0.0	46.5	74	14.5	56	24.1	38.6	7.8	$79.67
32.5	352	277	308	45%	44%	33%	66	62.0	48	0.0	62.0	65	19.3	48	30.9	50.2	11.8	$119.76
37.5	279	240	261	39%	39%	27%	58	45.3	40	0.0	45.3	57	14.5	40	21.1	35.5	9.7	$98.68
42.5	245	191	215	34%	33%	22%	50	32.4	32	0.0	32.4	49	10.0	32	14.2	24.2	8.2	$83.78
47.5	243	181	231	28%	27%	16%	42	27.3	24	0.0	27.3	40	8.0	24	10.8	18.8	8.5	$85.95
52.5	249	184	223	23%	22%	10%	34	22.0	16	0.0	22.0	32	6.4	16	7.1	13.5	8.5	$85.91
57.5	257	193	225	17%	16%	5%	25	17.1	7	0.0	17.1	24	5.0	7	3.4	8.4	8.7	$88.11
Total	2,236	1,686	1,979					336			336		101		160	261	75	$764.00

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

1,379 Annual Heat Load
1,509 Annual Btu Usage

5.0% Savings

Annual Savings Summary	
Fuel (mmBtu)	75
Cost ($)	$764.00

Town Hall
FIN Tube Radiant - Temperature Setback and Overheating Savings - Heating

Assumptions:

Occ. Indoor Temp.	75
Reduced Occ Temp,	72
Unocc. Indoor Temp.	62
Peak Heating Load	304 MBH

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	8	8	8
Unoccupied	0	0	0
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	100.00%	100.00%	100.00%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	1	8	1
Unoccupied	7	0	7
Weekends			
Occupied	0	4	0
Unoccupied	8	4	8
% Occupied	8.93%	85.71%	8.93%

Bin Temperature Data (Heating Only)				Occ	Red. Occ	Unocc	Existing Conditions					Proposed Condiitions					Total	Total
	Hours/Bin			% Load	% Load	% Load	Occupied		Unoccupied		Total	Occupied		Unoccupied		Total	Reduced	Reduced
				at IAT =	at IAT =	at IAT =	Load	Usage	Load	Usage	Usage	Load	Usage	Load	Usage	Usage	Usage	Cost
Bin Temp	0 - 8	8 - 16	16 - 24	75	72	62	(MBH)	(mmBtu)	(MBH)	(mmBtu)	(mmBtu)	(MBH)	(mmBtu)	(MBH)	(mmBtu)	(mmBtu)	(mmBtu)	($)
-17.5	0	0	0	100%	100%	86%	304	0.0	261	0.0	0.0	304	0.0	261	0.0	0.0	0.0	$0.00
-12.5	1	0	0	95%	94%	81%	288	0.3	245	0.0	0.3	287	0.0	245	0.2	0.2	0.0	$0.40
-7.5	0	0	1	89%	89%	75%	271	0.3	228	0.0	0.3	270	0.0	228	0.2	0.2	0.0	$0.40
-2.5	3	0	1	84%	83%	70%	255	1.0	212	0.0	1.0	253	0.1	212	0.8	0.9	0.2	$1.59
2.5	12	5	6	78%	78%	64%	238	5.5	196	0.0	5.5	236	1.4	196	3.3	4.7	0.7	$7.56
7.5	39	13	20	73%	72%	59%	222	16.0	179	0.0	16.0	219	3.6	179	10.0	13.6	2.4	$24.59
12.5	71	40	61	68%	66%	54%	205	35.3	163	0.0	35.3	202	9.3	163	20.5	29.8	5.5	$56.22
17.5	106	60	81	62%	61%	48%	189	46.7	146	0.0	46.7	185	12.6	146	26.2	38.8	7.9	$80.33
22.5	152	117	133	57%	55%	43%	173	69.4	130	0.0	69.4	168	21.1	130	35.9	57.0	12.4	$125.57
27.5	227	185	213	51%	50%	37%	156	97.6	113	0.0	97.6	151	29.9	113	48.4	78.4	19.2	$195.42
32.5	352	277	308	46%	44%	32%	140	130.9	97	0.0	130.9	134	39.8	97	62.1	101.9	29.0	$294.73
37.5	279	240	261	41%	39%	26%	123	96.1	81	0.0	96.1	117	29.8	81	42.4	72.1	24.0	$244.03
42.5	245	191	215	35%	33%	21%	107	69.5	64	0.0	69.5	100	20.5	64	28.6	49.1	20.4	$207.48
47.5	243	181	231	30%	27%	16%	90	59.2	48	0.0	59.2	83	16.4	48	21.8	38.2	21.0	$213.01
52.5	249	184	223	24%	22%	10%	74	48.5	31	0.0	48.5	66	13.2	31	14.2	27.5	21.0	$213.70
57.5	257	193	225	19%	16%	5%	58	38.8	15	0.0	38.8	49	10.3	15	6.9	17.2	21.7	$220.05
Total	2,236	1,686	1,979					715			715		208		322	530	186	$1,885.09

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

1,379 Annual Heat Load
1,509 Annual Btu Usage

12.3% Savings

Annual Savings Summary	
Fuel (mmBtu)	186
Cost ($)	$1,885.09

Town of Hamburg

Energy Management System Improvements

Buildings & Grounds Garage

Project #: 3008-09NFT

ECM #: 2

Measure Summary Table

18-Aug-10

Savings		
Average Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	156	MMBtu/Year
Environmental CO_2 Gas Savings(1)	18,112	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,626	Per Year
Total Energy & O&M Savings	$1,626	Per Year
Project Costs		
Total Measure Cost	$37,026	
Payback		
Simple Payback	22.8	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	22.8	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

3.32 passenger cars (Reduced)
42.12 barrels of oil (Saved)
1.65 houses energy use for 1 year
464.42 number of trees planted

Estimate of Project Economics
Utility Billing History for Fossil Fuel Consumption
Buildings & Grounds Garage

Month	Existing Facility Usage(CCF)	Existing Facility Usage(Dollars)	Existing Facility Usage(Gallons)	Existing Facility Usage(Dollars)	Existing Facility Usage (mmBtu)	Existing Facility Usage(Dollars)	Existing Estimated Boiler Usage(mmBtu)
January	2,028.48	$2,505.30	0.00	$0.00	202.85	$2,505.30	185.73
February	1,309.10	$1,516.78	0.00	$0.00	130.91	$1,516.78	119.86
March	1,009.21	$1,046.11	0.00	$0.00	100.92	$1,046.11	92.41
April	138.66	$154.76	0.00	$0.00	13.87	$154.76	12.70
May	24.42	$27.96	0.00	$0.00	2.44	$27.96	2.24
June	39.47	$50.57	0.00	$0.00	3.95	$50.57	3.61
July	19.19	$21.79	0.00	$0.00	1.92	$21.79	1.76
August	112.02	$115.25	0.00	$0.00	11.20	$115.25	10.26
September	272.68	$254.71	0.00	$0.00	27.27	$254.71	24.97
October	795.69	$772.82	0.00	$0.00	79.57	$772.82	72.85
November	1,546.11	$1,398.38	0.00	$0.00	154.61	$1,398.38	141.56
December	1,953.35	$1,800.04	0.00	$0.00	195.34	$1,800.04	178.85
Totals	9,248.39	$9,664.47	0.00	$0.00	924.84	$9,664.47	846.80

Assumptions:
Summer = June, July, August, September
operating hours are unchanged.

82%	Existing Boiler Efficiency		
82%	Proposed Boiler Efficiency		
91.56%	Estimated consumption due to boilers		
$1.04	Cost per CCF	$10.45	Cost per mmBtu(gas)
$0.00	Cost per Gallon	$0.00	Cost per mmBtu(oil)
		$10.45	Cost per mmBtu(average)

Total Base Load	
Consumption	78.04
% of total	8.44%
Total Heating Load	
Consumption	846.80
% of total	91.56%
Load from Calcs	847

Buildings & Grounds Garage
FIN Tube Radiant - Temperature Setback and Overheating Savings - Heating

Assumptions:

Occ. Indoor Temp.	70
Reduced Occ Temp,	70
Unocc. Indoor Temp.	62
Peak Heating Load	394 MBH

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	8	8	8
Unoccupied	0	0	0
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	100.00%	100.00%	100.00%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	1	8	1
Unoccupied	7	0	7
Weekends			
Occupied	0	0	0
Unoccupied	8	8	8
% Occupied	8.93%	71.43%	8.93%

Bin Temperature Data (Heating Only)				Occ	Red. Occ	Unocc	Existing Conditions					Proposed Condiitions					Total	Total
	Hours/Bin			% Load	% Load	% Load	Occupied		Unoccupied		Total	Occupied		Unoccupied		Total	Reduced	Reduced
Bin Temp	0 - 8	8 - 16	16 - 24	at IAT = 70	at IAT = 70	at IAT = 62	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Usage (mmBtu)	Cost ($)
-17.5	0	0	0	100%	100%	91%	394	0.0	358	0.0	0.0	394	0.0	358	0.0	0.0	0.0	$0.00
-12.5	1	0	0	94%	94%	85%	371	0.4	335	0.0	0.4	371	0.0	335	0.3	0.3	0.0	$0.34
-7.5	0	0	1	89%	89%	79%	349	0.3	313	0.0	0.3	349	0.0	313	0.3	0.3	0.0	$0.34
-2.5	3	0	1	83%	83%	74%	326	1.3	290	0.0	1.3	326	0.1	290	1.1	1.2	0.1	$1.37
2.5	12	5	6	77%	77%	68%	304	7.0	268	0.0	7.0	304	1.6	268	4.8	6.3	0.6	$6.71
7.5	39	13	20	71%	71%	62%	281	20.3	245	0.0	20.3	281	4.1	245	14.1	18.2	2.1	$21.62
12.5	71	40	61	66%	66%	57%	259	44.5	223	0.0	44.5	259	10.4	223	29.3	39.8	4.7	$49.55
17.5	106	60	81	60%	60%	51%	236	58.4	200	0.0	58.4	236	14.1	200	37.6	51.6	6.8	$70.56
22.5	152	117	133	54%	54%	45%	214	86.0	178	0.0	86.0	214	23.3	178	52.1	75.4	10.6	$110.29
27.5	227	185	213	49%	49%	39%	191	119.6	155	0.0	119.6	191	32.8	155	70.5	103.3	16.3	$170.74
32.5	352	277	308	43%	43%	34%	169	158.2	133	0.0	158.2	169	43.4	133	90.4	133.7	24.5	$256.06
37.5	279	240	261	37%	37%	28%	146	114.1	110	0.0	114.1	146	32.1	110	61.8	94.0	20.2	$210.94
42.5	245	191	215	31%	31%	22%	124	80.6	88	0.0	80.6	124	22.0	88	41.6	63.6	17.1	$178.24
47.5	243	181	231	26%	26%	17%	101	66.4	65	0.0	66.4	101	17.4	65	31.6	48.9	17.4	$181.97
52.5	249	184	223	20%	20%	11%	79	51.7	43	0.0	51.7	79	13.7	43	20.6	34.3	17.4	$181.60
57.5	257	193	225	14%	14%	5%	56	38.0	20	0.0	38.0	56	10.2	20	10.0	20.2	17.8	$186.00
Total	2,236	1,686	1,979					847			847		225		466	691	156	$1,626.34

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

847 Annual Heat Load
925 Annual Btu Usage

16.8% Savings

Annual Savings Summary	
Fuel (mmBtu)	156
Cost ($)	$1,626.34

Town of Hamburg
Energy Management System Improvements
Highway Offices

Project #: 3008-09NFT

ECM #: 2

Measure Summary Table

18-Aug-10

Savings		
Average Demand Savings	0.0	kW/Year
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	116	MMBtu/Year
Environmental CO_2 Gas Savings(1)	13,451	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,411	Per Year
Total Energy & O&M Savings	$1,411	Per Year
Project Costs		
Total Measure Cost	$31,944	
Payback		
Simple Payback	22.6	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	22.6	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

2.46 passenger cars (Reduced)
31.28 barrels of oil (Saved)
1.22 houses energy use for 1 year
344.89 number of trees planted

Estimate of Project Economics
Utility Billing History for Fossil Fuel Consumption
Highway Offices

Month	Existing Facility Usage(CCF)	Existing Facility Usage(Dollars)	Existing Facility Usage(Gallons)	Existing Facility Usage(Dollars)	Existing Facility Usage (mmBtu)	Existing Facility Usage(Dollars)	Existing Estimated Boiler Usage(mmBtu)
December	1,059	$1,406.52	0.00	$0.00	105.90	$1,406.52	94.23
February	917	$1,176.93	0.00	$0.00	91.70	$1,176.93	81.59
March	604	$731.91	0.00	$0.00	60.40	$731.91	53.74
April	542	$594.73	0.00	$0.00	54.20	$594.73	48.22
May	224	$234.64	0.00	$0.00	22.40	$234.64	19.93
June	100	$103.70	0.00	$0.00	10.00	$103.70	8.90
July	34	$49.57	0.00	$0.00	3.40	$49.57	3.03
August	7	$24.80	0.00	$0.00	0.70	$24.80	0.62
September	74	$84.77	0.00	$0.00	7.40	$84.77	6.58
October	254	$259.26	0.00	$0.00	25.40	$259.26	22.60
November	384	$403.32	0.00	$0.00	38.40	$403.32	34.17
December	917	$1,175.11	0.00	$0.00	91.70	$1,175.11	81.59
Totals	5,116.00	$6,245.26	0.00	$0.00	511.60	$6,245.26	455.20

Assumptions:
Summer = June, July, August, September
operating hours are unchanged.

82%	Existing Boiler Efficiency		
82%	Proposed Boiler Efficiency		
88.98%	Estimated consumption due to boilers		
$1.22	Cost per CCF	$12.21	Cost per mmBtu(gas)
$0.00	Cost per Gallon	$0.00	Cost per mmBtu(oil)
		$12.21	Cost per mmBtu(average)

Total Base Load	
Consumption	56.40
% of total	11.02%
Total Heating Load	
Consumption	455.20
% of total	88.98%
Load from Calcs	455

Highway Offices
FIN Tube Radiant - Temperature Setback and Overheating Savings - Heating

Assumptions:

Occ. Indoor Temp.	74
Reduced Occ Temp,	72
Unocc. Indoor Temp.	62
Peak Heating Load	197 MBH

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	8	8	8
Unoccupied	0	0	0
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	100.00%	100.00%	100.00%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	1	8	1
Unoccupied	7	0	7
Weekends			
Occupied	0	0	0
Unoccupied	8	8	8
% Occupied	8.93%	71.43%	8.93%

Bin Temperature Data (Heating Only)				Occ	Red. Occ	Unocc	Existing Conditions					Proposed Condiitions					Total	Total
	Hours/Bin			% Load	% Load	% Load	Occupied		Unoccupied		Total	Occupied		Unoccupied		Total	Reduced	Reduced
				at IAT =	at IAT =	at IAT =	Load	Usage	Load	Usage	Usage	Load	Usage	Load	Usage	Usage	Usage	Cost
Bin Temp	0 - 8	8 - 16	16 - 24	74	72	62	(MBH)	(mmBtu)	(MBH)	(mmBtu)	(mmBtu)	(MBH)	(mmBtu)	(MBH)	(mmBtu)	(mmBtu)	(mmBtu)	($)
-17.5	0	0	0	100%	100%	87%	197	0.0	171	0.0	0.0	197	0.0	171	0.0	0.0	0.0	$0.00
-12.5	1	0	0	95%	94%	81%	186	0.2	160	0.0	0.2	186	0.0	160	0.1	0.2	0.0	$0.29
-7.5	0	0	1	89%	89%	76%	175	0.2	149	0.0	0.2	175	0.0	149	0.1	0.2	0.0	$0.29
-2.5	3	0	1	84%	83%	70%	164	0.7	139	0.0	0.7	164	0.1	139	0.5	0.6	0.1	$1.15
2.5	12	5	6	78%	78%	65%	154	3.5	128	0.0	3.5	153	0.8	128	2.3	3.1	0.5	$5.67
7.5	39	13	20	73%	72%	60%	143	10.3	117	0.0	10.3	142	2.1	117	6.7	8.8	1.5	$18.29
12.5	71	40	61	67%	66%	54%	132	22.7	106	0.0	22.7	131	5.3	106	14.0	19.3	3.5	$42.12
17.5	106	60	81	62%	61%	49%	121	30.0	96	0.0	30.0	120	7.1	96	17.9	25.0	4.9	$60.19
22.5	152	117	133	56%	55%	43%	111	44.5	85	0.0	44.5	109	11.8	85	24.9	36.7	7.8	$94.72
27.5	227	185	213	51%	50%	38%	100	62.4	74	0.0	62.4	98	16.7	74	33.6	50.4	12.1	$147.21
32.5	352	277	308	45%	44%	32%	89	83.5	63	0.0	83.5	87	22.3	63	43.1	65.4	18.1	$221.51
37.5	279	240	261	40%	39%	27%	78	61.1	53	0.0	61.1	76	16.6	53	29.5	46.1	15.0	$183.36
42.5	245	191	215	34%	33%	21%	68	44.0	42	0.0	44.0	65	11.5	42	19.8	31.3	12.7	$155.20
47.5	243	181	231	29%	27%	16%	57	37.3	31	0.0	37.3	54	9.2	31	15.1	24.3	13.0	$158.60
52.5	249	184	223	23%	22%	10%	46	30.3	20	0.0	30.3	43	7.4	20	9.8	17.3	13.0	$158.88
57.5	257	193	225	18%	16%	5%	35	23.9	10	0.0	23.9	32	5.8	10	4.8	10.5	13.4	$163.39
Total	2,236	1,686	1,979					455			455		117		222	339	116	$1,410.86

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

455 Annual Heat Load
512 Annual Btu Usage

22.6% Savings

Annual Savings Summary	
Fuel (mmBtu)	116
Cost ($)	$1,410.86

Town of Hamburg
Energy Management System Improvements
Highway Garage

Project #: 3008-09NFT

ECM #: 2

Measure Summary Table

18-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	212	MMBtu/Year
Environmental CO_2 Gas Savings(1)	24,667	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$2,102	Per Year
Total Energy & O&M Savings	$2,102	Per Year
Project Costs		
Total Measure Cost	$37,026	
Payback		
Simple Payback	17.6	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	17.6	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

4.52 passenger cars (Reduced)
57.37 barrels of oil (Saved)
2.24 houses energy use for 1 year
632.49 number of trees planted

Highway Garage
FIN Tube Radiant - Temperature Setback and Overheating Savings - Heating

Assumptions:

Occ. Indoor Temp.	70
Reduced Occ Temp,	70
Unocc. Indoor Temp.	62
Peak Heating Load	516 MBH

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	8	8	8
Unoccupied	0	0	0
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	100.00%	100.00%	100.00%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	1	8	0
Unoccupied	7	0	8
Weekends			
Occupied	0	0	0
Unoccupied	8	8	8
% Occupied	8.93%	71.43%	0.00%

Bin Temperature Data (Heating Only)				Occ	Red. Occ	Unocc	Existing Conditions					Proposed Condiitions					Total	Total
	Hours/Bin			% Load	% Load	% Load	Occupied		Unoccupied		Total	Occupied		Unoccupied		Total	Reduced	Reduced
Bin Temp	0 - 8	8 - 16	16 - 24	at IAT = 70	at IAT = 70	at IAT = 62	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Usage (mmBtu)	Cost ($)
-17.5	0	0	0	100%	100%	91%	516	0.0	468	0.0	0.0	516	0.0	468	0.0	0.0	0.0	$0.00
-12.5	1	0	0	94%	94%	85%	486	0.5	439	0.0	0.5	486	0.0	439	0.4	0.4	0.0	$0.43
-7.5	0	0	1	89%	89%	79%	457	0.5	409	0.0	0.5	457	0.0	409	0.4	0.4	0.0	$0.47
-2.5	3	0	1	83%	83%	74%	427	1.7	380	0.0	1.7	427	0.1	380	1.4	1.5	0.2	$1.74
2.5	12	5	6	77%	77%	68%	398	9.1	351	0.0	9.1	398	1.8	351	6.4	8.3	0.9	$8.58
7.5	39	13	20	71%	71%	62%	368	26.5	321	0.0	26.5	368	4.7	321	19.0	23.7	2.8	$27.69
12.5	71	40	61	66%	66%	57%	339	58.3	292	0.0	58.3	339	11.8	292	40.0	51.8	6.5	$64.08
17.5	106	60	81	60%	60%	51%	309	76.4	262	0.0	76.4	309	16.2	262	51.0	67.2	9.2	$91.00
22.5	152	117	133	54%	54%	45%	280	112.5	233	0.0	112.5	280	27.2	233	70.9	98.1	14.4	$142.51
27.5	227	185	213	49%	49%	39%	250	156.5	203	0.0	156.5	250	38.2	203	96.1	134.2	22.3	$220.91
32.5	352	277	308	43%	43%	34%	221	207.0	174	0.0	207.0	221	50.7	174	123.0	173.7	33.4	$330.82
37.5	279	240	261	37%	37%	28%	191	149.3	144	0.0	149.3	191	37.6	144	84.2	121.8	27.5	$272.83
42.5	245	191	215	31%	31%	22%	162	105.5	115	0.0	105.5	162	25.6	115	56.6	82.2	23.2	$230.31
47.5	243	181	231	26%	26%	17%	133	86.8	85	0.0	86.8	133	20.0	85	43.1	63.1	23.8	$235.60
52.5	249	184	223	20%	20%	11%	103	67.6	56	0.0	67.6	103	15.8	56	28.1	44.0	23.7	$234.82
57.5	257	193	225	14%	14%	5%	74	49.7	27	0.0	49.7	74	11.8	27	13.6	25.5	24.2	$240.36
Total	2,236	1,686	1,979					1,108			1,108		262		634	896	212	$2,102.16

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

1,193 Annual Heat Load
1,278 Annual Btu Usage

16.6% Savings

Annual Savings Summary	
Fuel (mmBtu)	212
Cost ($)	$2,102.16

Town of Hamburg
Energy Management System Improvements
Senior Adult Day Care

Project #: 3008-09NFT

ECM #: 2

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	105	MMBtu/Year
Environmental CO_2 Gas Savings(1)	12,266	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,125	Per Year
Total Energy & O&M Savings	$1,125	Per Year
Project Costs		
Total Measure Cost	$68,607	
Payback		
Simple Payback	61.0	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	61.0	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

2.25 passenger cars (Reduced)
28.53 barrels of oil (Saved)
1.12 houses energy use for 1 year
314.52 number of trees planted

Estimate of Project Economics
Utility Billing History for Fossil Fuel Consumption
Senior Adult Day Care

Month	Existing Facility Usage(CCF)	Existing Facility Usage(Dollars)	Existing Facility Usage(Gallons)	Existing Facility Usage(Dollars)	Existing Facility Usage (mmBtu)	Existing Facility Usage(Dollars)	Existing Estimated Boiler Usage(mmBtu)
January-01	2,035.71	$2,509.22	0.00	$0.00	203.57	$2,509.22	169.18
February-01	1,293.31	$1,502.01	0.00	$0.00	129.33	$1,502.01	107.48
March-01	724.99	$761.81	0.00	$0.00	72.50	$761.81	60.25
April-01	190.46	$199.00	0.00	$0.00	19.05	$199.00	15.83
May-01	140.29	$151.18	0.00	$0.00	14.03	$151.18	11.66
June-01	73.73	$91.22	0.00	$0.00	7.37	$91.22	6.13
July-01	28.67	$43.95	0.00	$0.00	2.87	$43.95	2.38
August-01	107.52	$115.41	0.00	$0.00	10.75	$115.41	8.94
September-01	269.31	$266.25	0.00	$0.00	26.93	$266.25	22.38
October-01	733.18	$732.87	0.00	$0.00	73.32	$732.87	60.93
November-01	899.07	$841.63	0.00	$0.00	89.91	$841.63	74.72
December-01	1,795.07	$1,635.05	0.00	$0.00	179.51	$1,635.05	149.18
Totals	8,291.33	$8,849.60	0.00	$0.00	829.13	$8,849.60	689.05

Assumptions:
Summer = June, July, August, September
operating hours are unchanged.

82%	Existing Boiler Efficiency		
82%	Proposed Boiler Efficiency		
83.10%	Estimated consumption due to boilers		
$1.07	Cost per CCF	$10.67	Cost per mmBtu(gas)
$0.00	Cost per Gallon	$0.00	Cost per mmBtu(oil)
		$10.67	Cost per mmBtu(average)

Total Base Load	
Consumption	140.08
% of total	16.90%
Total Heating Load	
Consumption	689.05
% of total	83.10%
Load from Calcs	415

Senior Adult Day Care
FIN Tube Radiant - Temperature Setback and Overheating Savings - Heating

Assumptions:

Occ. Indoor Temp.	74
Reduced Occ Temp,	72
Unocc. Indoor Temp.	62
Peak Heating Load	179 MBH

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	8	8	8
Unoccupied	0	0	0
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	100.00%	100.00%	100.00%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	1	8	1
Unoccupied	7	0	7
Weekends			
Occupied	0	0	0
Unoccupied	8	8	8
% Occupied	8.93%	71.43%	8.93%

Bin Temperature Data (Heating Only)				Occ	Red. Occ	Unocc	Existing Conditions					Proposed Condiitions					Total	Total
	Hours/Bin			% Load	% Load	% Load	Occupied		Unoccupied		Total	Occupied		Unoccupied		Total	Reduced	Reduced
				at IAT =	at IAT =	at IAT =	Load	Usage	Load	Usage	Usage	Load	Usage	Load	Usage	Usage	Usage	Cost
Bin Temp	0 - 8	8 - 16	16 - 24	74	72	62	(MBH)	(mmBtu)	(MBH)	(mmBtu)	(mmBtu)	(MBH)	(mmBtu)	(MBH)	(mmBtu)	(mmBtu)	(mmBtu)	($)
-17.5	0	0	0	100%	100%	87%	179	0.0	156	0.0	0.0	179	0.0	156	0.0	0.0	0.0	$0.00
-12.5	1	0	0	95%	94%	81%	169	0.2	146	0.0	0.2	169	0.0	146	0.1	0.1	0.0	$0.23
-7.5	0	0	1	89%	89%	76%	160	0.2	136	0.0	0.2	159	0.0	136	0.1	0.1	0.0	$0.23
-2.5	3	0	1	84%	83%	70%	150	0.6	126	0.0	0.6	149	0.1	126	0.5	0.5	0.1	$0.92
2.5	12	5	6	78%	78%	65%	140	3.2	117	0.0	3.2	139	0.7	117	2.1	2.8	0.4	$4.52
7.5	39	13	20	73%	72%	60%	130	9.4	107	0.0	9.4	129	1.9	107	6.1	8.0	1.4	$14.58
12.5	71	40	61	67%	66%	54%	120	20.7	97	0.0	20.7	119	4.8	97	12.8	17.6	3.1	$33.59
17.5	106	60	81	62%	61%	49%	111	27.3	87	0.0	27.3	109	6.5	87	16.3	22.8	4.5	$47.99
22.5	152	117	133	56%	55%	43%	101	40.5	77	0.0	40.5	99	10.8	77	22.7	33.5	7.1	$75.53
27.5	227	185	213	51%	50%	38%	91	56.9	68	0.0	56.9	89	15.3	68	30.6	45.9	11.0	$117.38
32.5	352	277	308	45%	44%	32%	81	76.2	58	0.0	76.2	79	20.3	58	39.3	59.6	16.5	$176.62
37.5	279	240	261	40%	39%	27%	71	55.8	48	0.0	55.8	69	15.2	48	26.9	42.1	13.7	$146.20
42.5	245	191	215	34%	33%	21%	62	40.2	38	0.0	40.2	59	10.5	38	18.1	28.6	11.6	$123.75
47.5	243	181	231	29%	27%	16%	52	34.0	28	0.0	34.0	49	8.4	28	13.7	22.1	11.8	$126.46
52.5	249	184	223	23%	22%	10%	42	27.6	19	0.0	27.6	39	6.8	19	9.0	15.8	11.9	$126.69
57.5	257	193	225	18%	16%	5%	32	21.8	9	0.0	21.8	29	5.3	9	4.4	9.6	12.2	$130.28
Total	2,236	1,686	1,979					415			415		106		203	309	105	$1,124.96

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

689 Annual Heat Load
829 Annual Btu Usage

12.7% Savings

Annual Savings Summary	
Fuel (mmBtu)	105
Cost ($)	$1,124.96

Town of Hamburg
Energy Management System Improvements
Senior Garage

Project #: 3008-09NFT

ECM #: 2

Measure Summary Table

18-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	85	MMBtu/Year
Environmental CO_2 Gas Savings(1)	9,847	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$903	Per Year
Total Energy & O&M Savings	$903	Per Year
Project Costs		
Total Measure Cost	$13,068	
Payback		
Simple Payback	14.5	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	14.5	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

1.80 passenger cars (Reduced)
22.90 barrels of oil (Saved)
0.90 houses energy use for 1 year
252.49 number of trees planted

Estimate of Project Economics
Utility Billing History for Fossil Fuel Consumption
Senior Garage

Month	Existing Facility Usage(CCF)	Existing Facility Usage(Dollars)	Existing Facility Usage(Gallons)	Existing Facility Usage(Dollars)	Existing Facility Usage (mmBtu)	Existing Facility Usage(Dollars)	Existing Estimated Boiler Usage(mmBtu)
January-01	2,035.71	$2,509.22	0.00	$0.00	203.57	$2,509.22	169.18
February-01	1,293.31	$1,502.01	0.00	$0.00	129.33	$1,502.01	107.48
March-01	724.99	$761.81	0.00	$0.00	72.50	$761.81	60.25
April-01	190.46	$199.00	0.00	$0.00	19.05	$199.00	15.83
May-01	140.29	$151.18	0.00	$0.00	14.03	$151.18	11.66
June-01	73.73	$91.22	0.00	$0.00	7.37	$91.22	6.13
July-01	28.67	$43.95	0.00	$0.00	2.87	$43.95	2.38
August-01	107.52	$115.41	0.00	$0.00	10.75	$115.41	8.94
September-01	269.31	$266.25	0.00	$0.00	26.93	$266.25	22.38
October-01	733.18	$732.87	0.00	$0.00	73.32	$732.87	60.93
November-01	899.07	$841.63	0.00	$0.00	89.91	$841.63	74.72
December-01	1,795.07	$1,635.05	0.00	$0.00	179.51	$1,635.05	149.18
Totals	8,291.33	$8,849.60	0.00	$0.00	829.13	$8,849.60	689.05

Assumptions:
Summer = June, July, August, September
operating hours are unchanged.

82%	Existing Boiler Efficiency		
82%	Proposed Boiler Efficiency		
83.10%	Estimated consumption due to boilers		
$1.07	Cost per CCF	$10.67	Cost per mmBtu(gas)
$0.00	Cost per Gallon	$0.00	Cost per mmBtu(oil)
		$10.67	Cost per mmBtu(average)

Total Base Load	
Consumption	140.08
% of total	16.90%
Total Heating Load	
Consumption	689.05
% of total	83.10%
Load from Calcs	415

Senior Garage
FIN Tube Radiant - Temperature Setback and Overheating Savings - Heating

Assumptions:

Occ. Indoor Temp.	74
Reduced Occ Temp,	74
Unocc. Indoor Temp.	64
Peak Heating Load	179 MBH

Existing Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	8	8	8
Unoccupied	0	0	0
Weekends			
Occupied	8	8	8
Unoccupied	0	0	0
% Occupied	100.00%	100.00%	100.00%

Proposed Building Schedule:

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied	1	8	1
Unoccupied	7	0	7
Weekends			
Occupied	0	0	0
Unoccupied	8	8	8
% Occupied	8.93%	71.43%	8.93%

Bin Temperature Data (Heating Only)				Occ	Red. Occ	Unocc	Existing Conditions					Proposed Condiitions					Total	Total
	Hours/Bin			% Load	% Load	% Load	Occupied		Unoccupied		Total	Occupied		Unoccupied		Total	Reduced	Reduced
Bin Temp	0 - 8	8 - 16	16 - 24	at IAT = 74	at IAT = 74	at IAT = 64	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Load (MBH)	Usage (mmBtu)	Usage (mmBtu)	Usage (mmBtu)	Cost ($)
-17.5	0	0	0	100%	100%	89%	179	0.0	160	0.0	0.0	179	0.0	160	0.0	0.0	0.0	$0.00
-12.5	1	0	0	95%	95%	84%	169	0.2	150	0.0	0.2	169	0.0	150	0.1	0.2	0.0	$0.19
-7.5	0	0	1	89%	89%	78%	160	0.2	140	0.0	0.2	160	0.0	140	0.1	0.1	0.0	$0.19
-2.5	3	0	1	84%	84%	73%	150	0.6	130	0.0	0.6	150	0.1	130	0.5	0.5	0.1	$0.76
2.5	12	5	6	78%	78%	67%	140	3.2	120	0.0	3.2	140	0.7	120	2.1	2.9	0.3	$3.73
7.5	39	13	20	73%	73%	62%	130	9.4	111	0.0	9.4	130	1.9	111	6.4	8.3	1.1	$12.01
12.5	71	40	61	67%	67%	56%	120	20.7	101	0.0	20.7	120	4.9	101	13.3	18.1	2.6	$27.52
17.5	106	60	81	62%	62%	51%	111	27.3	91	0.0	27.3	111	6.6	91	17.1	23.7	3.7	$39.18
22.5	152	117	133	56%	56%	45%	101	40.5	81	0.0	40.5	101	11.0	81	23.8	34.8	5.7	$61.24
27.5	227	185	213	51%	51%	40%	91	56.9	71	0.0	56.9	91	15.6	71	32.4	48.0	8.9	$94.81
32.5	352	277	308	45%	45%	34%	81	76.2	62	0.0	76.2	81	20.9	62	42.0	62.8	13.3	$142.19
37.5	279	240	261	40%	40%	29%	71	55.8	52	0.0	55.8	71	15.7	52	29.1	44.8	11.0	$117.13
42.5	245	191	215	34%	34%	23%	62	40.2	42	0.0	40.2	62	11.0	42	19.9	30.9	9.3	$98.98
47.5	243	181	231	29%	29%	18%	52	34.0	32	0.0	34.0	52	8.9	32	15.6	24.5	9.5	$101.05
52.5	249	184	223	23%	23%	13%	42	27.6	23	0.0	27.6	42	7.3	23	10.9	18.2	9.4	$100.84
57.5	257	193	225	18%	18%	7%	32	21.8	13	0.0	21.8	32	5.8	13	6.3	12.1	9.7	$103.29
Total	2,236	1,686	1,979					415			415		110		220	330	85	$903.10

Calculations:

% Load = actual delta T / max design delta T
where T= temperature
MBH = Peak Heating Load x % Load
mmBtu = MBH / 1,000 x % Occupied x BIN Hours

689 Annual Heat Load
829 Annual Btu Usage

10.2% Savings

Annual Savings Summary	
Fuel (mmBtu)	85
Cost ($)	$903.10

Section 6

Domestic Hot Water System Improvements

DOMESTIC HOT WATER SYSTEM IMPROVEMENTS

ECM - 3

INVESTIGATION

The domestic hot water system in a building is the system which heats and distributes potable water to hand wash sinks and showers. The energy used in this type of system varies based on a number of factors including time of year, frequency of use in the buildings, water temperature requirements, heating equipment and standby storage losses. The development of tank-less and condensing heating equipment have increased the opportunity for energy savings associated with this type of building system. During the course of the study water usage was estimated based on the number and type of water fixtures in the buildings, the building use, utility history, and discussions with facility personnel.

For the options described below, implementation cost estimates were developed which include material and labor costs to replace the electric heaters and associated equipment. These cost estimates include costs for connecting to the existing water lines, and connection to the nearby natural gas supply line. The cost estimate is based on similar projects Wendel has completed, RS Means, and manufacturer budget pricing. There are no maintenance savings anticipated with the implementation of this measure. A summary of the potential savings and economics of this project are included in this section.

Town Hall

Existing System

The domestic hot water supply for the Town Hall is provided by an 85 gallon natural gas water heater. This heater is located in a mechanical room in the basement and is vented through a CAT B exhaust flue out a side wall. The heater was installed in 1994 and may soon reach the end of its useful life. The domestic hot water is stored within the tank at an assumed temperature of 120°F. The tank itself is assumed to have a thermal resistance value of 6 $h \cdot ft^2 \cdot °F/Btu$.

Figure E-6.1 Existing Domestic Hot Water Heater Town Hall

Proposed System

Option A

The proposed system would utilize a condensing water heater of similar capacity to the current natural gas unit. Energy savings will be achieved by increasing the efficiency of the heating system due to burner and heating efficiency. As part this system the existing flue vent would need to be replaced with a PVC vent.

Option B

The proposed system would utilize a tank-less natural gas water heater capable of meeting the building's hot water demand. Energy savings would be achieved by eliminating the standby losses associated with the storage of hot water within the tank. Additional savings will be achieved through an increase in burner efficiency. This increase in heating efficiency is less than the increase in efficiency from Option A. The effectiveness of this option is dependent upon the combination of both the increase in burner efficiency and elimination of the storage tank.

Highway Garage

Existing System

The domestic hot water supply for the Highway Garage is provided by an 80 gallon electric hot water heater. This heater is located in a mechanical room within the garage. The domestic hot

water is stored within the tank at an assumed temperature of 120°F. The tank itself is assumed to have a thermal resistance value of 6 h·ft²·°F/Btu.

Figure E-6.2 Existing Highway Garage Domestic Hot Water Heater

Proposed System

The proposed system would utilize a tank-less natural gas hot water heater capable of meeting the building's hot water demand. Energy savings would be achieved by eliminating the standby losses associated with storage of hot water within the tank. Additional savings will be achieved through an increase in burner efficiency. The effectiveness of this option is dependent upon the combination of both the increase in burner efficiency and elimination of the storage tank.

Figure E-6.3 Proposed Highway Garage Domestic Hot Water Heater

RECOMMENDATIONS

The Town Hall and Highway Garage appear to have relatively low usage of their domestic hot water system. In addition to this the storage tank losses associated with the existing equipment does not appear great enough to justify the added expense of replacing the existing equipment with the systems proposed. As a result, Wendel does not recommend this measure for implementation.

Since the Town Hall's domestic water heater will be reaching the end of its useful life in the near future, Wendel recommends that the town considers the proposed technologies at that time. The incremental cost of installing this more efficient equipment will likely be justified by energy savings.

Town of Hamburg
Domestic Hot Water Improvements
Town Hall
Option A - Condensing

Project #: 3008-09NFT

ECM #: 3

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	6	MMBtu/Year
Environmental CO_2 Gas Savings(1)	706	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$62	Per Year
Total Energy & O&M Savings	$62	Per Year
Project Costs		
Total Measure Cost	$4,675	
Payback		
Simple Payback	75.8	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	75.8	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

0.06 passenger cars (Reduced)
0.75 barrels of oil (Saved)
0.03 houses energy use for 1 year
8.22 number of trees planted

Project Name:	Town of Hamburg	ECM # 3
Project Number:	3008-09NFT	
Calculated By:	JGD	
Checked By:	AMB	
Date:	8/19/2010	

NATURAL GAS TO CONDENSING DOMESTIC WATER HEATER

Existing Condition:

Natural gas water heater

Proposed Condition:

Condensing natural gas water heater

Given and Assumed Data:

Water Usage

Number of Sinks		=	16	
Number of People (Employees & Visitors)		=	75	
Average Personal Sink Use Per Day		=	3	
Min Per Use		=	1	Min
Min Per Day		=	225	Min
Gal/min		=	1	GPM
Gallons per Day		=	225	gal/day
Days of use per year		=	260	days/yr
Annual Usage	U_A	=	58,500	gallons

Domestic Hot Water System

Rated GPH		=	125	GPH
Input Btu (max)		=	75,100	Btu/hr
Natural Gas System Efficiency	η_E	=	80%	
# of Units		=	1	units
Assumed Make-up Water Temperature	T_{in}	=	55	°F
Average Storage Temperature	T_{st}	=	120	°F
Cost Per mmBtu		=	$10.16	mmBtu
Months of Operation per year		=	12	Months/year

Project Name:	Town of Hamburg	ECM # 3
Project Number:	3008-09NFT	
Calculated By:	JGD	
Checked By:	AMB	
Date:	8/19/2010	

Proposed Data:

Rated GPH		=	150	
Input Btu (max)		=	130,000	Btu/hr
New Natural Gas Water Heater Efficiency	η_P	=	95%	

Calculations:

Conversion Factor #1	CF_1	=	8.33	Btu/gal- deg F
Conversion Factor #2	CF_2	=	103,000	Btu/Ccf

Existing Domestic Hot Water Heating

Existing Annual Ccf Consumption	=	384	Ccf/yr
$(((U_A * CF_1 * (T_{in} - T_{st}) / \eta_E) / CF_2)$			
Existing Annual Consumption (mmBtu)	=	38.44	mmBtu/yr

Proposed Domestic Hot Water Heating

Proposed Annual ccf Consumption	=	324	Ccf/yr
$((U_A * CF_1 * (T_{in} - T_{st}) / \eta_P) / CF_2)$			
Proposed Annual Consumption (mmBtu)	=	32.37	mmBtu/yr

Savings

Annual Energy Savings	=	6.07	mmBtu/yr
Annual Energy Cost Savings	=	$61.67	

Town of Hamburg

Domestic Hot Water Improvements

Town Hall

Option B - Tankless

Project #: 3008-09NFT

ECM #: 3

Measure Summary Table

18-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	6	MMBtu/Year
Environmental CO_2 Gas Savings(1)	706	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$62	Per Year
Total Energy & O&M Savings	$62	Per Year
Project Costs		
Total Measure Cost	$3,949	
Payback		
Simple Payback	64.0	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	64.0	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

0.06 passenger cars (Reduced)
0.75 barrels of oil (Saved)
0.03 houses energy use for 1 year
8.22 number of trees planted

Project Name: Town of Hamburg
Project Number: 3008-09NFT
Calculated By: JGD
Checked By: AMB
Date: 8/18/2010

ECM # 3

NATURAL GAS TO TANKLESS DOMESTIC WATER HEATER

Existing Condition:

Natural gas water heater

Proposed Condition:

Tankless Natural Gas Water Heater

Given and Assumed Data:

Water Usage

Number of Sinks		=	16	
Number of People (Employees & Visitors)		=	75	
Average Personal Sink Use Per Day		=	3	
Min Per Use		=	1	Min
Min Per Day		=	225	Min
Gal/min		=	1	GPM
Gallons per Day		=	225	gal/day
Days of use per year		=	260	days/yr
Annual Usage	U_A	=	58,500	gallons

Domestic Hot Water System

Rated GPH		=	125	GPH
Input Btu (max)		=	75,100	Btu/hr
Natural Gas System Efficiency	η_E	=	80%	
# of Units		=	1	units
Assumed Make-up Water Temperature	T_{in}	=	55	°F
Average Storage Temperature	T_{st}	=	120	°F
Tank Insulation (R-value)	R	=	6	hr-ft2-°F/Btu
Average Room Temperature	T_0	=	65	°F
Tank Surface Area	A	=	27.60	ft^2
Annual Tank Losses ($A * 1/R * (T_{st} - T_0)$)	ATL	=	253	Btu
Cost Per mmBtu		=	$10.16	mmBtu
Months of Operation per year		=	12	Months/year

Project Name: Town of Hamburg
Project Number: 3008-09NFT
Calculated By: JGD
Checked By: AMB
Date: 8/18/2010

ECM # 3

Proposed Data:

Rated GPH		=	150	
Input Btu (max)		=	130,000	Btu/hr
New Natural Gas Water Heater Efficiency	η_P	=	95%	

Calculations:

Conversion Factor #1	CF_1	=	8.33	Btu/gal- deg F
Conversion Factor #2	CF_2	=	103,000	Btu/Ccf

Existing Domestic Hot Water Heating

Existing Annual Ccf Consumption	=	384	Ccf/yr
$(((U_A * CF_1 * (T_{in} - T_{st}) / \eta_E) / CF_2) + ((ATL / \eta_E) / CF_2)$			
Existing Annual Consumption (mmBtu)	=	38.44	mmBtu/yr

Proposed Domestic Hot Water Heating

Proposed Annual ccf Consumption	=	324	Ccf/yr
$((U_A * CF_1 * (T_{in} - T_{st}) / \eta_P) / CF_2)$			
Proposed Annual Consumption (mmBtu)	=	32.37	mmBtu/yr

Savings

Annual Energy Savings	=	6.07	mmBtu/yr
Annual Energy Cost Savings	=	$61.67	

Town of Hamburg

Domestic Hot Water Improvements

Highway Garage

Project #: 3008-09NFT
ECM #: 3

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	1,954	kWh/Year
Fossil Fuel Savings	(7)	MMBtu/Year
Environmental CO_2 Gas Savings(1)	784	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$68	Per Year
Total Energy & O&M Savings	$68	Per Year
Project Costs		
Total Measure Cost	$6,273	
Payback		
Simple Payback	92.9	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	92.9	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

2931.72 lbs of coal (Saved)
4.13 lbs of Nox gas reduced
12.00 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

0.07 passenger cars (Reduced)
0.83 barrels of oil (Saved)
0.03 houses energy use for 1 year
9.12 number of trees planted

Project Name: Town of Hamburg
Project Number: 3008-09NFT
Calculated By: JGD
Checked By: AMB
Date: 8/19/2010

ECM # 3

ELECTRIC TO TANKLESS NATURAL GAS DOMESTIC WATER HEATER

Existing Condition:

Electric water heater

Proposed Condition:

Tankless Natural Gas Water Heater

Given and Assumed Data:

Water Usage

Number of Sinks / Showers		=	10	
Number of People (Employees & Visitors)		=	10	
Sink Use Per Day		=	2	
Min Per Use		=	1.5	Min
Min Per Day		=	30	Min
Gal/min		=	1.5	GPM
Gallons per Day		=	45	gal/day
Days of use per year		=	260	days/yr
Annual Usage	U_A	=	11,700	gallons

Domestic Hot Water System

Rated GPH		=	125	GPH
kW/Unit		=	4.5	kW
Electric System Efficiency	η_E	=	95%	
# of Units		=	1	units
Assumed Make-up Water Temperature	T_{in}	=	55	°F
Average Storage Temperature	T_{st}	=	120	°F
Tank Insulation (R-value)	R	=	6	hr-ft2-°F/Btu
Average Room Temperature	T_0	=	60	°F
Tank Surface Area	A	=	27.60	ft^2
Annual Tank Losses (A * 1/R * (T_{st} - T_0)	ATL	=	276	Btu
Cost Per kW		=	$10.42	kW
Cost Per kWh		=	$0.072	kWh
Months of Operation per year		=	12	Months/year

Project Name:	Town of Hamburg	ECM # 3
Project Number:	3008-09NFT	
Calculated By:	JGD	
Checked By:	AMB	
Date:	8/19/2010	

Proposed Data:

Rated GPH		=	150	
Input Btu (max)		=	130,000	Btu/hr
New Natural Gas Water Heater Efficiency	η_P	=	85%	
Cost Per mmBtu		=	$10.16	mmBtu

Calculations:

Conversion Factor #1	CF_1	=	8.33	Btu/gal- deg F
Conversion Factor #2	CF_2	=	103,000	Btu/Ccf
Conversion Factor #3	CF_3	=	3,412	Btu/kWh

Existing Domestic Hot Water Heating

Existing Annual kWh Consumption	=	1,954	kWh/yr
$(((U_A * CF_1 * (T_{in} - T_{st}) / \eta_E) / CF_3) + ((ATL / \eta_E) / CF_3)$			
Existing Annual Consumption (mmBtu)	=	6.67	mmBtu/yr
Existing Annual Energy Costs	=	$141	

Proposed Domestic Hot Water Heating

Proposed Annual ccf Consumption	=	72	Ccf/yr
$((U_A * CF_1 * (T_{in} - T_{st}) / \eta_P) / CF_2)$			
Proposed Annual Consumption (mmBtu)	=	7.24	mmBtu/yr
Proposed Annual Energy Costs	=	$74	

Savings

Annual Energy Savings	=	(0.57)	mmBtu/yr
Annual Energy Cost Savings	=	$67.51	

Section 7

Building Envelope Improvements

BUILDING ENVELOPE IMPROVEMENTS

ECM - 4

INVESTIGATION

The building envelope is a critical part of a facility's energy efficiency. Energy is transferred through the building's exterior skin in several ways. The largest single component is conductive heat transfer through the wall, windows, roof and other external surfaces. This energy loss is most notably mitigated by insulation installed during construction. The next form of energy transfer is through radiation, also known as solar heat gain. This is energy that is absorbed by the building through the windows. The final component is convective heat transfer, also known as infiltration. This is where outdoor air infiltrates the facility through cracks in the building envelope. These cracks develop over time increasing the amount of infiltration resulting in additional load on the building's HVAC system.

Wendel in conjunction with the services of a building envelope consultant evaluated several buildings for building envelope improvements. Various improvements were identified that reduce convective heat transfer where applicable. The buildings were inspected visually and air leakage paths were identified by using a smoke puffer to pinpoint location and severity of infiltration. Each building was inspected from the rooftop down to the basement. A list of proposed improvements was compiled and their potential energy savings calculated. Cost estimates for the proposed improvements were provided by a contractor specializing in this technology.

<u>Proposed System</u>

Potential infiltration points were investigated for the buildings listed below. While these buildings are well maintained cracks, small cracks in the buildings envelope can develop over time resulting in an energy loss. In general, most savings opportunities identified consisted of sealing along joints and windows, as well as adding weather-stripping to the doors.

The following is a full accounting of the proposed building envelope improvement measures. Energy savings calculations and cost estimates can be found for each building in this section.

Town Ice Arena

- 366 feet of door/hatch perimeter to be weather-stripped.
- 784 feet of window frame perimeter to be caulked.
- Seal & caulk 150 feet of roof/wall joint intersection.
- 8 roof top equipment sealing.

Town Hall

- 286 feet of door/hatch perimeter to be weather-stripped.
- 1740 feet of window frame perimeter to be caulked.
- 5 roof top equipment sealing.

Buildings and Grounds

- 448 feet of door/hatch perimeter to be weather-stripped.

Highway Department Office

- 235 feet of door/hatch perimeter to be weather-stripped.
- 990 feet of window frame perimeter to be caulked.
- 20 feet of A/C unit sealing.

Highway Department Garage

- 790 feet of door/hatch perimeter to be weather-stripped.

Nike Site / Buildings and Grounds

- 142 feet of door/hatch perimeter to be weather-stripped.
- 240 feet of window frame perimeter to be caulked.

Recreation Building

- 138 feet of door/hatch perimeter to be weather-stripped.
- 112 feet of window frame perimeter to be caulked.

Town Park Fitness Center

- 399 feet of door/hatch perimeter to be weather-stripped.

- 226 feet of window frame perimeter to be caulked.
- Seal & caulk 1000 feet of roof/wall joint intersection.

Senior Adult Day Care

- 86 feet of door/hatch perimeter to be weather-stripped.
- 176 feet of window frame perimeter to be caulked.
- Insulate gap around train car.
- Seal & caulk 270 feet of roof/wall joint intersection.
- Seal & caulk 150 feet of rim joist.

RECOMMENDATIONS

Wendel recommends installing weather-stripping on exterior doors, sealing roof/wall joints, and caulking around windows and roof penetrations. The reduction in air infiltration will reduce the load on the building's HVAC system and will result in energy savings.

For the Buildings and Grounds Garage, Highway Department Garage, Nike Site/ Buildings and Grounds and the Recreation Building, the anticipated energy savings do not justify the cost of installation. For these buildings Wendel does not recommend the proposed building envelope improvements as an energy conservation measure.

Town of Hamburg

Building Envelope Improvements

Town Ice Arena

Project #: 3008-09NFT

ECM #: 4

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	131	MMBtu/Year
Environmental CO_2 Gas Savings(1)	15,276	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,374	Per Year
Total Energy & O&M Savings	$1,374	Per Year
Project Costs		
Total Measure Cost	$19,466	
Payback		
Simple Payback	14.2	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	14.2	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Savings (1 year)

2.80 passenger cars (Reduced)
35.52 barrels of oil (Saved)
1.39 houses energy use for 1 year
391.68 number of trees planted

Project Name:	Town of Hamburg	ECM# 4
Project Number:	3008-09NFT	
Calculated By:	JGD / ZeroDraft	
Checked By:	AMB	
Date:	8/19/2010	

Infiltration Rates Q = k x dPn x A

k =	20	
(dP)^n =	7.44	
A =	4.29	ft^2
Q =	**638.60**	cfm

Natural Gas Heating System Cost = (Q x DD x Price per therm)/2890

Q =	638.60	cfm
DD =	5940	
Price/therm =	1.05	dollars
Energy Savings =	**131.26**	**mmBtu**
Estimated Savings =	**$1,374**	

Hole area "A" is based upon:

366 feet of door/hatch perimeter at 1/16"
464 feet of window frame perimeter at 1/64"
320 feet of operable window sash perimeter at 1/32"
150 feet of roof/wall intersection at 1/16"
8 roof mechanical roof ventilators at 64 feet at 1/32"

Total square feet = 4.29 ft^2

Town of Hamburg

Building Envelope Improvements

Town Hall

Project #: 3008-09NFT

ECM #: 4

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	124	MMBtu/Year
Environmental CO_2 Gas Savings(1)	14,460	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,413	Per Year
Total Energy & O&M Savings	$1,413	Per Year
Project Costs		
Total Measure Cost	$23,649	
Payback		
Simple Payback	16.7	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	16.7	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Savings (1 year)

2.65 passenger cars (Reduced)
33.63 barrels of oil (Saved)
1.32 houses energy use for 1 year
370.76 number of trees planted

Project Name:	Town of Hamburg	ECM# 4
Project Number:	3008-09NFT	
Checked By:	JGD / ZeroDraft	
Project #:	3008-09NFT	
ECM #:	4	

Infiltration Rates $Q = k \times dP^n \times A$

k =	20	
(dP)^n =	7.44	
A =	4.06	ft^2
Q =	**604.50**	cfm

Natural Gas Heating System Cost = (Q x DD x Price per therm)/2890

Q =	604.50	cfm
DD =	5940	
Price/therm =	1.14	dollars
Energy Savings =	**124.25**	**mmBtu**
Estimated Savings =	**$1,413**	

Hole area "A" is based upon:

286 feet of door/hatch perimeter at 1/16"
1740 feet of window frame perimeter at 1/64"
156 feet of miscellaneous caulking at 1/64"
5 roof mechanical roof ventilators at 40 feet at 1/32"

Total square feet = 4.06 ft^2

Town of Hamburg

Building Envelope Improvements

Buildings & Grounds

Project #: 3008-09NFT

ECM #: 4

Measure Summary Table

18-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	98	MMBtu/Year
Environmental CO_2 Gas Savings(1)	11,355	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,020	Per Year
Total Energy & O&M Savings	$1,020	Per Year
Project Costs		
Total Measure Cost	$31,444	
Payback		
Simple Payback	30.8	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	30.8	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Savings (1 year)

2 passenger cars (Reduced)
26 barrels of oil (Saved)
1 houses energy use for 1 year
291 number of trees planted

Project Name:	Town of Hamburg	ECM# 4
Project Number:	3008-09NFT	
Calculated By:	JGD / ZeroDraft	
Checked By:	AMB	
Date:	8/18/2010	

Infiltration Rates $Q = k \times dP^n \times A$

k =	20	
(dP)^n =	7.44	
A =	3.19	ft^2
Q =	**474.69**	cfm

Natural Gas Heating System Cost = (Q x DD x Price per therm)/2890

Q =	474.69	cfm
DD =	5940	
Price/therm =	1.04	dollars
Energy Savings =	**97.57**	**mmBtu**
Estimated Savings =	**$1,020**	

Hole area "A" is based upon:

80 feet of door/hatch perimeter at 1/16"
710 feet of door/hatch perimeter at 3/64"

Total square feet = 3.19 ft^2

Town of Hamburg

Building Envelope Improvements

Highway Office

Project #: 3008-09NFT

ECM #: 4

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	107	MMBtu/Year
Environmental CO_2 Gas Savings(1)	12,439	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,305	Per Year
Total Energy & O&M Savings	$1,305	Per Year
Project Costs		
Total Measure Cost	$14,502	
Payback		
Simple Payback	11.1	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	11.1	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Savings (1 year)

2.28 passenger cars (Reduced)
28.93 barrels of oil (Saved)
1.13 houses energy use for 1 year
318.95 number of trees planted

Project Name:	Town of Hamburg	ECM# 4
Project Number:	3008-09NFT	
Calculated By:	JGD / ZeroDraft	
Checked By:	AMB	
Date:	8/19/2010	

Infiltration Rates $Q = k \times dP^n \times A$

k =	20	
(dP)^n =	7.44	
A =	3.49	ft^2
Q =	**520.03**	cfm

Natural Gas Heating System Cost = (Q x DD x Price per therm)/2890

Q =	520.03	cfm
DD =	5940	
Price/therm =	1.22	dollars
Energy Savings =	**106.88**	**mmBtu**
Estimated Savings =	**$1,305**	

Hole area "A" is based upon:

235 feet of door/hatch perimeter at 1/16"
396 feet of window frame perimeter at 1/64"
594 feet of operable window sash perimeter at 1/32"
20 feet of A/C unit sealing at 1/8"

Total square feet = 3.49 ft^2

Town of Hamburg

Building Envelope Improvements

Highway Garage

Project #: 3008-09NFT

ECM #: 4

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	71	MMBtu/Year
Environmental CO_2 Gas Savings(1)	8,305	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$708	Per Year
Total Energy & O&M Savings	$708	Per Year
Project Costs		
Total Measure Cost	$15,416	
Payback		
Simple Payback	21.8	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	21.8	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Savings (1 year)

1.52 passenger cars (Reduced)
19.31 barrels of oil (Saved)
0.76 houses energy use for 1 year
212.95 number of trees planted

Project Name:	Town of Hamburg	ECM# 4
Project Number:	3008-09NFT	
Calculated By:	JGD / ZeroDraft	
Checked By:	AMB	
Date:	8/19/2010	

Infiltration Rates $Q = k \times dP^n \times A$

k =	20	
(dP)^n =	7.44	
A =	2.33	ft^2
Q =	**347.20**	cfm

Natural Gas Heating System Cost = (Q x DD x Price per therm)/2890

Q =	347.20	cfm
DD =	5940	
Price/therm =	0.99	dollars
Energy Savings =	**71.36**	**mmBtu**
Estimated Savings =	**$708**	

Hole area "A" is based upon:

448 feet of door/hatch perimeter at 1/16"

Total square feet = 2.33 ft^2

Town of Hamburg

Building Envelope Improvements

Nike Site Buildings & Grounds

Project #: 3008-09NFT

ECM #: 4

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	32	MMBtu/Year
Environmental CO_2 Gas Savings(1)	3,745	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$361	Per Year
Total Energy & O&M Savings	$361	Per Year
Project Costs		
Total Measure Cost	$6,828	
Payback		
Simple Payback	18.9	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	18.9	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Savings (1 year)

0.69 passenger cars (Reduced)
8.71 barrels of oil (Saved)
0.34 houses energy use for 1 year
96.02 number of trees planted

Project Name:	Town of Hamburg	ECM# 4
Project Number:	3008-09NFT	
Calculated By:	JGD / ZeroDraft	
Checked By:	AMB	
Date:	8/19/2010	

Infiltration Rates $Q = k \times dP^n \times A$

k =	20	
(dP)^n =	7.44	
A =	1.05	ft^2
Q =	**156.55**	cfm

Natural Gas Heating System Cost = (Q x DD x Price per therm)/2890

Q =	156.55	cfm
DD =	5940	
Price/therm =	1.12	dollars
Energy Savings =	**32.18**	**mmBtu**
Estimated Savings =	**$361**	

Hole area "A" is based upon:

142 feet of door/hatch perimeter at 1/16"
240 feet of window frame perimeter at 1/64"

Total square feet = 1.05 ft^2

Town of Hamburg

Building Envelope Improvements

Recreation Building

Project #: 3008-09NFT

ECM #: 4

Measure Summary Table

18-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	26	MMBtu/Year
Environmental CO_2 Gas Savings(1)	3,077	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$296	Per Year
Total Energy & O&M Savings	$296	Per Year
Project Costs		
Total Measure Cost	$7,799	
Payback		
Simple Payback	26.3	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	26.3	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Savings (1 year)

0.56 passenger cars (Reduced)
7.16 barrels of oil (Saved)
0.28 houses energy use for 1 year
78.91 number of trees planted

Project Name:	Town of Hamburg	ECM# 4
Project Number:	3008-09NFT	
Calculated By:	JGD / ZeroDraft	
Checked By:	AMB	
Date:	8/18/2010	

Infiltration Rates $Q = k \times dP^n \times A$

k =	20	
(dP)^n =	7.44	
A =	0.86	ft^2
Q =	**128.65**	cfm

Natural Gas Heating System Cost = (Q x DD x Price per therm)/2890

Q =	128.65	cfm
DD =	5940	
Price/therm =	1.12	dollars
Energy Savings =	**26.44**	**mmBtu**
Estimated Savings =	**$296**	

Hole area "A" is based upon:

138 feet of door/hatch perimeter at 1/16"
112 feet of window frame perimeter at 1/64"

Total square feet = .86 ft^2

Town of Hamburg

Building Envelope Improvements

Town Park Fitness Center

Project #: 3008-09NFT

ECM #: 4

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	233	MMBtu/Year
Environmental CO_2 Gas Savings(1)	27,131	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$2,440	Per Year
Total Energy & O&M Savings	$2,440	Per Year
Project Costs		
Total Measure Cost	$34,481	
Payback		
Simple Payback	14.1	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	14.1	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Savings (1 year)

4.97 passenger cars (Reduced)
63.09 barrels of oil (Saved)
2.47 houses energy use for 1 year
695.66 number of trees planted

Project Name:	Town of Hamburg	ECM# 4
Project Number:	3008-09NFT	
Calculated By:	JGD / ZeroDraft	
Checked By:	AMB	
Date:	8/19/2010	

Infiltration Rates $Q = k \times dP^n \times A$

k =	20	
(dP)^n =	7.44	
A =	7.62	ft^2
Q =	**1134.21**	cfm

Natural Gas Heating System Cost = (Q x DD x Price per therm)/2890

Q =	1134.21	cfm
DD =	5940	
Price/therm =	1.05	dollars
Energy Savings =	**233.12**	**mmBtu**
Estimated Savings =	**$2,440**	

Hole area "A" is based upon:

399 feet of door/hatch perimeter at 1/16"
226 feet of window frame perimeter at 1/64"
8 feet of miscellaneous sealing at 1/16"
1000 feet of rim joist/wall intersection at 1/16"

Total square feet = 7.62 ft^2

Town of Hamburg

Building Envelope Improvements

Senior Adult Day Care

Project #: 3008-09NFT

ECM #: 4

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	148	MMBtu/Year
Environmental CO_2 Gas Savings(1)	17,185	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,576	Per Year
Total Energy & O&M Savings	$1,576	Per Year
Project Costs		
Total Measure Cost	$19,960	
Payback		
Simple Payback	12.7	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	12.7	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Savings (1 year)

3.15 passenger cars (Reduced)
39.96 barrels of oil (Saved)
1.56 houses energy use for 1 year
440.64 number of trees planted

Project Name:	Town of Hamburg	ECM# 4
Project Number:	3008-09NFT	
Checked By:	JGD / ZeroDraft	
Project #:	3008-09NFT	
Date:	8/19/2010	

Infiltration Rates $Q = k \times dP^n \times A$

k =	20	
(dP)^n =	7.44	
A =	4.83	ft^2
Q =	**718.43**	cfm

Natural Gas Heating System Cost = (Q x DD x Price per therm)/2890

Q =	718.43	cfm
DD =	5940	
Price/therm =	1.07	dollars
Energy Savings =	**147.66**	**mmBtu**
Estimated Savings =	**$1,576**	

Hole area "A" is based upon:

86 feet of door/hatch perimeter at 1/16"
176 feet of window frame perimeter at 1/64"
2.125 sq. feet of gap around train car
270 feet of roof/wall intersection at 1/16"
150 feet of rim joist at 1/32"

Total square feet = 4.83 ft^2

Section 8

Ice Rink Improvements

ICE RINK IMPROVEMENTS

ECM - 5

INVESTIGATION

The Town Ice Rink is a 55,550 square foot facility with a 17,000 square foot ice rink. This rink is currently used from late August until June by the Town's residents and various athletic groups. Ice rinks are unique facilities in regards to the mechanical equipment used in the creation and treating of the ice. Due to this unique nature, ice rinks typically present an opportunity for energy improvement.

Figure 8.1Town Ice Rink

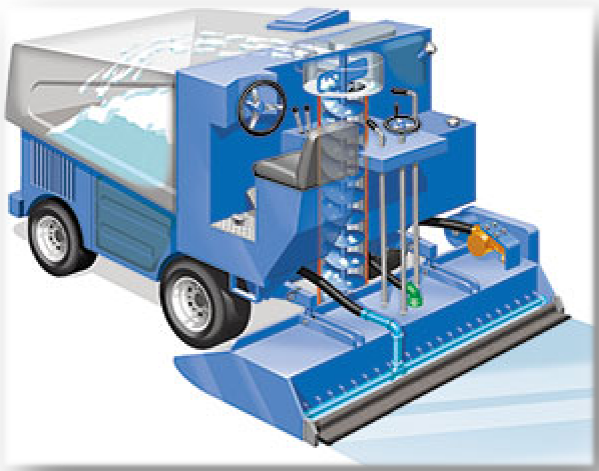
Existing System

The Nike Base was converted into an ice rink in the 1970s. The original building was renovated to accommodate lockers rooms, offices and a skate rental area. The original building consists of a concrete slab with CMU walls. A low sloped roof is located over the skate rental area and a flat roof over the locker rooms.

An addition was built on the north side to house an ice rink area and mechanical rooms. The ice rink area is constructed with a concrete slab, a steel rigid frame structure. Concrete masonry unit (CMU) walls infill the lower half of the steel structure, metal cladding with spray foam insulation wrap around the upper half, and a gable roof. The current ceiling over the ice rink

surface composed of gray corrugated metal panels that span the area between the structural supports. The mechanical rooms are constructed with a concrete slab, CMU walls and a flat roof.

The ice temperature is maintained by a refrigeration system that features two (2) reciprocating ammonia compressors. The refrigeration system cools a low temperature brine solution that circulates under the ice surface. Temperature sensors in the concrete slab monitor the ice temperature and cycle on the compressors as needed. The brine solution is circulated by a set of single speed twenty five (25) horse power (HP) pumps.



The ice service is maintained by a Zamboni that resurfaces the ice typically twelve (12) times a day. Each resurfacing requires approximately 100 gallons of hot water at 140°F and 50 gallons of cold water.

Proposed System

Wendel investigated the buildings systems for potential energy improvements. It was found that many of the systems and practices that are in place are very energy efficient. During the investigation several opportunities were explored, and included the following improvements:

- Low Emissivity Ceiling
- Brine Header Insulation
- Variable Speed Drive on Brine Pumps
- Water Treatment of Flood Water

Wendel initially investigated and ruled out flood water controls for the Zamboni due to the efficient operation of this system by the town's staff. Wendel also ruled out heat recover from the compressors due to a lack of a useable heat sink relative to the mechanical room.

Low Emissivity Ceiling

Low Emissivity or "low-e" ceilings work because the material it is made of has a very low potential to transfer radiant energy. Most objects and materials, including bright white-faced insulation, have an emissivity factor of 0.9; this means they are 90 percent efficient in transferring their radiant energy to other objects. A good low-e ceiling has an emissivity factor of 0.03, or is 3 percent efficient in transferring its radiant energy.

Figure 8.2 Low Emissivity Ceiling

A common example of radiant heat transfer, are infrared heaters radiant heaters. These heaters heat the objects that are located directly in front of them rather than heating the air around them. Radiant energy will always flow from objects at a higher temperature to objects at a lower temperature. The greater the temperature differential, the faster the rate of heat transfer. Since the ice rink ceiling is always warmer than the ice surface, there is a constant transfer of radiant energy to the ice. When a low-e ceiling is installed over the ice sheet, it interrupts the flow of radiant energy to the ice. Even with cold temperatures on the day of the review, the ceiling radiation was still considerable (6 Btu/hr.sqft.F). A low emissivity ceiling reduces the radiant heat load in an ice rink thus decreasing the refrigeration load. The installation of the low emissivity ceiling will also help reduce ceiling condensation from all of the areas that would be covered up with its installation. This would in turn reduce ice maintenance associated with having to cut stalagmites off the ice after a night of condensation dripping.

An incidental but very beneficial side effect of the low-e ceiling is that it is highly reflective. This substantially increases the perceived light level and may allow you to decrease the number of light fixtures, resulting in even greater energy savings.

Brine Header Insulation

As previously described in the existing system section, a brine solution is used to transfer heat between the ice surface and the refrigeration system. This brine is typically around 15°F on the discharge side of the brine pumps. A large brine header feeds several smaller pipes that circulate under the ice surface. The main brine header and connections are located in a three (3) foot pit on the north side of the ice rink. The pipes in this pit are not insulated and coved by a steel plate. Since the brine is at such a low temperature there is a high potential for heat transfer between the brine and the ambient conditions. By insulting these pipes energy savings can be achieved by reducing the load on the refrigeration system.

Figure 8.3 Ice buildup on the brine head at the Town of Hamburg

Variable Speed Drive on Brine Pumps

A brine solution is presently circulated under the arena floor by a 25 HP centrifugal pump. The pump is sized to deliver the required cooling during extreme heat load conditions such as during flooding and during warm weather. Most of the time, however, the flows are much higher than is necessary. The operation of the pump also transfers energy (heat) to the brine, resulting in further inefficiencies.

The installation of a variable speed drive (VSD) on the brine pump will result in energy savings during non design load periods. The VSD would control the brine flow based on ice temperature and occupancy schedule. This will reduce the required pump energy and the required refrigeration plant energy, allowing brine flow to match partial load conditions. The refrigeration compressors should be locked out below a minimum brine pump speed, since evaporator heat transfer drops off quickly with laminar flow in the evaporator tubes. With very low evaporator heat transfer, the refrigeration plant operation could become unstable, with surging and short cycling of the compressors.

Additional control and potential savings could be achieved by installing an infrared temperature sensor mounted on the ceiling to provide more accurate and responsive feedback for ice surface temperature control. The infrared sensor works by monitoring the ice surface temperature and can be more responsive to changes in ice temperature multiple sensors can be installed to provide average temperatures across the ice pad. For example, the greatest refrigeration requirement occurs during and immediately after flooding. However, the ice acts as an insulator, so that brine temperature does not show this added load for several minutes. Because these temperature sensing methods are more reflective of the ice surface condition than brine temperature, they will allow the brine pump and refrigeration plant to react more quickly to floods, and thus reduce the swing in ice temperature. This in turn allows the average ice surface temperature to be raised, further reducing the load on the refrigeration plant.

Water Treatment of Flood Water

Water purity has a direct effect on the quality of ice and the amount of energy used to produce and maintain the ice pad. Ice rinks are large consumers of water in general. As previously noted the Town of Hamburg ice rink requires approximately 1,800 gallons of water per day for ice

maintenance. As previously noted approximately 1,200 gallons of this water is hot water and is maintained at 140°F. As a general rule, heated city water is used to fill the resurface tank which in turn is used to flood the ice sheet. The water is heated to provide a better bond to the existing ice and to melt and fill in cracks in the ice caused by skate blades. With the use of demineralized flood water the need for heating is eliminated because pure water bonds very easily to the existing ice sheet.

Energy savings will be achieved in two ways. The first will be an elimination of the need to heat flood water prior to resurfacing. Since the flood water is at a lower temperature energy savings will be achieved by the refrigeration system by reducing the amount of energy needed to freeze the flood water, thereby reducing the work of the refrigeration system. Pure water also provides a harder ice surface that is more resistant to cuts and scrapes.

Cost Estimates

Cost estimates where developed that include material and labor costs to install as low-e ceiling, brine header insulation, VSD on brine pumps, and water treatment equipment. The cost estimate is based on similar projects Wendel has completed, RS Means, and manufacturer budget pricing. There are no maintenance savings anticipated by this measure. A summary of the potential savings and economics of this project can be seen in this section

RECOMMENDATIONS

Wendel recommends insulating the brine header, installing a low emissivity ceiling, and installing a variable speed drive on the brine pumps. These measures will reduce the amount of energy consumed by the rink's refrigeration system, at a projected construction cost that promotes a good return on investment.

Wendel does not recommend installing a water treatment system. While these systems have been effectively installed in many ice rinks to lower the flood water temperature, the cost to implement this system in the Town of Hamburg is not justified by the calculated savings.

Town of Hamburg
Ice Rink Improvements
Brine Header Insulation
Town Ice Rink

Project #: 3008-09NFT
ECM #: 5

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	19,191	kWh/Year
Fossil Fuel Savings	0	MMBtu/Year
Environmental CO_2 Gas Savings(1)	15,967	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,615	Per Year
Total Energy & O&M Savings	$1,615	Per Year
Project Costs		
Total Measure Cost	$32,670	
Payback		
Simple Payback	20.2	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	20.2	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

28,786 lbs of coal (Saved)
41 lbs of Nox gas reduced
118 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

1.33 passenger cars (Reduced)
16.84 barrels of oil (Saved)
0.66 houses energy use for 1 year
185.70 number of trees planted

Project Name:	Town of Hamburg	ECM# 5
Project Number:	3008-09NFT	
Calculated By:	JGD	
Checked By:	AMB	
Date:	8/19/2010	

Brine Header Insulation

Given and Assumed Data:

Total # of days per year of operation	=	197	days/year
COP of refrigeration system	=	3.0	
Cost/kWh of electricity	=	$0.08	
Brine Supply Temperature	=	10	°F
Brine Return Temperature	=	20	°F
Main Supply Header Diameter	=	0.67	feet
Main Supply Header Length	=	90	feet
Main Return Header Diameter	=	0.7	feet
Main Reurn Header Length	=	90	feet
Supply Diameter	=	0.2	feet
Exposed Supply Length	=	4	feet
Supply Lines	=	168	
Return Diameter	=	0.2	feet
Exposed Return Length	=	3	feet
Return Lines	=	168	
Ambient Air Temperature	=	60	°F

Existing Condition:

Surface Area of Exposed Supply	=	540.4	sqft
Surface Area of Exposed Return	=	457.7	sqft
Existing Insulation R-Value	=	1.0	hr-ft2-°F/Btu
Existing Heat Gain of Supply Header	=	27,018	Btu / Hr
Existing Heat Gain of Return Header	=	18,307	Btu / Hr
Total System Heat Gain	=	45,324	Btu / Hr
Total System Heat Gain (Annual)	=	17,858	Tons

Proposed Condition:

Surface Area of Exposed Supply	=	540.4	sqft
Surface Area of Exposed Return	=	457.7	sqft
Proposed Insulation R-Value	=	12.0	hr-ft2-°F/Btu
Proposed Heat Gain of Supply Header	=	2,251	Btu / Hr
Proposed Heat Gain of Return Header	=	1,526	Btu / Hr
Total System Heat Gain	=	3,777	Btu / Hr
Total System Heat Gain (Annual)	=	1,488	Tons

Energy Savings:

Total Annual System Heat Gain Reduction	=	16,370	Tons
Total Annual Energy Savings	=	19,190.69	kWh
Total Annual Energy Savings	=	$1,615.43	

Town of Hamburg
Ice Rink Improvements
Low Emissivity Ceiling
Town Ice Rink

Project #: 3008-09NFT
ECM #: 5

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	45,882	kWh/Year
Fossil Fuel Savings	0	MMBtu/Year
Environmental CO_2 Gas Savings(1)	38,174	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$3,862	Per Year
Total Energy & O&M Savings	$3,862	Per Year
Project Costs		
Total Measure Cost	$59,035	
Payback		
Simple Payback	15.3	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	15.3	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

68,823 lbs of coal (Saved)
97 lbs of Nox gas reduced
282 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

3.17 passenger cars (Reduced)
40.27 barrels of oil (Saved)
1.58 houses energy use for 1 year
443.99 number of trees planted

Project Name: Town of Hamburg
Project Number: 3008-09NFT
Calculated By: JGD
Checked By: AMB
Date: 8/19/2010

LOW EMISSIVITY CEILING

Existing Condition:

The ceiling of the ice rink is coated with white paint, which radiates a considerable amount of heat to the ice below.

Proposed Condition:

An aluminum faced surface installed under the ceiling would have a lower emissivity and transmit a lower heat load to the ice below.

Given and Assumed Data:

Temperature of ceiling	T_c =	45	
Temperature of ice	T_i =	28	
Length of ice area	y =	200	
Width of ice area	x =	85	
Mid-height of room	d =	25	
Emissivity of existing ceiling	ε_c =	0.93	
Emissivity of proposed ceiling	ε_n =	0.03	
Emissivity of ice	ε_i =	0.95	
COP of refrigeration system	=	4.5	
Cost/kWh of electricity	=	0.084	
Total # of days per year of operation	=	197	days/year

Conversion Factors: 3

σ = Stefan-Boltzmann Constant σ = 1.714E-09 Btu/(hr-ft^2-°R^4)

Theory: $q_r = A\, f_{ci}\, \sigma(T_c^4 - T_i^4)$

where q_r = heat load from radiation
A = area
T = temperature in degrees Rankin
f_{ci} = configuration factor

Project Name: Town of Hamburg
Project Number: 3008-09NFT
Calculated By: JGD
Checked By: AMB
Date: 8/19/2010

Calculations:

Area of Ceiling				
length x width	A_c	=	17,000	sq ft
Area of Ice				
length x width	A_i	=	17,000	sq ft
Ratio, width to height				
width/height		=	3.4	
Ratio, length to height				
length/height		=	8.0	
Angle Factor				
from chart on page 34.3	F_{ci}	=	0.70	
Existing Configuration Factor				
$\{1/F_{ci} + (1/\varepsilon_c-1)+A_c/A_i*(1/\varepsilon_i-1)\}^{-1}$	f_{ci}	=	0.64248	
Existing Radiant Heat Load				
$q_r = A\, f_{ci}\, \sigma(T_c^4 - T_i^4)$	q_r	=	155,542	Btu/hr
Existing kW Load on Compressor from Ceiling				
Btu/hr/COP/3413		=	10.17	kW
Existing kWh Used by Compressor for Ceiling				
kW * days * 24		=	48,096	kWh/yr
Proposed Configuration Factor				
$\{1/F_{ci} + (1/\varepsilon_p-1)+A_c/A_i*(1/\varepsilon_i-1)\}^{-1}$	f_{ci}	=	0.029573	
Proposed Radiant Heat Load				
$q_r = A\, f_{ci}\, \sigma(T_c^4 - T_i^4)$		=	7,160	Btu/hr
Proposed kW Load on Compressor from Ceiling				
Btu/hr/COP/3413		=	0.47	kW
Proposed kWh Load on Compressor for Ceiling				
kW * days * 24		=	2,214	kWh/yr
Projected kWh Savings				
Present kWh - Projected kWh			45,882	kWh/yr
Projected kWh Cost Savings				
Present kWh Cost - Projected kWh Cost			$ 3,862	

References:

ASHRAE Refrigeration Handbook, 1998, page 36.3

Town of Hamburg
Ice Rink Improvements
Variable Speed Brine Pump Control
Town Ice Rink

Project #: 3008-09NFT
ECM #: 5

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	24,948	kWh/Year
Fossil Fuel Savings	0	MMBtu/Year
Environmental CO_2 Gas Savings(1)	20,757	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$2,100	Per Year
Total Energy & O&M Savings	$2,100	Per Year
Project Costs		
Total Measure Cost	$23,159	
Payback		
Simple Payback	11.0	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	11.0	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

37,422 lbs of coal (Saved)
53 lbs of Nox gas reduced
153 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

1.72 passenger cars (Reduced)
21.90 barrels of oil (Saved)
0.86 houses energy use for 1 year
241.41 number of trees planted

Project Name: Town of Hamburg
Project Number: 3008-09NFT
Calculated By: JGD
Checked By: AMB
Date: 8/19/2010

VARIABLE SPEED DRIVE APPLICATION
Brine Pumps

Existing Condition:

The existing 30 hp motors on the brine pumps supply brine to the ice rink.

Proposed Condition:

Reconfigure control for 30 hp Variable Speed Drive on 30 hp motors

Given and Assumed Data:

Existing System Parameters:

Motor Horsepower	=	25	hp
Number of Motors	=	1	
Motor Efficiency (exist)	=	94%	
Motor Efficiency (new)	=	94%	
Motor Design Load Factor	=	80%	
Total Annual Hours of Operation	=	4,728	hours/year
Marginal Demand Cost	=	$10.40	/kW
Marginal Energy Usage Cost	=	$0.084	/kWh

Proposed System Parameters:

VFD Efficiency	=	97%	

Conversion Factors:

Horsepower to Power	=	0.746	kW/hp
Kilowatt-Hours to Thousand Btus	=	3.412	MBtu/kWh

Calculations:

Peak Motor Demand (exist) = 15.9 kW
(hp x 0.746 kW/hp x %load/eff)

Load Profile Information:

Table 2240.1

% Flow	Existing % Power	VFD % Power	kW Difference	Operating Hours	kWh Savings
0.55	1.00	0.15	13.97		0
0.60	1.00	0.20	13.15	2,000	26,293
0.65	1.00	0.26	12.16		0
0.70	1.00	0.34	10.85		0
0.75	1.00	0.44	9.20		0
0.80	1.00	0.52	7.89		0
0.85	1.00	0.60	6.57		0
0.90	1.00	0.79	3.45		0
0.95	1.00	0.90	1.64		0
1.00	1.00	1.03	(0.49)	2,728	(1,345)
			Total:	4,728	24,948

Annual Reduction in Pumping Energy = 24,948 kWh/yr
(from Table 2240.1 above)
Annual Electric Energy Operating Cost Savings = $2,100 /yr.
(annual energy savings kWh/yr x energy rate $/kWh)

References:

(1) Bell & Gossett ITT Bulletin No. TEH-685, Variable Speed/Variable Volume Pumping Fundamentals

Town of Hamburg
Ice Rink Improvements
Water Treatment
Town Ice Rink

Project #: 3008-09NFT
ECM #: 5

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	6,413	kWh/Year
Fossil Fuel Savings	127	MMBtu/Year
Environmental CO_2 Gas Savings(1)	12,439	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,873	Per Year
Total Energy & O&M Savings	$1,873	Per Year
Project Costs		
Total Measure Cost	$64,295	
Payback		
Simple Payback	34.3	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	34.3	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

9,619 lbs of coal (Saved)
14 lbs of Nox gas reduced
39 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

1.03 passenger cars (Reduced)
13.12 barrels of oil (Saved)
0.51 houses energy use for 1 year
144.67 number of trees planted

Project Name:	Town of Hamburg	ECM # 3
Project Number:	3008-09NFT	
Calculated By:	JGD	
Checked By:	AMB	
Date:	8/19/2010	

Flood Water Treatment - Heating Reduction

Existing Condition:

Natural gas water heater heats flood water to 140°F

Proposed Condition:

Water Treatment reduces flood water temperature to 90 °F

Given and Assumed Data:

Water Usage				
Average Number of Resurfacings per day		=	12	
Gallons of Hot Water per Resurfacing		=	100	gallons
Average Daily Hot Water consumption		=	1,200	gallons
Days of use per year		=	210	days/yr
Annual Usage	A	=	252,000	gallons
Hot Water System				
Natural Gas System Efficiency	η	=	80%	
# of Units		=	1	units
Assumed Make-up Water Temperature	T_{in}	=	55	°F
Flood Water Temperature	T_{fl}	=	140	°F
General Assumptions				
Cost Per mmBtu		=	$10.47	mmBtu
Conversion Factor #1	CF_1	=	8.33	Btu/gal- deg F
Conversion Factor #2	CF_2	=	103,000	Btu/Ccf

Proposed Data:

Hot Water System				
Natural Gas System Efficiency		=	80%	
# of Units		=	1	units
Assumed Make-up Water Temperature	T_{in}	=	55	°F
Flood Water Temperature	T_{fl2}	=	90	°F

Calculations:

Existing Hot Water Heating			
Existing Annual ccf Consumption (A*CF1*(Tfl - Tin))/η/CF2	=	2,165	Ccf/yr
Existing Annual mmBtu Consumption	=	217	mmBtu/yr
Proposed Hot Water Heating			
Proposed Annual ccf Consumption (A*CF1*(Tfl2 - Tin))/η/CF2	=	892	Ccf/yr
Proposed Annual mmBtu Consumption	=	89	mmBtu/yr
Savings			
Annaul Fuel Usage Savings	=	127	mmBtu
Annual Annual Energy Savings	=	$1,333	

Project Name: Town of Hamburg
Project Number: 3008-09NFT
Calculated By: JGD
Checked By: AMB
Date: 8/19/2010

ECM # 3

Flood Water Treatment - Cooling Load Reduction

Existing Condition:

Natural gas water heater heats flood water to 140°F

Proposed Condition:

Water Treatment reduces flood water temperature to 90 °F

Given and Assumed Data:

Water Usage				
Average Number of Resurfacings per day		=	12	
Gallons of Hot Water per Resurfacing	V	=	100	gallons
Average Daily Hot Water consumption		=	1,200	gallons
Days of use per year		=	197	days/yr
Annual Usage		=	236,400	gallons
Cooling Load				
Flood Water Temperature	T_{fl}	=	140	°F
Ice Surface Temperature	T_s	=	28	°F
Cooling Load From Resurfacing	CL	=	211,549	Btu
$V*CF_1*[1*(T_{fl}-32)+144+.49*(32-T_s)]$				
COP of refrigeration system (Assumed)	COP	=	4.5	
Refrideration System Input Energy ($CL/COP/CF_2$)		=	13.78	kW
Annual Energy Consumption		=	32,571	kWh
General Assumptions				
Electric Utility Cost		=	$0.08	kWh
Conversion Factor #1	CF_1	=	8.33	Btu/gal- deg F
Conversion Factor #2	CF_2	=	3,412	Btu/kW

Proposed Data:

Cooling Load				
Flood Water Temperature	T_{fl}	=	90	°F
Ice Surface Temperature	T_s	=	28	°F
Cooling Load From Resurfacing	CL	=	169,899	Btu
$V*CF_1*[1*(T_{fl}-32)+144+.49*(32-T_s)]$				
COP of refrigeration system (Assumed)	COP	=	4.5	
Refrideration System Input Energy ($CL/COP/CF_2$)		=	11.07	kW
Annual Energy Consumption		=	26,159	kWh

Energy Savings:

Annaul Electric Usage Savings	=	6,413	kWh
Annual Electric Energy Savings	=	$539.81	

Reference:

ASHRAE Handbook 2006 Refrigeration - 35.3

Section 9

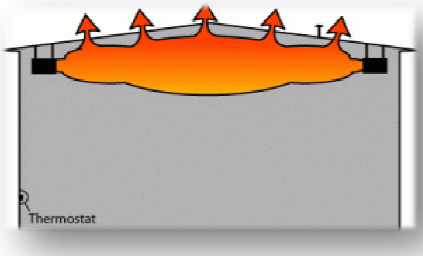
Destratification Fans

DESTRATIFICATION FANS

ECM - 6

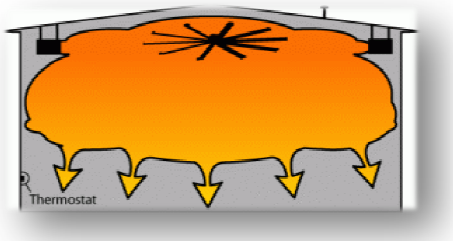
INVESTIGATION

Large open buildings, such as highway garages with high ceilings, often experience air stratification at the ceiling. Stratification is the formation of air at different densities filling a space. It occurs when the ceiling is warmer than the floor.



This keeps the warmer, lighter (less dense) air at the ceiling and the colder, heavier (denser) air near the floor. The uneven distribution of heat through a space will result in increased heating losses at the ceiling. Further inefficiencies result due to the fact that in most buildings the occupants and thermostats are located near the floor. Since the air is not evenly distributed the sensor will call for heating more often than if the air was more evenly distributed.

Heat recirculation is the process of mixing the air to evenly distribute heat trapped near the ceiling down to the occupants, rather than escaping through the roof through infiltration, conduction and radiation. Destratification fans are designed to operate efficiently at low speeds. A motor turns a fan very slowly in the forward direction (counterclockwise) which will provide enough air movement to circulate the hot air at the ceiling down to the floor without causing drafts. Spaces heated by infrared (IR) heat are less susceptible to stratification. Infrared heaters work by heating objects within the space rather than the air in the space. These objects reradiate the heat into the space thus heating the air. While not as sever, stratification will occur in these spaces as the air heated by the objects rises.



Building and Grounds Garage

Existing System

The Buildings and Grounds garage has a large garage bay area with approximately 25 foot ceilings. Heating for this area is provided by infrared heating. The space temperature sensors

are located approximately five (5) feet from the floor of the garage. The roof is a metal deck with insulation on the underside. Drawings for this building were not available, so it was assumed that the thermal resistance of the roof is R-19 and the walls is R-14

Figure 9.1 Buildings and Grounds Garage

Proposed System

The proposed system would feature a destratification fan located in the center of the structure. The fan would have a 12 foot diameter and be capable of moving approximately 103,460 CFM of air. The fan would operate continuously during the heating season circulating air from the ceiling to the floor. In doing so, energy savings will be achieved by reducing the operating hours of the existing heating system and decreasing the energy loss through the building's roof.

Highway Garage

Existing System

The Highway garage has a large garage bay area with approximately 25 foot ceilings. The building is separated into two (2) sides by a dividing wall down the center of the building. Heating for this area is provided by infrared heating. The space temperature sensors are located approximately five (5) feet from the floor of the garage. The roof is a metal deck with

insulation on the underside. Drawings for this building were not available, so it was assumed that the thermal resistance of the roof is R-19 and the walls is R-14

Figure 9.2 Highway Garage

Proposed System

The proposed system would feature two (2) destratification fans located in the center of each side of the structure. Each fan would have an 8 foot diameter and be capable of moving, approximately 41,905 CFM of air. The fan would operate continuously during the heating season circulating air from the ceiling to the floor. In doing so, energy savings will be achieved by reducing the operating hours of the existing heating system and decreasing the energy loss through the building's roof.

RECOMMENDATIONS

Wendel recommend the installation of a destratification fans in the Buildings and Grounds Garage. During the heating season energy savings will achieved by improving the equalization of air temperatures throughout the buildings and reducing energy loss through the roof. As for the Highway Department Garage, the cost to implementing this measure is not justified by the calculated savings and therefore is not recommended.

Town of Hamburg
Destratification Fans
Buildings & Grounds Garage

Project #: 3008-09NFT
ECM #: 6

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	(3,526)	kWh/Year
Fossil Fuel Savings	115	MMBtu/Year
Environmental CO_2 Gas Savings(1)	10,501	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,161	Per Year
Total Energy & O&M Savings	$1,161	Per Year
Project Costs		
Total Measure Cost	$11,471	
Payback		
Simple Payback	9.9	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	9.9	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

-5288.50 lbs of coal (Saved)
-7.45 lbs of Nox gas reduced
-21.65 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

0.87 passenger cars (Reduced)
11.08 barrels of oil (Saved)
0.43 houses energy use for 1 year
122.14 number of trees planted

Project Name:	Town of Hamburg	ECM #	6
Project Number:	3008-09NFT		
Calculated By:	JGD		
Checked By:	KLK		
Date:	7/23/10		

INSTALL CEILING FANS

Proposed Building HVAC Set-Back Schedule

Weekdays	12 AM - 8 AM	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied (OH)	2	8	0
Unoccupied (UH)	6	0	8
Weekends			
Occupied (OH)	0	0	0
Unoccupied (UH)	8	8	8
% Occupied	17.86%	71.43%	0.00%

Given and Assumed Data:

Temp at Thermostat	(Occupied)	Tt	=	70	F
Temp at Thermostat	(Unoccupied)	Tt	=	64	F
Ceiling Height		Ht	=	25	Ft
Area of Ceiling		Ac	=	20,000	Sq Ft
Area of Walls		Aw	=	15,000	Sq Ft
"U" Factor of Ceiling		Uc	=	0.053	Btuh/Sq Ft/F
"U" Factor of Wall		Uw	=	0.071	Btuh/Sq Ft/F
Hours Per Year	(Occupied)	Hr	=	1,407	Hrs/Year
Hours Per Year	(Unoccupied)	Hr	=	3,321	Hrs/Year
Efficiency of Heating Unit		%	=	80%	
Operating Horsepower of Fan		Hp	=	1	Hp
One Horsepower				0.7457	kW/Hp
Cost of 1kWh				$0.08	$/kWh
Cost of 1 Unit of Fuel				$10.00	$/Unit

Project Name:	Town of Hamburg	ECM #	6
Project Number:	3008-09NFT		
Calculated By:	JGD		
Checked By:	KLK		
Date:	7/23/10		

Calculations:

Occupied

Temp at Ceiling Tc= Tt + 0.01(Ht - 5)(Tt) See Ref	Tc	=	85	F
Average Wall Temp Tw=(Tc-Tt)/2+Tt	Tw	=	78	F
Energy Savings Qc = Ac (U)(Tc-Tt)(Hr)	Qc	=	22.8	mmBtu
Energy Savings Qw = Aw (U)(Tw-Tt)(Hr)	Qw	=	11.6	mmBtu
$ Saved Per Year = Qc+Qw(Cost of Fuel)/(Btu/Unit x Eff)		=	$430	Per Year

Unoccupied

Temp at Ceiling Tc= Tt + 0.01(Ht - 5)(Tt) See Ref	Tc	=	79	F
Average Wall Temp Tw=(Tc-Tt)/2+Tt	Tw	=	72	F
Energy Savings Q = A (U)(Tc-Tt)(Hr)	Qc	=	53.7	mmBtu
Energy Savings Qw = Aw (U)(Tw-Tt)(Hr)	Qw	=	27.3	mmBtu
$ Saved Per Year = Q(Cost of Fuel)/(Btu/Unit x Eff)		=	$1,013	Per Year

No. of Fans Required = Area Ceiling/ Manuf Area	=	1	Fans
Cost of Oper Fans = No. Fans(Hp Fan)(Hr)(0.7457)($/kWh)	=	$282	

Savings:

Annual Heating Savings	=	115.4	mmBtu
Annual Electric Savings	=	-3526	kWh
Net Savings = $ Saved - Cost of Op Fans	=	$1,161	Per Year

References:

Severns, William H. and Fellows, Julian R. - Air Conditioning and Refrigeration
John Wiley & Sons, Inc 1962 Pg 81

Town of Hamburg
Destratification Fans
Highway Garage

Project #: 3008-09NFT
ECM #: 6

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	(3,526)	kWh/Year
Fossil Fuel Savings	90	MMBtu/Year
Environmental CO_2 Gas Savings(1)	7,520	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$869	Per Year
Total Energy & O&M Savings	$869	Per Year
Project Costs		
Total Measure Cost	$21,815	
Payback		
Simple Payback	25.1	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	25.1	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

-2398.32 kg of coal (Saved)
-1.34 kg of Nox gas reduced
-9.58 kg of SO2 gas reduced

Equivalent Savings (1 year)

1.38 passenger cars (Reduced)
17.49 barrels of oil (Saved)
0.68 houses energy use for 1 year
192.83 number of trees planted

Project Name:	Town of Hamburg	ECM #	6
Project Number:	3008-09NFT		
Calculated By:	JGD		
Checked By:	KLK		
Date:	8/19/10		

INSTALL CEILING FANS

Proposed Building HVAC Set-Back Schedule

Weekdays	(12 AM - 8 AM)	(8 AM - 4 PM)	(4 PM - 12 AM)
Occupied (OH)	2	8	0
Unoccupied (UH)	6	0	8
Weekends			
Occupied (OH)	0	0	0
Unoccupied (UH)	8	8	8
% Occupied	17.86%	71.43%	0.00%

Given and Assumed Data:

Temp at Thermostat	(Occupied)	Tt	70	F
Temp at Thermostat	(Unoccupied)	Tt	64	F
Ceiling Height		Ht	25	Ft
Area of Ceiling		Ac	15,000	Sq Ft
Area of Walls		Aw	12,500	Sq Ft
"U" Factor of Ceiling		Uc	0.053	Btuh/Sq Ft/F
"U" Factor of Wall		Uw	0.071	Btuh/Sq Ft/F
Hours Per Year	(Occupied)	Hr	1407	Hrs/Year
Hours Per Year	(Unoccupied)	Hr	3321	Hrs/Year
Efficiency of Heating Unit		%	80%	
Operating Horsepower of Fan		Hp	0.5	Hp
One Horsepower			0.7457	kW/Hp
Cost of 1kWh			$0.07	$/kWh
Cost of 1 Unit of Fuel			$10.00	$/Unit

Calculations:

Occupied

Temp at Ceiling Tc= Tt + 0.01(Ht - 5)(Tt) See Ref	=	85	F
Average Wall Temp Tw=(Tc-Tt)/2+Tt	=	78	F
Energy Savings Qc = Ac (U)(Tc-Tt)(Hr)	=	17.1	mmBtu
Energy Savings Qw = Aw (U)(Tw-Tt)(Hr)	=	9.7	mmBtu
$ Saved Per Year = Qc+Qw(Cost of Fuel)/(Btu/Unit x Eff)	=	$335	Per Year

Occupied

Temp at Ceiling Tc= Tt + 0.01(Ht - 5)(Tt) See Ref	=	79	F
Average Wall Temp Tw=(Tc-Tt)/2+Tt	=	72	F
Energy Savings Q = A (U)(Tc-Tt)(Hr)	=	40.3	mmBtu
Energy Savings Qw = Aw (U)(Tw-Tt)(Hr)	=	22.8	mmBtu
$ Saved Per Year = Q(Cost of Fuel)/(Btu/Unit x Eff)	=	$788	Per Year
No. of Fans Required = Area Ceiling/ Manuf Area	=	2	Fans
Cost of Oper Fans = No. Fans(Hp Fan)(Hr)(0.7457)($/kWh)	=	$254	

Savings:

Annual Heating Savings	=	89.8	mmBtu
Annual Electric Savings	=	-3526	kWh
Net Savings = $ Saved - Cost of Op Fans	=	$869	Per Year

References:

Severns, William H. and Fellows, Julian R. - Air Conditioning and Refrigeration
John Wiley & Sons, Inc 1962 Pg 81

Section 10

Low Flow Shower Heads

LOW FLOW SHOWER HEADS

ECM – 7

INVESTIGATION

Conserving hot water can reduce operational and energy costs as well as usage of this resource. Shower facilities typically present an opportunity for energy savings due to the large amount of hot water usage associated with these facilities. The energy used in this type of system varies based on a number of factors including time of year, frequency of use in the buildings, heating equipment and fixture flow rates. During the course of the study water usage was estimated based on number and type of fixtures in the buildings, the building use, utility history, and discussions with facility personnel.

This section includes itemized summaries of proposed fixture replacements. Each summary contains calculations for energy savings and water savings. In addition cost estimates were developed by a contractor that specializes in water conservation and fixture replacements. Following is a general description of typical conservation opportunities found at the Town of Hamburg Ice Arena.

Figure 10.1 Existing Shower Heads

Existing System

The Town Ice Rink contains several shower heads. Most have a flow rate of 2.5 gallons per minute (GPM).

Proposed System

An opportunity for energy and operational savings exists by replacing these fixtures with more modern "low flow" options with a flow rate of 1.5 gallon per minute (GPM). Detailed information including fixture types, locations and quantities are presented in the attached analysis. Operation & Maintenance savings are anticipated with this measure due to the reduction in water consumption.

RECOMMENDATIONS

Wendel recommends that the Town of Hamburg implement the proposed fixture upgrades. The proposed improvements will result in energy savings associated with a reduction in hot water usage. Additional operational savings will be realized from a reduction in water consumption.

Town of Hamburg
Low Flow Shower Heads
Town Ice Rink

Project #: 3008-09NFT
ECM #: 7

Measure Summary Table

19-Aug-10

Savings		
Water Savings	26.7	kGal/Year
Fossil Fuel Savings	5	MMBtu/Year
Environmental CO_2 Gas Savings(1)	643	Lbs./Year
Operational & Maintenance Savings	$79	Per Year
Energy Savings ($)	$56	Per Year
Total Energy & O&M Savings	$135	Per Year
Project Costs		
Total Measure Cost	$1,699	
Payback		
Simple Payback	12.6	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	12.6	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0.00 lbs of coal (Saved)
0.00 lbs of Nox gas reduced
0.00 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

0.05 passenger cars (Reduced)
0.68 barrels of oil (Saved)
0.03 houses energy use for 1 year
7.48 number of trees planted

Project:	Town of Hamburg	ECM# 7
Building:	Town Ice Rink	
Date:	8/19/2010	
Calculated By:	JGD	
Reviewed By:	AMB	

Hot Water Savings

Town Ice Rink

Natural Gas $/therm		$	1.047
Cost of Hot Water/kgal		$	7.09
Percentage of Hot Water to produce 80 Deg. F Mix for faucet usage			30.00%
Percentage of Hot Water to produce 104 Deg. F Mix for shower usage	7892.73%		70.00%

Before Upgrades

Fixtures	No.	Use Rate	Frequency	Days	**Yearly Use**
4" and 8" Center Sets	0	0.66 gpm	4Mins/Day	197	0 kgals
4" and 8" Center Sets	0	0.66 gpm	4Mins/Day	197	0 kgals
4" & 8" Center Sets	**From An**	0.66 gpm	4Mins/Day	197	0 kgals
4" Center Sets	0	0.66 gpm	4Mins/Day	197	0 kgals
4" Center Sets	0	0.66 gpm	4Mins/Day	197	0 kgals
8" Center Sets	0	0.66 gpm	4Mins/Day	197	0 kgals
8" Center Sets	0	0.66 gpm	4Mins/Day	197	0 kgals
Misc Faucet	0	0.66 gpm	4Mins/Day	197	0 kgals
Single faucets	0	0.66 gpm	4Mins/Day	197	0 kgals
Old Gooseneck Faucet	0	0.66 gpm	4Mins/Day	197	0 kgals
High Flow Dish Sprayer	0	2.10 gpm	60Mins/Day	197	0 kgals
4" and 8" Misc.	0	0.15 gpm	4Mins/Day	197	0 kgals
Kitchen Sink	0	1.40 gpm	60Mins/Day	197	0 kgals
Kitchen Sink	0	2.10 gpm	60Mins/Day	197	0 kgals
Whirlpool	0	28 Galls/Use	2Use/Day	197	0 kgals
Unimat 35 Washing Machine	0	35 Galls/Load	6 Loads/Day	197	0 kgals
2.5 GPM Shower Heads	9	1.75 gpm	6Mins/Day	197	19 kgals
2.0 GPM Shower Heads	0	1.40 gpm	6Mins/Day	197	0 kgals
Hand Held Shower Heads	0	1.75 gpm	6Mins/Day	197	0 kgals
Low flow Shower Heads	0	1.75 gpm	6Mins/Day	197	0 kgals
Total					**19 kgals**

Project: Town of Hamburg ECM# 7
Building: Town Ice Rink
Date: 8/19/2010
Calculated By: JGD
Reviewed By: AMB

Hot Water Savings

Town Ice Rink

Cost of Natural Gas: $ 1.047 per therm

Cold Water Temperature: 55 F
Domestic Hot Water Temperature: 120 F
Converter Efficiency: 80%
Water Density: 8.33 lb/gal
Water Specific Heat: 1 Btu/(lb-F)
Cost per kgal DHW = $ 7.09 per kgal

	After Upgrades					Savings		
Upgrade Fixtures	No.	Use Rate	Frequency	Days	**Yearly Use**	**Water**	**Fuel (mmBtu)**	**Fuel $ Savings**
0.5 Gpm Aerator	0	0.15 gpm	4Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
1.5 Gpm Aerator	0	0.45 gpm	4Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
1.0 Gpm Aerator	0	0.30 gpm	4Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
4" Push Button Faucets	0	0.15 gpm	2Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
4" Faucets	0	0.15 gpm	4Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
8" Push Button Faucets	0	0.15 gpm	2Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
8" Faucets	0	0.15 gpm	4Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
Sensor Faucet	0	0.15 gpm	2Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
Pushbutton F.	0	0.15 gpm	2Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
New Gooseneck Faucet	0	0.15 gpm	4Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
1.28 Hand Held Sprayer	0	0.90 gpm	60Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
No Upgrade	0	0.15 gpm	4Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
No Upgrade	0	1.40 gpm	60Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
2.0 Gpm Aerator	0	1.40 gpm	60Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
No Upgrade	0	28 Galls/Use	2Use/Day	197	0 kgals	0 kgals	0.00	$0.00
No Upgrade	0	35 Galls/Load	6 Loads/Day	197	0 kgals	0 kgals	0.00	$0.00
1.5 Gpm S H	9	1.05 gpm	6Mins/Day	197	11 kgals	8 kgals	5.33	$55.82
1.5 Gpm S H	0	1.05 gpm	6Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
1.5 Gpm Hand Held Replacement	0	1.05 gpm	6Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
No Upgrade	0	1.75 gpm	6Mins/Day	197	0 kgals	0 kgals	0.00	$0.00
Total					**165 kgals**	**27 kgals**	**5.33**	**$55.82**

Section 11

Compressed Air System Upgrades

COMPRESSED AIR SYSTEM UPGRADES

ECM – 8

INVESTIGATION

Compressed air systems are used in a variety of applications to provide tools and equipment with high pressure air. A compressed air system's energy consumption is based on a variety of factors including the type of compressor, the operating pressure, the type of moisture control, the frequency of use and leaks in the distribution system. Compressed air systems are in place at both the Town's Buildings and Grounds garage, and the Highway garage.

Wendel has reviewed the equipment and operation of these systems. In this process Wendel has identified possible equipment replacements that will result in energy savings. Some assumptions regarding volume flow rates of compressed air were made based on the current equipment and their published flow rates. System pressures were monitored on site and recorded as well as system run times and down times.

Figure 11.1 Buildings and Grounds Compressed Air

For the options described below cost estimates where developed that include material and labor costs to replace the electric heaters and associated equipment. These cost estimates include costs for connecting to the existing air lines, and connection to the nearby natural gas supply line. The cost estimate is based on similar projects Wendel has completed, RS Means,

and manufacturer budget pricing. There are no maintenance savings anticipated by this measure. A summary of the potential savings and economics of this project are included in this section.

Buildings and Grounds Garage

Existing System

The Buildings and Grounds garage has a 10HP reciprocating compressor and tank system. This system runs constantly to maintain an operating pressure of 150psig in the tank and distribution system. The compressor cycles overnight to maintain this system pressure. Moisture in the system is removed by manual blow down of the compressed air system. This process drains the system of air resulting in longer compressor operation than would otherwise be necessary.

Proposed System

The existing reciprocating compressor will be replaced with a variable speed rotating screw compressor. Traditional reciprocating compressors typically operate with no load control and will operate between two set pressure points. When maximum pressure is reached the compressor goes to off load. During periods of medium to low air demand, the no load power consumption can be excessive relative to the air output. The installation of a variable speed drive will allow the compressor's power consumption to match the compressed air system's demand. The controls associated with this system will also allow the compressor to setback at night when the only load would be leak losses. This compressor system will have a built-in no loss type drain valve that will allow the system to evacuate water without the loss of air or the need for a blow down.

Highway Garage

Existing System

The Highway garage has two (2) 7.5HP reciprocating compressor and tank system. This system runs constantly to maintain an operating pressure of 125psig in the tank and distribution system. The compressor cycles overnight to maintain this system pressure. Moisture in the system is removed by manual blow down of the compressed air system. This process drains the system of air resulting in longer compressor operation than would otherwise be necessary.

Figure 11.2 Proposed Compressed Air Systems

Proposed System

The existing reciprocating compressor will be replaced with a variable speed rotating screw compressor. Traditional reciprocating compressors typically operate with no load control and will operate between two set pressure points. When maximum pressure is reached the compressor goes to off load. During periods of medium to low air demand, the no load power consumption can be excessive relative to the air output. The installation of a variable speed drive will allow the compressor's power consumption to match the compressed air system's demand. The controls associated with this system will also allow the compressor to setback at night when the only load would be leak losses. This compressor system will have a built-in no loss type drain valve that will allow the system to evacuate water without the loss of air or the need for a blow down.

RECOMMENDATIONS

Wendel recommends that the Town of Hamburg implement the proposed upgrades to the aforementioned compressed air systems at the Buildings and Grounds garage and Highway garage. The proposed improvements will result in a more energy efficient and demand responsive system.

Town of Hamburg
Compressed Air System Improvements
Buildings and Grounds Garage

Project #: 3008-09NFT
ECM #: 8

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	12,964	kWh/Year
Fossil Fuel Savings	0	MMBtu/Year
Environmental CO_2 Gas Savings(1)	10,786	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,245	Per Year
Total Energy & O&M Savings	$1,245	Per Year
Project Costs		
Total Measure Cost	$17,388	
Payback		
Simple Payback	14.0	Year(s)
Potential Incentives	$1,556	
Simple Payback with Incentives	12.7	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

19,445 lbs of coal (Saved)
27 lbs of Nox gas reduced
80 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

0.90 passenger cars (Reduced)
11.38 barrels of oil (Saved)
0.45 houses energy use for 1 year
125.44 number of trees planted

Project Name:	Town of Hamburg	ECM #	8
Project Number:	300809NFT		
Calculated By:	JGD		
Checked By:	KLK		
Date:	6/4/2010		

INSTALL VARIABLE SPEED AIR COMPRESSOR

Existing Condition:

One Reciprocating Compressor and storage tank

Proposed Condition:

Single Rotarty Screw Compressor and storage tank

Given and Assumed Data:

Existing System Parameters:

Compressor # 1:

Air Compressor BHP	=	10	bhp
Air Compressor Motor Efficiency	=	84.5%	
SCFM Capacity	=	23.7	scfm
Compressor Avalable Hours	=	8,760	hrs/year
System Operation			
System Minimum Discharge Pressure	=	120	Psig
System Maximum Discharge Pressure	=	160	Psig
System Operating Discharge Pressure	=	150	Psig
Marginal Electric Usage Cost	=	$ 0.096	/kWh
Assumed Leak Losses (Average)	=	5	scfm

Proposed System Parameters:

Proposed compressor brake horsepower (bhp)	=	7.5	bhp
Air Compressor Motor Efficiency		91.7%	
Proposed compressor SCFM Capacity	=	22.7	scfm

Constants and Conversion Factors:

Horsepower to Power	=	0.746	kW/hp
Motor Load Factor	=	75%	

Formulas:

Percent of full load kW with inlet modulatior	0.2662	x	%	of full load capacity	+	0.7376
Percent of full load kW with variable speed	0.9682	x	%	of full load capacity	+	0.0318

KWh/yr = % of full load kW x full load kW x hours/yr

Project Name: Town of Hamburg ECM # 8
Project Number: 300809NFT
Calculated By: JGD
Checked By: KLK
Date: 6/4/2010

Energy Savings Calculations:

Existing Compressor Full Load Electrical Demand (full load power x .746 kW/bhp / comp. motor efficiency)	=	6.6	kW
Existing Compressor Actual Peak Electrical Demand (kWh at actual peak from table 1 / hours at peak)	=	6.6	kW
Existing Annual Energy Usage (inlet modulation) (summation of (power x hours of operation))	=	23,325	kWh
Proposed Compressor Full Load Electrical Demand (compressor power *0.746 kW/bhp / motor eff./drive eff.)	=	4.6	kW
Proposed Compressor Actual Peak Electrical Demand (compressor power *0.746 kW/bhp / motor eff./drive eff.)	=	4.8	kW
Proposed Annual Energy Usage (summation of (power x hours of operation))	=	10,527	kWh/year
Annual Energy Usage Savings (exist. energy - proposed energy)	=	12,798	kWh/year
Energy Cost Savings (annual energy savings x $/kWh)	=	$1,229	$/Year

Table 1

CFM	% Capacity	% Capacity	Hours	Existing Energy (kWh)	Proposed Energy (kWh)	Savings (kWh)
5.925	25%	26.1%	1400	7,454	1,823	5,632
11.85	50%	52.2%	1200	6,918	2,950	3,968
17.775	75%	78.3%	800	4,965	2,892	2,073
23.7	100%	104.4%	600	3,988	2,863	1,125
Totals			4000	23,325	10,527	12,798

References:

(1) Gardner-Denver, Form 13-10-211, 1st edition, 1984.

Project Name:	Town of Hamburg	ECM# 8
Project Number:	300809NFT	
Calculated By:	JGD	
Checked By:	KLK	
Date:	8/19/2010	

INSTALL AUTOMATIC DRAIN VALVES

Existing Condition: The compressed air system has to be purged every week in order for the system to remove particles and moisture that are adversely affecting the quality of the compressed air.

Proposed Condition: Install automatic drain valves

Given and Assumed Data:

Hours of Operation	=	8,760	Hrs
Storage Tank Size	=	160	gallons
Air Pressure	=	125	psig
Kw Savings From chart - See ref	=	0.18	kW
Cost of Kwh	=	$0.096	$/kWh
Motor Horsepower	=	10.00	HP
Motor Efficiency (%)	=	86.5%	
Compressor Efficiency	=	90.0%	

Current Conditions:

Full Purge Cycles	=	52	/year
Annual Electric Usage	=	165.99	kWh
Time to Re-pressurize Tank	=	20	min

Proposed Conditions:

Full Purge Cycles	=	Constant	
Electricity Used by Drain Valve	=	0	kWh
Annual Electric Usage	=	0	kWh

Calculations:

kWh Saved= Hrs*kW	=	166	kWh
Dollar Savings = kWh Saved *$/kWh	=	$16	Per Year

References:

Baughn, E. Steve Plant Engineering January 16, 1992 Pg 85

Coltec Industries, Helpful Compressor Information, Jan, 1993, page 12

Town of Hamburg
Compressed Air System Improvements
Highway Department Garage

Project #: 3008-09NFT
ECM #: 8

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	3.2	kW/Month
Electrical Energy Savings	20,077	kWh/Year
Fossil Fuel Savings	0	MMBtu/Year
Environmental CO_2 Gas Savings(1)	16,704	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,927	Per Year
Total Energy & O&M Savings	$1,927	Per Year
Project Costs		
Total Measure Cost	$18,840	
Payback		
Simple Payback	9.8	Year(s)
Potential Incentives	$2,409	
Simple Payback with Incentives	8.5	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

30,115 lbs of coal (Saved)
42 lbs of Nox gas reduced
123 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

1.39 passenger cars (Reduced)
17.62 barrels of oil (Saved)
0.69 houses energy use for 1 year
194.27 number of trees planted

Project Name:	Town of Hamburg	ECM #	8
Project Number:	300809NFT		
Calculated By:	JGD		
Checked By:	KLK		
Date:	6/4/2010		

INSTALL VARIABLE SPEED AIR COMPRESSOR

Existing Condition:

Two Reciprocating Compressors and storage tanks pipe in parallel

Proposed Condition:

Single Rotarty Screw Compressor and storage tank

Given and Assumed Data:

Existing System Parameters:

Compressor # 1:			
Air Compressor BHP	=	7.5	bhp
Air Compressor Motor Efficiency	=	86.5%	
SCFM Capacity	=	24	scfm
Compressor Avalable Hours	=	8,760	hrs/year
Compressor # 2:			
Air Compressor BHP	=	7.5	bhp
Air Compressor Motor Efficiency	=	84.0%	
SCFM Capacity	=	24	scfm
Compressor Avalable Hours	=	8,760	hrs/year
System Operation			
System Minimum Discharge Pressure	=	90	Psig
System Maximum Discharge Pressure	=	135	Psig
System Operating Discharge Pressure	=	110	Psig
Marginal Electric Usage Cost	=	$ 0.096	/kWh
Assumed Leak Losses (Average)	=	5	scfm

Proposed System Parameters:

Proposed compressor brake horsepower (bhp)	=	10	bhp
Air Compressor Motor Efficiency		91.7%	
Proposed compressor SCFM Capacity	=	43	scfm

Constants and Conversion Factors:

Horsepower to Power	=	0.746	kW/hp
Motor Load Factor	=	75%	

Formulas:

Percent of full load kW with inlet modulatior	0.2662	x	%	of full load capacity	+	0.7376
Percent of full load kW with variable speed	0.9682	x	%	of full load capacity	+	0.0318

KWh/yr = % of full load kW x full load kW x hours/yr

Project Name: Town of Hamburg ECM # 8
Project Number: 300809NFT
Calculated By: JGD
Checked By: KLK
Date: 6/4/2010

Energy Savings Calculations:

Existing Compressor Full Load Electrical Demand (full load power x .746 kW/bhp / comp. motor efficiency)	=	9.8	kW
Existing Compressor Actual Peak Electrical Demand (kWh at actual peak from table 1 / hours at peak)	=	9.9	kW
Existing Annual Energy Usage (inlet modulation) (summation of (power x hours of operation))	=	34,687	kWh
Proposed Compressor Full Load Electrical Demand (compressor power *0.746 kW/bhp / motor eff./drive eff.)	=	6.1	kW
Proposed Compressor Actual Peak Electrical Demand (compressor power *0.746 kW/bhp / motor eff./drive eff.)	=	6.7	kW
Proposed Annual Energy Usage (summation of (power x hours of operation))	=	14,777	kWh/year
Annual Energy Usage Savings (exist. energy - proposed energy)	=	19,911	kWh/year
Energy Cost Savings (annual energy savings x $/kWh)	=	$1,911	$/Year

Table 1

CFM	% Capacity	% Capacity	Hours	Existing Energy (kWh)	Proposed Energy (kWh)	Savings (kWh)
11.85	25%	27.6%	1400	11,086	2,551	8,535
23.7	50%	55.1%	1200	10,288	4,140	6,148
35.55	75%	82.7%	800	7,383	4,062	3,321
47.4	100%	110.2%	600	5,930	4,024	1,907
Totals			4000	34,687	14,777	19,911

References:

(1) Gardner-Denver, Form 13-10-211, 1st edition, 1984.

Project Name:	Town of Hamburg	ECM# 8
Project Number:	300809NFT	
Calculated By:	JGD	
Checked By:	KLK	
Date:	6/4/2010	

INSTALL AUTOMATIC DRAIN VALVES

Existing Condition: The compressed air system has to be purged every week in order for the system to remove particles and moisture that are adversely affecting the quality of the compressed air.

Proposed Condition: Install automatic drain valves

Given and Assumed Data:

Hours of Operation	=	8760	Hrs
Storage Tank Size	=	160	gallons
Air Pressure	=	125	psig
Kw Savings From chart - See ref	=	0.18	kW
Cost of Kwh	=	$0.096	$/kWh
Motor Horsepower	=	10.00	HP
Motor Efficiency (%)	=	86.5%	
Compressor Efficiency	=	90.0%	

Current Conditions:

Full Purge Cycles	=	52	/year
Annual Electric Usage	=	165.99	kWh
Time to Re-pressurize Tank	=	20	min

Proposed Conditions:

Full Purge Cycles	=	Constant	
Electricity Used by Drain Valve	=	0	kWh
Annual Electric Usage	=	0	kWh

Calculations:

kWh Saved= Hrs*kW		=	166	kWh
Dollar Savings =	kWh Saved *$/kWh	=	$16	Per Year

References:

Baughn, E. Steve Plant Engineering January 16, 1992 Pg 85

Coltec Industries, Helpful Compressor Information, Jan, 1993, page 12

Section 12

Overhead Door Controls

OVERHEAD DOOR CONTROLS / REPLACEMENT

ECM – 9

INVESTIGATION

Overhead doors are a key feature of Highway garages. These doors are sized to be large enough to allow access for vehicle traffic. Due to their large size, when these doors are opened conditioned air in the space is quickly escapes and replaced with unconditioned outdoor air, regardless of wind, energy will move from warm to cold. When this happens the building's HVAC system responds by activating to condition the air to the thermostat set point. The amount of energy the HVAC system needs is dependent on the outdoor air temperature and the amount of time the doors are open. This measure looks at reducing the amount of time the doors are open by increasing the speed of the doors and installing controls to automatically close the doors after a vehicle passes through.

Figure 12.1 Example of Existing Overhead Door

<u>Existing System</u>

The Highway Garage consists of 11 overhead doors, five (5) on the west side and six (6) on the east side. The doors located on the west side have been specially reinforced to withstand the occasionally high wind received at this location. Facility personnel informed Wendel during the course of the building tour, which doors are often opened for extended periods of time. Several overhead doors often are damaged by equipment during the course of normal operation. These damaged panels are expensive to replace and in the interim will not be able to form an appropriate seal leading to additional infiltration.

Proposed System

The proposed system would replace the existing doors with high speed, break away rubber doors. The proposed doors would open and close faster than the current door assemblies, thus reducing the amount of air that can infiltrate the conditioned space. A door control system is also utilized that would close the door after either a programmed period of time or a vehicle pass through. This will reduce the hours that these doors are open. The rubber panels are more resistant to damage and are designed to break away and be reattached in the event of a vehicle strike.

Figure 12.2 Example of Proposed Overhead Door

Cost estimates were developed that include material and labor costs to replace the current door assemblies with the proposed option. The cost estimate is based on similar projects Wendel has completed, RS Means, and contractor budget pricing. A summary of the potential savings and economics of this project can be seen in this section. It is anticipated that this measure will result in maintenance savings associated with a reduction in repairs or replacements to door panels. These maintenance savings however are subject to potential occurrences and as such cannot be quantified.

RECOMMENDATIONS

Wendel does not recommend that the Town of Hamburg implement the proposed high speed overhead doors. High speed doors will reduce energy costs by limiting the amount of time a door is opened. The high winds experienced at this location require the installation of a more resilient overhead door. The cost of the door system required would not be justified by the potential energy savings.

Town of Hamburg
Overhead Door Controls/Replacement
Highway Garage

Project #: 3008-09NFT

ECM #: 9

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	0	kWh/Year
Fossil Fuel Savings	312	MMBtu/Year
Environmental CO_2 Gas Savings(1)	36,325	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$3,096	Per Year
Total Energy & O&M Savings	$3,096	Per Year
Project Costs		
Total Measure Cost	$273,920	
Payback		
Simple Payback	88.5	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	88.5	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

0 lbs of coal (Saved)
0 lbs of Nox gas reduced
0 lbs of SO2 gas reduced

Equivalent Savings (1 year)

3.0 passenger cars (Reduced)
38.3 barrels of oil (Saved)
1.5 houses energy use for 1 year
422.5 number of trees planted

Project Name:	Town of Hamburg	ECM # :	9
Project Number:	3008-09NFT		
Calculated By:	JGD		
Checked By:	KLK		
Date:	8/19/2010		

INSTALL HIGH SPEED OVERHEAD DOOR

Given and Assumed Data:

Temperature in the Conditioned Space (Ti)	=	60	°F
Average Winter OA Temperature (To)	=	35	°F
Gas Unit Efficiency (n)	=	85%	
Marginal Gas Usage Cost	=	9.92	$
Number of Days in Heating Season	=	181	days

Existing System Parameters:

Number of Garage Doors	=	11	
Length of Door	=	10	ft
Height of Door	=	14	ft
Total Area of Garage Doors (A)	=	140	ft^2
Thermal Resistance (R-value)	=	6	Btu/hr·ft2·°R
Door Speed	=	20	inch/s
Hours each Doors is open per heating season (h) (without control)	=	58.5	hours
Effictiveness of Opening	=	0.35	

Proposed System Parameters:

Number of Garage Doors (North)	=	11	
Length of Door	=	10	ft
Height of Door	=	14	ft
Total Area of Garage Doors (A)	=	140	ft^2
Thermal Resistance (R-value)	=	4	Btu/hr·ft2·°R
Door Speed	=	60	inch/s
Hours each Doors is open per heating season (h) (with control)	=	19.5	hours
Effictiveness of Opening	=	0.35	

Constants and Conversion Factors:

Horsepower to Power	=	0.746	kW/hp
Conversion Factor	=	1.08	
Average Wind Velocity	=	492	ft/min

Energy Savings Calculations:

Existing System Calculations:

Rate Volume of Un-Conditioned Air That Enters Space / doorway (CFM)	=	24,108	CFM
Q = 1.08 x CFM x delta T x hrs x # openings	=	419	mmBtu
Conductive Heat Loss	=	28	mmBtu

Proposed System Calcualtions:

Rate Volume of Un-Conditioned Air That Enters Space / doorway (CFM)	=	24,108	CFM
Q = 1.08 x CFM x delta T x hrs x # openings	=	140	mmBtu
Conductive Heat Loss	=	42	mmBtu

Energy Savings

Energy Savings	=	312.12	mmBtu
Energy Savings ($)	=	$3,095.66	

Section 13

Traffic Signal Upgrades

TRAFFIC SIGNAL UPGRADES

ECM – 10

INVESTIGATION

The Town of Hamburg operates 10 traffic control devices, located at major intersections and fire stations. Wendel visited each intersection and recorded specific information about each traffic signal. A detailed record of all current signal heads was compiled. Calculations were performed to establish the current level of electrical energy consumption. These calculations were compared to the utility billing information that the City provided to Wendel. From this information, Wendel was able to identify and evaluate retrofit or replacement opportunities to reduce energy consumption & costs.

Figure 13.1 Existing Incandescent Traffic Signals

Existing System

The Town's traffic control devices operate 24 hours a day, 7 days a week, year round. A combination of lighting technology is used by the Town of Hamburg in various traffic signals. Almost all of the traffic signals contain LED lighting, while one intersection has not been upgraded to LED technology. Detailed accounting of the current and proposed traffic signal lighting is provided in this section. Wendel calculated the current electrical consumption for these fixtures and compared it to the utility bills provided by Hamburg. Traffic signals in the Town are individually metered so any upgrades will have instantaneous energy savings. Typically traffic equipment is billed on a calculated usage on a tariff rate which changes have to be submitted to the utility after installation for approval and then invoicing changes are

implemented.

Proposed System

Based on Wendel's investigation, the following upgrades to the existing traffic control system are proposed:

- Replace all incandescent red, yellow and green signal faces with LED at the intersection of Legion and Division.

As this is the only location which still utilizes incandescent technology, it is recommended that the Town upgrade the signals through maintenance activities. For example, whenever an incandescent lamp burns out, replace it with a LED module from stock.

RECOMMENDATION

It is recommended that the Town of Hamburg self implement the proposed traffic signal system upgrades throughout the Town in order to improve energy efficiency and for several other reasons listed below.

- Standardization of high efficiency LED lamps.
- Elimination of inefficient incandescent lamps.
- Increased reliability and visibility with LED traffic signals, which results in an increase in traffic safety.

This improvement measure is suggested to be self implemented by the Town due to the limited scope of work.

Town of Hamburg
Traffic Signal Upgrades

Project #: 3008-09NFT

ECM #: 10

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	17.4	kW/Year
Electrical Energy Savings	4,310	kWh/Year
Fossil Fuel Savings	0	MMBtu/Year
Environmental CO_2 Gas Savings(1)	3,586	Lbs./Year
Operational & Maintenance Savings	$7	Per Year
Energy Savings ($)	$448	Per Year
Total Energy & O&M Savings	$454	Per Year
Project Costs		
Total Measure Cost	$1,568	
Payback		
Simple Payback	3.5	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	3.5	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

6465 lbs of coal (Saved)
9.11 lbs of Nox gas reduced
26 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

0.30 passenger cars (Reduced)
3.78 barrels of oil (Saved)
0.15 houses energy use for 1 year
42 number of trees planted

Legion and Division

	LIGHTING DESCRIPTION	Measure # 1	Measure # 2	Measure # 3
1	Existing Equipment	69 watt INC	69 watt INC	69 watt INC
2	Replacement Equipment	8 watt LED	6 watt LED	12 watt LED
3	fixture code	Green Ball 8"	Red Ball 8"	Yellow Ball 8"
4	Floor/Room	0	0	0
5	Lowest Recorded Lighting Level @Task	0	0	0
6	Min. Required Lighting Level for Task			
7	Total Annual Hours	3,942	3,942	876
CONNECTED KW/LUMINAIRE				
8	Existing Luminaire kW	0.069	0.069	0.069
9	New Luminaire kW	0.008	0.006	0.012
KW/KWH SAVINGS				
10	# of Existing Units	8	8	8
11	# of New Units	8	8	8
12	Total Existing Connected kW	0.552	0.552	0.552
13	Total New Connected kW	0.064	0.048	0.096
14	Total Customer Monthly kW Savings	0.488	0.504	0.456
15	Total Existing Annual kWh	2175.984	2175.984	483.552
16	Total New Annual kWh	252.288	189.216	84.096
17	Total Customer Annual kWh Savings	1924	1987	399
MEASURE INSTALLATION COST				
18	Material Cost Each	$52.00	$39.00	$44.00
19	Installation Cost Each	$0.00	$0.00	$0.00
20	Total Material & Installation Cost Each	$0.00	$0.00	$0.00
21	Total Material Cost	$416.00	$312.00	$352.00
22	Total Installation Cost	$0.00	$0.00	$0.00
23	Total Material & Installation Cost	$416.00	$312.00	$352.00
HAZARDOUS MATERIAL DISPOSAL COST				
24	Total # Haz.Mat. Ballasts To Be Disposed	0	0	0
25	Total # Lamps	8	8	8
26	Total Cost for Disposal	$0.00	$0.00	$0.00
PROJECT COST				
27	Including Costs - Before Rebates	$549.12	$411.84	$464.64
28	Total Rebates	$0.00	$0.00	$0.00
29	Including Costs - After Rebates	$549.12	$411.84	$464.64
ANNUAL BILL SAVINGS				
30	Calculated Bill Savings	$199.77	$206.32	$41.48
31	Payback Before Rebates (Years)	2.7	2.0	11.2
32	Payback After Rebates (Years)	2.7	2.0	11.2

Legion and Division

	Legion and Division ***Operation & Maintenance***	Measure # 1	Measure # 2	Measure # 3
1	Existing Equipment	69 watt INC	69 watt INC	69 watt INC
2	Replacement Equipment	8 watt LED	6 watt LED	12 watt LED
3	fixture code	Green Ball 8"	Red Ball 8"	Yellow Ball 8"
	Current Lamps			
4	Lamps Per Fixture	1	1	1
5	Annual Run Hours	3,942	3,942	876
6	Cost Per Lamp	$2.00	$2.00	$2.00
7	Lamp Life (hours)	2000	2000	2000
8	Number of fixtures	8	8	8
9	Maintenance Cost Per Year	$31.54	$31.54	$7.01
	Proposed Lamps			
10	Lamps Per Fixture	1	1	1
11	Annual Run Hours	3,942	3,942	876
12	Cost Per Lamp	$52.00	$39.00	$44.00
13	Lamp Life (hours)	50000	50000	50000
14	Number of fixtures	8	8	8
15	Maintenance Cost Per Year	$32.80	$24.60	$6.17
	Total Savings			
16	Maintenance Savings	-$1.26	$6.94	$0.84

	Current Ballasts			
17	Ballasts Per Fixture	0	0	0
18	Annual Run Hours	3,942	3,942	876
19	Cost Per Ballast	$0.00	$0.00	$0.00
20	Ballast Life (hours)	0	0	0
21	Number of fixtures	8	8	8
22	Maintenance Cost Per Year	$0.00	$0.00	$0.00
	Proposed Ballasts			
23	Ballasts Per Fixture	0	0	0
24	Annual Run Hours	3,942	3,942	876
25	Cost Per Ballast	$0.00	$0.00	$0.00
26	Ballast Life (hours)	0	0	0
27	Number of fixtures	8	8	8
28	Maintenance Cost Per Year	$0.00	$0.00	$0.00
	Total Savings			
29	Maintenance Savings	$0.00	$0.00	$0.00

Section 14

Street Lighting Upgrades

STREET LIGHTING UPGRADES

ECM – 11

INVESTIGATION

The Town of Hamburg has a significant amount of street lighting equipment throughout the town. This equipment is owned and maintained by the utilities, with the Town paying the energy and maintenance costs. Both National Grid and NYSEG provide street lighting services to the Town. Calculations were performed to establish the current level of electrical energy consumption. These calculations were compared to the utility billing information that the Town provided to Wendel. From this information, Wendel was able to identify and evaluate retrofit or replacement opportunities to reduce energy consumption and maintenance.

Existing System

The Town's street and general outdoor lighting is leased based on an approved New York State Public Service Commission (NYS PSC) tariff rate from National Grid and NYSEG. These rate structures include calculated usage at set wattages and run times determined by the tariff. Maintenance is included in the tariff and covers all associated equipment such as poles, fixtures, wire and lamps. Current equipment utilizes High Intensity Discharge equipment that ranges in wattage from 50 watts to 1,000 watts. The majority of the lighting is of lower wattage ranging from 50 watts to 150 watts. Almost all of the lighting is High Pressure Sodium lighting with the exception of a few Metal Halide fixtures.

Proposed System

For energy efficiency, it is proposed that the lower wattage street lighting fixtures (50w to 150w) be replaced with LED Equipment. Equipment is available from quality American made manufacturers that consume 40 to 60 percent of the energy of the current equipment with the same light output. The wattages of the proposed equipment range from 26 watts to 108 watts. The equipment has a modular design so the equipment is maintainable and the entire fixture would not have to be replaced due to a faulty component.

Currently neither utility company serving the Town has any policy or program to change from their current street lighting to newer technology. While the technology is available both National Grid and NYSEG are not pursuing any changes in their tariffs until there are better established standards for the new street lighting technology.

Based on Wendel's investigation both utility companies have differing policies regarding the transfer of equipment to the customer.

NYSEG is currently awaiting approval of a new energy only tariff, that is currently pending with the NYS PSC. This will allow the customer to take over the ownership and maintenance of the equipment. The customer will only receive a bill from the utility for the energy usage which will be a calculated value, using the specified wattage of the fixture installed by the owner multiplied by the tariff established run hours. The energy only rate once passed, is expected to be 30% higher than the current rate paid by the customer.

National Grid does not have a pending Tariff change and the energy only rate would maintain the same energy cost that the Town is currently paying. Changing of equipment would require the customer to take over the ownership and maintenance of the equipment. The energy charges would be billed at the same rate as the Town is currently paying however meters would need to be added at an additional cost to the Town. Also the Town would have to buy the existing equipment from the utility. National Grid was unable to come up with a specific cost when contacted due to the varying types of equipment and the rate at which the equipment worth is calculated on a 15 year life cycle. If any equipment were to be changed it would need to be evaluated on a case by case basis to determine the cost.

The calculations at the end of this section include many factors. To establish the baseline hours for both utility tariffs typical wattages for all the existing equipment was divided by the billed monthly kilowatt hours. The utility rate was determined from just the energy costs as outlined on the provided utility bills. This rate is used for the existing and proposed cases with the exception of the NYSEG calculation where the proposed case rate is 30% higher due to the pending tariff change. Maintenance savings were estimated at 10% savings for the equipment changed due to longer expected equipment life spans as well as competitive bidding for the

maintenance agreement.

RECOMMENDATION

Due to the unfavorable payback it is not recommended that the Town implements the installation of LED street lighting equipment at this time. This technology is new and has significant costs associated with its implementation. Standards are currently being created by Energy Star and the Design Lights Consortium, as they are implemented by manufacturers, utilities will likely adopt incentive programs to reduce implementation costs. LED equipment incentives will make this efficiency opportunity more cost effective for the town.

For more information on upcoming LED standards:
http://www.designlights.org/solidstate.about.php

http://www.energystar.gov/index.cfm?c=ssl_res.pt_ssl

Town of Hamburg
Street Lighting Upgrades
Town of Hamburg (NYSEG)

Project #: 3008-09NFT
ECM #: 11

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	N/A	kW/Month
Electrical Energy Savings	558,207	kWh/Year
Fossil Fuel Savings	N/A	MMBtu/Year
Environmental CO_2 Gas Savings(1)	464,428	Lbs./Year
Operational & Maintenance Savings	$8,742	Per Year
Energy Savings ($)	$30,893	Per Year
Total Energy & O&M Savings	$39,635	Per Year
Project Costs		
Total Measure Cost	$2,226,606	
Payback		
Simple Payback	56.2	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	56.2	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

837310.63 lbs of coal (Saved)
1180.05 lbs of Nox gas reduced
3427.95 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

38.58 passenger cars (Reduced)
489.91 barrels of oil (Saved)
19.17 houses energy use for 1 year
5401.57 number of trees planted

Street Lighting Upgrades
Town of Hamburg (NYSEG)
Project No.: 3008-09NFT

Existing

Fixt No.	Type	Qty	Wattage
1	50WHPS light	117	65
2	70W HPS light	13	95
3	100W HPS light	42	130
4	150 HPS light	2	195
5	50W HPS cobra head light	53	65
6	70W HPS cobra head light	212	95
7	100W HPS cobra head light	571	130
8	150W HPS cobra head light	548	195
9	50W HPS post top light	5	65
10	70W HPS post top light	148	95
11	100W HPS post top light	12	130

Proposed

Fixt No.	Type	Qty	Wattage
1	Lumark LDRC-TXS-A01-E	117	26
2	Lumark LDRC-TXS-A02-E	13	53
3	Lumark LDRC-TXS-A02-E	42	53
4	Lumark LDRC-TXS-A04-E	2	103
5	Lumark LDRC-TXS-A01-E	53	26
6	Lumark LDRC-TXS-A02-E	212	53
7	Lumark LDRC-TXS-A02-E	571	53
8	Lumark LDRC-TXS-A04-E	548	103
9	McGraw Edison GAT-50-LED-E1	5	58
10	McGraw Edison GAT-50-LED-E1	148	58
11	McGraw Edison GAT-50-LED-E1	12	58

Energy Savings

	Existing			Proposed			Savings		
Fixt no.	Exist kW	Exist kWh	Existing $	Proposed kW	Proposed kWh	Proposed $ (1)	kW Saved	kWh Saved	$ Saved
1	7.6	35301	$2,740.16	3.0	14120	$1,424.88	4.6	21,181	$1,315.28
2	1.2	5733	$444.98	0.7	3198	$322.73	0.5	2,534	$122.25
3	5.5	25344	$1,967.29	2.2	10333	$1,042.67	3.2	15,012	$924.63
4	0.4	1810	$140.52	0.2	956	$96.49	0.2	854	$44.03
5	3.4	15991	$1,241.27	1.4	6396	$645.46	2.1	9,595	$595.81
6	20.1	93486	$7,256.65	11.2	52156	$5,262.98	8.9	41,331	$1,993.67
7	74.2	344563	$26,745.84	30.3	140475	$14,175.29	44.0	204,087	$12,570.54
8	106.9	496025	$38,502.77	56.4	262003	$26,438.57	50.4	234,022	$12,064.20
9	0.3	1509	$117.10	0.3	1346	$135.84	0.0	162	-$18.74
10	14.1	65264	$5,065.96	8.6	39845	$4,020.78	5.5	25,419	$1,045.19
11	1.6	7241	$562.08	0.7	3231	$326.01	0.9	4,011	$236.08
Total	**235.3**	**1092267**	**$84,784.64**	**115.1**	**534060**	**$53,891.70**	**120.3**	**558207**	**$30,892.94**

(1) As Per NYSEG Proposed Energy only cost is 30% Higher than current tariff

4642 Annual hrs (Calculated from Utility Bill)
$0.078 Existing Utility Rate
$0.101 Proposed Utility Rate
30% Proposed Rate Change

Maintenance Savings

Existing Annual Maintenance Cost	$186,010.30
Proposed Annual Maintenance Cost	$177,267.82
Maintenance Savings	$8,742.48

Town of Hamburg
Street Lighting Upgrades
Town of Hamburg (National Grid)
Project No.: 3008-09NFT

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	N/A	kW/Month
Electrical Energy Savings	473,382	kWh/Year
Fossil Fuel Savings	N/A	MMBtu/Year
Environmental CO_2 Gas Savings(1)	393,854	Lbs./Year
Operational & Maintenance Savings	$12,033	Per Year
Energy Savings ($)	$51,086	Per Year
Total Energy & O&M Savings	$63,119	Per Year
Project Costs		
Total Measure Cost	$3,143,507	
Payback		
Simple Payback	49.8	Year(s)
Potential Incentives	$0	
Simple Payback with Incentives	49.8	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Electric Reduction

710072.49 lbs of coal (Saved)
1000.73 lbs of Nox gas reduced
2907.04 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

32.72 passenger cars (Reduced)
415.46 barrels of oil (Saved)
16.26 houses energy use for 1 year
4580.74 number of trees planted

Street Lighting Upgrades
Town of Hamburg (National Grid)
Project No.: 3008-09NFT

Energy Savings

Existing

Fixt No.	Type	Qty	Wattage
1	Lum 70W Std	973	95
2	Lum 100W Std	358	130
3	Lum 150	512	195
4	Lum 70/100W Arch	569	95

Proposed

Fixt No.	Type	Qty	Wattage
1	Lumark LDRC-TXS-A02-E	973	53
2	Lumark LDRC-TXS-A02-E	358	53
3	Lumark LDRC-TXS-A04-E	512	103
4	McGraw Edison GAT-50-LED-E1	569	58

3466 Annual hrs (Calculated from Utility Bill)

	Existing			Proposed			Savings		
Fixt No.	Exist kW	Exist kWh	Existing $	Proposed kW	Proposed kWh	Proposed $	kW Saved	kWh Saved	$ Saved
1	92.4	320355	$34,571.80	51.6	178725	$19,287.43	40.9	141,631	$15,284.38
2	46.5	161295	$17,406.52	19.0	65759	$7,096.50	27.6	95,537	$10,310.02
3	99.8	346019	$37,341.36	52.7	182769	$19,723.90	47.1	163,250	$17,617.46
4	54.1	187340	$20,217.22	33.0	114376	$12,343.15	21.1	72,964	$7,874.08
Total	**292.9**	**1,015,011**	**$109,536.91**	**156.3**	**541,629**	**$58,450.98**	**136.6**	**473,382**	**$51,085.93**

Maintenance Savings

Existing Annual Maintenance Cost	$273,471.59
Proposed Annual Maintenance Cost	$261,438.84
Maintenance Savings	$12,032.75

Section 15

Photovoltaic System

PHOTOVOLTAIC SYSTEM

ECM-12

INVESTIGATION

The Town of Hamburg is interested in further reducing their electrical energy consumption and carbon footprint by installing a photovoltaic module array. Photovoltaic modules produce electrical energy from solar radiation, and can be used to offset a facility's electrical consumption. These systems also help promote environmental and energy conservation by producing power from a clean and abundant source. These systems best operate in areas of little shading, with a clear view of the southern sky. Wendel evaluated options for a photovoltaic system located at the Town Hall.

Figure -15.1 Example of a Photovoltaic System

Proposed System

The proposed photovoltaic array will be positioned on the northeast corner of the building. The array will consist of several photovoltaic modules that will be connected together in a manner that will maximize the output of the system. The modules will also be mounted on a 30° angle. Modules mounted at a 30° angle will produce more energy during the summer when the days are longer and there is a lower percentage of cloud cover. A utility grade inverter will be mounted either within the building or pad mounted on the exterior, depending on the size of the system. The inverter will be connected to the building's electrical system to

provide quality electrical energy to the facility.

Figure -15.2 Location of Photovoltaic System

While on site, Wendel utilized a tool called the "Solar Pathfinder" to determine shading effects on the photovoltaic system. Using this tool, the geographic location, and annual weather data for this site, Wendel modeled the annual production for a 25 kW system using a Sharp 240W module. This module was chosen for analysis purposes only. A system layout sketch of the south roof was created to verify that adequate space is available for a photovoltaic system.

Wendel has evaluated many different types of mounting systems. For the purposes of this study it has been assumed that the system will be anchored with a penetrated roof mounting system. These systems provide a stable platform for the modules. These systems work by connecting the system to the building's structural framework underneath the roof surface. This type of system also allows the modules to be mounted at higher angles. The other option is to use a ballasted system. These systems are often less expensive and will not result in any roof penetrations. These systems can be less stable and often require the modules to be mounted at lower angles. For the purposes of the study a penetrated mounting system was assumed.

Figure -15.3 Solar Pathfinder on Roof

Quality Control and Testing

A photovoltaic panel is made up of numerous PV cells and of electrical interconnects which are used to bring the output of each of those cells together to provide the overall power output of the module or panel. As little as one defective cell or electrical interconnection can cause serious degradation of the performance of the overall panel within as little as 6 to 12 months after installation. Once installed, one underperforming panel can cause degradation of an entire PV string. A defect in the panel can happen during the manufacturing process and sometimes may be overlooked in final quality control at the point of manufacture. A defect in the panel can also happen during transportation to the site causing the same overall degradation in the string performance. Once all the panels are mounted in the array, troubleshooting and replacement of a bad module becomes a much more difficult and expensive task.

Wendel has found that it is typically industry practice for installers to simply put a voltmeter on the leads from a module to test open-circuit voltage. If that Voc is within the manufacturer's specifications, the installer will feel confident the entire module is fine. However, a single or

even multiple bad cells in that module, might not cause a decrease in Voc. By doing an I-V curve analysis with a field I-V curve analyzer, we will be able to view the entire curve with voltage and current measurements at numerous points. Therefore, the degradation of the panel performance will be readily visible, and that panel can then be deemed defective by the installer and set aside rather than installed. Any defective modules could be returned to the manufacturer at this time for a warranty replacement.

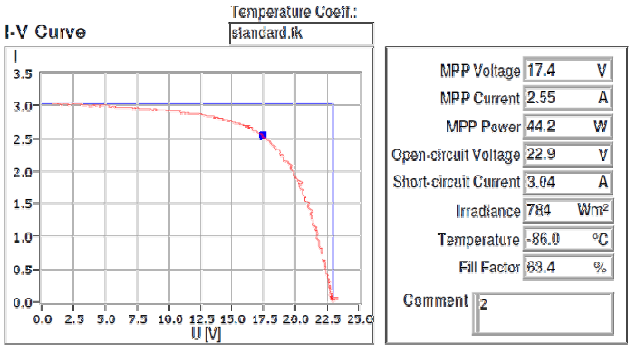


Figure 15.4A, Proper I-V Curve (information provided by IMT Solar)

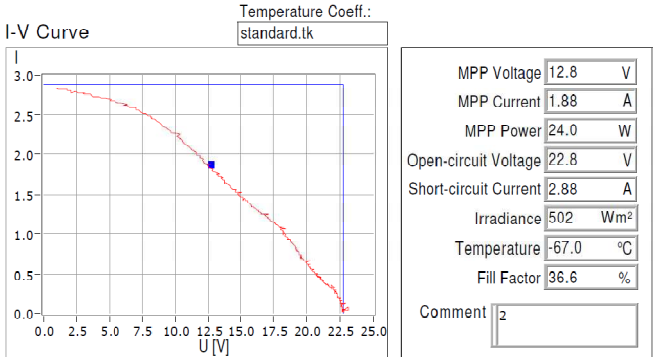


Figure 15.4B, Improper I-V Curve (information provided by IMT Solar)

Figures 3A and 3B are two I-V curves taken from the same panel. The first curve was taken in full sunlight with no shading on the panel. You can see a nice smooth curve with an open circuit voltage of 22.9V. Simply applying a voltmeter to the leads would have read approximately this same Voc value. The second curve was taken with two cells blocked, simulating bad cells or bad electrical connections between a couple of cells. You can see how badly the I-V curve has deteriorated, indicating problems with the panel. However the Voc still measures 22.8V. If a voltmeter was used to field test this panel rather than an I-V curve analyzer, this problem would have been missed.

The overall benefits to the customer if the installer performs 100% I-V curve analysis prior to installation are:

- Initial knowledge that all panels are 100% operational at time of installation
- Stronger position for future warranty claims against the panel manufacturer if necessary due to panel failure or degradation of performance (i.e. customer can show explicitly that the panels were tested properly and all passed prior to installation…"they weren't damaged in shipment")
- Enormous cost savings of not having to troubleshoot individual strings or the entire array one to five years ahead because a poor panel has now failed or caused an entire string to fail

System Monitoring

A well-designed and installed PV solar array should provide years of production with minimal maintenance in ideal conditions. However, when something does start to go wrong, it is very important to understand what is happening and to take corrective action as soon as possible and certainly before more catastrophic failure becomes imminent. In some jurisdictions, incentive money and payout may also be tied to on-going performance reporting of the installed system.

Most inverters today have data output on the real-time performance of the array itself. However, without a reference measurement it is impossible to tell if the degradation of performance is normal at the moment (position of sun in the sky, clouds overhead, etc.) or if it is an indication of something going wrong, such as dirt build up on the panels, loose wire connection, etc. Furthermore, the more the data on the monitoring system can break down the information to the smallest piece of the system, the easier troubleshooting becomes.

Today a monitoring system should at a minimum consist of a calibrated reference cell (irradiance sensor) mounted in the same plane as the array and a temperature measurement from a PV module. This information when compared to the array data from the inverter will give the owner/operator a reference to determine whether the array performance is degrading on its own or if it is following the output of the reference cell. If current transducers are installed for each string in the array, the monitoring can further be broken down to show which specific

string is degrading.

Monitoring systems may consist of the sensors, a data logger to time and date stamp the data, a communication network to move the data to a visualization screen, and the display itself. Any further meteorological inputs desired, up to a full weather station, can be input into the system. Current and voltage measurements of the individual strings may also be desired to bring into the monitoring system. In some cases, any/or all of this data may also be input into the building management system if applicable.

We suggest the use of a solar silicon irradiance sensor with a temperature output which comes from a temperature sensor mounted on the back of the reference cell. These sensors come in a variety of output signal voltage and current ranges. The monitoring system would then consist of the irradiance and temperature outputs coming into the analog inputs built into our communications gateway. The gateway can then move the scaled irradiance and temperature values across Ethernet (wired or wireless) to a visual touch screen in the inverter area or other specified maintenance locations. On screen displays then show the true irradiance and temperature at any moment. If current transducers are utilized in the combiner boxes, this data can also be brought into the system for displaying individual string performance as well.

Maintenance

Photovoltaic systems require maintenance in the form of cleaning the array. As dirt builds up on a module surface, energy production will be reduced. If leaves or other objects block a cell on a module, the electric output of the module and therefore the string could be impacted. The monitoring equipment described above is a great tool that can be utilized to determine general maintenance of the system needs to take place. As dirt builds up on the modules, the system will show that production is lower than normal and maintenance could be scheduled. While these tools are great for determining when maintenance is needed, the array's tilt angle will limit the amount of maintenance required due to dirt being washed away.

With the incorporation of the aforementioned monitoring equipment, a service contract will have little value. The monitoring equipment will alert the facility of problems with the array, and maintenance could be scheduled at that time. Furthermore, it will likely be more cost

effective for the facility to clean the modules rather than to enter into a service contract for the same service. It can be assumed that the system will need to be cleaned an average of four times a year. There will be 109 modules. If it takes two minutes to clean one module, thus would result in an annual time expenditure of approximately 14.5 hours a year. Assuming a labor rate of $40 per hour, the resulting in house cost would be approximately $580 per year. Typical service contracts can range in cost from $1,000 to $2,500 per year for a system this size.

Financial Considerations

The cost estimate used for this measure was based on bids received for similar projects and are summarized in this section. Savings will be achieved by the electrical production from the photovoltaic modules. The photovoltaic modules will reduce the facilities electric consumption; there may be times when the photovoltaic panels reduce the facility's demand as well. This demand reduction will not be consistent, for instance if there is a very cloudy day during the facility's demand peak, any demand saving associated with this measure will not be achieved. Savings calculations are provided in this section. To offset some of the costs associated with this type of project, the New York State Energy Research and Development Authority (NYSERDA) has instituted an incentive program for photovoltaic systems. The incentive value has been evaluated and is summarized on the measure cost summary. Should the incentive program be unavailable at any time, the project will be reevaluated for its economic feasibility.

RECOMMENDATIONS

A Photovoltaic system provides a leadership statement for a community and demonstrates an owner's commitment to energy efficiency and renewable energy technologies. Often times the initial cost of these systems can be prohibitive, however when combined with other energy efficiency improvements these initial cost can become more manageable. Due to the extended payback period of this measure Wendel does not recommend the implementation of this measure.

Town of Hamburg

Photovoltaic System (5kW)

Town Hall

Project #: 3008-09NFT
ECM #: 12

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	6,555	kWh/Year
Fossil Fuel Savings	0	MMBtu/Year
Environmental CO_2 Gas Savings(1)	5,454	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$413	Per Year
Total Energy & O&M Savings	$413	Per Year
Project Costs		
Total Measure Cost	$72,080	
Payback		
Simple Payback	174.5	Year(s)
Potential Incentives	$10,080	
Simple Payback with Incentives	150.1	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

9832.50 lbs of coal (Saved)
13.86 lbs of Nox gas reduced
40.25 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

0.45 passenger cars (Reduced)
5.75 barrels of oil (Saved)
0.23 houses energy use for 1 year
63.43 number of trees planted

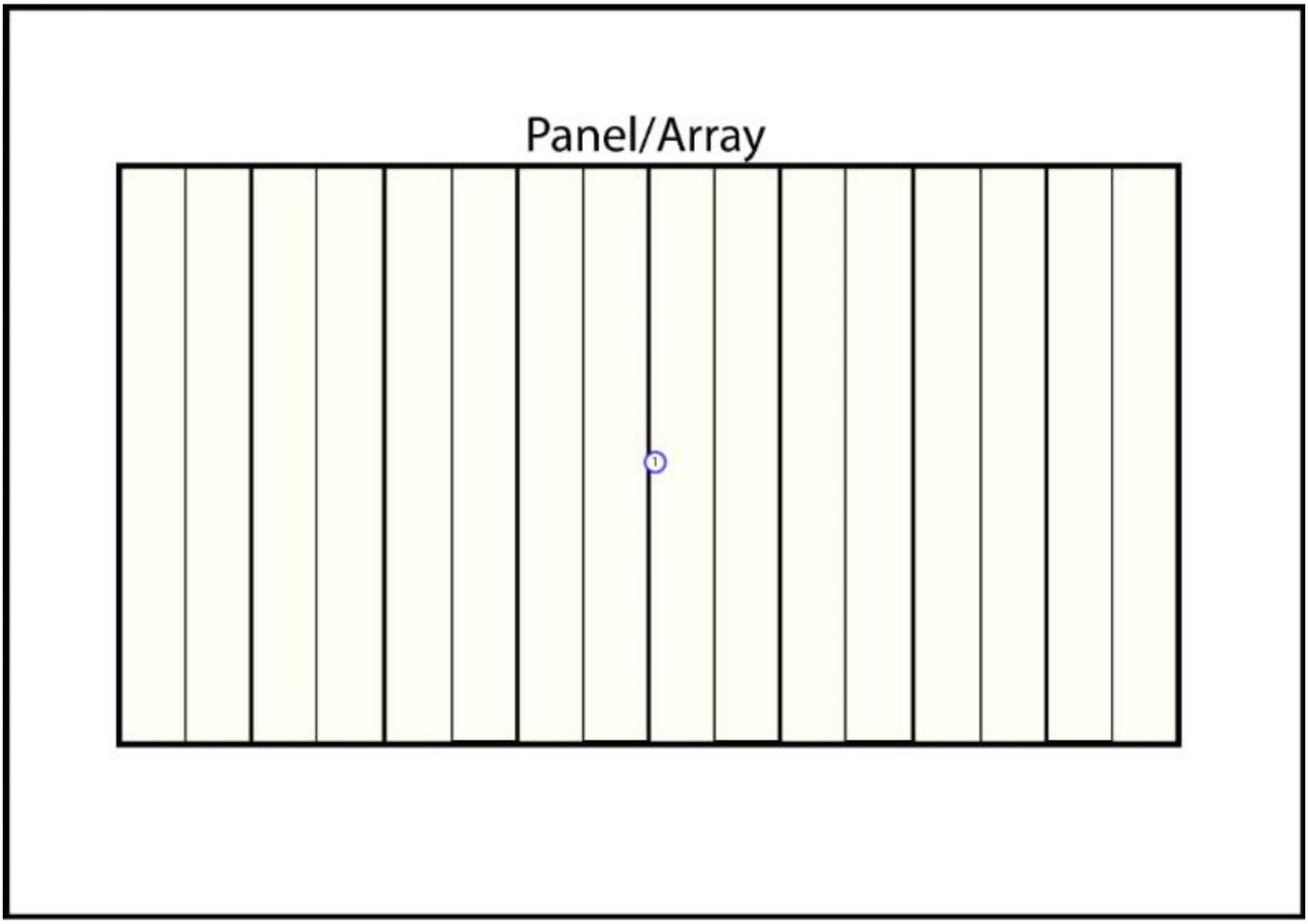
Wendel
Site Report

Report Name	Town of Hamburg
Report Date	4/28/2010 10:08:26 AM
Declination	-10d 35m
Location	HAMBURG, NY 14075
Lat/Long	42.729 / -78.838
Weather Station	Buffalo-Greater Buffalo Intl A, NY, Elevation: 705 Feet, (42.933/-78.733)
Site Distance	15 Miles
Report Type	PV
Array Type	Fixed Angle
Tilt Angle	32.00 deg
Ideal Tilt Angle	32.00 deg
Azimuth	180.00 deg
Ideal Azimuth	180.00 deg
Electric Cost	0.063 ($/KWH)
Panel Make	Sharp
Panel Model	NU-U240F1
Panel Count	104
DC Rate (per panel)	240.0 Watts
Total System Size	24,960.0 Watts
Inverter Make	PV Powered
Inverter Model	PVP30KW-LV-208
Inverter Count	1
Derate Method	Using Components
Derate Factor	0.778
Layout Configuration	Single Picture
Layout Point Count	1

Notes: [None]

Wendel
System Picture Layout

Layout Type	Single Picture
Layout Point Count	1



Wendel
Summary Report

Solar Obstruction Data

Month	Actual Shaded Solar Radiation Azimuth=180.0 Tilt=32.0 KWH/m ^{2} /day	Actual Shaded AC Energy (KWH) Azimuth=180.00 Tilt=32.00	Actual Unshaded AC Energy (KWH) Azimuth=180.0 Tilt=32.00	Ideal Unshaded AC Energy (KWH) Azimuth=180.0 Tilt=32.00	PV Solar Cost Savings 0.063 ($/KWH)	PVWatts Unshaded % Actual Site Azimuth=180.0 Tilt=32.00	Actual Site Efficiency % Azimuth=180.0 Tilt=32.00	Ideal Site Efficiency % Azimuth=180.0 Tilt=32.00
January	2.20	1,385.60	1,396.00	1,396.00	$87.29	98.00 %	98.00 %	98.00 %
February	2.93	1,703.45	1,732.00	1,732.00	$107.32	97.69 %	96.73 %	96.73 %
March	4.30	2,647.60	2,652.00	2,652.00	$166.80	99.61 %	99.38 %	99.38 %
April	4.90	2,796.95	2,801.00	2,801.00	$176.21	99.22 %	99.22 %	99.22 %
May	5.66	3,227.31	3,228.00	3,228.00	$203.32	99.49 %	99.31 %	99.31 %
June	6.26	3,393.84	3,394.00	3,394.00	$213.81	99.60 %	99.60 %	99.60 %
July	5.93	3,247.85	3,250.00	3,250.00	$204.61	99.45 %	99.12 %	99.12 %
August	5.42	2,990.26	2,994.00	2,994.00	$188.39	99.15 %	99.15 %	99.15 %
September	4.66	2,546.52	2,554.00	2,554.00	$160.43	99.22 %	99.01 %	99.01 %
October	3.34	1,977.21	1,990.00	1,990.00	$124.56	98.95 %	98.08 %	98.08 %
November	2.10	1,186.50	1,190.00	1,190.00	$74.75	98.34 %	98.34 %	98.34 %
December	1.86	1,151.23	1,158.00	1,158.00	$72.53	98.06 %	97.55 %	97.55 %
Totals	**49.58**	**28,254.32**	**28,339.00**	**28,339.00**	**$1,780.02**	**98.90 %**	**98.62 %**	**98.62 %**
	Effect: 98.91%					**Unweighted**	**Unweighted**	**Unweighted**
	Sun Hrs: 4.13					**Yearly Avg**	**Yearly Avg**	**Yearly Avg**

Notes: [None]

Wendel
Solar Site Analysis Report

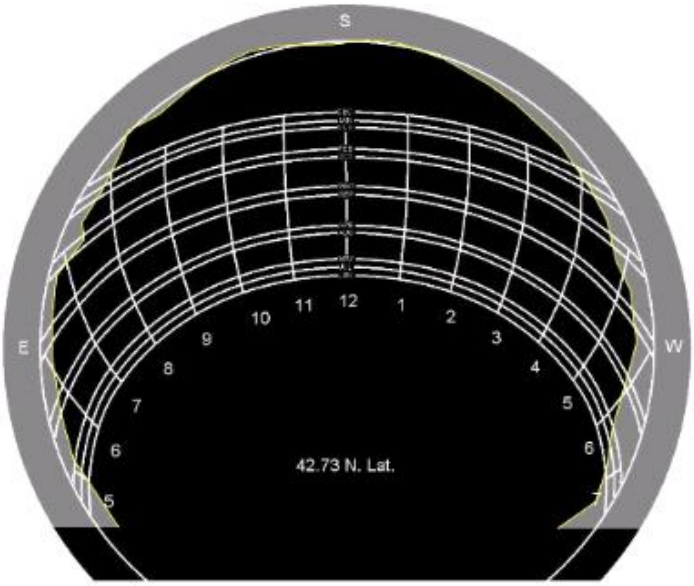
1

Image File IMG_7381.JPG

Solar Obstruction Data

Month	Actual Shaded Solar Radiation Azimuth=180.0 Tilt=32.0 KWH/m^2/day	Actual Shaded AC Energy (KWH) Azimuth=180.00 Tilt=32.00	Actual Unshaded AC Energy (KWH) Azimuth=180.0 Tilt=32.00	Ideal Unshaded AC Energy (KWH) Azimuth=180.0 Tilt=32.00	PV Solar Cost Savings 0.063 ($/KWH)	PVWatts Unshaded % Actual Site Azimuth=180.0 Tilt=32.00	Actual Site Efficiency % Azimuth=180.0 Tilt=32.00	Ideal Site Efficiency % Azimuth=180.0 Tilt=32.00
January	2.20	1,385.60	1,396.00	1,396.00	$87.29	98.00 %	98.00 %	98.00 %
February	2.93	1,703.45	1,732.00	1,732.00	$107.32	97.69 %	96.73 %	96.73 %
March	4.30	2,647.60	2,652.00	2,652.00	$166.80	99.61 %	99.38 %	99.38 %
April	4.90	2,796.95	2,801.00	2,801.00	$176.21	99.22 %	99.22 %	99.22 %
May	5.66	3,227.31	3,228.00	3,228.00	$203.32	99.49 %	99.31 %	99.31 %
June	6.26	3,393.84	3,394.00	3,394.00	$213.81	99.60 %	99.60 %	99.60 %
July	5.93	3,247.85	3,250.00	3,250.00	$204.61	99.45 %	99.12 %	99.12 %
August	5.42	2,990.26	2,994.00	2,994.00	$188.39	99.15 %	99.15 %	99.15 %
September	4.66	2,546.52	2,554.00	2,554.00	$160.43	99.22 %	99.01 %	99.01 %
October	3.34	1,977.21	1,990.00	1,990.00	$124.56	98.95 %	98.08 %	98.08 %
November	2.10	1,186.50	1,190.00	1,190.00	$74.75	98.34 %	98.34 %	98.34 %
December	1.86	1,151.23	1,158.00	1,158.00	$72.53	98.06 %	97.55 %	97.55 %
Totals	**49.58**	**28,254.32**	**28,339.00**	**28,339.00**	**$1,780.02**	**98.90 %**	**98.62 %**	**98.62 %**
	Effect: 98.91%					**Unweighted**	**Unweighted**	**Unweighted**
	Sun Hrs: 4.13					**Yearly Avg**	**Yearly Avg**	**Yearly Avg**

Notes: [None]



Town of Hamburg

Photovoltaic System (25kW)

Town Hall

Project #: 3008-09NFT
ECM #: 12

Measure Summary Table

19-Aug-10

Savings		
Average Demand Savings	0.0	kW/Month
Electrical Energy Savings	28,254	kWh/Year
Fossil Fuel Savings	0	MMBtu/Year
Environmental CO_2 Gas Savings(1)	23,508	Lbs./Year
Operational & Maintenance Savings	$0	Per Year
Energy Savings ($)	$1,780	Per Year
Total Energy & O&M Savings	$1,780	Per Year
Project Costs		
Total Measure Cost	$260,838	
Payback		
Simple Payback	146.5	Year(s)
Potential Incentives	$43,750	
Simple Payback with Incentives	122.0	Year(s)

(1) Environmental CO2 Gas Savings is estimated with the conversion according to the ARRA guidelines.

Environmental Savings From Annual Electric Reduction

42381.48 lbs of coal (Saved)
59.73 lbs of Nox gas reduced
173.51 lbs of SO2 gas reduced

Equivalent Objects Saved (1 year)

1.95 passenger cars (Reduced)
24.80 barrels of oil (Saved)
0.97 houses energy use for 1 year
273.41 number of trees planted

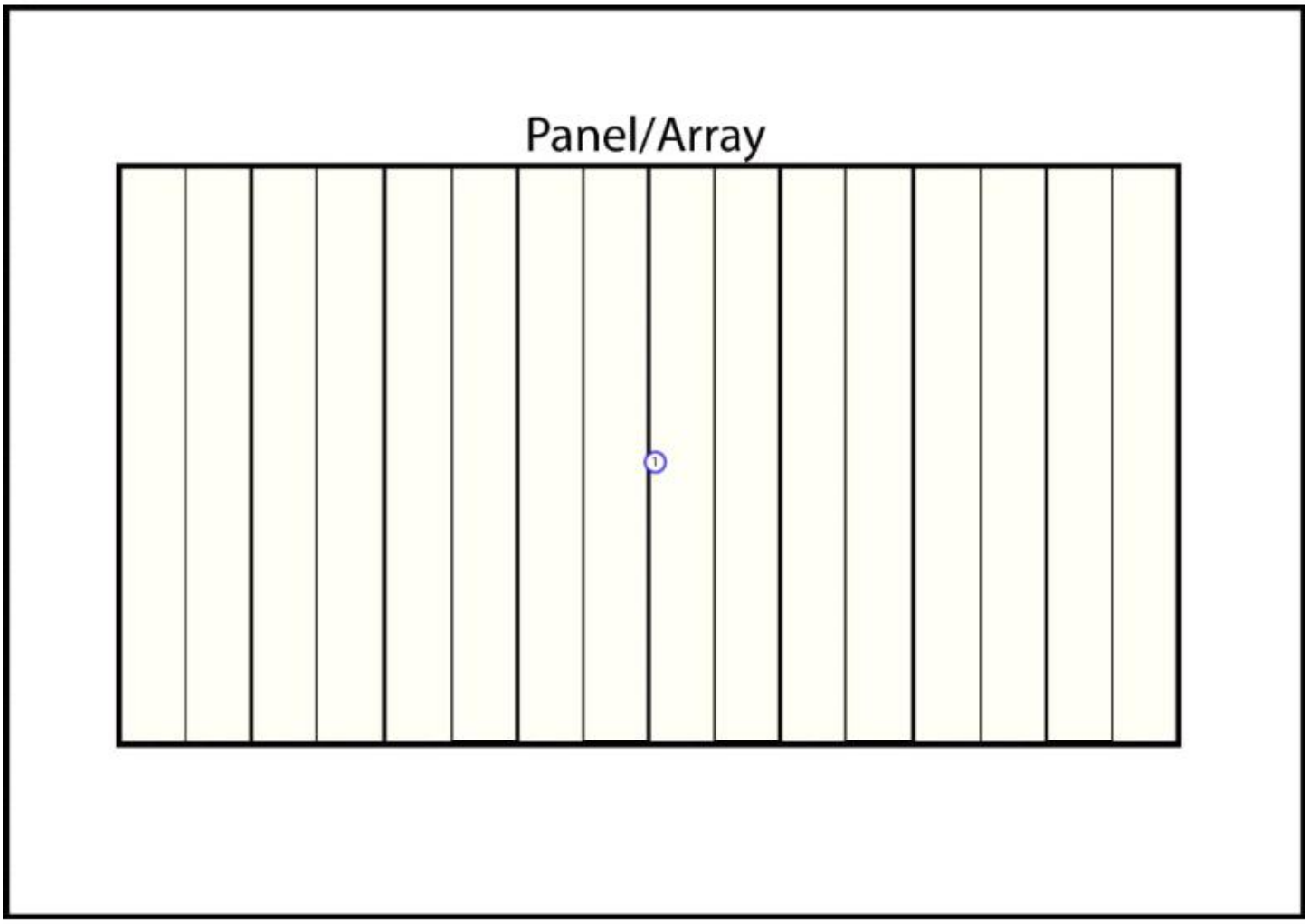
Wendel
Site Report

Report Name	Town of Hamburg
Report Date	4/28/2010 10:08:26 AM
Declination	-10d 35m
Location	HAMBURG, NY 14075
Lat/Long	42.729 / -78.838
Weather Station	Buffalo-Greater Buffalo Intl A, NY, Elevation: 705 Feet, (42.933/-78.733)
Site Distance	15 Miles
Report Type	PV
Array Type	Fixed Angle
Tilt Angle	32.00 deg
Ideal Tilt Angle	32.00 deg
Azimuth	180.00 deg
Ideal Azimuth	180.00 deg
Electric Cost	0.063 ($/KWH)
Panel Make	Sharp
Panel Model	NU-U240F1
Panel Count	24
DC Rate (per panel)	240.0 Watts
Total System Size	5,760.0 Watts
Inverter Make	PV Powered
Inverter Model	PVP3000
Inverter Count	2
Derate Method	Using Components
Derate Factor	0.782
Layout Configuration	Single Picture
Layout Point Count	1

Notes: [None]

Wendel
System Picture Layout

Layout Type	Single Picture
Layout Point Count	1



Wendel
Summary Report

Solar Obstruction Data

Month	Actual Shaded Solar Radiation Azimuth=180.0 Tilt=32.0 KWH/m^2/day	Actual Shaded AC Energy (KWH) Azimuth=180.00 Tilt=32.00	Actual Unshaded AC Energy (KWH) Azimuth=180.0 Tilt=32.00	Ideal Unshaded AC Energy (KWH) Azimuth=180.0 Tilt=32.00	PV Solar Cost Savings 0.063 ($/KWH)	PVWatts Unshaded % Actual Site Azimuth=180.0 Tilt=32.00	Actual Site Efficiency % Azimuth=180.0 Tilt=32.00	Ideal Site Efficiency % Azimuth=180.0 Tilt=32.00
January	2.20	321.60	324.00	324.00	$20.26	98.00 %	98.00 %	98.00 %
February	2.93	394.30	401.00	401.00	$24.84	97.69 %	96.73 %	96.73 %
March	4.30	613.00	614.00	614.00	$38.62	99.61 %	99.38 %	99.38 %
April	4.90	649.03	650.00	650.00	$40.89	99.22 %	99.22 %	99.22 %
May	5.66	749.00	749.00	749.00	$47.19	99.49 %	99.31 %	99.31 %
June	6.26	787.92	788.00	788.00	$49.64	99.60 %	99.60 %	99.60 %
July	5.93	754.46	755.00	755.00	$47.53	99.45 %	99.12 %	99.12 %
August	5.42	694.38	695.00	695.00	$43.75	99.15 %	99.15 %	99.15 %
September	4.66	590.38	592.00	592.00	$37.19	99.22 %	99.01 %	99.01 %
October	3.34	459.09	462.00	462.00	$28.92	98.95 %	98.08 %	98.08 %
November	2.10	276.00	277.00	277.00	$17.39	98.34 %	98.34 %	98.34 %
December	1.86	266.68	268.00	268.00	$16.80	98.06 %	97.55 %	97.55 %
Totals	**49.58**	**6,555.84**	**6,575.00**	**6,575.00**	**$413.02**	**98.90 %**	**98.62 %**	**98.62 %**
	Effect: 98.91%					**Unweighted**	**Unweighted**	**Unweighted**
	Sun Hrs: 4.13					**Yearly Avg**	**Yearly Avg**	**Yearly Avg**

Notes: [None]

Wendel
Solar Site Analysis Report

1

Image File IMG_7381.JPG

Solar Obstruction Data

Month	Actual Shaded Solar Radiation Azimuth=180.0 Tilt=32.0 KWH/m^2/day	Actual Shaded AC Energy (KWH) Azimuth=180.00 Tilt=32.00	Actual Unshaded AC Energy (KWH) Azimuth=180.0 Tilt=32.00	Ideal Unshaded AC Energy (KWH) Azimuth=180.0 Tilt=32.00	PV Solar Cost Savings 0.063 ($/KWH)	PVWatts Unshaded % Actual Site Azimuth=180.0 Tilt=32.00	Actual Site Efficiency % Azimuth=180.0 Tilt=32.00	Ideal Site Efficiency % Azimuth=180.0 Tilt=32.00
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June	6.26	787.92	788.00	788.00	$49.64	99.60 %	99.60 %	99.60 %
July	5.93	754.46	755.00	755.00	$47.53	99.45 %	99.12 %	99.12 %
August	5.42	694.38	695.00	695.00	$43.75	99.15 %	99.15 %	99.15 %
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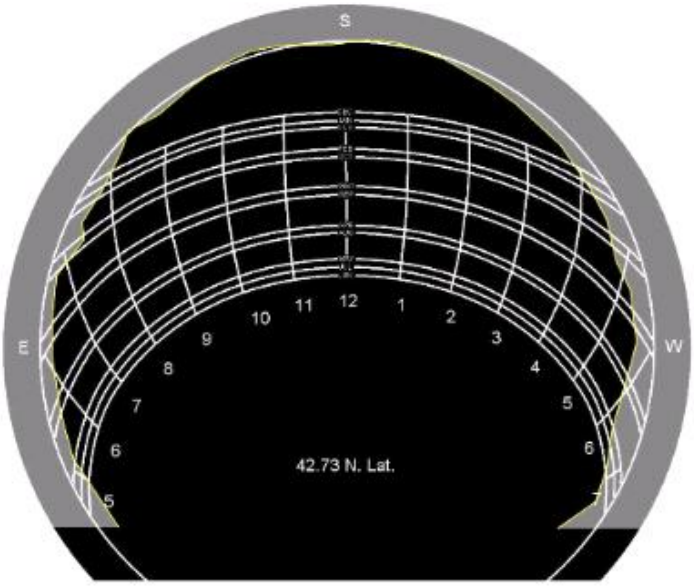
December	1.86	266.68	268.00	268.00	$16.80	98.06 %	97.55 %	97.55 %
Totals	**49.58**	**6,555.86**	**6,575.00**	**6,575.00**	**$413.02**	**98.90 %**	**98.62 %**	**98.62 %**
	Effect: 98.91%					**Unweighted**	**Unweighted**	**Unweighted**
	Sun Hrs: 4.13					**Yearly Avg**	**Yearly Avg**	**Yearly Avg**

Notes: [None]



NEW YORK STATE

NYSERDA New York State Energy Research and Development Authority

PROGRAMS | FUNDING OPPORTUNITIES | INCENTIVES FOR... | WHERE CAN I FIND...?
EVENTS | CONTACT US/DIRECTIONS | ABOUT NYSERDA | OTHER NYSERDA SITES

Wednesday, May 26, 2010

You Are Here: Home ▷ NYSERDA Clean Power Estimator

Clean Power Estimator

GENERAL ASSUMPTIONS

City, State	Hamburg NY
Utility	National Grid (Niagara Mohawk)
Rate	Large General Service (SC3 Secondary)
Technologies	PV only

PV SYSTEM

Size	25 kW-ac PV System
Cost	$10,500 per kW-ac
Tilt	30°
Orientation	South
PV Output Adjustment	-17%
O and M Cost	$0 per year

FINANCIAL ASSUMPTIONS

Electric Bill	$1,000 per month
Escalation	0.0% per year
Tax Status	Tax Exempt
Taxable Income	$500,000 per year
Payment	Pay Cash

Place cursor over the ? symbols for help

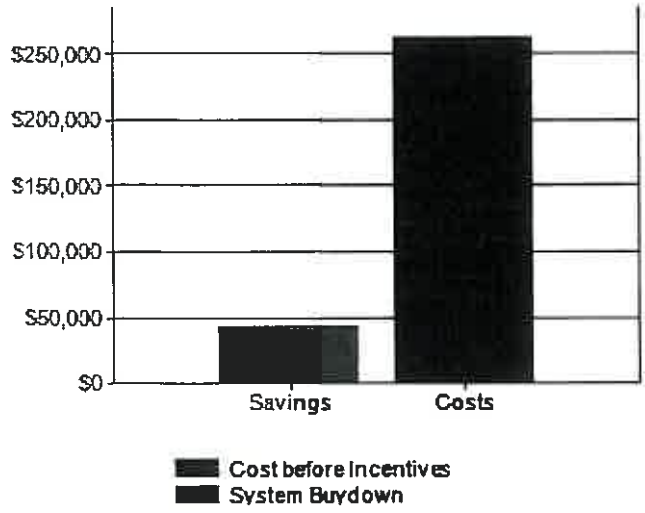
System Summary

Net system cost after all incentives:	$218,750
PV system electricity production:	19,080 kWh/year
Electricity production supplied by system:	42%
Carbon dioxide emission reduction:	25,739 lbs per year
Internal rate of return:	-999900%
Net present value:	-$191,113
Years to payback:	n/a

SELECT...	NET COST YEAR 1	MONTHLY ELECTRIC BILL	DAILY PV PRODUCTION	DAILY ELECTRICITY USE	MONTHLY PV OUTPUT
	NET CASH FLOW	CUM NET CASH FLOW	CUM DISC CASH FLOW	NET CASH FLOW DETAIL	POLLUTION PREVENTION

Net Cost Detail - Year 1

$300,000 System



System Cost			$262,500
Incentives			
	NYSERDA Buydown (Nonprofit) (Jan. 2010)	$43,750	
	less **Total Incentives**		$43,750
NET COST FOR YEAR 1			$218,750

This represents cost details for the first year of this system. Tax credits and other benefits received over time are not fully represented.

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17 Columbia Circle, Albany, NY 12203-6399 Toll-Free: 1-866-NYSERDA or Local: 518-862-1090 Fax: 518-862-1091
New York City and Buffalo Regional Offices

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Section 16

Energy Incentives Evaluation

ENERGY INCENTIVES EVALUATION

As part of this study, Wendel was also responsible for identifying and performing a preliminary evaluation of potential grant monies that could help fund the installation of the recommended measures. Through this evaluation, it was determined that certain measures appear to be eligible for implementation incentives through NYSERDA's Existing Facilities Program (EFP), PON 1219. EFP offers incentives for a variety of energy projects including Pre-Qualified and Performance-Based Incentives. Applicants can receive incentives ($/unit) for pre-qualified electric-efficiency measures. Projects can receive up to $30,000 through pre-qualified incentives. The performance-based component of the Existing Facilities Program offers incentives to customers or ESCO's who are working on large-scale electric efficiency projects that deliver verifiable annual electric savings. Performance-based incentives are typically higher than pre-qualified incentives but are based on an engineering analysis and are potentially subject to measurement and verification (M&V) requirements. Unless otherwise approved by NYSERDA, performance-based projects must qualify for an incentive of at least $10,000. Smaller projects should consider pre-qualified incentives. For the purposes of this study Wendel has used incentive rates associated with the prescriptive program.

The Solar PV Incentive Program PON 2112 offers incentives that are awarded based on the amount of peak wattage a system will produce up to 25kW. The total incentive will be paid to an NYSERDA eligible installer and passed on to the facility owner. Potential incentives are shown in the summary table for each measure.

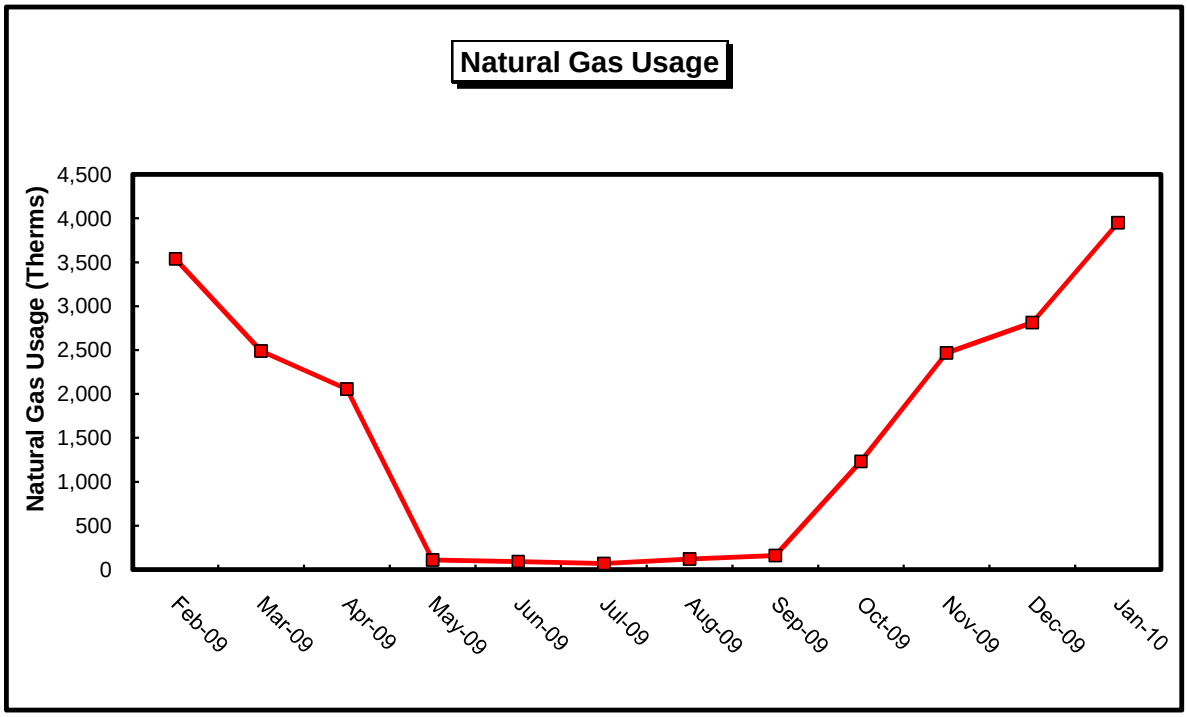
Appendix A

Utility Data

Project Name: Town of Hamburg - Ice Rink
Project Address: 2718 Lakeview Road
Lake View NY, 14085
Utility Company: National Fuel
Account No.: 3128279-02
Date: 8/19/2010
Facility Area: 55,550 SQ. FT.

ANNUAL NATURAL GAS USAGE

Usage Period	Quantity Used (CCF)	Trans. Cost	Distr. Cost	Total
2009-2010				
Feb-09	3,539	$0.00	$0.00	$4,370.88
Mar-09	2,488	$0.00	$0.00	$2,882.70
Apr-09	2,055	$0.00	$0.00	$2,130.13
May-09	111	$0.00	$0.00	$123.89
Jun-09	93	$0.00	$0.00	$106.46
Jul-09	68	$0.00	$0.00	$87.13
Aug-09	119	$0.00	$0.00	$135.14
Sep-09	159	$0.00	$0.00	$163.58
Oct-09	1,233	$0.00	$0.00	$1,151.74
Nov-09	2,468	$0.00	$0.00	$2,397.06
Dec-09	2,815	$0.00	$0.00	$2,546.03
Jan-10	3,950	$0.00	$0.00	$3,639.98
Totals:	**19,098**	**$0**	**$0**	**$19,735**
Energy Intensity (MMBTU/SQ FT):				**0.034**
Average Cost per Unit:				**$1.03**



PO Box 4103
Buffalo, NY 14264
National Fuel

1001

TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Please make check payable to National Fuel or pay online at www.nationalfuelgas.com.

Amount Due
$3,639.98

Please pay by **February 19, 2010** to avoid a 1.5% late payment charge.
Please donate to the Neighbor-For-Neighbor Heat Fund by adding $1, $2, or $5 to your payment.

Account Number 3128279 02

Return this stub if paying by mail. Bring entire bill if paying in person. To pay online go to www.nationalfuelgas.com.

Ice Rink

*A-16-HH9-AM-04992-23

312827902 00000000000000000000363998001

15-AT TOWN OF HAMBURG
ICE RINK
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

23

National Fuel

FOR EMERGENCIES CALL: 1-800-444-3130

For questions or service call National Fuel: (716) 686-6123 7:00am to 6:00pm Mon-Fri

Account Number: **3128279 02**
Service Address: **2980 LAKEVIEW RD ICE**
Name: **TOWN OF HAMBURG**
Service Classification: **03-NY GENERAL - NONRESIDENTIAL**

General Information

Your Natural Gas Delivery Company is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
Office Hours: Monday-Friday 8:15am to 4:30pm
WWW.NATIONALFUELGAS.COM

Your Natural Gas Supplier is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
WWW.NATIONALFUELGAS.COM

Please pay by **February 19, 2010** to avoid a 1.5% late payment charge.

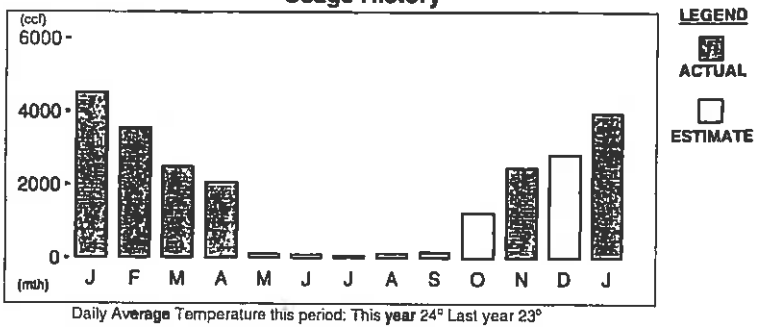
Account Summary as of January 26, 2010
(Complete detail of Current Month Charges on reverse side)

Last Month's Ending Balance	2,546.03
Customer Payments Received	-2,546.03
Balance Remaining	0.00
Current Month Charges	3,639.98
Total Account Balance	**3,639.98**

Budget Plan

Have you considered the Budget Plan?
If you enroll in the Budget Plan, your monthly payment amount would be **$1673.00** based on your prior usage and current billing rates. Please go to our website to enroll or call us.

Usage History



Daily Average Temperature this period: This year 24° Last year 23°

Gas Usage

Meter No.	Present Read Date	Present Read	Present Read Type	Prev. Read Date	Prev. Read	Prev. Read Type	Additional CCF	Total Meter CCF
9725831	01/25/2010	95131	COMPANY	12/21/2009	91181	ESTIMATED	0	3950
								3950

Total Consumption (ccf) for 35 days
12 Month Total Usage 19098 ccf
12 Month Average 1591 ccf
Next Meter Read on or about 03/23/2010

12:42:12 Wednesday, February 10, 2010

KGLN0014-1 NATIONAL FUEL GAS DISTRIBUTION CORPORATION DATE: 02/10/10

BILLING PRINT

RBA NUM : 3128279 - 02
NAME : TOWN OF HAMBURG
PREM ADDR : 2980 LAKEVIEW RD ICE HAMBURG NY 14075
MAIL ADDR : 2718 LAKEVIEW RD LAKE VIEW NY 14085
RBA STAT : ACTIVE
CAC : AT RV CL : 14
BILL CTL : 15 SV CL : 3
CUST TYPE : PUBLIC AUTHORI

PB : 0.00
TDB : 3639.98
LPCD : 021910

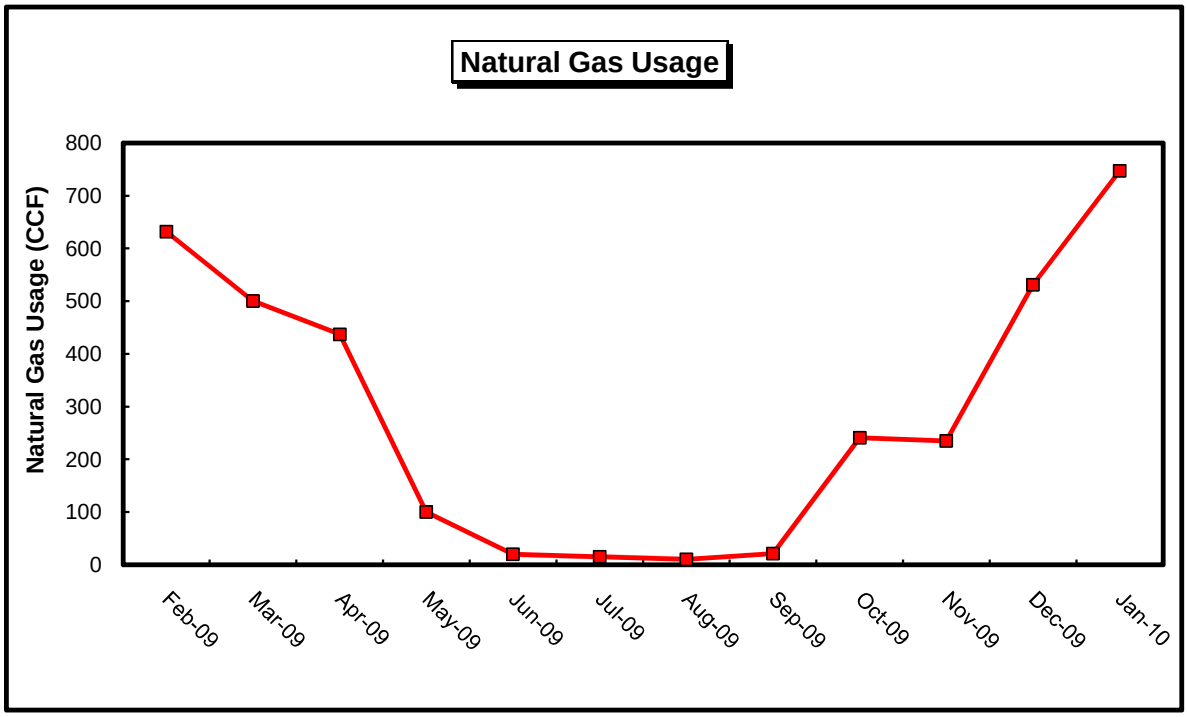
	BILL DATE	BILL DAYS	DEG DAYS	READ TYPE	METER READ	BILL TYPE	CONS CCF	NET BILL	SALES TAX
1	012510	35	1385	CMP	95131	MTH-REG	3950	3639.98	0.00
2	122109	33	991	CLC	91181	MTH-REG	2815	2546.03	0.00
3	111809	29	507	CMP	88366	MTH-REG	2468	2397.06	0.00
4	102009	28	418	CLC	85898	MTH-REG	1233	1151.74	0.00
5	092209	33	66	CMP	84665	MTH-REG	159	163.58	0.00
6	082009	28	1	CLC	84506	MTH-REG	119	135.14	0.00
7	072309	31	19	CMP	84387	MTH-REG	68	87.13	0.00
8	062209	32	95	ADJ	84319	MTH-60D	93	106.46	0.00
9	052109	28	248	CMP	84226	MTH-REG	111	123.89	0.00
10	042309	34	793	CMP	84115	MTH-REG	2055	2130.13	0.00
11	032009	24	762	CMP	82060	MTH-REG	2488	2882.70	0.00
12	022409	32	1244	CMP	79572	MTH-REG	3539	4370.88	0.00
13	012309	35	1469	CMP	76033	MTH-REG	4508	5865.80	0.00
14	121908	29	1009	EST	71525	MTH-REG	2654	3304.74	0.00
15	112008	30	594	CMP	68871	MTH-REG	1968	2393.44	0.00
16	102108	32	279	CMP	66903	MTH-REG	1316	1768.53	0.00
17	091908	30	51	CMP	65587	MTH-REG	249	365.72	0.00
18	082008	28	11	CMP	65338	MTH-REG	52	94.42	0.00
19	072308	30	1	CMP	65286	MTH-REG	79	145.68	0.00
20	062308	33	129	CMP	65207	MTH-REG	166	273.35	0.00
21	052108	28	357	CMP	65041	MTH-REG	345	524.69	0.00
22	042308	29	497	CMP	64696	MTH-REG	966	1365.60	0.00
23	032508	33	1170	CMP	63730	MTH-REG	3294	4368.17	0.00
24	022108	28	1061	CMP	60436	MTH-REG	2941	3780.07	0.00
25	012408	29	932	CMP	57495	MTH-REG	3084	3954.78	0.00
26	122607	40	1321	CMP	54411	MTH-REG	3484	4186.39	0.00
27	111607	28	496	CMP	50927	MTH-REG	1758	2140.45	0.00
28	101907	30	109	CMP	49169	MTH-REG	827	1056.70	0.00
29	091907	29	46	CMP	48342	MTH-REG	60	86.57	0.00
30	082107	29	6	CMP	48282	MTH-REG	51	77.12	0.00
31	072307	32	12	CMP	48231	MTH-REG	62	92.84	0.00
32	062107	30	31	CMP	48169	MTH-REG	83	119.63	0.00
33	052207	29	324	CMP	48086	MTH-REG	229	305.22	0.00
34	042307	32	733	CMP	47857	MTH-REG	1232	1523.67	0.00
35	032207	28	995	CMP	46625	MTH-REG	2382	2926.69	0.00
36	022207	29	1340	CMP	44243	MTH-REG	2988	3569.05	0.00
37	012407	35	1036	CMP	41255	MTH-REG	2870	3544.91	0.00
38	122006	34	844	CMP	38385	MTH-REG	2388	2925.63	0.00
39	111606	28	574	CMP	35997	MTH-REG	1593	1657.78	0.00
40	101906	29	319	CMP	34404	MTH-REG	1035	1023.98	0.00
41	092006	30	66	CMP	33369	MTH-REG	47	67.94	0.00
42	082106	28	3	CMP	33322	MTH-REG	42	63.70	0.00
43	072406	32	0	CMP	33280	MTH-REG	46	69.79	0.00
44	062206	30	41	CMP	33234	MTH-REG	155	203.43	0.00
45	052306	29	294	CMP	33079	MTH-REG	391	510.74	0.00
46	042406	32	574	CMP	32688	MTH-REG	1049	1342.11	0.00
47	032306	29	984	CMP	31639	MTH-REG	2161	2776.30	0.00
48	022206	29	1007	CMP	29478	MTH-REG	2390	3310.92	0.00
49	012406	35	1050	CMP	27088	MTH-REG	2365	3553.85	0.00
50	122005	29	1102	CMP	24723	MTH-REG	2341	3509.60	0.00
51	112105	33	594	CMP	22382	MTH-REG	1951	3514.86	0.00
52	101905	28	183	CMP	20431	MTH-REG	877	1520.39	0.00
53	092105	30	1	CMP	19554	MTH-REG	144	204.48	0.00

54	[illegible]	2[illegible]	0	CMP	19410	MTH-REG	34			0.0C
55	072505	33	0	CMP	19376	MTH-REG	40	62.84		0.0C
56	062205	33	113	CMP	19336	MTH-REG	189	229.06		0.0C
57	052005	28	429	CMP	19147	MTH-REG	549	649.55		0.0C
58	042205	31	591	CMP	18598	MTH-REG	1138	1384.10		0.0C
59	032205	28	1141	CMP	17460	MTH-REG	2479	2632.16		0.0C
60	022205	28	1128	CMP	14981	MTH-REG	2526	2681.98		0.0C
61	012505	36	1363	CMP	12455	MTH-REG	3035	3394.59		0.0C
62	122004	32	937	CMP	9420	MTH-REG	2456	2901.99		0.0C
63	111804	29	533	CMP	6964	MTH-REG	1721	1915.24		0.0C
64	102004	28	296	CMP	5243	MTH-REG	986	987.94		0.0C
65	092204	32	44	CMP	4257	MTH-REG	136	151.61		0.0C
66	082104	30	28	CMP	4121	MTH-REG	28	44.24		0.0C
67	072204	31	30	CMP	4093	MTH-REG	54	71.96		0.0C
68	062104	29	122	CMP	4039	MTH-REG	93	111.71		0.0C
69	052304	31	279	CMP	3946	MTH-REG	374	403.16		0.0C
70	042204	30	582	CMP	3572	MTH-REG	1210	1213.49		0.0C
71	032304	29	950	CMP	2362	MTH-REG	2288	2233.03		0.0C
72	022304	31	1326	CMP	74	MTH-REG	2840	2840.14		0.0C

Project Name: Town of Hamburg - Ice Rink 2
Project Address: 2718 Lakeview Road
Lake View NY, 14085
Utility Company: National Fuel
Account No.: 3128280-06
Date: 8/19/2010
Facility Area: 55,550 SQ. FT.

ANNUAL NATURAL GAS USAGE

Usage Period	Quantity Used (CCF)	Trans. Cost	Distr. Cost	Total
2009-2010				
Feb-09	632	$0.00	$0.00	$817.51
Mar-09	500	$0.00	$0.00	$616.16
Apr-09	437	$0.00	$0.00	$485.99
May-09	100	$0.00	$0.00	$114.07
Jun-09	20	$0.00	$0.00	$35.78
Jul-09	15	$0.00	$0.00	$32.52
Aug-09	10	$0.00	$0.00	$25.71
Sep-09	21	$0.00	$0.00	$36.21
Oct-09	241	$0.00	$0.00	$246.31
Nov-09	235	$0.00	$0.00	$253.80
Dec-09	531	$0.00	$0.00	$516.73
Jan-10	747	$0.00	$0.00	$728.45
Totals:	**3,489**	**$0**	**$0**	**$3,909**
Energy Intensity (MMBTU/SQ FT):				**0.006**
Average Cost per Unit:				**$1.12**



PO Box 4103
Buffalo, NY 14264
national fuel

1001

Please make check payable to National Fuel or pay online at www.nationalfuelgas.com.

Amount Due
$728.45

Please pay by **February 19, 2010** to avoid a 1.5% late payment charge.
Please donate to the Neighbor-For-Neighbor Heat Fund by adding $1, $2, or $5 to your payment.

TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Account Number 3128280 06

Return this stub if paying by mail. Bring entire bill if paying in person. To pay online go to www.nationalfuelgas.com.

Ice Rink

*A-16-HH9-AM-04993-23

312828006 00000000000000000000072845001

15-AT
TOWN OF HAMBURG
RECREATION DEPT
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

23

FOR EMERGENCIES CALL: 1-800-444-3130

For questions or service call National Fuel: (716) 686-6123 7:00am to 6:00pm Mon-Fri

Please pay by **February 19, 2010** to avoid a 1.5% late payment charge.

Account Number: **3128280 06**
Service Address: **2980 LAKEVIEW RD SHOW**
Name: **TOWN OF HAMBURG**
Service Classification: **03-NY GENERAL - NONRESIDENTIAL**

General Information

Your Natural Gas Delivery Company is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
5 UNION RD
TE 44
CHEEKTOWAGA NY 14227
Office Hours: Monday-Friday 8:15am to 4:30pm
WWW.NATIONALFUELGAS.COM

Your Natural Gas Supplier is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
WWW.NATIONALFUELGAS.COM

Account Summary as of January 26, 2010

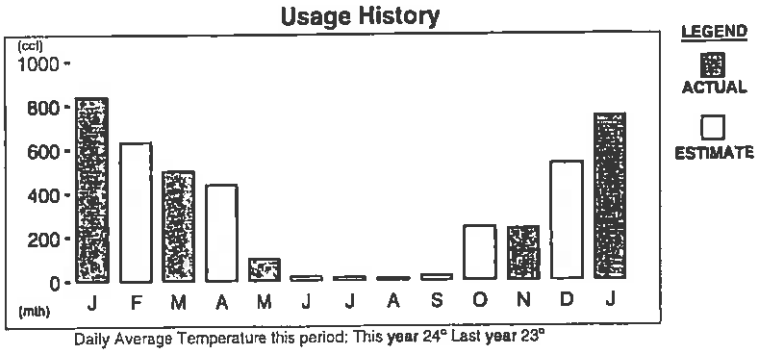
(Complete detail of Current Month Charges on reverse side)

Last Month's Ending Balance	516.73
Customer Payments Received	-516.73
Balance Remaining	0.00
Current Month Charges	728.45
Total Account Balance	**728.45**

Budget Plan

Have you considered the Budget Plan?
If you enroll in the Budget Plan, your monthly payment amount would be **$337.00** based on your prior usage and current billing rates. Please go to our website to enroll or call us.

Usage History



Daily Average Temperature this period: This year 24° Last year 23°

Gas Usage

Meter No.	Present Read Date	Present Read	Present Read Type	Prev. Read Date	Prev. Read	Prev. Read Type	Additional CCF	Total Meter CCF
29295	01/25/2010	3502	COMPANY	12/21/2009	2755	ESTIMATED	0	747
								747

Total Consumption (ccf) for 35 days
12 Month Total Usage 3489 ccf

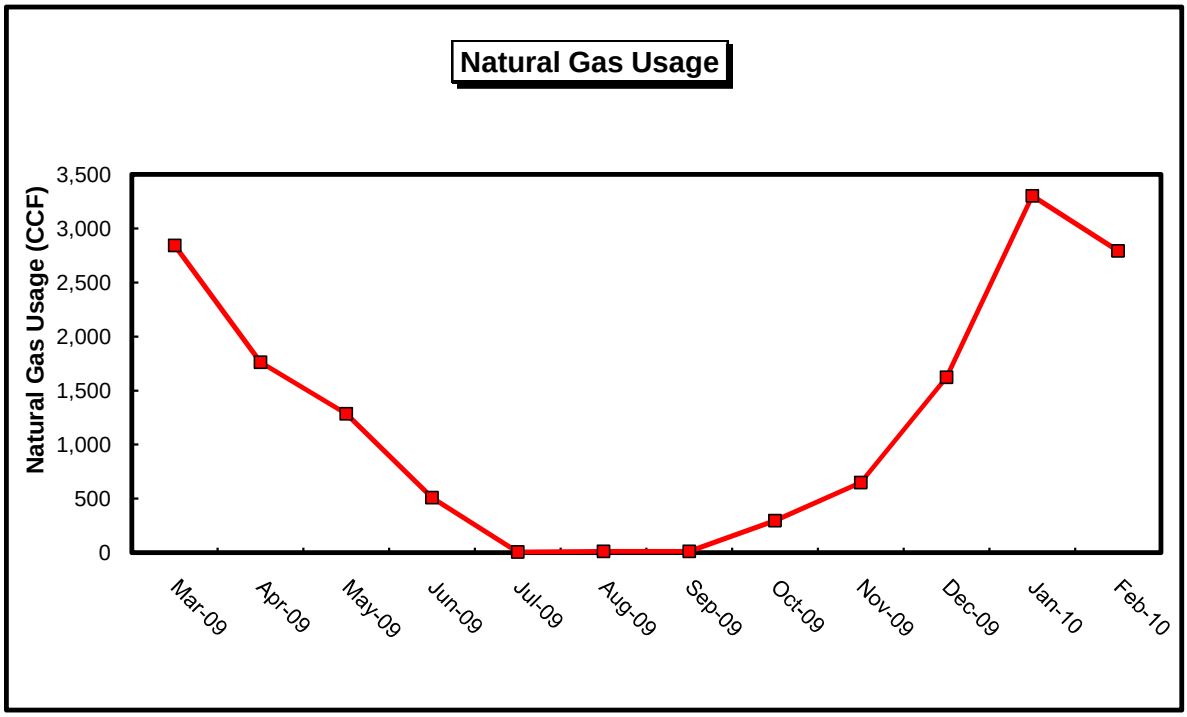
12 Month Average 290 ccf

Next Meter Read on or about 03/23/2010

Project Name: Town of Hamburg - Town Hall
Project Address: 2718 Lakeview Road
Lake View NY, 14085
Utility Company: National Fuel
Account No.: 3350720-01
Date: 8/19/2010
Facility Area: 35,763 SQ. FT.

ANNUAL NATURAL GAS USAGE

Usage Period	Quantity Used (CCF)	Trans. Cost	Distr. Cost	Total
2009-2010				
Mar-09	2,843	$0.00	$0.00	$3,406.32
Apr-09	1,762	$0.00	$0.00	$2,051.29
May-09	1,285	$0.00	$0.00	$1,260.95
Jun-09	509	$0.00	$0.00	$495.02
Jul-09	6	$0.00	$0.00	$23.33
Aug-09	12	$0.00	$0.00	$28.94
Sep-09	11	$0.00	$0.00	$27.76
Oct-09	296	$0.00	$0.00	$285.15
Nov-09	648	$0.00	$0.00	$655.19
Dec-09	1,623	$0.00	$0.00	$1,575.29
Jan-10	3,302	$0.00	$0.00	$2,890.09
Feb-10	2,792	$0.00	$0.00	$2,631.44
Totals:	**15,089**	**$0**	**$0**	**$15,331**
Energy Intensity (MMBTU/SQ FT):				**0.042**
Average Cost per Unit:				**$1.02**



Buffalo, NY 14264
National Fuel

1002

Please make check payable to National Fuel or pay online at www.nationalfuelgas.com.

Amount Due
$2,631.44

Please pay by **March 3, 2010** to avoid a 1.5% late payment charge.
Please donate to the Neighbor-For-Neighbor Heat Fund by adding $1, $2, or $5 to your payment.

TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Account Number 3350720 01

Return this stub if paying by mail. Bring entire bill if paying in person. To pay online go to www.nationalfuelgas.com.

Town Hall

335072001 0000000000000000000263144002

*A-17-QSU-AM-00465

02-AT TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

FOR EMERGENCIES CALL: 1-800-444-3130

National Fuel

For questions or service call National Fuel: (716) 686-6123 7:00am to 6:00pm Mon-Fri

Account Number: **3350720 01**
Service Address: **6100 S PARK AVE TOWNHL**
Name: **TOWN OF HAMBURG**
Service Classification: **03-NY GENERAL - NONRESIDENTIAL**

Please pay by **March 3, 2010** to avoid a 1.5% late payment charge.

Account Summary as of February 5, 2010
(Complete detail of Current Month Charges on reverse side)

Last Month's Ending Balance	2,234.90
Customer Payments Received	-2,234.90
Balance Remaining	0.00
Current Month Charges	2,631.44
Total Account Balance	**2,631.44**

General Information

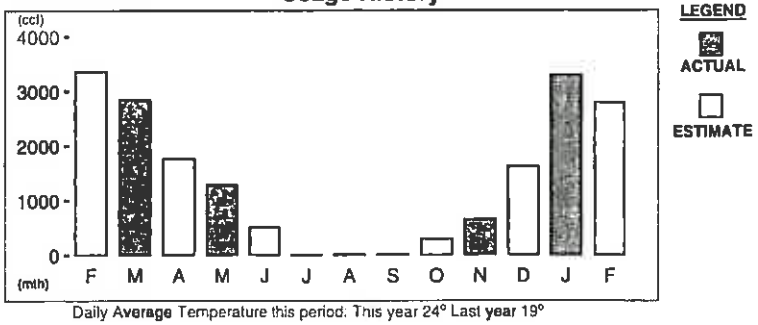
Your Natural Gas Delivery Company is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
Service Hours: Monday-Friday 8:15am to 4:30pm
WWW.NATIONALFUELGAS.COM

Your Natural Gas Supplier is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
WWW.NATIONALFUELGAS.COM

Budget Plan

Have you considered the Budget Plan?
If you enroll in the Budget Plan, your monthly payment amount would be **$1386.00** based on your prior usage and current billing rates. Please go to our website to enroll or call us.

Usage History



Daily Average Temperature this period: This year 24° Last year 19°

Gas Usage

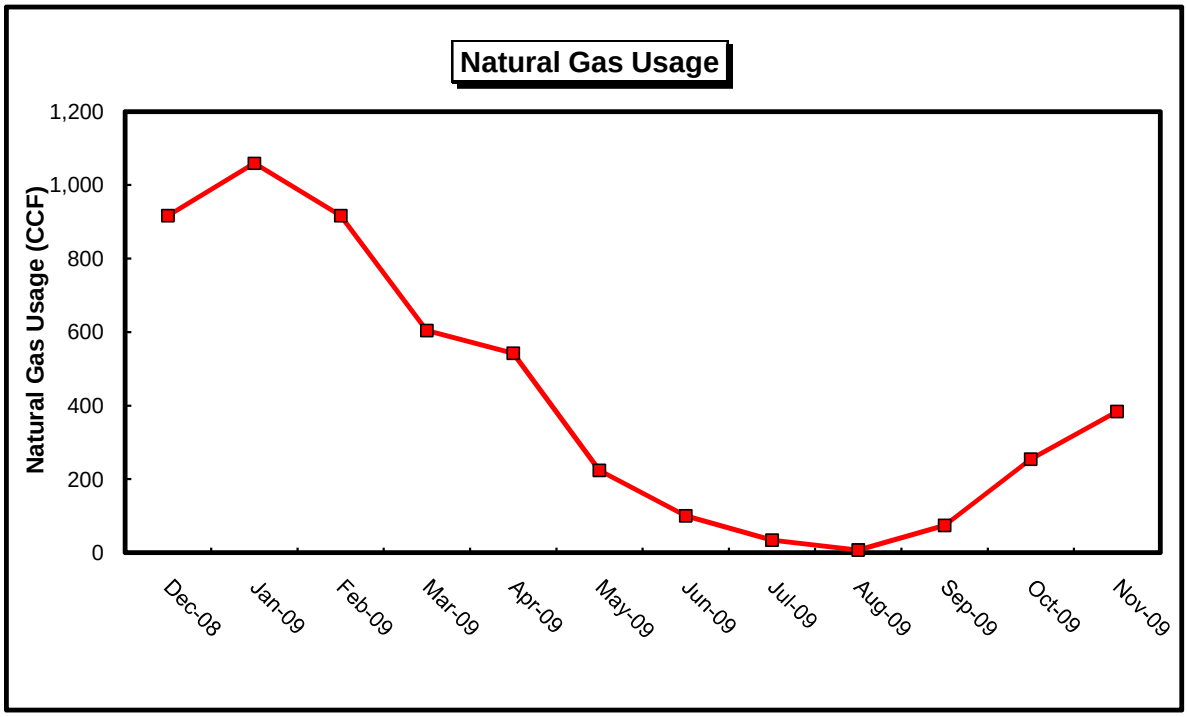
eter No.	Present Read Date	Present Read	Present Read Type	Prev. Read Date	Prev. Read	Prev. Read Type	Additional CCF	Total Meter CCF
3520143	02/03/2010	13921	**ESTIMATED**	01/05/2010	11129	COMPANY	0	2792
								2792

Total Consumption (ccf) for 29 days
12 Month Total Usage 15089 ccf
12 Month Average 1257 ccf
Next Meter Read on or about 03/04/2010

Project Name: Town of Hamburg - Highway Office
Project Address: 2718 Lakeview Road
Lake View NY, 14085
Utility Company: National Fuel
Account No.: 3128278-04
Date: 8/19/2010
Facility Area: 7,656 SQ. FT.

ANNUAL NATURAL GAS USAGE

Usage Period	Quantity Used (CCF)	Trans. Cost	Distr. Cost	Total
2009				
Dec-08	917	$0.00	$0.00	$1,175.11
Jan-09	1,059	$0.00	$0.00	$1,406.52
Feb-09	917	$0.00	$0.00	$1,176.93
Mar-09	604	$0.00	$0.00	$731.91
Apr-09	542	$0.00	$0.00	$594.73
May-09	224	$0.00	$0.00	$234.64
Jun-09	100	$0.00	$0.00	$103.70
Jul-09	34	$0.00	$0.00	$49.57
Aug-09	7	$0.00	$0.00	$24.80
Sep-09	74	$0.00	$0.00	$84.77
Oct-09	254	$0.00	$0.00	$259.26
Nov-09	384	$0.00	$0.00	$403.32
Totals:	**5,116**	**$0**	**$0**	**$6,245**
Energy Intensity (MMBTU/SQ FT):				**0.067**
Average Cost per Unit:				**$1.22**



Buffalo, NY 14264
National Fuel

0812

TOWN OF HAMBURG
2720 LAKEVIEW RD BLDG A
LAKE VIEW NY 14085-9612

Please make check payable to National Fuel or pay online at www.nationalfuelgas.com.

Amount Due
$1,175.11

Please pay by **January 15, 2009** to avoid a 1.5% late payment charge.
Please donate to the Neighbor-For-Neighbor Heat Fund by adding $1, $2, or $5 to your payment.

Account Number 3128278 04

Return this stub if paying by mail. Bring entire bill if paying in person. To pay online go to www.nationalfuelgas.com.

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*A-17-2UA-AM-00083

14-AT

TOWN OF HAMBURG
YOUTH BL
2720 LAKEVIEW RD BLDG A
LAKE VIEW NY 14085-9612

National Fuel

FOR EMERGENCIES CALL: 1-800-444-3130

For questions or service call National Fuel: (716) 686-6123 7:00am to 6:00pm Mon-Fri

Account Number: **3128278 04**
Service Address: **2720 LAKEVIEW RD BLDG A**
Name: **TOWN OF HAMBURG**
Service Classification: **03-NY GENERAL - NONRESIDENTIAL**

General Information

Your Natural Gas Delivery Company is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
TE 44
EKTOWAGA NY 14227
Office Hours: Monday-Friday 8:15am to 4:30pm
WWW.NATIONALFUELGAS.COM

Your Natural Gas Supplier is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
WWW.NATIONALFUELGAS.COM

Account Summary as of December 22, 2008
(Complete detail of Current Month Charges on reverse side)

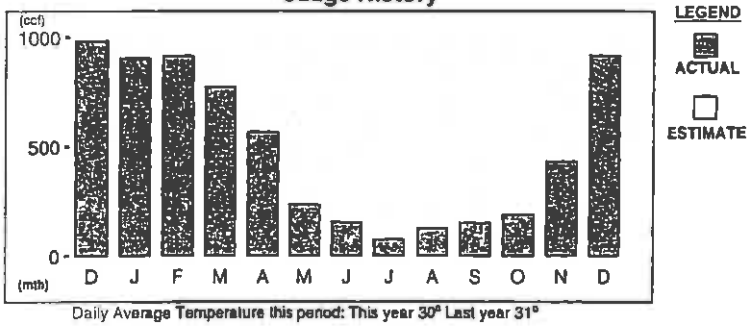
Last Month's Ending Balance	563.33
Customer Payments Received	-563.33
Balance Remaining	0.00
Current Month Charges	1,175.11
Total Account Balance	1,175.11

RECEIVED
DEC 26 2008
TOWN OF HAMBURG
HIGHWAY DEPT.

Budget Plan

Have you considered the Budget Plan?
If you enroll in the Budget Plan, your monthly payment amount would be **$657.00** based on your prior usage and current billing rates. Please go to our website to enroll or call us.

Usage History



Daily Average Temperature this period: This year 30° Last year 31°

Gas Usage

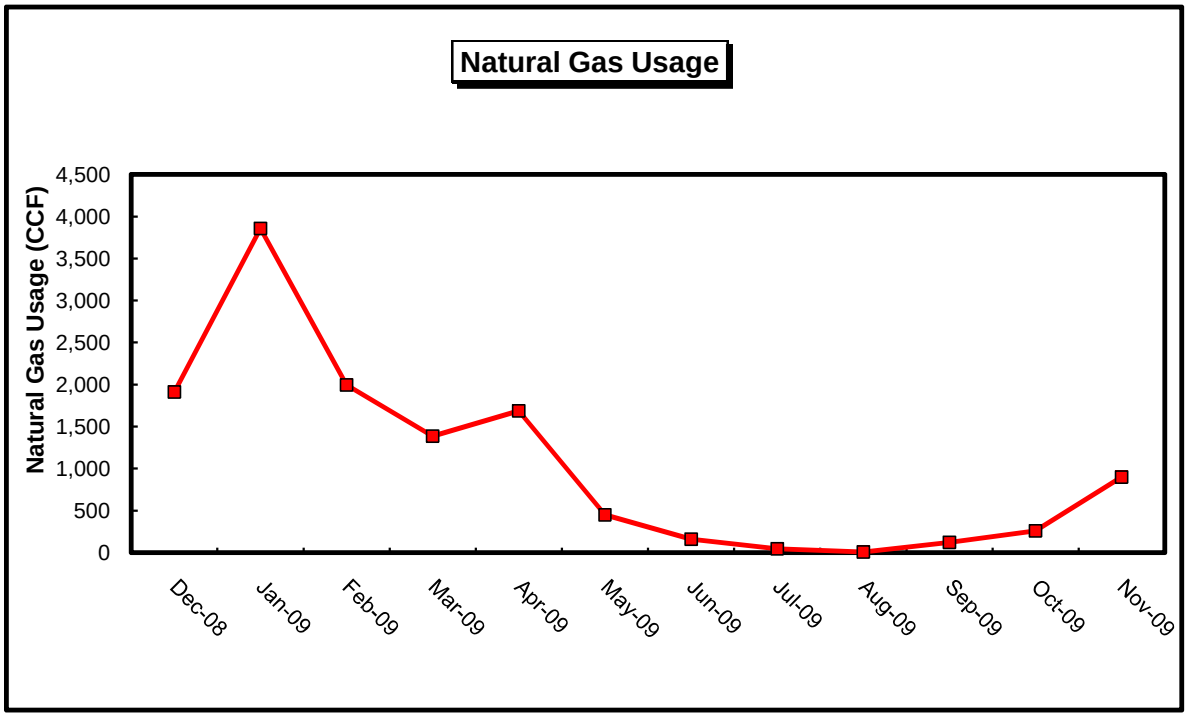
Meter No.	Read Date	Present Read	Read Type	Prev. Read Date	Prev. Read	Read Type	Additional CCF	Total Meter CCF
27208	12/22/2008	9936	COMPANY	11/19/2008	9019	COMPANY	0	917
								917

Total Consumption (ccf) for 33 days
12 Month Total Usage 5442 ccf
12 Month Average 453 ccf
Next Meter Read on or about 01/21/2009

Project Name: Town of Hamburg - Highway Garage
Project Address: 2718 Lakeview Road
Lake View NY, 14085
Utility Company: National Fuel
Account No.: 4566639-03
Date: 8/19/2010
Facility Area: 19,360 SQ. FT.

ANNUAL NATURAL GAS USAGE

Usage Period	Quantity Used (CCF)	Trans. Cost	Distr. Cost	Total
2009-2010				
Dec-08	1,911	$0.00	$0.00	$2,025.48
Jan-09	3,858	$0.00	$0.00	$5,067.46
Feb-09	1,994	$0.00	$0.00	$2,519.63
Mar-09	1,385	$0.00	$0.00	$1,667.05
Apr-09	1,688	$0.00	$0.00	$1,126.13
May-09	451	$0.00	$0.00	$156.70
Jun-09	160	$0.00	$0.00	$54.59
Jul-09	45	$0.00	$0.00	-$715.11
Aug-09	7	$0.00	$0.00	$20.28
Sep-09	122	$0.00	$0.00	$79.22
Oct-09	259	$0.00	$0.00	$165.73
Nov-09	900	$0.00	$0.00	$508.08
Totals:	**12,780**	**$0**	**$0**	**$12,675**
Energy Intensity (MMBTU/SQ FT):				**0.066**
Average Cost per Unit:				**$0.99**



Buffalo, NY 14264
National Fuel

0812

TOWN OF HAMBURG
2720 LAKEVIEW RD,
LAKE VIEW NY 14085-9612

BLDG. B

Please make check payable to National Fuel or pay online at www.nationalfuelgas.com.

Amount Due
$1,550.64

Please pay by **January 15, 2009** to avoid a 1.5% late payment charge.
Please donate to the Neighbor-For-Neighbor Heat Fund by adding $1, $2, or $5 to your payment.

Account Number 4566639 03

Return this stub if paying by mail. Bring entire bill if paying in person. To pay online go to www.nationalfuelgas.com.

4566639 03 0000000000000000000015506 4012

*A-17-2UA-AM-00735

14-AT

TOWN OF HAMBURG
2720 LAKEVIEW RD
LAKE VIEW NY 14085-9612

FOR EMERGENCIES CALL: 1-800-444-3130

National Fuel

For questions or service call National Fuel: (716) 686-6123 7:00am to 6:00pm Mon-Fri

Account Number: **4566639 03**
Service Address: **2720 LAKEVIEW RD**
Name: **TOWN OF HAMBURG**
Service Classification: **03-NY GENERAL - NONRESIDENTIAL**

General Information

Your Natural Gas Delivery Company is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
TE 44
EKTOWAGA NY 14227
ice Hours: Monday-Friday 8:15am to 4:30pm
WWW.NATIONALFUELGAS.COM

Your Natural Gas Supplier is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
WWW.NATIONALFUELGAS.COM

Account Summary as of December 22, 2008

(Complete detail of Current Month Charges on reverse side)

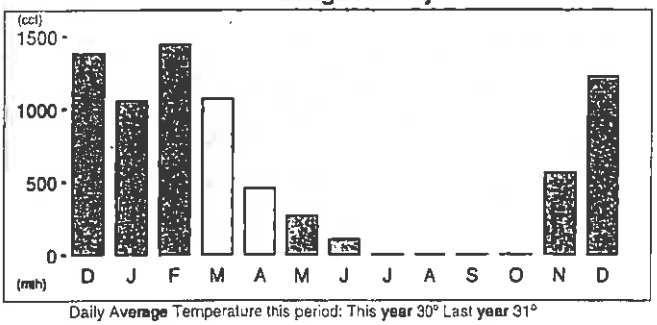
Last Month's Ending Balance	725.09
Customer Payments Received	-725.09
Balance Remaining	0.00
Current Month Charges	1,550.64
Total Account Balance	**1,550.64**

RECEIVED
DEC 26 2008
TOWN OF HAMBURG
HIGHWAY DEPT.

Budget Plan

Have you considered the Budget Plan?
If you enroll in the Budget Plan, your monthly payment amount would be **$759.00** based on your prior usage and current billing rates. Please go to our website to enroll or call us.

Usage History



Daily Average Temperature this period: This year 30° Last year 31°

Gas Usage

ter No.	Read Date	Present Read	Read Type	Prev. Read Date	Prev. Read	Read Type	Additional CCF	Total Meter CCF
23986	12/22/2008	68792	COMPANY	11/19/2008	67570	COMPANY	0	1222
								1222

Total Consumption (ccf) for 33 days
12 Month Total Usage 6191 ccf
12 Month Average 515 ccf
Next Meter Read on or about 01/21/2009

Buffalo, NY 14264
National Fuel

0812

TOWN OF HAMBURG
2720 LAKEVIEW RD BLDG B
LAKE VIEW NY 14085-9612

Please make check payable to National Fuel or pay online at www.nationalfuelgas.com.

Amount Due
$161.36

Please pay by **January 15, 2009** to avoid a 1.5% late payment charge.
Please donate to the Neighbor-For-Neighbor Heat Fund by adding $1, $2, or $5 to your payment.

Account Number 4385430 03

Return this stub if paying by mail. Bring entire bill if paying in person. To pay online go to www.nationalfuelgas.com.

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*A-17-2UA-AM-00672

14-AT

TOWN OF HAMBURG
HIGHWAY DEPT
2720 LAKEVIEW RD BLDG B
LAKE VIEW NY 14085-9612

National Fuel

FOR EMERGENCIES CALL: 1-800-444-3130

For questions or service call National Fuel: (716) 686-6123 7:00am to 6:00pm Mon-Fri

Account Number: **4385430 03**
Service Address: **2720 LAKEVIEW RD BLDG B**
Name: **TOWN OF HAMBURG**
Service Classification: **03-NY GENERAL - NONRESIDENTIAL**

General Information

Your Natural Gas Delivery Company is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
TE 44
EKTOWAGA NY 14227
ice Hours: Monday-Friday 8:15am to 4:30pm
WWW.NATIONALFUELGAS.COM

Your Natural Gas Supplier is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
WWW.NATIONALFUELGAS.COM

Budget Plan

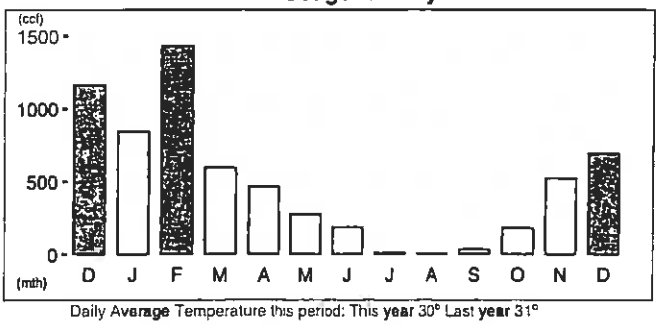
Have you considered the Budget Plan?

Account Summary as of December 22, 2008
(Complete detail of Current Month Charges on reverse side)

Last Month's Ending Balance	-313.48
Payments Received Since Last Bill	0.00
Balance Remaining	-313.48
Current Month Charges	474.84
Total Account Balance	**161.36**

RECEIVED
DEC 26 2008
TOWN OF HAMBURG
HIGHWAY DEPT.

Usage History



Daily Average Temperature this period: This year 30° Last year 31°

Gas Usage

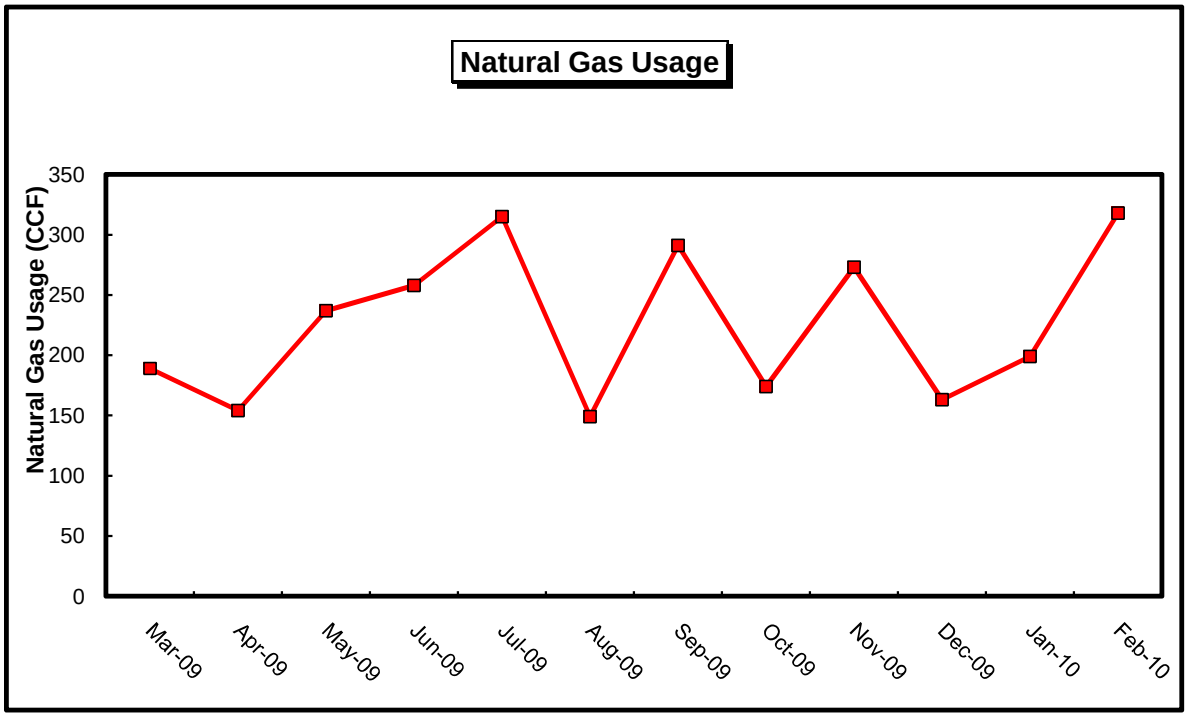
ter No.	Read Date	Present Read	Read Type	Prev. Read Date	Prev. Read	Read Type	Additional CCF	Total Meter CCF
27854	12/22/2008	72896	COMPANY	11/17/2008	72207	ESTIMATED	0	689
								689

Total Consumption (ccf) for 35 days
12 Month Total Usage 5223 ccf
12 Month Average 435 ccf
Next Meter Read on or about 02/19/2009

Project Name: Town of Hamburg - Golf Course
Project Address: 2718 Lakeview Road
Lake View NY, 14085
Utility Company: National Fuel
Account No.: 5913071-07
Date: 8/19/2010
Facility Area: 9,840 SQ. FT.

ANNUAL NATURAL GAS USAGE

Usage Period	Quantity Used (CCF)	Trans. Cost	Distr. Cost	Total
2009-2010				
Mar-09	189	$0.00	$0.00	$249.43
Apr-09	154	$0.00	$0.00	$200.09
May-09	237	$0.00	$0.00	$253.91
Jun-09	258	$0.00	$0.00	$259.54
Jul-09	315	$0.00	$0.00	$331.62
Aug-09	149	$0.00	$0.00	$169.82
Sep-09	291	$0.00	$0.00	$301.71
Oct-09	174	$0.00	$0.00	$174.64
Nov-09	273	$0.00	$0.00	$289.09
Dec-09	163	$0.00	$0.00	$179.41
Jan-10	199	$0.00	$0.00	$199.24
Feb-10	318	$0.00	$0.00	$329.39
Totals:	**2,720**	**$0**	**$0**	**$2,938**
Energy Intensity (MMBTU/SQ FT):				**0.028**
Average Cost per Unit:				**$1.08**



PO Box 4103
Buffalo, NY 14264
national fuel

1002

TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Please make check payable to National Fuel or pay online at www.nationalfuelgas.com.

Amount Due
$239.54

Please pay by **March 3, 2010** to avoid a 1.5% late payment charge.
Please donate to the Neighbor-For-Neighbor Heat Fund by adding $1, $2, or $5 to your payment.

Account Number 5913071 07

Return this stub if paying by mail. Bring entire bill if paying in person. To pay online go to www.nationalfuelgas.com.

Golf Course

*A-17-QSU-AM-02229

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02-AT TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

FOR EMERGENCIES CALL: 1-800-444-3130

For questions or service call National Fuel: (716) 686-6123 7:00am to 6:00pm Mon-Fri

Please pay by **March 3, 2010** to avoid a 1.5% late payment charge.

Account Number: **5913071 07**
Service Address: **6374 BOSTON STATE RD**
Name: **TOWN OF HAMBURG**
Service Classification: **03-NY GENERAL - NONRESIDENTIAL**

General Information

Your Natural Gas Delivery Company is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
'TE 44
EEKTOWAGA NY 14227
Office Hours: Monday-Friday 8:15am to 4:30pm
WWW.NATIONALFUELGAS.COM

Your Natural Gas Supplier is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
WWW.NATIONALFUELGAS.COM

Account Summary as of February 5, 2010

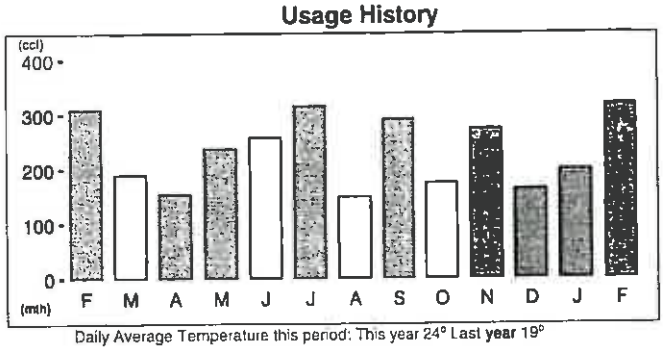
(Complete detail of Current Month Charges on reverse side)

Last Month's Ending Balance	-89.85
Payments Received Since Last Bill	0.00
Balance Remaining	-89.85
Current Month Charges	329.39
Total Account Balance	**239.54**

Budget Plan

Have you considered the Budget Plan?
If you enroll in the Budget Plan, your monthly payment amount would be **$258.00** based on your prior usage and current billing rates. Please go to our website to enroll or call us.

Usage History



Daily Average Temperature this period: This year 24° Last year 19°

Gas Usage

Meter No.	Present Read Date	Present Read	Present Read Type	Prev. Read Date	Prev. Read	Prev. Read Type	Additional CCF	Total Meter CCF
24456149	02/02/2010	3535	COMPANY	01/05/2010	3217	COMPANY	0	318
								318

Total Consumption (ccf) for 28 days
12 Month Total Usage 2720 ccf

12 Month Average 226 ccf

Next Meter Read on or about 03/04/2010

12:4 February 10, 2010 DATE: 02/10/10

KGLN0014-1 NATIONAL FUEL GAS DISTRIBUTION CORPORATION

BILLING PRINT

RBA NUM : 5913071 - 07
NAME : TOWN OF HAMBURG
PREM ADDR : 6374 BOSTON STATE RD HAMBURG NY 14075
MAIL ADDR : 2718 LAKEVIEW RD LAKE VIEW NY 14085
RBA STAT : ACTIVE
CAC : AT RV CL : 14
BILL CTL : 2 SV CL : 3
CUST TYPE : PUBLIC AUTHORI

PB : -89.85
TDB : 239.54
LPCD : 030310

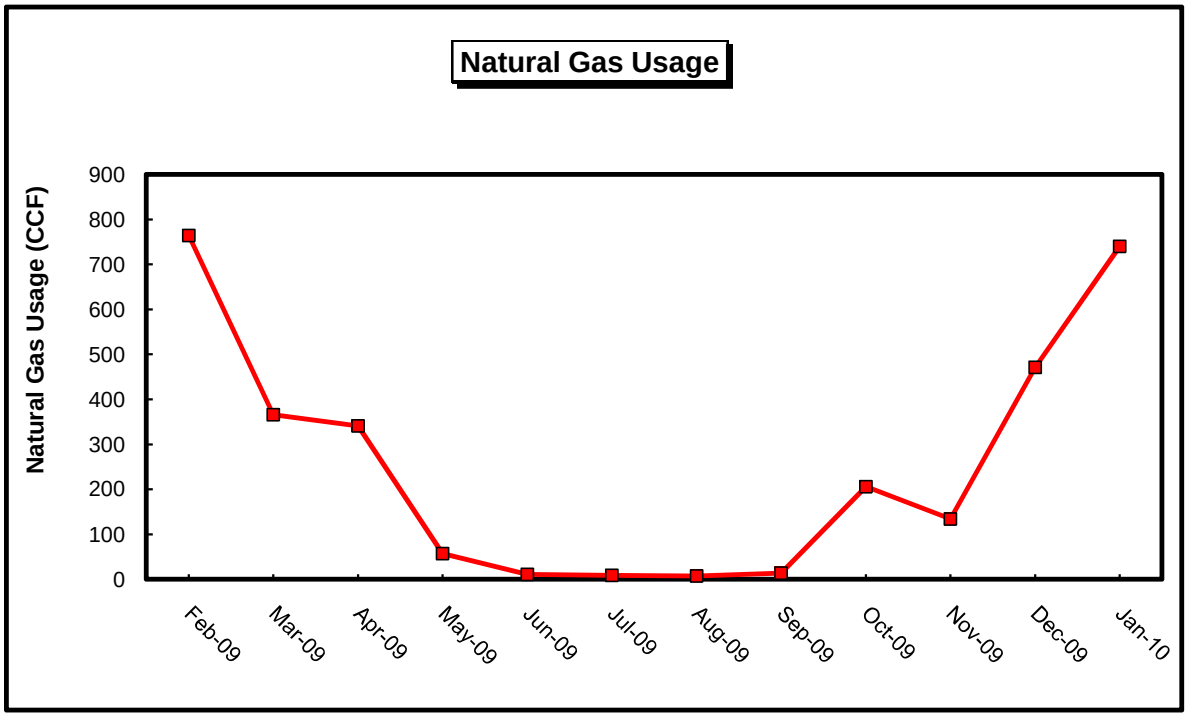
	BILL DATE	BILL DAYS	DEG DAYS	READ TYPE	METER READ	BILL TYPE	CONS CCF	NET BILL	SALES TAX
1	020210	28	1139	CMP	3535	MTH-REG	318	329.39	0.00
2	010510	34	1310	CMP	3217	MTH-REG	199	199.24	0.00
3	120209	33	682	CMP	3018	MTH-REG	163	179.41	0.00
4	103009	29	475	CMP	2855	MTH-REG	273	289.09	0.00
5	100109	30	121	CLC	2582	MTH-REG	174	174.64	0.00
6	090109	29	20	CMP	2408	MTH-REG	291	301.71	0.00
7	080309	28	13	CLC	2117	MTH-REG	149	169.82	0.00
8	070609	33	45	CMP	1968	MTH-REG	315	331.62	0.00
9	060309	29	211	CLC	1653	MTH-REG	258	259.54	0.00
10	050509	32	556	CMP	1395	MTH-REG	237	253.91	0.00
11	040309	30	764	CMP	1158	MTH-REG	154	200.09	0.00
12	030409	27	1014	EST	1004	MTH-REG	189	249.43	0.00
13	020509	31	1383	CMP	815	MTH-REG	309	428.24	0.00
14	010509	33	1219	CMP	506	MTH-REG	242	340.42	0.00
15	120308	36	905	CMP	264	MTH-REG	212	276.57	0.00
16	102808	27	395	CMP	52	MTH-REG	195	273.04	0.00
17	100108	33	95	CMP	9857	MTH-REG	248	363.28	0.00
18	082908	28	16	CMP	9609	MTH-REG	239	367.70	0.00
19	080108	31	1	CMP	9370	MTH-REG	272	474.55	0.00
20	070108	29	26	CMP	9098	MTH-REG	250	408.71	0.00
21	060208	32	348	CMP	8848	MTH-REG	285	442.43	0.00
22	050108	30	425	CMP	8563	MTH-REG	198	305.42	0.00
23	040108	32	1048	CMP	8365	MTH-REG	180	264.74	0.00
24	022908	29	1149	CMP	8185	MTH-REG	203	283.25	0.00
25	013108	29	1002	CMP	7982	MTH-REG	174	246.15	0.00
26	010208	30	1072	CMP	7808	MTH-REG	193	260.10	0.00
27	120307	34	889	CMP	7615	MTH-REG	233	306.41	0.00
28	103007	29	216	CMP	7382	MTH-REG	209	287.43	0.00
29	100107	32	64	CMP	7173	MTH-REG	268	338.94	0.00
30	083007	28	6	CMP	6905	MTH-REG	261	329.35	0.00
31	080207	31	1	CMP	6644	MTH-REG	286	382.41	0.00
32	070207	31	36	CMP	6358	MTH-REG	302	407.72	0.00
33	060107	30	190	CMP	6056	MTH-REG	308	408.03	0.00
34	050207	29	656	CMP	5748	MTH-REG	240	308.79	0.00
35	040307	32	903	CMP	5508	MTH-REG	220	294.18	0.00
36	030207	29	1317	CMP	5288	MTH-REG	286	369.21	0.00
37	020107	28	1059	CMP	5002	MTH-REG	230	296.77	0.00
38	010407	35	947	CMP	4772	MTH-REG	125	173.64	0.00
39	113006	31	614	CMP	4647	MTH-REG	172	219.79	0.00
40	103006	31	493	CMP	4475	MTH-REG	298	282.40	0.00
41	092906	30	131	CLC	4177	MTH-REG	163	208.79	0.00
42	083006	29	6	CMP	4014	MTH-REG	340	438.89	0.00
43	080106	32	0	CLC	3674	MTH-REG	159	211.87	0.00
44	063006	28	31	CMP	3515	MTH-REG	300	378.45	0.00
45	060206	30	184	CLC	3215	MTH-REG	173	231.00	0.00
46	050306	30	472	CMP	3042	MTH-REG	77	109.53	0.00
47	040306	32	876	CLC	2965	MTH-REG	289	392.54	0.00
48	030206	30	1116	CMP	2676	MTH-REG	172	247.01	0.00
49	013106	27	817	CST	2504	MTH-REG	143	235.34	0.00
50	010406	37	1318	CMP	2361	MTH-REG	227	346.96	0.00
51	112805	31	653	CST	2134	MTH-REG	190	358.36	0.00
52	102805	28	349	CMP	1944	MTH-REG	308	580.10	0.00
53	093005	30	36	CLC	1636	MTH-REG	58	97.01	0.00

54	[illegible]	29	0	CMP	1578	MTH-ADJ	243		0.00
55	080205	32	0	ADJ	1335	MTH-ADJ	269	326.93	0.00
56	070105	29	20	CMP	1066	MTH-ADJ	181	217.26	0.00
57	060205	31	310	ADJ	885	MTH-ADJ	428	512.17	0.00
58	050205	28	476	CMP	457	MTH-REG	272	353.32	0.00
59	040405	32	1072	CLC	185	MTH-REG	241	287.22	0.00
60	030305	29	1145	CMP	9944	MTH-REG	200	236.33	0.00
61	020205	29	1259	CLC	9744	MTH-REG	374	431.95	0.00
62	010405	34	1165	CMP	9370	MTH-REG	151	197.53	0.00
63	120104	30	678	CLC	9219	MTH-REG	224	287.06	0.00
64	110104	32	426	CMP	8995	MTH-REG	213	234.73	0.00
65	093004	9	22	CLC	8782	INL-REG	20	24.94	0.00

Project Name: Town of Hamburg - Nike Base / B&G
Project Address: 2718 Lakeview Road
Lake View NY, 14085
Utility Company: National Fuel
Account No.: 3128281-04
Date: 8/19/2010
Facility Area: 4,168 SQ. FT.

ANNUAL NATURAL GAS USAGE

Usage Period	Quantity Used (CCF)	Trans. Cost	Distr. Cost	Total
2009-2010				
Feb-09	764	$0.00	$0.00	$985.94
Mar-09	366	$0.00	$0.00	$452.51
Apr-09	341	$0.00	$0.00	$383.10
May-09	57	$0.00	$0.00	$71.28
Jun-09	11	$0.00	$0.00	$27.07
Jul-09	9	$0.00	$0.00	$26.55
Aug-09	7	$0.00	$0.00	$23.46
Sep-09	14	$0.00	$0.00	$29.94
Oct-09	206	$0.00	$0.00	$212.70
Nov-09	134	$0.00	$0.00	$151.77
Dec-09	471	$0.00	$0.00	$461.77
Jan-10	740	$0.00	$0.00	$721.96
Totals:	**3,120**	**$0**	**$0**	**$3,548**
Energy Intensity (MMBTU/SQ FT):				**0.075**
Average Cost per Unit:				**$1.14**



12:4 February 10, 2010

KGLN0014-1 NATIONAL FUEL GAS DISTRIBUTION CORPORATION DATE: 02/10/10

BILLING PRINT

RBA NUM : 3128281 - 04
NAME : TOWN OF HAMBURG
PREM ADDR : 2980 LAKEVIEW RD MAINT. HAMBURG NY 14075
MAIL ADDR : 2718 LAKEVIEW LAKE VIEW NY 14085
RBA STAT : ACTIVE
CAC : AT RV CL : 14
BILL CTL : 15 SV CL : 3
CUST TYPE : PUBLIC AUTHORI

PB : 0.00
TDB : 721.96
LPCD : 021910

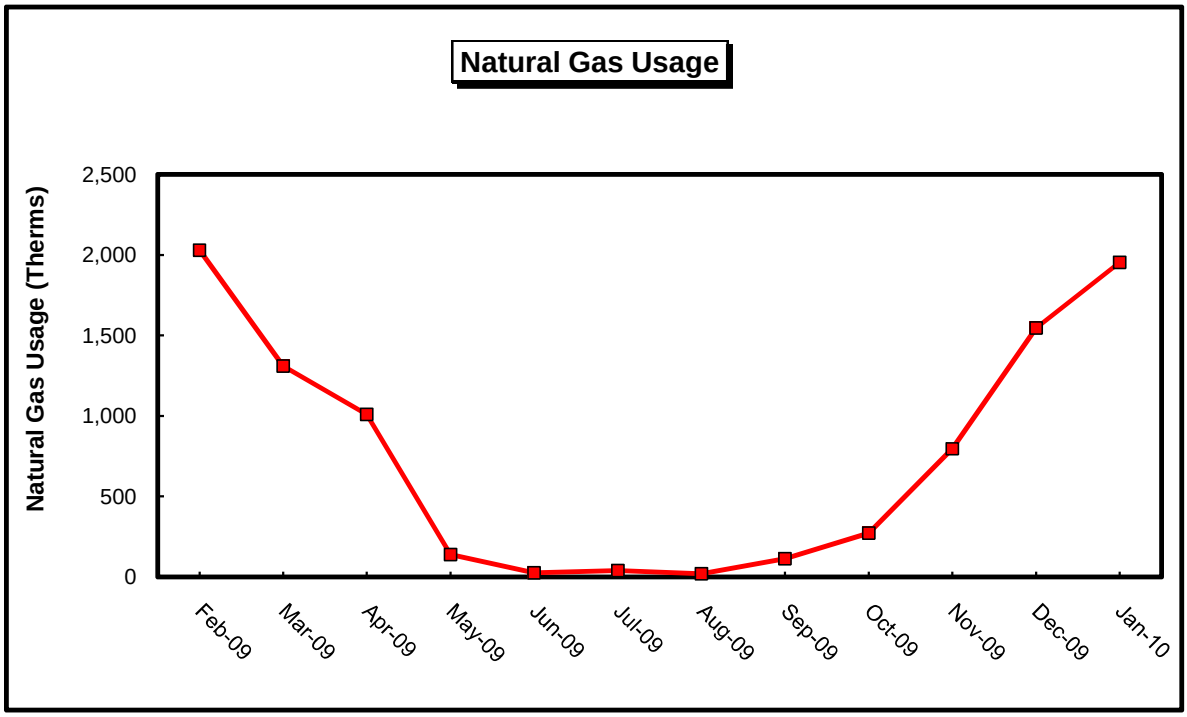
	BILL DATE	BILL DAYS	DEG DAYS	READ TYPE	METER READ	BILL TYPE	CONS CCF	NET BILL	SALES TAX
1	012510	35	1385	CMP	5384	MTH-REG	740	721.96	0.00
2	122109	33	991	CLC	4644	MTH-REG	471	461.77	0.00
3	111809	29	507	CMP	4173	MTH-REG	134	151.77	0.00
4	102009	28	418	CLC	4039	MTH-REG	206	212.70	0.00
5	092209	33	66	CMP	3833	MTH-REG	14	29.94	0.00
6	082009	28	1	CLC	3819	MTH-REG	7	23.46	0.00
7	072309	31	19	CMP	3812	MTH-REG	9	26.55	0.00
8	062209	32	95	ADJ	3803	MTH-60D	11	27.07	0.00
9	052109	28	248	CMP	3792	MTH-REG	57	71.28	0.00
10	042309	34	793	CMP	3735	MTH-REG	341	383.10	0.00
11	032009	24	762	CMP	3394	MTH-REG	366	452.51	0.00
12	022409	33	1275	CMP	3028	MTH-REG	764	985.94	0.00
13	012209	34	1438	EST	2264	MTH-REG	695	941.58	0.00
14	121908	29	1009	EST	1569	MTH-REG	489	641.99	0.00
15	112008	30	594	CMP	1080	MTH-REG	277	360.83	0.00
16	102108	32	279	CMP	803	MTH-REG	96	147.30	0.00
17	091908	30	51	CMP	707	MTH-REG	7	25.55	0.00
18	082008	28	11	CMP	700	MTH-REG	6	24.52	0.00
19	072308	30	1	CMP	694	MTH-REG	7	26.21	0.00
20	062308	33	129	CMP	687	MTH-REG	53	98.39	0.00
21	052108	28	357	CMP	634	MTH-REG	63	107.67	0.00
22	042308	29	497	CMP	571	MTH-REG	200	299.53	0.00
23	032508	33	1170	CMP	371	MTH-REG	572	799.26	0.00
24	022108	28	1061	CMP	9799	MTH-REG	588	789.27	0.00
25	012408	29	932	CMP	9211	MTH-REG	520	697.71	0.00
26	122607	40	1321	CMP	8691	MTH-REG	741	934.05	0.00
27	111607	28	496	CMP	7950	MTH-REG	225	297.69	0.00
28	101907	30	109	CMP	7725	MTH-REG	23	46.82	0.00
29	091907	29	46	CMP	7702	MTH-REG	9	27.17	0.00
30	082107	29	6	CMP	7693	MTH-REG	7	23.59	0.00
31	072307	32	12	CMP	7686	MTH-REG	8	23.10	0.00
32	062107	30	31	CMP	7678	MTH-REG	9	23.27	0.00
33	052207	29	324	CMP	7669	MTH-REG	69	99.36	0.00
34	042307	32	733	CMP	7600	MTH-REG	315	408.88	0.00
35	032207	30	1063	CMP	7285	MTH-REG	744	943.22	0.00
36	022007	27	1307	EST	6541	MTH-REG	631	782.42	0.00
37	012407	35	1036	CMP	5910	MTH-REG	547	709.36	0.00
38	122006	34	844	CMP	5363	MTH-REG	435	562.29	0.00
39	111606	28	574	CMP	4928	MTH-REG	291	323.58	0.00
40	101906	29	319	CMP	4637	MTH-REG	100	112.12	0.00
41	092006	30	66	CMP	4537	MTH-REG	10	22.83	0.00
42	082106	28	3	CMP	4527	MTH-REG	6	19.30	0.00
43	072406	32	0	CMP	4521	MTH-REG	11	26.10	0.00
44	062206	30	41	CMP	4510	MTH-REG	12	26.14	0.00
45	052306	29	294	CMP	4498	MTH-REG	95	132.16	0.00
46	042406	32	574	CMP	4403	MTH-REG	209	282.87	0.00
47	032306	29	984	CMP	4194	MTH-REG	510	686.03	0.00
48	022206	29	1007	CMP	3684	MTH-REG	571	821.72	0.00
49	012406	35	1050	CMP	3113	MTH-REG	576	897.06	0.00
50	122005	29	1102	CMP	2537	MTH-REG	595	918.35	0.00
51	112105	33	594	CMP	1942	MTH-REG	354	662.95	0.00
52	101905	28	183	CMP	1588	MTH-REG	65	124.53	0.00
53	092105	30	1	CMP	1523	MTH-REG	14	29.39	0.00

54			0	CMP	1509	MTH-REG	10		0.00
55	072505	33	0	CMP	1499	MTH-REG	8	26.10	0.00
56	062205	33	113	CMP	1491	MTH-REG	23	40.93	0.00
57	052005	28	429	CMP	1468	MTH-REG	168	209.74	0.00
58	042205	31	591	CMP	1300	MTH-REG	213	278.25	0.00
59	032205	28	1141	CMP	1087	MTH-REG	540	606.81	0.00
60	022205	28	1128	CMP	547	MTH-REG	528	592.20	0.00
61	012505	36	1363	CMP	19	MTH-REG	668	786.13	0.00
62	122004	32	937	CMP	9351	MTH-REG	359	453.45	0.00
63	111804	29	533	CMP	8992	MTH-REG	195	238.12	0.00
64	102004	28	296	CMP	8797	MTH-REG	78	93.35	0.00
65	092204	32	44	CMP	8719	MTH-REG	24	38.68	0.00
66	082104	30	28	CMP	8695	MTH-REG	21	36.86	0.00
67	072204	31	30	CMP	8674	MTH-REG	24	40.25	0.00
68	062104	29	122	CMP	8650	MTH-REG	23	37.49	0.00
69	052304	31	279	CMP	8627	MTH-REG	109	128.24	0.00
70	042204	30	582	CMP	8518	MTH-REG	217	237.12	0.00
71	032304	32	1055	CMP	8301	MTH-REG	533	557.88	0.00
72	022004	28	1221	EST	7768	MTH-REG	554	587.91	0.00

Project Name: Town of Hamburg - B&G
Project Address: 2718 Lakeview Road
Lake View NY, 14085
Utility Company: National Fuel
Account No.: 4550209-09
Date: 8/19/2010
Facility Area: 20,000 SQ. FT.

ANNUAL NATURAL GAS USAGE

Usage Period	Quantity Used (Therms)	Trans. Cost	Distr. Cost	Total
2009-2010				
Feb-09	2,028	$0.00	$0.00	$2,505.30
Mar-09	1,309	$0.00	$0.00	$1,516.78
Apr-09	1,009	$0.00	$0.00	$1,046.11
May-09	139	$0.00	$0.00	$154.76
Jun-09	24	$0.00	$0.00	$27.96
Jul-09	39	$0.00	$0.00	$50.57
Aug-09	19	$0.00	$0.00	$21.79
Sep-09	112	$0.00	$0.00	$115.25
Oct-09	273	$0.00	$0.00	$254.71
Nov-09	796	$0.00	$0.00	$772.82
Dec-09	1,546	$0.00	$0.00	$1,398.38
Jan-10	1,953	$0.00	$0.00	$1,800.04
Totals:	**9,248**	**$0**	**$0**	**$9,664**
Energy Intensity (MMBTU/SQ FT):				**0.046**
Average Cost per Unit:				**$1.04**



PO Box 4103
Buffalo, NY 14264
national Fuel

1001

TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Please make check payable to National Fuel or pay online at www.nationalfuelgas.com.

Amount Due
$1,800.04

Please pay by **February 19, 2010** to avoid a 1.5% late payment charge.
Please donate to the Neighbor-For-Neighbor Heat Fund by adding $1, $2, or $5 to your payment.

Account Number 4550209 09

Return this stub if paying by mail. Bring entire bill if paying in person. To pay online go to www.nationalfuelgas.com.

~~Bike Site BTG~~ ~~Recreation Bldg.~~ BTG

455020909 00000000000000000000180004001

*A-16-HH9-AM-05001-23

15-AT TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

23

FOR EMERGENCIES CALL: 1-800-444-3130

national Fuel

For questions or service call National Fuel: (716) 686-6123 7:00am to 6:00pm Mon-Fri

Please pay by **February 19, 2010** to avoid a 1.5% late payment charge.

Account Number: **4550209 09**
Service Address: **2718 LAKEVIEW RD**
Name: **TOWN OF HAMBURG**
Service Classification: **03-NY GENERAL - NONRESIDENTIAL**

General Information

Your Natural Gas Delivery Company is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
TE 44
EKTOWAGA NY 14227
Office Hours: Monday-Friday 8:15am to 4:30pm
WWW.NATIONALFUELGAS.COM

Your Natural Gas Supplier is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
WWW.NATIONALFUELGAS.COM

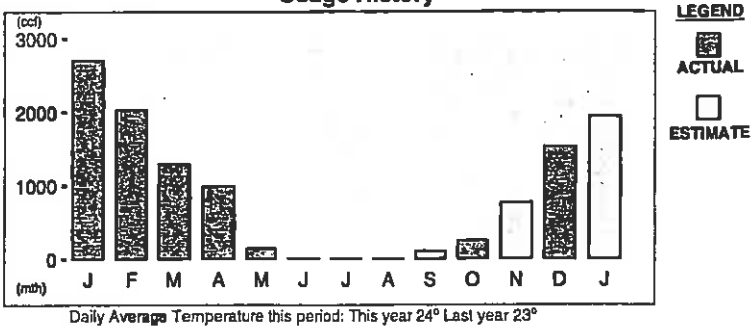
Account Summary as of January 26, 2010
(Complete detail of Current Month Charges on reverse side)

Last Month's Ending Balance	1,398.38
Customer Payments Received	-1,398.38
Balance Remaining	0.00
Current Month Charges	1,800.04
Total Account Balance	**1,800.04**

Budget Plan

Have you considered the Budget Plan?
If you enroll in the Budget Plan, your monthly payment amount would be **$897.00** based on your prior usage and current billing rates. Please go to our website to enroll or call us.

Usage History



Daily Average Temperature this period: This year 24° Last year 23°

Gas Usage

Meter No.	Present Read Date	Present Read	Present Read Type	Prev. Read Date	Prev. Read	Prev. Read Type	Additional CCF	Total Meter CCF
27181	01/22/2010	60284	ESTIMATED	12/22/2009	58351	COMPANY	0	1933
								1933

Total Consumption (ccf) for 31 days
12 Month Total Usage 9040 ccf

12 Month Average 753 ccf

Next Meter Read on or about 02/22/2010

KGLN0015-1 NATIONAL FUEL GAS DISTRIBUTION CORPORATION DATE: 02/10/10
ACCOUNTS RECEIVABLE PRINT

RBA NUM : 4550209 - 09
NAME : TOWN OF HAMBURG
PREM ADDR : 2718 LAKEVIEW RD HAMBURG NY
MAIL ADDR : 2718 LAKEVIEW RD LAKE VIEW NY 14085
RBA STATUS : ACTIVE CAC : AT

PB : 0.00
TDB : 1800.04
OVRDUE:
AGE :

TRANS DATE	EMP ID	TRANSACTION TYPE	TRANS AMOUNT	BALANCE
012610		TOTAL BILLED CHARGES	1800.04	1800.04
012110		RATEPAYER PYMT	-1398.38	0.00
122309		TOTAL BILLED CHARGES	1398.38	1398.38
121609		RATEPAYER PYMT	-772.82	0.00
112009		TOTAL BILLED CHARGES	772.82	772.82
111209		RATEPAYER PYMT	-254.71	0.00
102209		TOTAL BILLED CHARGES	254.71	254.71
101309		RATEPAYER PYMT	-106.21	0.00
092309		TOTAL BILLED CHARGES	115.25	106.21
082409		TOTAL BILLED CHARGES	21.79	-9.04
082409		60-DAY REBILL ADJUST	-30.83	-30.83
081009		RATEPAYER PYMT	-50.57	0.00
072309		TOTAL BILLED CHARGES	50.57	50.57
071409		RATEPAYER PYMT	-27.96	0.00
062309		TOTAL BILLED CHARGES	27.96	27.96
061509		RATEPAYER PYMT	-154.76	0.00
052209		TOTAL BILLED CHARGES	154.76	154.76
052109		RATEPAYER PYMT	-1046.11	0.00
042309		TOTAL BILLED CHARGES	1046.11	1046.11
041409		RATEPAYER PYMT	-1516.78	0.00
032409		TOTAL BILLED CHARGES	1516.78	1516.78
031609		RATEPAYER PYMT	-2505.30	0.00
022309		TOTAL BILLED CHARGES	2505.30	2505.30
021209		RATEPAYER PYMT	-3530.52	0.00
012609		DELAYED BILL ADJUST	1007.45	3530.52
012309		TOTAL BILLED CHARGES	2523.07	2523.07
011609		RATEPAYER PYMT	-2272.07	0.00
122208		TOTAL BILLED CHARGES	2272.07	2272.07
120808		RATEPAYER PYMT	-995.05	0.00
111908		TOTAL BILLED CHARGES	995.05	995.05
111108		RATEPAYER PYMT	-18.94	0.00
102008		TOTAL BILLED CHARGES	59.04	18.94
091908		TOTAL BILLED CHARGES	24.40	-40.10
082008		TOTAL BILLED CHARGES	23.43	-64.50
072208		TOTAL BILLED CHARGES	26.41	-87.93
062008		TOTAL BILLED CHARGES	177.93	-114.34
052108		TOTAL BILLED CHARGES	516.94	-292.27
052108		60-DAY REBILL ADJUST	-809.21	-809.21
051408		RATEPAYER PYMT	-1629.32	0.00
042308		RATEPAYER PYMT	-2349.78	1629.32
042208		TOTAL BILLED CHARGES	1629.32	3979.10
032408		TOTAL BILLED CHARGES	2349.78	2349.78
031408		RATEPAYER PYMT	-2947.51	0.00
022108		TOTAL BILLED CHARGES	2947.51	2947.51
021408		RATEPAYER PYMT	-2435.00	0.00
020408		RATEPAYER PYMT	-2278.79	2435.00
012308		TOTAL BILLED CHARGES	2435.00	4713.79
122107		DELAYED BILL ADJUST	47.92	2278.79
122007		TOTAL BILLED CHARGES	2230.87	2230.87

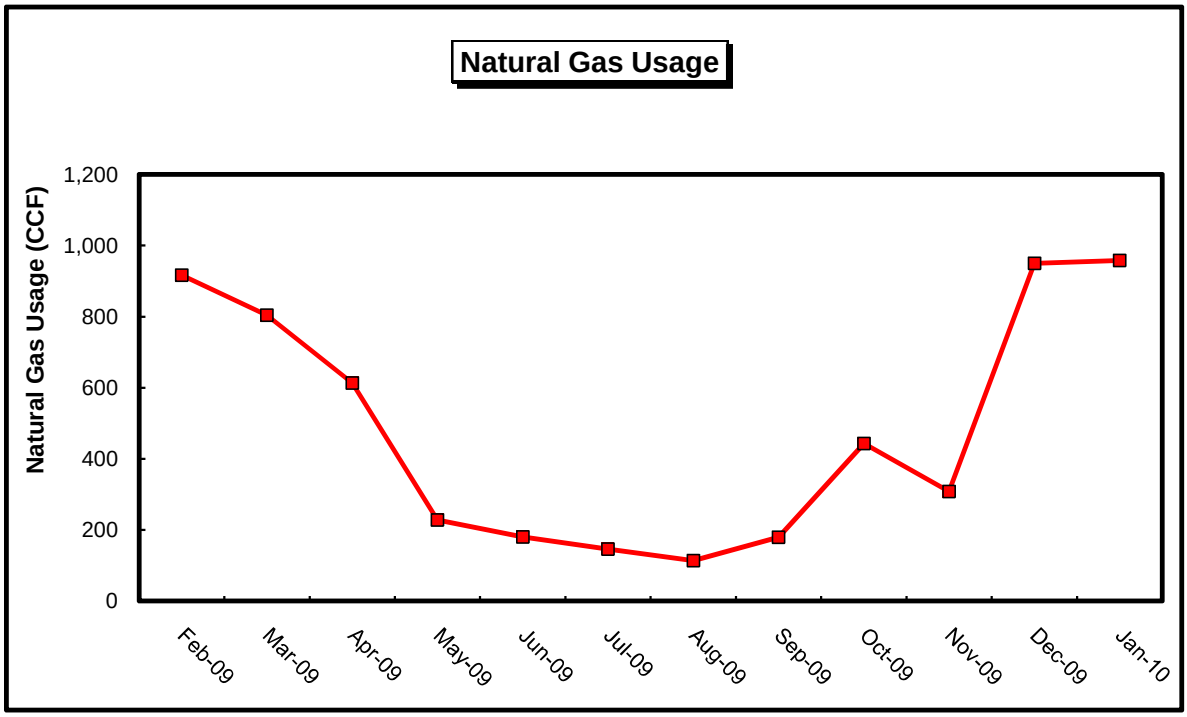
KGLN0015-1 NATIONAL FUEL GAS DISTRIBUTION CORPORATION DATE: 02/10/10
ACCOUNTS RECEIVABLE PRINT

TRANS DATE	EMP ID	TRANSACTION TYPE	TRANS AMOUNT	BALANCE
121407		RATEPAYER PYMT	-616.26	0.00
111907		TOTAL BILLED CHARGES	616.26	616.26
110907		RATEPAYER PYMT	-34.80	0.00
101907		TOTAL BILLED CHARGES	34.80	34.80
101507		RATEPAYER PYMT	-25.96	0.00
092007		TOTAL BILLED CHARGES	25.96	25.96
091407		RATEPAYER PYMT	-17.97	0.00
082107		TOTAL BILLED CHARGES	17.97	17.97
081707		RATEPAYER PYMT	-20.97	0.00
072307		TOTAL BILLED CHARGES	20.97	20.97
071207		RATEPAYER PYMT	-29.43	0.00
062107		TOTAL BILLED CHARGES	29.43	29.43
061107		RATEPAYER PYMT	-181.79	0.00
052207		TOTAL BILLED CHARGES	255.07	181.79
042307		TOTAL BILLED CHARGES	1186.18	-73.28
032207		TOTAL BILLED CHARGES	2309.69	-1259.46
031507		RATEPAYER PYMT	-7148.40	-3569.15
022107		TOTAL BILLED CHARGES	3579.25	3579.25
021507		RATEPAYER PYMT	-2119.57	0.00
012307		TOTAL BILLED CHARGES	2119.57	2119.57
011607		RATEPAYER PYMT	-1595.08	0.00
122006		TOTAL BILLED CHARGES	1595.08	1595.08
121106		RATEPAYER PYMT	-801.82	0.00
111706		TOTAL BILLED CHARGES	801.82	801.82
111406		RATEPAYER PYMT	-174.24	0.00
101906		TOTAL BILLED CHARGES	174.24	174.24
101906		RATEPAYER PYMT	-22.48	0.00
092006		TOTAL BILLED CHARGES	22.48	22.48
091106		RATEPAYER PYMT	-20.91	0.00
082106		TOTAL BILLED CHARGES	20.91	20.91
081506		RATEPAYER PYMT	-23.61	0.00
072206		TOTAL BILLED CHARGES	23.61	23.61
071706		RATEPAYER PYMT	-57.47	0.00
062206		TOTAL BILLED CHARGES	57.47	57.47
061206		RATEPAYER PYMT	-226.90	0.00
052306		TOTAL BILLED CHARGES	226.90	226.90
051006		RATEPAYER PYMT	-811.80	0.00
042406		TOTAL BILLED CHARGES	811.80	811.80
041106		RATEPAYER PYMT	-2314.26	0.00
032306		TOTAL BILLED CHARGES	2314.26	2314.26
030906		RATEPAYER PYMT	-2389.47	0.00
022206		TOTAL BILLED CHARGES	2389.47	2389.47
021306		RATEPAYER PYMT	-3015.53	0.00
012406		TOTAL BILLED CHARGES	3015.53	3015.53
011706		RATEPAYER PYMT	-3122.62	0.00
122105		TOTAL BILLED CHARGES	3122.62	3122.62
120805		RATEPAYER PYMT	-1390.73	0.00
111805		TOTAL BILLED CHARGES	1414.21	1390.73
111005		RATEPAYER PYMT	-166.00	-23.48
102105		RATEPAYER PYMT	-23.48	142.52

Project Name: Town of Hamburg - Town Park - Fitness Center
Project Address: 2718 Lakeview Road
Lake View NY, 14085
Utility Company: National Fuel
Account No.: 3424250-03
Date: 8/19/2010
Facility Area: 3,060 SQ. FT.

ANNUAL NATURAL GAS USAGE

Usage Period	Quantity Used (CCF)	Trans. Cost	Distr. Cost	Total
2009-2010				
Feb-09	916	$0.00	$0.00	$1,122.27
Mar-09	804	$0.00	$0.00	$941.92
Apr-09	613	$0.00	$0.00	$640.53
May-09	228	$0.00	$0.00	$230.29
Jun-09	180	$0.00	$0.00	$188.10
Jul-09	146	$0.00	$0.00	$165.66
Aug-09	114	$0.00	$0.00	$125.64
Sep-09	179	$0.00	$0.00	$176.22
Oct-09	443	$0.00	$0.00	$434.95
Nov-09	308	$0.00	$0.00	$320.21
Dec-09	950	$0.00	$0.00	$855.99
Jan-10	958	$0.00	$0.00	$912.98
Totals:	**5,842**	**$0**	**$0**	**$6,115**
Energy Intensity (MMBTU/SQ FT):				**0.191**
Average Cost per Unit:				**$1.05**



PO Box 4103
Buffalo, NY 14264
national Fuel

1001

Please make check payable to National Fuel or pay online at www.nationalfuelgas.com.

Amount Due
$912.98

Please pay by **February 26, 2010** to avoid a 1.5% late payment charge.
Please donate to the Neighbor-For-Neighbor Heat Fund by adding $1, $2, or $5 to your payment.

TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Account Number 3424250 03

Return this stub if paying by mail. Bring entire bill if paying in person. To pay online go to www.nationalfuelgas.com.

Town Park Fitness Center

342425003 00000000000000000000091298001

*A-17-NXR-AM-00257

18-AT TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

FOR EMERGENCIES CALL: 1-800-444-3130

national Fuel

For questions or service call National Fuel: (716) 686-6123 7:00am to 6:00pm Mon-Fri

Account Number: 3424250 03
Service Address: 4420 LAKE SHORE RD
Name: TOWN OF HAMBURG
Service Classification: 03-NY GENERAL - NONRESIDENTIAL

General Information

Your Natural Gas Delivery Company is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
UNION RD
E 44
CHEEKTOWAGA NY 14227
Office Hours: Monday-Friday 8:15am to 4:30pm
WWW.NATIONALFUELGAS.COM

Your Natural Gas Supplier is:
NATIONAL FUEL GAS DISTRIBUTION CORPORATION
2875 UNION RD
SUITE 44
CHEEKTOWAGA NY 14227
WWW.NATIONALFUELGAS.COM

Please pay by February 26, 2010 to avoid a 1.5% late payment charge.

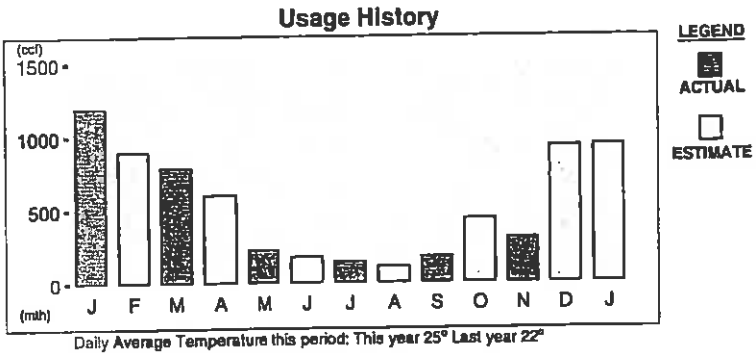
Account Summary as of February 2, 2010
(Complete detail of Current Month Charges on reverse side)

Last Month's Ending Balance	855.99
Customer Payments Received	-855.99
Balance Remaining	0.00
Current Month Charges	912.98
Total Account Balance	**912.98**

Budget Plan

Have you considered the Budget Plan?
If you enroll in the Budget Plan, your monthly payment amount would be **$554.00** based on your prior usage and current billing rates. Please go to our website to enroll or call us.

Usage History



Daily Average Temperature this period: This year 25° Last year 22°

Gas Usage

Meter No.	Present Read Date	Present Read	Present Read Type	Prev. Read Date	Prev. Read	Prev. Read Type	Additional CCF	Total Meter CCF
6028209	01/27/2010	38198	ESTIMATED	12/28/2009	37262	ESTIMATED	0	936 936

Total Consumption (ccf) for 30 days
12 Month Total Usage 5705 ccf

12 Month Average 475 ccf

Next Meter Read on or about 03/26/2010

February 10, 2010

KGLN0014-1 NATIONAL FUEL GAS DISTRIBUTION CORPORATION DATE: 02/10/10

BILLING PRINT

RBA NUM : 3424250 - 03
NAME : TOWN OF HAMBURG
PREM ADDR : 4420 LAKE SHORE RD HAMBURG NY 14075
MAIL ADDR : 2718 LAKEVIEW RD LAKE VIEW NY 14085
RBA STAT : ACTIVE
CAC : AT RV CL : 14
BILL CTL : 18 SV CL : 3
CUST TYPE : PUBLIC AUTHORI

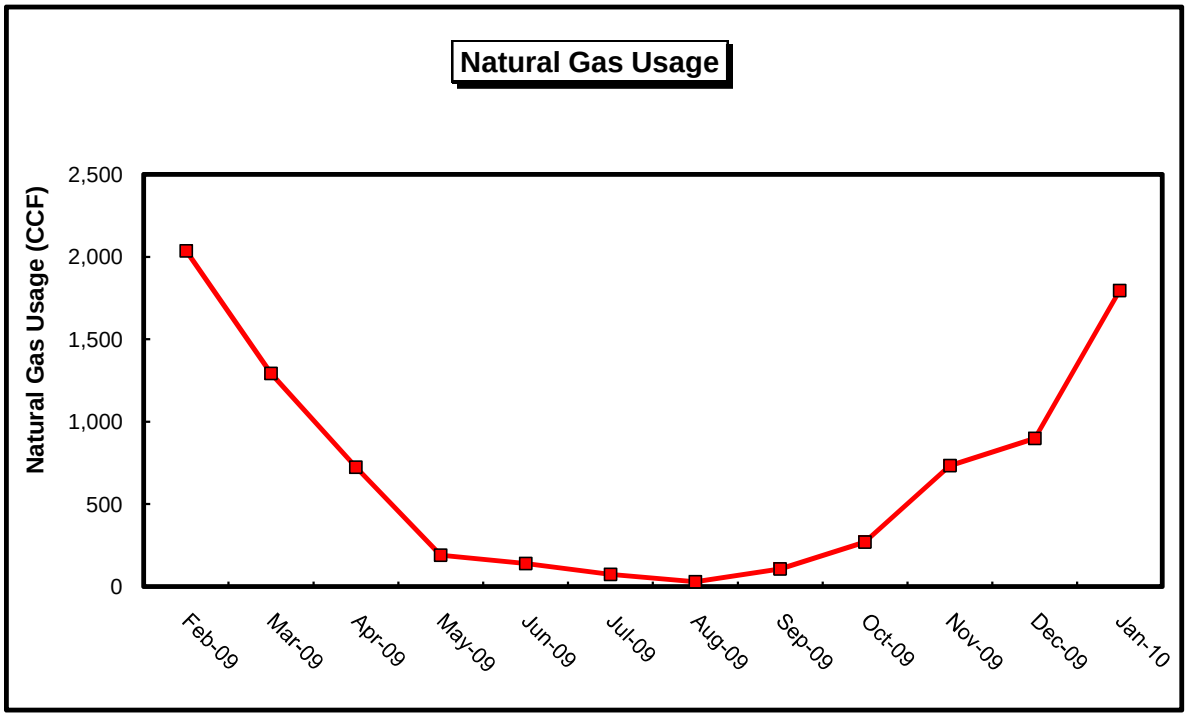
PB : 0.00
TDB : 912.98
LPCD : 022610

	BILL DATE	BILL DAYS	DEG DAYS	READ TYPE	METER READ	BILL TYPE	CONS CCF	NET BILL	SALES TAX
1	012710	30	1199	EST	38198	MTH-REG	936	912.98	0.00
2	122809	35	1152	CLC	37262	MTH-REG	928	855.99	0.00
3	112309	31	567	CMP	36334	MTH-REG	301	320.21	0.00
4	102309	28	447	CLC	36033	MTH-REG	433	434.95	0.00
5	092509	31	76	CMP	35600	MTH-REG	175	176.22	0.00
6	082509	28	1	CLC	35425	MTH-REG	111	125.64	0.00
7	072809	33	19	CMP	35314	MTH-REG	143	165.66	0.00
8	062509	29	86	CLC	35171	MTH-REG	176	188.10	0.00
9	052709	30	250	CMP	34995	MTH-REG	223	230.29	0.00
10	042709	33	650	CLC	34772	MTH-REG	599	640.53	0.00
11	032509	28	877	CMP	34173	MTH-REG	785	941.92	0.00
12	022509	28	1088	CLC	33388	MTH-REG	895	1122.27	0.00
13	012809	33	1432	CMP	32493	MTH-REG	1192	1587.58	0.00
14	122608	35	1244	CLC	31301	MTH-REG	1152	1477.82	0.00
15	112108	30	641	CMP	30149	MTH-REG	362	466.50	0.00
16	102208	28	311	CLC	29787	MTH-REG	376	521.21	0.00
17	092408	33	69	CMP	29411	MTH-REG	75	120.35	0.00
18	082208	29	11	CLC	29336	MTH-REG	120	198.58	0.00
19	072408	30	1	EST	29216	MTH-REG	114	205.32	0.00
20	062408	28	71	CLC	29102	MTH-REG	171	279.88	0.00
21	052708	33	405	CMP	28931	MTH-REG	248	381.07	0.00
22	042408	28	456	CLC	28683	MTH-REG	523	771.09	0.00
23	032708	31	1100	CMP	28160	MTH-REG	874	1195.23	0.00
24	022508	27	1039	CLC	27286	MTH-REG	1118	1461.88	0.00
25	012908	34	1138	CMP	26168	MTH-REG	1528	1984.80	0.00
26	122607	30	1064	CLC	24640	MTH-REG	1073	1324.71	0.00
27	112607	34	772	CMP	23567	MTH-REG	749	937.38	0.00
28	102307	29	122	CLC	22818	MTH-REG	217	299.51	0.00
29	092407	32	48	CMP	22601	MTH-REG	117	152.99	0.00
30	082307	29	6	CLC	22484	MTH-REG	112	152.53	0.00
31	072507	30	6	CMP	22372	MTH-REG	101	142.97	0.00
32	062507	31	37	CLC	22271	MTH-REG	147	203.17	0.00
33	052507	30	290	CMP	22124	MTH-REG	1353	1703.87	0.00
34	042507	30	696	CLC	20771	MTH-REG	633	796.25	0.00
35	032607	31	1020	EST	20138	MTH-REG	880	1114.00	0.00
36	022307	29	1368	CLC	19258	MTH-REG	1134	1381.96	0.00
37	012507	30	983	EST	18124	MTH-REG	849	1063.67	0.00
38	122606	35	853	CLC	17275	MTH-REG	769	986.45	0.00
39	112106	29	630	EST	16506	MTH-REG	580	654.77	0.00
40	102306	28	372	CLC	15926	MTH-REG	380	375.08	0.00
41	092506	33	95	CMP	15546	MTH-REG	124	163.50	0.00
42	082306	29	3	CLC	15422	MTH-REG	100	136.95	0.00
43	072506	29	0	CMP	15322	MTH-REG	134	178.82	0.00
44	062606	32	31	CLC	15188	MTH-REG	129	170.73	0.00
45	052506	29	256	CMP	15059	MTH-REG	234	311.60	0.00
46	042606	30	506	CLC	14825	MTH-REG	443	583.46	0.00
47	032706	31	1029	CMP	14382	MTH-REG	1012	1312.89	0.00
48	022406	29	995	CLC	13370	MTH-REG	728	1029.15	0.00
49	012606	30	912	CMP	12642	MTH-REG	1079	1657.80	0.00
50	122705	34	1248	CLC	11563	MTH-REG	947	1414.98	0.00
51	112305	30	584	CMP	10616	MTH-REG	207	391.28	0.00
52	102405	31	286	CLC	10409	MTH-REG	298	538.12	0.00
53	092305	30	5	EST	10111	MTH-REG	87	129.80	0.00

Project Name: Town of Hamburg - Adult Day Care
Project Address: 2718 Lakeview Road
Lake View NY, 14085
Utility Company: National Fuel
Account No.: 5306111-10
Date: 8/19/2010
Facility Area: 4,500 SQ. FT.

ANNUAL NATURAL GAS USAGE

Usage Period	Quantity Used (CCF)	Trans. Cost	Distr. Cost	Total
2009-2010				
Feb-09	2,036	$0.00	$0.00	$2,509.22
Mar-09	1,293	$0.00	$0.00	$1,502.01
Apr-09	725	$0.00	$0.00	$761.81
May-09	190	$0.00	$0.00	$199.00
Jun-09	140	$0.00	$0.00	$151.18
Jul-09	74	$0.00	$0.00	$91.22
Aug-09	29	$0.00	$0.00	$43.95
Sep-09	108	$0.00	$0.00	$115.41
Oct-09	269	$0.00	$0.00	$266.25
Nov-09	733	$0.00	$0.00	$732.87
Dec-09	899	$0.00	$0.00	$841.63
Jan-10	1,795	$0.00	$0.00	$1,635.05
Totals:	**8,291**	**$0**	**$0**	**$8,850**
Energy Intensity (MMBTU/SQ FT):				**0.184**
Average Cost per Unit:				**$1.07**



PO Box 4103
Buffalo, NY 14264
national Fuel

1001

TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Please make check payable to National Fuel or pay online at www.nationalfuelgas.com.

Amount Due
$1,635.05

Please pay by **February 17, 2010** to avoid a 1.5% late payment charge.
Please donate to the Neighbor-For-Neighbor Heat Fund by adding $1, $2, or $5 to your payment.

Account Number 5306111 10

Return this stub if paying by mail. Bring entire bill if paying in person. To pay online go to www.nationalfuelgas.com.

*A-17-F6B-AM-00561

530611110 00000000000000000000163505001

13-AT
TOWN OF HAMBURG
ADULT DAY CARE
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Senior Day Care

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national Fuel

FOR EMERGENCIES CALL: 1-800-444-3130

For questions or service call National Fuel: (716) 686-6123 7:00am to 6:00pm Mon-Fri

ccount Number: 5306111 10
ervice Address: 353 PLEASANT AVE
lame: TOWN OF HAMBURG
ervice Classification: 03-NY GENERAL - NONRESIDENTIAL

General Information

our Natural Gas Delivery Company is:
ATIONAL FUEL GAS DISTRIBUTION CORPORATION
375 UNION RD
44
TOWAGA NY 14227
ffice Hours: Monday-Friday 8:15am to 4:30pm
WW.NATIONALFUELGAS.COM

our Natural Gas Supplier is:
ATIONAL FUEL GAS DISTRIBUTION CORPORATION
375 UNION RD
JITE 44
HEEKTOWAGA NY 14227
WW.NATIONALFUELGAS.COM

Please pay by February 17, 2010 to avoid a 1.5% late payment charge.

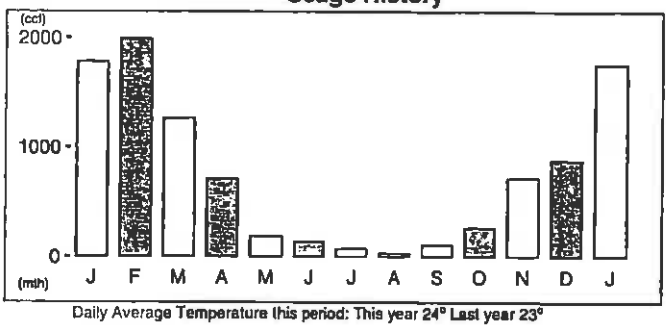
Account Summary as of January 22, 2010
(Complete detail of Current Month Charges on reverse side)

Last Month's Ending Balance	841.63
Customer Payments Received	-841.63
Balance Remaining	0.00
Current Month Charges	1,635.05
Total Account Balance	**1,635.05**

udget Plan

ave you considered the Budget Plan?
you enroll in the Budget Plan, your monthly payment amount ould be **$778.00** based on your prior usage and current billing tes. Please go to our website to enroll or call us.

Usage History



Daily Average Temperature this period: This year 24° Last year 23°

Gas Usage

No.	Present Read Date	Present Read	Present Read Type	Prev. Read Date	Prev. Read	Prev. Read Type	Additional CCF	Total Meter CCF
28764	01/20/2010	94078	ESTIMATED	12/17/2009	92325	COMPANY	0	1753
								1753

Total Consumption (ccf) for 34 days
12 Month Total Usage 8097 ccf
12 Month Average 674 ccf
Next Meter Read on or about 02/18/2010

KGLN0014-1 NATIONAL FUEL GAS DISTRIBUTION CORPORATION DATE: 02/10/10
BILLING PRINT

RBA NUM : 5306111 - 10
NAME : TOWN OF HAMBURG
PREM ADDR : 353 PLEASANT AVE HAMBURG NY 14075
MAIL ADDR : 2718 LAKEVIEW RD LAKE VIEW NY 14085
RBA STAT : ACTIVE
CAC : AT RV CL : 14
BILL CTL : 13 SV CL : 3
CUST TYPE : PUBLIC AUTHORI

PB : 0.00
TDB : 1635.05
LPCD : 021710

	BILL DATE	BILL DAYS	DEG DAYS	READ TYPE	METER READ	BILL TYPE	CONS CCF	NET BILL	SALES TAX
1	012010	34	1389	CLC	94078	MTH-REG	1753	1635.05	0.00
2	121709	31	874	CMP	92325	MTH-REG	878	841.63	0.00
3	111609	31	544	CLC	91447	MTH-REG	716	732.87	0.00
4	101609	29	358	CMP	90731	MTH-REG	263	266.25	0.00
5	091709	30	44	CLC	90468	MTH-REG	105	115.41	0.00
6	081809	27	1	CMP	90363	MTH-REG	28	43.95	0.00
7	072209	29	19	CLC	90335	MTH-REG	72	91.22	0.00
8	062309	33	95	CMP	90263	MTH-REG	137	151.18	0.00
9	052109	28	248	ADJ	90126	MTH-60D	186	199.00	0.00
10	042309	31	693	CMP	89940	MTH-REG	708	761.81	0.00
11	032309	28	910	CLC	89232	MTH-REG	1263	1502.01	0.00
12	022309	32	1275	CMP	87969	MTH-REG	1988	2509.22	0.00
13	012209	31	1293	CLC	85981	MTH-REG	1780	2363.52	0.00
14	122208	34	1227	CMP	84201	MTH-REG	1708	2168.09	0.00
15	111808	29	577	CLC	82493	MTH-REG	819	1033.71	0.00
16	102008	32	284	CMP	81674	MTH-REG	225	327.02	0.00
17	091808	29	46	CLC	81449	MTH-REG	115	178.35	0.00
18	082008	30	11	CMP	81334	MTH-REG	37	73.53	0.00
19	072108	31	1	CLC	81297	MTH-REG	63	119.99	0.00
20	062008	31	150	CMP	81234	MTH-REG	98	168.38	0.00
21	052008	29	341	CLC	81136	MTH-REG	479	728.65	0.00
22	042108	32	680	EST	80657	MTH-REG	904	1293.36	0.00
23	032008	28	1022	CLC	79753	MTH-REG	1318	1783.85	0.00
24	022108	30	1154	CMP	78435	MTH-REG	2326	3029.33	0.00
25	012208	32	1044	CLC	76109	MTH-REG	1261	1652.88	0.00
26	122107	35	1164	CMP	74848	MTH-REG	1398	1721.15	0.00
27	111607	29	496	CLC	73450	MTH-REG	627	801.52	0.00
28	101807	29	109	CMP	72823	MTH-REG	149	209.43	0.00
29	091907	29	46	CLC	72674	MTH-REG	85	116.97	0.00
30	082107	32	6	CMP	72589	MTH-REG	74	108.00	0.00
31	072007	30	12	CLC	72515	MTH-REG	48	74.70	0.00
32	062007	30	35	CMP	72467	MTH-REG	107	152.39	0.00
33	052107	31	345	ADJ	72360	MTH-60D	247	331.82	0.00
34	042007	30	723	CMP	72113	MTH-REG	829	1048.26	0.00
35	032107	27	980	CLC	71284	MTH-REG	1133	1425.45	0.00
36	022207	31	1420	CMP	70151	MTH-REG	2063	2500.32	0.00
37	012207	33	997	CLC	68088	MTH-REG	1231	1558.20	0.00
38	122006	34	844	CMP	66857	MTH-REG	760	969.13	0.00
39	111606	29	585	CLC	66097	MTH-REG	734	790.11	0.00
40	101806	29	319	CMP	65363	MTH-REG	248	266.54	0.00
41	091906	32	55	CLC	65115	MTH-REG	105	141.50	0.00
42	081806	29	3	CMP	65010	MTH-REG	36	57.06	0.00
43	072006	29	0	CLC	64974	MTH-REG	33	52.91	0.00
44	062106	30	57	CMP	64941	MTH-REG	90	124.22	0.00
45	052206	31	325	ADJ	64851	MTH-60D	183	247.62	0.00
46	042106	30	558	CMP	64668	MTH-REG	592	782.95	0.00
47	032206	29	988	CLC	64076	MTH-REG	1256	1650.15	0.00
48	022106	29	1002	CMP	62820	MTH-REG	1684	2377.05	0.00
49	012306	34	1020	CLC	61136	MTH-REG	1302	1992.95	0.00
50	122005	33	1210	CMP	59834	MTH-REG	1721	2672.50	0.00
51	111705	30	519	CLC	58113	MTH-REG	677	1259.49	0.00
52	101805	28	172	CMP	57436	MTH-REG	142	259.52	0.00
53	092005	29	1	CLC	57294	MTH-REG	48	75.58	0.00

54	[illegible]	[illegible]	0	CMP	57246	MTH-REG	21			0.0C
55	072105	30	0	CLC	57225	MTH-REG	48	71.44		0.0C
56	062105	32	113	CMP	57177	MTH-REG	187	228.88		0.0C
57	052005	29	444	ADJ	56990	MTH-60D	359	438.00		0.0C
58	042105	30	576	CMP	56631	MTH-REG	728	909.06		0.0C
59	032205	29	1180	CLC	55903	MTH-REG	1447	1571.04		0.0C
60	022105	31	1307	CMP	54456	MTH-REG	2225	2400.72		0.0C
61	012105	32	1186	CLC	52231	MTH-REG	1307	1504.87		0.0C
62	122004	33	951	CMP	50924	MTH-REG	1256	1521.75		0.0C
63	111704	28	519	CLC	49668	MTH-REG	595	695.16		0.0C
64	102004	30	300	CMP	49073	MTH-REG	194	214.41		0.0C
65	092004	31	45	CLC	48879	MTH-REG	149	166.26		0.0C
66	082004	30	24	CMP	48730	MTH-REG	49	67.11		0.0C
67	072104	29	30	ADJ	48681	MTH-60D	48	65.38		0.0C
68	062204	33	126	CMP	48633	MTH-REG	58	76.96		0.0C
69	052004	28	275	CLC	48575	MTH-REG	365	396.27		0.0C
70	042204	31	617	CMP	48210	MTH-REG	831	857.35		0.0C
71	032204	31	1020	CLC	47379	MTH-REG	1107	1119.96		0.0C
72	022004	29	1278	CMP	46272	MTH-REG	1609	1646.22		0.0C

Project Name: Town of Hamburg - Recreation Ice Rink
Project Address: 2980 Lakeview Road
Lake View, NY 14085
Facility Area: 55,550 sq.ft.

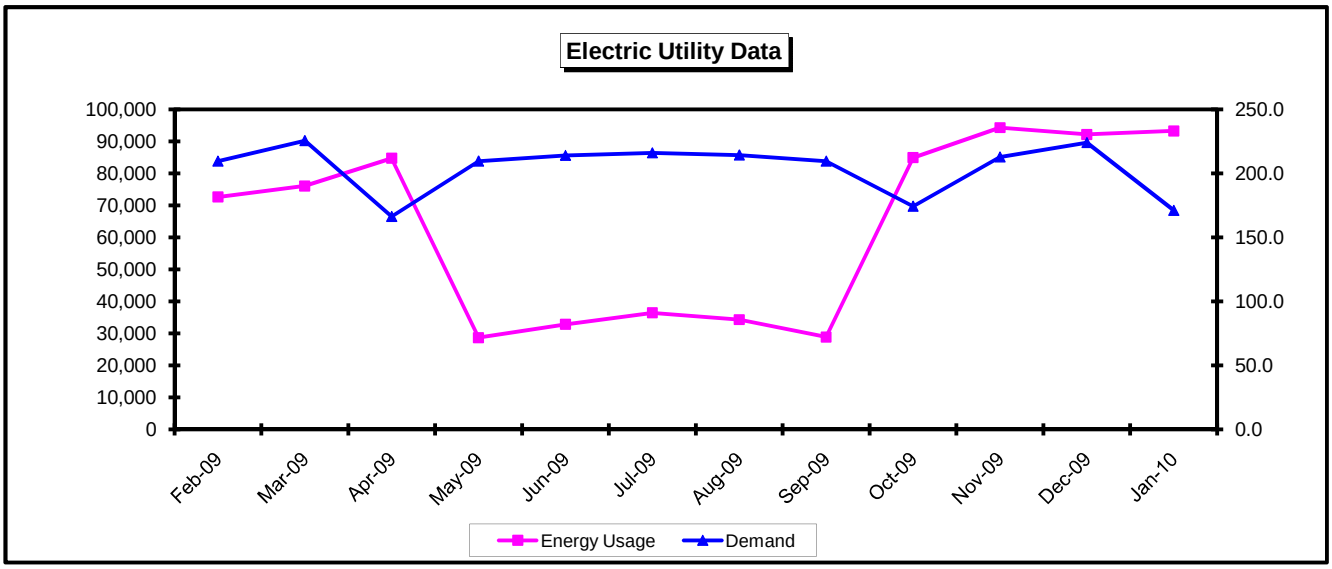
Utility Company: National Grid
Acct. No.: 92287-00104
Date: 8/19/2010

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009-2010								
Feb-09	209.6	$2,179.8	72,668	$7,471	$9,651	30	720	0.48
Mar-09	225.6	$2,346.2	76,096	$6,140	$8,486	29	696	0.48
Apr-09	166.4	$1,730.6	84,751	$5,398	$7,129	33	792	0.64
May-09	209.6	$2,179.8	28,705	$2,916	$5,096	29	696	0.20
Jun-09	214.0	$2,225.6	32,847	$3,109	$5,335	30	720	0.21
Jul-09	216.0	$2,246.4	36,444	$3,564	$5,810	33	792	0.21
Aug-09	214.4	$2,229.8	34,310	$3,472	$5,702	28	672	0.24
Sep-09	209.6	$2,179.8	28,877	$3,176	$5,356	30	720	0.19
Oct-09	174.4	$1,813.8	84,962	$6,040	$7,853	29	696	0.70
Nov-09	212.8	$2,213.1	94,339	$7,541	$9,754	31	744	0.60
Dec-09	224.0	$2,329.6	92,207	$6,786	$9,115	31	744	0.55
Jan-10	171.2	$1,780.5	93,305	$8,322	$10,102	33	792	0.69
Avg./Totals:	**204.0**	**$25,455**	**759,511**	**63,934**	**$89,389**	**366**	**8,784**	**0.43**

Energy Intensity (kWh/sq.ft.):	**13.67**	**Avg. Cost/kWh:**	**$0.084**
Blended Cost (inc.demand)/kWh:	**$0.118**	**Avg. Cost/kW:**	**$10.40**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



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www.nationalgridus.com

TOWN OF HAMBURG REC ICE RINK
2980 LAKEVIEW RD
LAKE VIEW NY 14085

BILLING PERIOD
Dec 10, 2009 to Jan 12, 2010

ACCOUNT NUMBER	PLEASE PAY BY	AMOUNT DUE
92287-00104	Feb 12, 2010	$ 19,217.47

C & I BUSINESS TEAM M-F 8-5
1-800-664-6729

AUTOMATED SERVICES
1-888-932-0301

GAS OR ELECTRIC EMERGENCIES
1-800-892-2345
(Does not replace 911 emergency medical service)

POWER OUTAGE OR DOWNED LINE
1-800-867-5222

ADDRESS
300 Erie Blvd West
Syracuse, NY 13202

DATE BILL ISSUED
Jan 19, 2010

ACCOUNT BALANCE

Previous Balance		9,115.44
Payment Received	*No payments have been received during this billing period*	- 0.00
Balance Forward		**9,115.44**
Current Charges		+ 10,102.03
	Amount Due ▶	$ 19,217.47

To avoid late payment charges of 1.5%, $ 19,217.47 must be received by Feb 12 2010.

SUMMARY OF CURRENT CHARGES

	DELIVERY SERVICES	SUPPLY SERVICES	TOTAL
Electric Service	4,809.77	5,292.26	10,102.03
Total Current Charges	**$ 4,809.77**	**$ 5,292.26**	**$ 10,102.03**

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★ **WILL WE BE ABLE TO REACH YOU DURING A POWER OUTAGE?:** During a power outage, phones with a direct link to a local phone line are able to operate. Phones that are **not** directly linked (for example, wireless phones with answering machines) need electricity to make/receive calls. If you would like to register another phone number, such as a cell phone, as your account's primary phone number, please go to www.nationalgridus.com/myaccount to update your information so that we may be able to reach you with important information during power outages.

Enrollment Information

To enroll with a supplier or change to another supplier, you will need the following information about your account:
Loadzone Frontier
Acct No: 92287-00104 Cycle: 9, TOWN

Electric Usage History

Month	kWh	Month	kWh
Jan 09	83553	Aug 09	34310
Feb 09	72668	Sep 09	28877
Mar 09	76096	Oct 09	84962
Apr 09	84751	Nov 09	94339
May 09	28705	Dec 09	92207
Jun 09	32847	Jan 10	93305
Jul 09	36444		

Billed Demand Last 12 months

Minimum	166.4
Maximum	225.6
Average	204

KEEP THIS PORTION FOR YOUR RECORDS

RETURN THIS PORTION WITH YOUR PAYMENT

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ACCOUNT NUMBER	PLEASE PAY BY	AMOUNT DUE
92287-00104	Feb 12, 2010	$ 19,217.47

300 Erie Blvd West
Syracuse NY 13202-0960

ENTER AMOUNT ENCLOSED
$

Write account number on check and make payable to National Grid

***AUTO**SCH 3-DIGIT 140
TOWN OF HAMBURG REC ICE RINK
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

04227

NATIONAL GRID
PO BOX 1303
BUFFALO NY 14240

001010203 922870010450019217470 43

nationalgrid

www.nationalgridus.com

TOWN OF HAMBURG REC ICE RINK
2980 LAKEVIEW RD
LAKE VIEW NY 14085

BILLING PERIOD
Dec 10, 2009 to Jan 12, 2010

ACCOUNT NUMBER	PLEASE PAY BY	AMOUNT DUE
92287-00104	Feb 12, 2010	$ 19,217.47

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www.nationalgridus.com/paperless

▶ For Your Information

The following charges are already included in the "Delivery Services" portion of your bill. If you were to choose an alternate supplier, billing charges would be paid to National Grid by that supplier. For information on metering services visit, http://www.dps.state.ny.us/esco_metering.html.

Billing & Metering Services

Electric Meter Ownership	7.64
Electric Meter Installation & Maintenance	5.27
Electric Meter Data Service/Reading	2.24
Billing	.53
Total Metering & Billing Services	**$15.68**

Your Account: Electric History

Name: TOWN OF HAMBURG REC ICE RINK
Account Number: 9228700104 [VIEW ANOTHER ACCOUNT]
Service Address: 2980 LAKEVIEW RD LAKE VIEW NY 14085

Details | Electric History | Processed Payment History

Read Date & Days	Read Type	Total kWh	Utility Charges	Supplier Charges	Late Payment Charges	Total Charges	Metered Peak kW	Billed Peak kW	Load Factor
01/12/2010 33 days	Actual	93,305	$10,102.03	$0.00	$0.00	$10,102.03	171.20	171.20	0.6881
12/10/2009 31 days	Actual	92,207	$9,115.44	$0.00	$0.00	$9,115.44	224.00	224.00	0.5532
11/09/2009 31 days	Actual	94,339	$9,754.38	$0.00	$0.00	$9,754.38	212.80	212.80	0.5958
10/09/2009 29 days	Actual	84,962	$7,853.31	$0.00	$0.00	$7,853.31	174.40	174.40	0.6999
09/10/2009 30 days	Actual	28,877	$5,356.13	$0.00	$0.00	$5,356.13	209.60	209.60	0.1913
08/11/2009 28 days	Actual	34,310	$5,701.90	$0.00	$0.00	$5,701.90	214.40	214.40	0.2381
07/14/2009 33 days	Actual	36,444	$5,810.36	$0.00	$0.00	$5,810.36	216.00	216.00	0.2130
06/11/2009 30 days	Actual	32,847	$5,334.63	$0.00	$0.00	$5,334.63	214.40	214.40	0.2127
05/12/2009 29 days	Actual	28,705	$5,095.62	$0.00	$0.00	$5,095.62	209.60	209.60	0.1967
04/13/2009 33 days	Actual	84,751	$7,128.68	$0.00	$0.00	$7,128.68	166.40	166.40	0.6430
03/11/2009 29 days	Actual	76,096	$8,485.80	$0.00	$0.00	$8,485.80	225.60	225.60	0.4846
02/10/2009 29 days	Actual	72,668	$9,650.62	$0.00	$0.00	$9,650.62	209.60	209.60	0.4981
01/12/2009 33 days	Actual	83,553	$8,769.65	$0.00	$306.07	$9,075.72	168.00	168.00	0.6279
12/10/2008 33 days	Actual	91,881	$10,549.55	$0.00	$147.83	$10,697.38	212.80	212.80	0.5451
11/07/2008 30 days	Actual	85,375	$9,855.36	$0.00	$138.10	$9,993.46	212.80	212.80	0.5572
10/08/2008 28 days	Actual	75,043	$9,206.62	$0.00	$85.66	$9,292.28	169.60	169.60	0.6584
09/10/2008 33 days	Actual	25,858	$5,710.61	$0.00	$0.00	$5,710.61	196.80	196.80	0.1658
08/08/2008 30 days	Actual	40,568	$8,682.11	$0.00	$0.00	$8,682.11	217.60	217.60	0.2589
07/09/2008 29 days	Actual	35,551	$7,637.38	$0.00	$0.00	$7,637.38	211.20	211.20	0.2418
06/10/2008 33 days	Actual	41,842	$7,527.56	$0.00	$0.00	$7,527.56	216.00	216.00	0.2445
05/08/2008 28 days	Actual	21,784	$5,542.26	$0.00	$0.00	$5,542.26	209.60	209.60	0.1546
04/10/2008 30 days	Actual	53,862	$8,926.01	$0.00	$0.00	$8,926.01	219.20	219.20	0.3412
03/11/2008 29 days	Actual	73,934	$10,606.56	$0.00	$153.75	$10,760.31	219.20	219.20	0.4846
02/11/2008 30 days	Actual	80,207	$10,054.40	$0.00	$2.93	$10,057.33	209.60	209.60	0.5314

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Your Account: Electric History

Name: TOWN OF HAMBURG REC ICE RINK

Account Number: 9228700104 VIEW ANOTHER ACCOUNT

Service Address: 2980 LAKEVIEW RD LAKE VIEW NY 14085

Details | Electric History | Payment History

Read Date & Days	Read Type	Total kWh	Utility Charges	Supplier Charges	Late Payment Charges	Total Charges	Metered Peak kW	Billed Peak kW	Load Factor
04/10/2008 30 days	Actual	53,862	$8,926 01	$0.00	$0 00	$8,926.01	219 20	219.20	0 3412
03/11/2008 29 days	Actual	73,934	$10,606 56	$0.00	$153 75	$10,760.31	219.20	219 20	0 4846
02/11/2008 30 days	Actual	80,207	$10,054.40	$0.00	$2 93	$10,057 33	209 60	209.60	0 5314
01/12/2008 32 days	Actual	66,908	$10,847 91	$0.00	$195 18	$11,043 09	224.00	224.00	0 5051
12/11/2007 33 days	Actual	94,749	$13,012 32	$0.00	$0.00	$13,012.32	227 20	227 20	0.5265
11/08/2007 29 days	Actual	85,961	$10,203.81	$0 00	$0 00	$10,203.81	161.60	161 60	0.7642
10/10/2007 29 days	Actual	77,790	$9,758.54	$0 00	$0 00	$9,758 54	172.80	172 80	0.6468
09/11/2007 32 days	Actual	24,310	$5,580.86	$0 00	$0.00	$5,580 86	187 20	187.20	0 1690
08/10/2007 29 days	Actual	41,475	$7,654.87	$0.00	$0.00	$7,654.87	208.00	208 00	0.2864
07/12/2007 30 days	Actual	36,894	$6,984.86	$0.00	$0.00	$6,984.86	206 40	206.40	0.2482
06/12/2007 35 days	Actual	42,186	$7,044 61	$0.00	$83.40	$7,128.01	204.00	204 00	0 2461
05/08/2007 28 days	Actual	23,600	$5,560 07	$0.00	$0 00	$5,560.07	196 00	196.00	0.1791
04/10/2007 32 days	Actual	72,400	$9,020.70	$0 00	$0.00	$9,020 70	164 00	164 00	0.5748
03/09/2007 30 days	Actual	74,400	$10,913 48	$0 00	$0.00	$10,913 48	208 00	208.00	0.4967
02/07/2007 29 days	Actual	74,800	$10,358 56	$0.00	$0 00	$10,358.56	216.00	216 00	0.4975
01/09/2007 32 days	Actual	90,000	$9,391 64	$0.00	$0 00	$9,391.64	216 00	216.00	0 5425
12/08/2006 31 days	Actual	87,200	$10,631 64	$0.00	$0.00	$10,631.64	220.00	220.00	0.5327
11/07/2006 29 days	Actual	75,600	$9,407.16	$0.00	$0.00	$9,407.16	204 00	204 00	0.5324
10/09/2006 31 days	Actual	67,200	$7,846 31	$0.00	$0.00	$7,846.31	180.00	180.00	0.5017
09/08/2006 30 days	Actual	28,000	$5,745 80	$0 00	$13.09	$5,758.89	200 00	200.00	0 1944
08/09/2006 29 days	Actual	37,600	$7,170 71	$0.00	$0 00	$7,170.71	208.00	208 00	0 2597
07/11/2006 32 days	Actual	36,000	$6,408.93	$0.00	$88.59	$6,497.52	208.00	208.00	0.2253
06/09/2006 30 days	Actual	30,400	$5,905.88	$0 00	$82.62	$5,988 50	212 00	212.00	0.1991
05/10/2006 30 days	Actual	27,600	$5,508.13	$0 00	$118.26	$5,626 39	204 00	204 00	0 1879

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Your Account: Electric History

Name: TOWN OF HAMBURG REC ICE RINK
Account Number: 9228700104 VIEW ANOTHER ACCOUNT
Service Address: 2980 LAKEVIEW RD LAKE VIEW NY 14085

Details | Electric History | Processed Payment History

Read Date & Days	Read Type	Total kWh	Utility Charges	Supplier Charges	Late Payment Charges	Total Charges	Metered Peak kW	Billed Peak kW	Load Factor
10/09/2009 29 days	Actual	84,962	$7,853.31	$0.00	$0.00	$7,853.31	174.40	174.40	0.6999
09/10/2009 30 days	Actual	28,877	$5,356.13	$0.00	$0.00	$5,356.13	209.60	209.60	0.1913
08/11/2009 28 days	Actual	34,310	$5,701.90	$0.00	$0.00	$5,701.90	214.40	214.40	0.2381
07/14/2009 33 days	Actual	36,444	$5,810.36	$0.00	$0.00	$5,810.36	216.00	216.00	0.2130
06/11/2009 30 days	Actual	32,847	$5,334.63	$0.00	$0.00	$5,334.63	214.40	214.40	0.2127
05/12/2009 29 days	Actual	28,705	$5,095.62	$0.00	$0.00	$5,095.62	209.60	209.60	0.1967
04/13/2009 33 days	Actual	84,751	$7,128.68	$0.00	$0.00	$7,128.68	166.40	166.40	0.6430
03/11/2009 29 days	Actual	76,096	$8,485.80	$0.00	$0.00	$8,485.80	225.60	225.60	0.4846
02/10/2009 29 days	Actual	72,668	$9,650.62	$0.00	$0.00	$9,650.62	209.60	209.60	0.4981
01/12/2009 33 days	Actual	83,553	$8,769.65	$0.00	$306.07	$9,075.72	168.00	168.00	0.6279
12/10/2008 33 days	Actual	91,881	$10,549.55	$0.00	$147.83	$10,697.38	212.80	212.80	0.5451
11/07/2008 30 days	Actual	85,375	$9,855.36	$0.00	$138.10	$9,993.46	212.80	212.80	0.5572
10/08/2008 28 days	Actual	75,043	$9,206.62	$0.00	$85.66	$9,292.28	169.60	169.60	0.6584
09/10/2008 33 days	Actual	25,858	$5,710.61	$0.00	$0.00	$5,710.61	196.80	196.80	0.1658
08/08/2008 30 days	Actual	40,568	$8,682.11	$0.00	$0.00	$8,682.11	217.60	217.60	0.2589
07/09/2008 29 days	Actual	35,551	$7,637.38	$0.00	$0.00	$7,637.38	211.20	211.20	0.2418
06/10/2008 33 days	Actual	41,842	$7,527.56	$0.00	$0.00	$7,527.56	216.00	216.00	0.2445
05/08/2008 28 days	Actual	21,784	$5,542.26	$0.00	$0.00	$5,542.26	209.60	209.60	0.1546
04/10/2008 30 days	Actual	53,862	$8,926.01	$0.00	$0.00	$8,926.01	219.20	219.20	0.3412
03/11/2008 29 days	Actual	73,934	$10,606.56	$0.00	$153.75	$10,760.31	219.20	219.20	0.4846
02/11/2008 30 days	Actual	80,207	$10,054.40	$0.00	$2.93	$10,057.33	209.60	209.60	0.5314
01/12/2008 32 days	Actual	86,908	$10,847.91	$0.00	$195.18	$11,043.09	224.00	224.00	0.5051
12/11/2007 33 days	Actual	94,749	$13,012.32	$0.00	$0.00	$13,012.32	227.20	227.20	0.5265
11/08/2007 29 days	Actual	85,961	$10,203.81	$0.00	$0.00	$10,203.81	161.60	161.60	0.7642

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Download Interval Data

Account Management
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Your Bill

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Other Online Options
- Street Lighting
- Report Energy Theft
- New Choices

2

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CUAR038

Account Activity Statement

*** Account Information ***

Account Number:
92287-00104

Requested By:
TOWN OF HAMBURG REC ICE RINK
(716)649-2430 Extension: 0000

Mail To:
TOWN OF HAMBURG REC ICE RINK
2718 LAKEVIEW RD
LAKE VIEW NY 14085

Service Address:
2980 LAKEVIEW RD
LAKE VIEW NY 14085

*** Current Account Status ***

Current Bill:	$7853.31
Billed Prior:	$0.00
Balance Due:	$7853.31
Credit Amount:	$0.00
Budget Charges:	$0.00
Actual Charges:	$0.00

DATE	CHARGE TYPE	ACTUAL CHARGE	CHARGE AMOUNT	CREDIT AMOUNT	TOTAL BILL	PREVIOUS BALANCE	DAYS USED	KWH	KW	THERMS
08-10-09	ELECTRIC SERVICE		$9206.62					75043	169	
08-10-09	Regular Bill				$15002.89	$5796.27	28			
08-10-09	Late Payment Charge		$85.66							
08-10-24	Payment			$5710.61						
08-11-06	Late Payment Charge		$139.38							
08-11-10	ELECTRIC SERVICE		$9855.36					85375	212	
08-11-10	Regular Bill				$19287.02	$9431.66	30			
08-11-21	Payment			$9292.28						
08-12-09	Late Payment Charge		$149.92							
08-12-11	ELECTRIC SERVICE		$10549.55					91881	212	
08-12-11	Regular Bill				$20694.21	$10144.66	33			
09-01-08	Late Payment Charge		$310.41							
09-01-13	ELECTRIC SERVICE		$8769.65					83553	168	
09-01-13	Regular Bill				$29774.27	$21004.62	33			
09-01-19	Payment			$15002.89						
09-01-28	Payment			$20694.21						
09-02-11	ELECTRIC SERVICE		$9650.62					72668	209	
09-02-11	Regular Bill				$3727.79		29			
09-02-26	Payment			$9080.06						
09-03-12	ELECTRIC SERVICE		$8485.80					76096	225	
09-03-12	Regular Bill				$3133.53		29			
09-03-19	Payment			$3727.79						
09-04-14	ELECTRIC SERVICE		$7128.68					84751	166	
09-04-14	Regular Bill				$6534.42		33			
09-04-28	Payment			$3133.53						
09-05-12	Late Payment Charge		$51.01							
09-05-13	CANCELED ELECTRIC SERVICE		$6196.04					42633	229	
09-05-13	Regular Bill				$9647.94	$3451.90	29			
09-05-22	Payment			$6534.42						
09-06-02	ELECTRIC SERVICE		$5095.62					28705	209	
09-06-02	Adjustment			$6196.04						
09-06-02	Regular Bill				$2013.10		29			
09-06-08	Payment			$9647.94						
09-06-12	ELECTRIC SERVICE		$5334.63					32847	214	
09-06-12	Regular Bill					$-2300.21	30			
09-06-22	Payment			$2013.10						
09-07-15	ELECTRIC SERVICE		$5810.36					36444	216	
09-07-15	Regular Bill				$1497.05		33			
09-08-04	Payment			$1497.05						
09-08-12	ELECTRIC SERVICE		$5701.90					34310	214	
09-08-12	Regular Bill				$5701.90		28			
09-08-28	Payment			$5701.90						
09-09-11	ELECTRIC SERVICE		$5356.13					28877	209	
09-09-11	Regular Bill				$5356.13		30			
09-10-05	Payment			$5356.13						

CUAR038

Account Activity Statement

DATE	CHARGE TYPE	ACTUAL CHARGE	CHARGE AMOUNT	CREDIT AMOUNT	TOTAL BILL	PREVIOUS BALANCE	DAYS USED	KWH	KW	THERMS
09-10-12	Regular Bill				$7853.31		29			
09-10-12	ELECTRIC SERVICE		$7853.31					84962	174	

Project Name: Town of Hamburg - Town Hall
Project Address: 6100 South Park Avenue
Hamburg, NY 14075
Facility Area: 35,763 sq.ft.

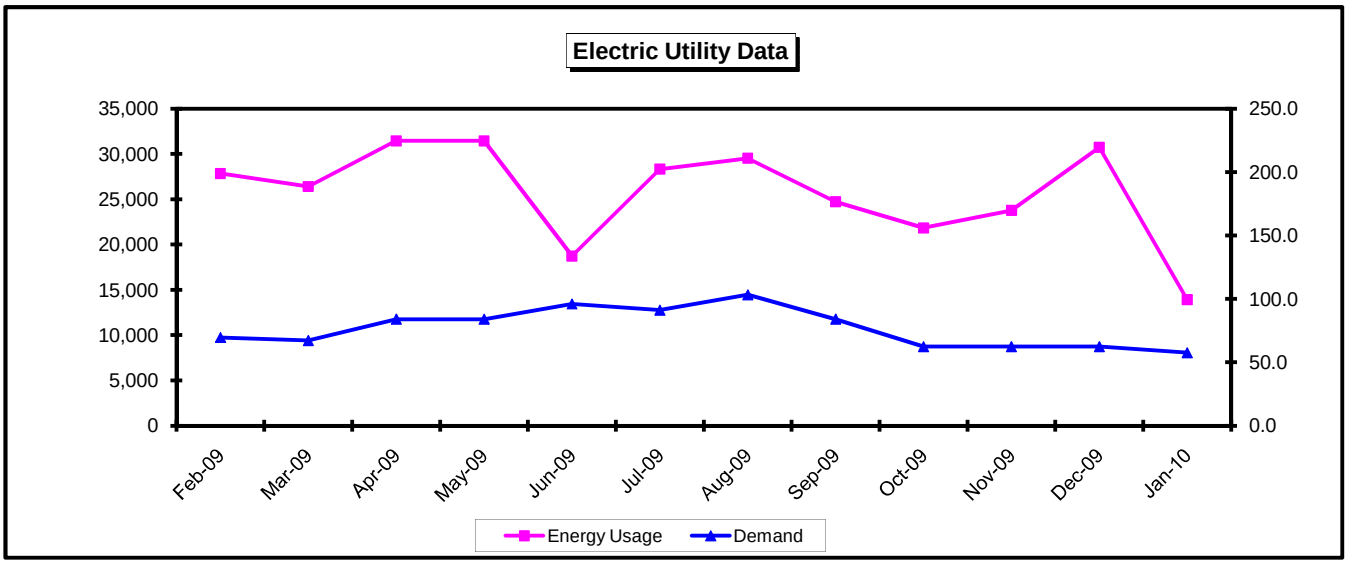
Utility Company: NYSEG
Acct. No.: 1001-3106-801
Date: 8/19/2010

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009-2010								
Feb-09	69.6	$557	27,840	$1,924	$2,481	30	720	0.56
Mar-09	67.2	$538	26,400	$1,505	$2,042	28	672	0.58
Apr-09	84.0	$672	31,440	$1,628	$2,300	34	816	0.46
May-09	84.0	$672	31,440	$1,969	$2,641	30	720	0.52
Jun-09	96.0	$768	18,720	$995	$1,763	30	720	0.27
Jul-09	91.2	$730	28,320	$1,844	$2,573	31	744	0.42
Aug-09	103.2	$826	29,520	$2,013	$2,838	27	648	0.44
Sep-09	84.0	$672	24,720	$1,582	$2,254	30	720	0.41
Oct-09	62.4	$499	21,840	$1,413	$1,912	32	768	0.46
Nov-09	62.4	$499	23,760	$1,516	$2,015	34	816	0.47
Dec-09	62.4	$499	30,720	$2,352	$2,851	30	720	0.68
Jan-10	57.6	$461	13,920	$788	$1,249	29	696	0.35
Avg./Totals:	**77.0**	**$7,392**	**308,640**	**19,529**	**$26,921**	**365**	**8,760**	**0.47**

Energy Intensity (kWh/sq.ft.):	**8.63**	**Avg. Cost/kWh:**	**$0.063**
Blended Cost (inc.demand)/kWh:	**$0.087**	**Avg. Cost/kW:**	**$8.00**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



NYSEG
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	TOWN OF HAMBURG
Account Number:	1001-3106-801
Statement Date:	January 29, 2010
Amount Due:	**$1,249.05**

Service Address: 6100 S PARK AVE TOWN HALL, HAMBURG NY 14075
Next Scheduled Read Date: On or about February 26, 2010

Account Summary

Previous invoice	$2,851.07
Payments received as of 01/28/10	-2,851.07
Balance forward	0.00
Energy charges	1,249.05
Payment due upon receipt.	$1,249.05

To avoid a 1.5% late payment charge, please make payment by the "Last Day to Pay" date displayed below.

Municipal

See details beginning on page 3

See messages on page 2

Contribute to Project SHARE by adding $1, $2 or $5 to the full amount of your payment. Your charitable gift is tax-deductible.

Please return bottom portion with your payment. Make checks payable to NYSEG.

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NYSEG
P.O. Box 5600
Ithaca, NY 14852-5600

Account Number
10013106801
Last Day to Pay
02/21/10
Amount Due
$1,249.05
Amount Paid
$

TOWN OF HAMBURG
TOWN HALL
BUILDING & GROUNDS DEPT
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Please do not write below this line.

7010013106801000012490500001249 05

NYSEG
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	TOWN OF HAMBURG
Account Number:	1001-3106-819
Statement Date:	December 02, 2009
Amount Due:	**$1,597.98**

Service Address: 6100 S PARK AVE TOWN GAR, HAMBURG NY 14075
Next Scheduled Read Date: On or about December 30, 2009

Account Summary

Previous invoice	$1,454.73
Payments received as of 12/01/09	-1,454.73
Balance forward	0.00
Energy charges	1,597.98
Payment due upon receipt.	$1,597.98

To avoid a 1.5% late payment charge, please make payment by the "Last Day to Pay" date displayed below.

Municipal

See details beginning on page 3

See messages on page 2

Contribute to Project SHARE by adding $1, $2 or $5 to the full amount of your payment. Your charitable gift is tax-deductible.

Please return bottom portion with your payment. Make checks payable to NYSEG.

NYSEG
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NYSEG
P.O. Box 5600
Ithaca, NY 14852-5600

Account Number
10013106819
Last Day to Pay
12/25/09
Amount Due
$1,597.98
Amount Paid
$

TOWN OF HAMBURG
TOWN HALL GARAGE
BUILDING & GROUNDS DEPT
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Please do not write below this line.

30100131068190000159798000015979 8

NYSEG Billing History

Account Number 1001-3106-801
Customer Name TOWN OF HAMBURG
Service Address 6100 S PARK AVE TOWN HALL
Service Address HAMBURG NY 14075

Electric Meter NGE0055158918

Read Date	Previous Read	kWh Usage	kW Usage	Tax	Usage Amount w/ Tax
1/28/2010	1/9/2010	13920	57.6	$0.00	$1,249.05
1/8/2010	12/2/2009	30720	62.4	$0.00	$2,851.07
12/1/2009	10/28/2009	23760	62.4	$0.00	$2,015.23
10/27/2009	9/26/2009	21840	62.4	$0.00	$1,911.83
9/25/2009	8/27/2009	24720	84.0	$0.00	$2,254.44
8/26/2009	7/31/2009	29520	103.2	$0.00	$2,838.18
7/30/2009	6/30/2009	28320	91.2	$0.00	$2,573.43
6/29/2009	6/9/2009	18720	96.0	$0.00	$1,763.25
6/8/2009	5/1/2009	31440	84.0	$0.00	$2,641.40
4/30/2009	3/28/2009	31440	84.0	$0.00	$2,300.27
3/27/2009	2/28/2009	26400	67.2	$0.00	$2,042.23
2/27/2009	1/31/2009	27840	69.6	$0.00	$2,481.07
1/30/2009	1/3/2009	27840	69.6	$0.00	$3,010.51
1/2/2009	12/2/2008	34080	74.4	$0.00	$3,264.73
12/1/2008	10/29/2008	30720	67.2	$0.00	$3,041.83
10/28/2008	9/27/2008	26160	64.8	$0.00	$2,691.05
9/26/2008	8/29/2008	24960	86.4	$0.00	$3,009.83
8/28/2008	8/1/2008	27840	81.6	$0.00	$3,351.88
7/31/2008	6/28/2008	40560	96.0	$0.00	$5,925.47
6/27/2008	5/31/2008	30720	105.6	$0.00	$4,477.75
5/30/2008	4/30/2008	24480	64.8	$0.00	$2,782.30
4/29/2008	4/1/2008	25440	69.6	$0.00	$3,054.92
3/31/2008	3/4/2008	24720	62.4	$0.00	$2,880.94
3/3/2008	2/1/2008	29280	67.2	$0.00	$3,314.32
	Totals	655440	N/A	$0.00	$67,726.98

Project Name: Town of Hamburg - Proshop
Project Address: 6374 Boston State Road
Hamburg, NY 14075
Facility Area: 6,570 sq.ft.

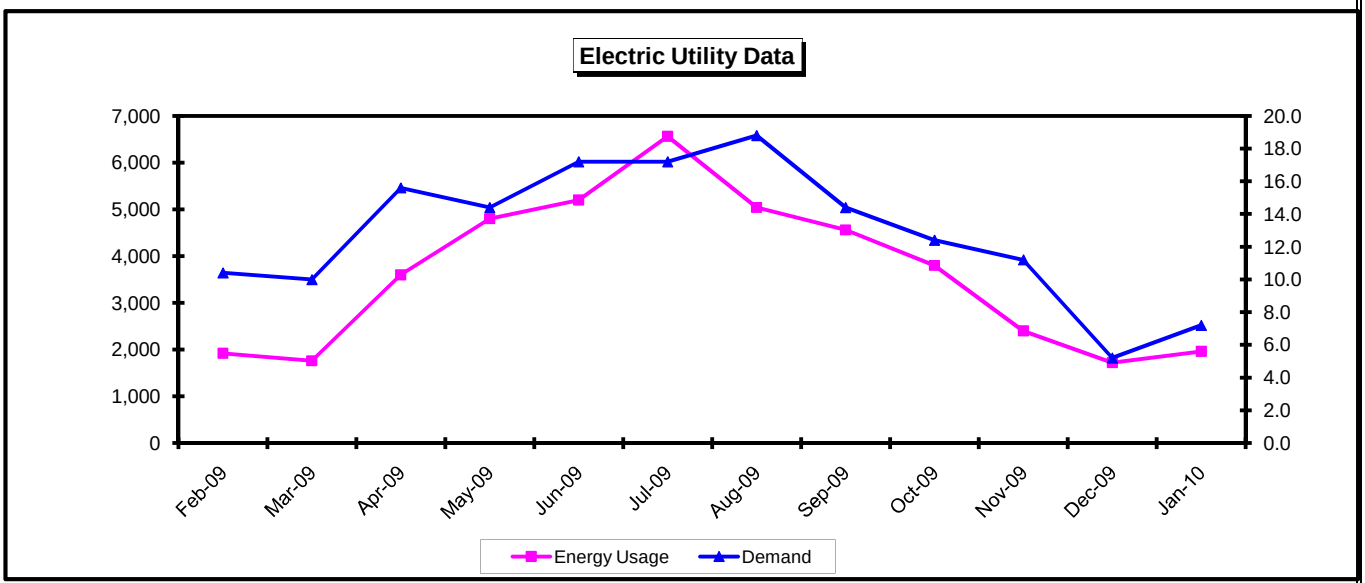
Utility Company: NYSEG
Acct. No.: 1001-0073-541
Date: 8/19/2010

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009-2010								
Mar-09	10.4	$83	1,920	$143	$226	30	720	0.26
Apr-09	10.0	$80	1,760	$121	$201	29	696	0.25
May-09	15.6	$125	3,600	$197	$321	29	696	0.33
Jun-09	14.4	$115	4,800	$284	$399	32	768	0.43
Jul-09	17.2	$138	5,200	$348	$486	29	696	0.43
Aug-09	17.2	$138	6,560	$434	$572	33	792	0.48
Sep-09	18.8	$150	5,040	$356	$506	29	696	0.39
Oct-09	14.4	$115	4,560	$302	$418	30	720	0.44
Nov-09	12.4	$99	3,800	$262	$361	32	768	0.40
Dec-09	11.2	$90	2,400	$167	$257	31	744	0.29
Jan-10	5.2	$42	1,720	$139	$181	34	816	0.41
Feb-10	7.2	$58	1,960	$149	$207	27	648	0.42
Avg./Totals:	**12.8**	**$1,232**	**43,320**	**2,903**	**$4,135**	**365**	**8,760**	**0.38**

Energy Intensity (kWh/sq.ft.):	**6.59**	**Avg. Cost/kWh:**	**$0.067**
Blended Cost (inc.demand)/kWh:	**$0.095**	**Avg. Cost/kW:**	**$8.00**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



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	TOWN OF HAMBURG
Account Number:	1001-0073-541
Statement Date:	February 03, 2010
Amount Due:	$207.08

Service Address: 6374 BOSTON STATE RD, HAMBURG NY 14075
Next Scheduled Read Date: On or about March 03, 2010

Account Summary

Previous invoice	$180.64
Payments received as of 02/02/10	-180.64
Balance forward	0.00
Energy charges	207.08
Payment due upon receipt.	$207.08

To avoid a 1.5% late payment charge, please make payment by the "Last Day to Pay" date displayed below.

Municipal

See details beginning on page 3

See messages on page 2

Contribute to Project SHARE by adding $1, $2 or $5 to the full amount of your payment. Your charitable gift is tax-deductible.

Please return bottom portion with your payment. Make checks payable to NYSEG.

NYSEG
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NYSEG
P.O. Box 5600
Ithaca, NY 14852-5600

Account Number
10010073541
Last Day to Pay
02/26/10
Amount Due
$207.08
Amount Paid
$ 207.08

TOWN OF HAMBURG
BUILDING & GROUNDS DEPT
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Please do not write below this line.

NYSEG
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TOWN OF HAMBURG
Account Number: 1001-0073-541
Statement Date: February 03, 2010

Service Address: 6374 BOSTON STATE RD, HAMBURG NY 14075

NYSEG DETAILED ACCOUNT ACTIVITY

Electricity Service *- Nonresidential*
Electricity Rate *- 12002 NYSEG Supply Service*

Service from: 01/07/10 - 02/02/10
PoD ID: N01000000261602

Meter Number	Current Meter Read Date	Reading	Previous Meter Read Date	Reading	Reading Difference	Meter Multr	Billed Usage	Billing Period
43690442	02/02/10	18728 A	01/07/10	18679 A	49	40	1960 kwh	27 days
43690442	02/02/10	63.95 A	01/07/10	63.77 A	0.18	40	7.20 kw	27 days

Type of read: A - Actual, E - Estimate, C - Customer and N - No read

Electricity Delivery Charges

Basic service charge					5.66
Bill issuance charge					0.89
Meter charge					2.03
Meter service charge					2.84
Meter data service charge					2.58
Demand charge	7.2000	kw	@	8.00	57.60
Delivery charge	1960	kwh	@	0.00416	8.15
Transition charge	1960	kwh	@	-0.00231259	-4.53
NY state assessment	1960	kwh	@	0.00238	4.66
SBC/RPS charge	1960	kwh	@	0.0042	8.23
Subtotal Electricity Delivery					$88.11

Electricity Supply Charges

Variable supply charge	1960	kwh	@	0.05789967	113.48
Merchant function charge	1960	kwh	@	0.0028	5.49
Subtotal Electricity Supply					$118.97

Total Electricity Cost **$207.08**

Total Energy Charges **$207.08**

NYSEG Billing History

Account Number 1001-0073-541
Customer Name TOWN OF HAMBURG
Service Address 6374 BOSTON STATE RD
Service Address HAMBURG NY 14075

Electric Meter NLG0043690442

Read Date	Previous Read	kWh Usage	kW Usage	Tax	Usage Amount w/ Tax
2/2/2010	1/7/2010	1960	7.2	$0.00	$207.08
1/6/2010	12/4/2009	1720	5.2	$0.00	$180.64
12/3/2009	11/3/2009	2400	11.2	$0.00	$256.90
11/2/2009	10/2/2009	3800	12.4	$0.00	$361.14
10/1/2009	9/1/2009	4560	14.4	$0.00	$417.65
8/31/2009	8/4/2009	5040	18.8	$0.00	$506.01
8/3/2009	7/2/2009	6560	17.2	$0.00	$572.08
7/1/2009	6/3/2009	5200	17.2	$0.00	$485.74
6/2/2009	5/2/2009	4800	14.4	$0.00	$399.48
5/1/2009	4/3/2009	3600	15.6	$0.00	$321.31
4/2/2009	3/5/2009	1760	10.0	$0.00	$200.88
3/4/2009	2/5/2009	1920	10.4	$0.00	$225.80
2/4/2009	1/6/2009	2240	10.0	$0.00	$288.44
1/5/2009	12/6/2008	1960	6.4	$0.00	$215.25
12/5/2008	11/4/2008	2440	11.2	$0.00	$304.08
11/3/2008	10/3/2008	3880	12.4	$0.00	$426.77
10/2/2008	9/5/2008	4720	17.6	$0.00	$577.71
9/4/2008	8/5/2008	6520	19.2	$0.00	$789.05
8/4/2008	7/3/2008	7680	19.2	$0.00	$1,132.13
7/2/2008	6/3/2008	6120	20.0	$0.00	$910.50
6/2/2008	5/2/2008	4400	12.8	$0.00	$517.75
5/1/2008	4/3/2008	3960	16.4	$0.00	$531.47
4/2/2008	3/5/2008	2280	10.0	$0.00	$314.63
3/4/2008	2/5/2008	2360	9.2	$0.00	$311.89
	Totals	91880	N/A	$0.00	$10,454.38

02/12/2010 18:24 FAX 1 800 87 5947 NYSEG CARE CENTER

Project Name: Town of Hamburg - Pro Shop Summer
Project Address: 6374 Boston State Road
Hamburg, NY 14075
Facility Area: 3,270 sq.ft.

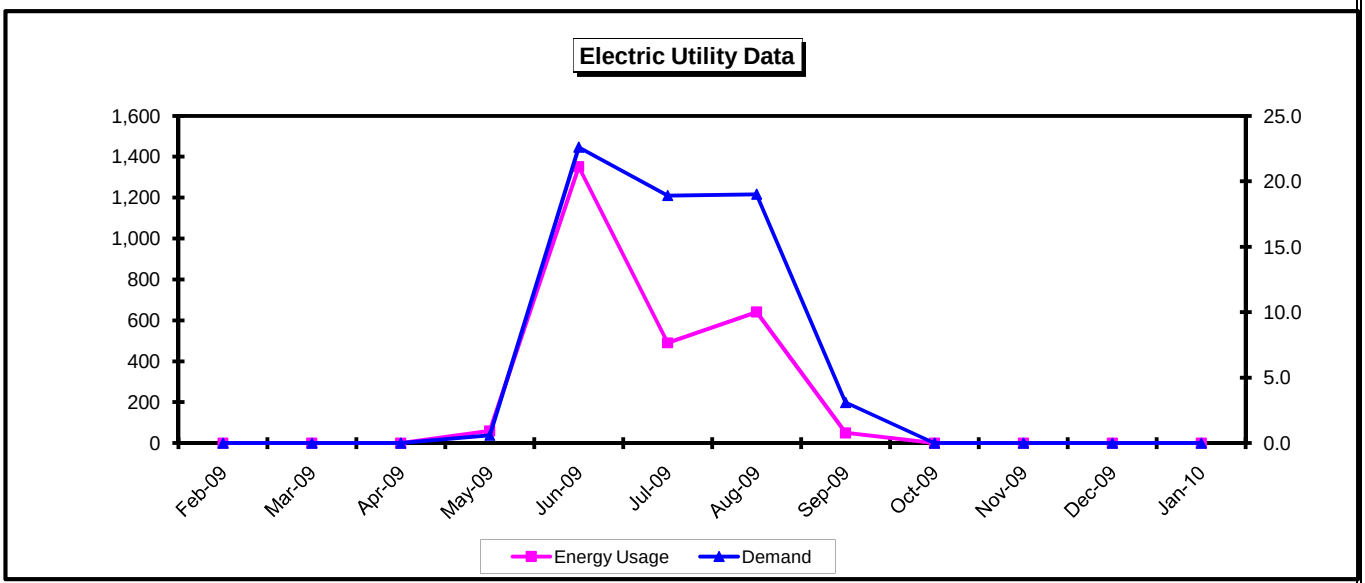
Utility Company: NYSEG
Acct. No.: 1001-0073-525
Date: 8/19/2010

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009-2010								
Feb-09	0.0	$0	0	$14	$14	30	720	-
Mar-09	0.0	$0	0	$14	$14	28	672	-
Apr-09	0.0	$0	0	$14	$14	34	816	-
May-09	0.6	$0	59	$22	$22	29	696	0.14
Jun-09	22.6	$0	1,351	$271	$271	31	744	0.08
Jul-09	18.9	$0	490	$253	$253	31	744	0.03
Aug-09	19.0	$0	641	$217	$217	27	648	0.05
Sep-09	3.1	$0	50	$44	$44	30	720	0.02
Oct-09	0.0	$0	0	$14	$14	32	768	-
Nov-09	0.0	$0	0	$14	$14	34	816	-
Dec-09	0.0	$0	0	$14	$14	31	744	-
Jan-10	0.0	$0	0	$28	$28	28	672	-
Avg./Totals:	**5.4**	**$0**	**2,591**	**919**	**$919**	**365**	**8,760**	**0.03**

Energy Intensity (kWh/sq.ft.):	**0.79**	**Avg. Cost/kWh:**	**$0.355**
Blended Cost (inc.demand)/kWh:	**$0.355**	**Avg. Cost/kW:**	**$0.00**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



NYSEG
Reliable. Essential.

	HAMBURG GOLF COURSE
Account Number:	1001-0073-525
Statement Date:	February 04, 2010
Amount Due:	$28.00

Service Address: 6374 BOSTON STATE RD, HAMBURG NY 14075
Next Scheduled Read Date: On or about March 03, 2010

Account Summary

Previous invoice	$14.00
Payments received as of 02/04/10	-14.00
Balance forward	0.00
Energy charges	28.00
Payment due upon receipt.	$28.00

To avoid a 1.5% late payment charge, please make payment by the "Last Day to Pay" date displayed below.

Municipal

Meter Exchange

See details beginning on page 3

See messages on page 2

Contribute to Project SHARE by adding $1, $2 or $5 to the full amount of your payment. Your charitable gift is tax-deductible.

Please return bottom portion with your payment. Make checks payable to NYSEG.

NYSEG
Reliable. Essential.

NYSEG
P.O. Box 5600
Ithaca, NY 14852-5600

Account Number
10010073525
Last Day to Pay
02/27/10
Amount Due
$28.00
Amount Paid
$ 28.00

HAMBURG GOLF COURSE
TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Please do not write below this line.

7010010073525000000280000000002800

NYSEG
Reliable. Essential.

HAMBURG GOLF COURSE
Account Number: 1001-0073-525
Statement Date: February 04, 2010

Service Address: 6374 BOSTON STATE RD, HAMBURG NY 14075

NYSEG DETAILED ACCOUNT ACTIVITY

Electricity Service *- Nonresidential*
Electricity Rate *- 12002 NYSEG Supply Service*

Service from: 12/04/09 - 02/03/10
PoD ID: N01000000229294

Meter Number	Current Meter Read Date	Reading	Previous Meter Read Date	Reading	Reading Difference	Billed Usage	Billing Period
03715499	01/11/10	3465 E	12/04/09	3465 A	0	0 kwh	39 days
02465103	02/03/10	0 A	01/12/10	0 A	0	0 kwh	23 days
03715499	02/03/10	64.17 E	12/04/09	64.17 A	0.00	0.00 kw	62 days

Type of read: A - Actual, E - Estimate, C - Customer and N - No read

Electricity Delivery Charges

Basic service charge	5.66	@ 2.000000	11.32
Bill issuance charge	0.89	@ 2.000000	1.78
Meter charge	2.03	@ 2.000000	4.06
Meter service charge	2.84	@ 2.000000	5.68
Meter data service charge	2.58	@ 2.000000	5.16
Subtotal Electricity Delivery			$28.00
Total Electricity Cost			**$28.00**
Total Energy Charges			**$28.00**

NYSEG Billing History

Account Number 1001-0073-525
Customer Name HAMBURG GOLF COURSE
Service Address 6374 BOSTON STATE RD
Service Address HAMBURG NY 14075

Electric Meter NAB0005275490

Read Date	Previous Read	kWh Usage	kW Usage	Tax	Usage Amount w/ Tax
2/3/2010	12/4/2009	0	0.0	$0.00	$28.00
12/3/2009	11/3/2009	0	0.0	$0.00	$14.00
11/2/2009	10/1/2009	0	0.0	$0.00	$14.00
9/30/2009	9/1/2009	0	0.0	$0.00	$14.00
8/31/2009	8/4/2009	50	3.1	$0.00	$44.22
8/3/2009	7/2/2009	641	19.0	$0.00	$217.14
7/1/2009	6/3/2009	490	18.9	$0.00	$252.90
6/2/2009	5/2/2009	1351	22.6	$0.00	$270.91
5/1/2009	4/3/2009	59	0.6	$0.00	$21.80
4/2/2009	3/5/2009	0	0.0	$0.00	$14.00
3/4/2009	2/4/2009	0	0.0	$0.00	$14.00
2/3/2009	1/10/2009	0	0.0	$0.00	$14.00
1/9/2009	12/6/2008	0	0.0	$0.00	$14.00
12/5/2008	11/4/2008	68	0.3	$0.00	$21.75
11/3/2008	10/3/2008	121	0.2	$0.00	$25.39
10/2/2008	9/5/2008	921	17.3	$0.00	$234.84
9/4/2008	8/5/2008	1217	16.9	$0.00	$265.27
8/4/2008	7/3/2008	1529	17.5	$0.00	$346.27
7/2/2008	6/3/2008	1041	17.6	$0.00	$279.92
6/2/2008	5/2/2008	378	16.7	$0.00	$181.84
5/1/2008	4/3/2008	128	13.1	$0.00	$131.21
4/2/2008	3/5/2008	109	0.2	$0.00	$25.90
3/4/2008	2/3/2008	116	0.3	$0.00	$27.07
	Totals	2591	N/A	$0.00	$932.97

Project Name: Town of Hamburg - Highway Department
Project Address: 2720 Lakeview RD
Hamburg NY, 14075
Facility Area: 27,016 sq.ft.

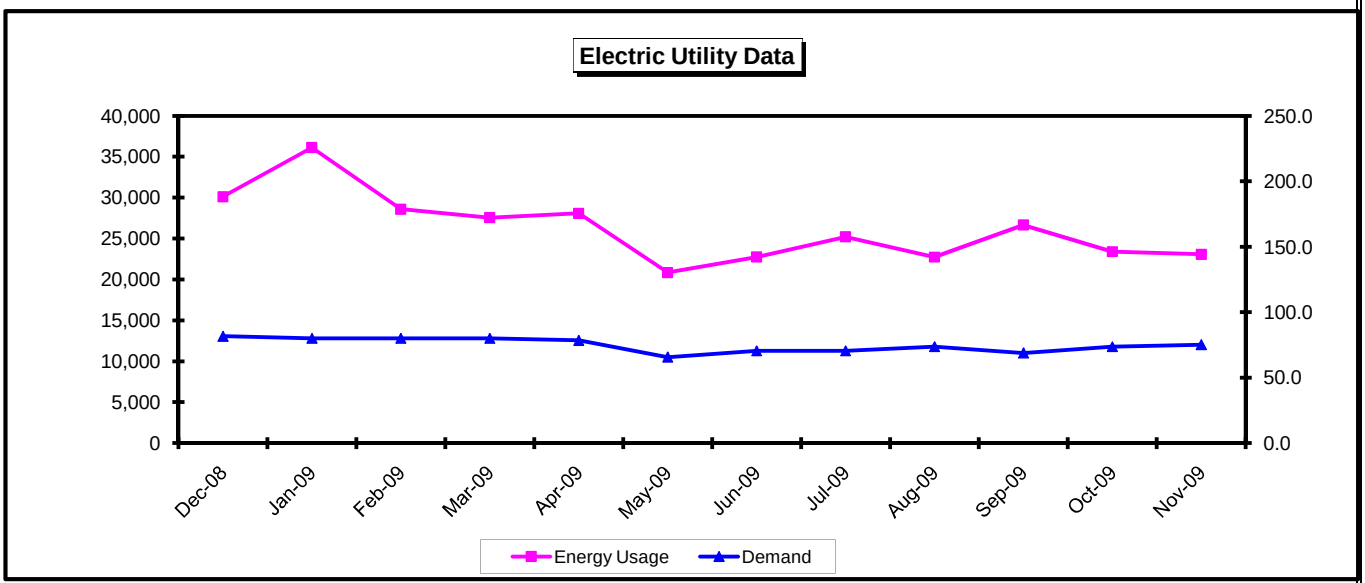
Utility Company: National Grid
Acct. No.: 16349-39102
Date: 8/19/2010

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009-2010								
Dec-08	81.6	$824	30,124	$2,781	$3,586	30	720	0.51
Jan-09	80.0	$808	36,124	$3,259	$4,049	31	744	0.61
Feb-09	80.0	$808	28,594	$2,422	$3,211	31	744	0.48
Mar-09	80.0	$808	27,554	$1,849	$2,638	30	720	0.48
Apr-09	78.4	$792	28,081	$1,609	$2,383	33	792	0.45
May-09	65.6	$663	20,853	$1,388	$2,044	29	696	0.46
Jun-09	70.4	$711	22,747	$1,473	$2,174	30	720	0.45
Jul-09	70.4	$750	25,205	$1,682	$2,422	33	792	0.45
Aug-09	73.6	$805	22,732	$1,464	$2,256	28	672	0.46
Sep-09	68.8	$753	26,653	$1,721	$2,465	30	720	0.54
Oct-09	73.6	$805	23,399	$1,567	$2,359	29	696	0.46
Nov-09	75.2	$823	23,076	$1,522	$2,330	31	744	0.41
Avg./Totals:	**74.8**	**$9,350**	**315,142**	**22,740**	**$31,915**	**365**	**8,760**	**0.48**

Energy Intensity (kWh/sq.ft.):	**11.67**	**Avg. Cost/kWh:**	**$0.072**
Blended Cost (inc.demand)/kWh:	**$0.101**	**Avg. Cost/kW:**	**$10.42**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



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SERVICE FOR
TOWN OF HAMBURG HIGHWAY DEPT
2720 LAKEVIEW RD
HAMBURG NY 14075

BILLING PERIOD
Oct 21, 2009 to Nov 19, 2009

ACCOUNT NUMBER	PLEASE PAY BY	AMOUNT DUE
16349-39102	Dec 16, 2009	$ 2,329.62

C & I BUSINESS TEAM M-F 8-5
1-800-664-6729

AUTOMATED SERVICES
1-888-932-0301

GAS OR ELECTRIC EMERGENCIES
1-800-892-2345
(Does not replace 911 emergency medical service)

POWER OUTAGE OR DOWNED LINE
1-800-867-5222

ADDRESS
300 Erie Blvd West
Syracuse, NY 13202

DATE BILL ISSUED
Nov 20, 2009

ACCOUNT BALANCE

Previous Balance		2,358.70
Payment Received on NOV 10 (*Check*)	*THANK YOU*	- 2,358.70
Current Charges		+ 2,329.62
	Amount Due ▶	$ 2,329.62

To avoid late payment charges of 1.5%, $ 2,329.62 must be received by Dec 16 2009.

SUMMARY OF CURRENT CHARGES

	DELIVERY SERVICES	SUPPLY SERVICES	TOTAL
Electric Service	1,239.74	1,089.88	2,329.62
Total Current Charges	**$ 1,239.74**	**$ 1,089.88**	**$ 2,329.62**

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★ **WILL WE BE ABLE TO REACH YOU DURING A POWER OUTAGE?:** During a power outage, phones with a direct link to a local phone line are able to operate. Phones that are **not** directly linked (for example, wireless phones with answering machines) need electricity to make/receive calls. If you would like to register another phone number, such as a cell phone, as your account's primary phone number, please go to www.nationalgridus.com/myaccount to update your information so that we may be able to reach you with important information during power outages.

Enrollment Information

To enroll with a supplier or change to another supplier, you will need the following information about your account:
Loadzone Frontier
Acct No: 16349-39102 Cycle: 15, TOWN

Electric Usage History

Month	kWh	Month	kWh
Nov 08	25600	Jun 09	22747
Dec 08	30924	Jul 09	25205
Jan 09	36124	Aug 09	22732
Feb 09	28594	Sep 09	26653
Mar 09	27554	Oct 09	23399
Apr 09	28081	Nov 09	23076
May 09	20853		

Billed Demand Last 12 months

Minimum	65.6
Maximum	83.2
Average	75.0666

RECEIVED
DEC 01 2009
TOWN OF HAMBURG
HIGHWAY DEPT.

KEEP THIS PORTION FOR YOUR RECORDS

RETURN THIS PORTION WITH YOUR PAYMENT.

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ACCOUNT NUMBER	PLEASE PAY BY	AMOUNT DUE
16349-39102	Dec 16, 2009	$ 2,329.62

300 Erie Blvd West
Syracuse NY 13202

ENTER AMOUNT ENCLOSED
$ 2,329.62

Write account number on check and make payable to National Grid

***AUTO**SCH 3-DIGIT 140
TOWN OF HAMBURG HIGHWAY DEPT
2720 LAKEVIEW RD
LAKE VIEW NY 14085-9612

05509

NATIONAL GRID
PO BOX 1303
BUFFALO NY 14240

000232962 16349391029000232962350

Project Name: Town of Hamburg - Town Park Fitness Center
Project Address: 4420 Lake Shore Road
Hamburg, NY 14075
Facility Area: 3,060 sq.ft.

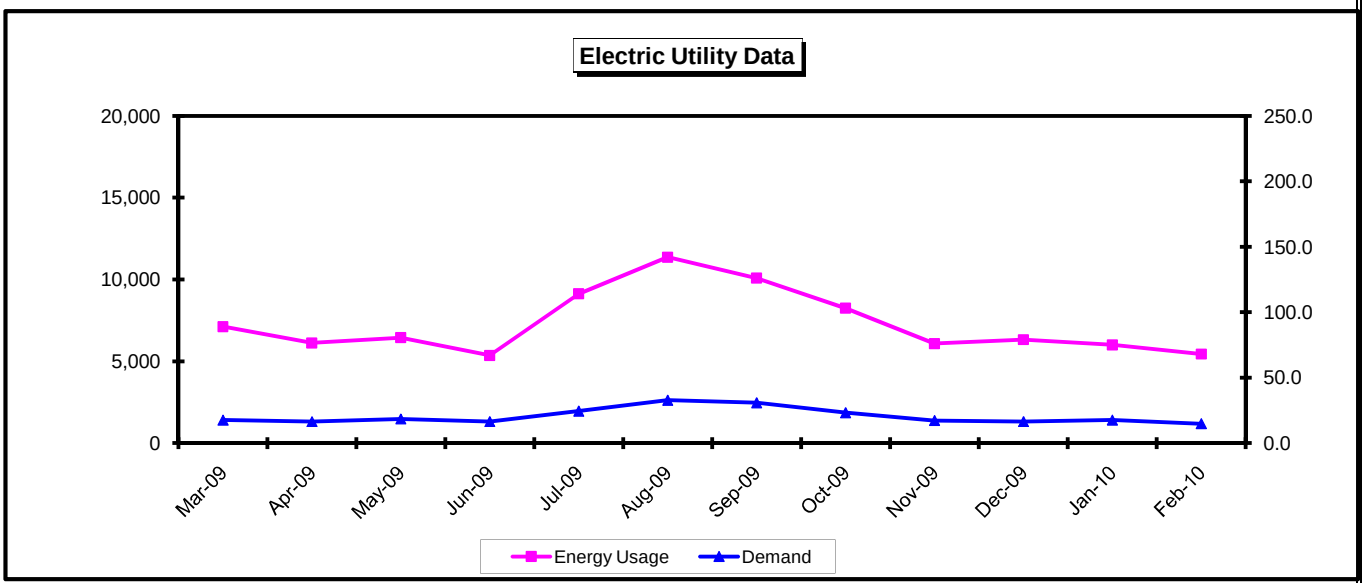
Utility Company: National Grid
Acct. No.: 12449-01103
Date: 8/19/2010

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009-2010								
Mar-09	17.6	$141	7,120	$628	$769	30	720	0.56
Apr-09	16.4	$131	6,120	$473	$604	30	720	0.52
May-09	18.4	$147	6,440	$507	$654	32	768	0.46
Jun-09	16.4	$131	5,360	$451	$582	29	696	0.47
Jul-09	24.4	$195	9,120	$745	$941	30	720	0.52
Aug-09	32.8	$262	11,360	$890	$1,153	32	768	0.45
Sep-09	30.8	$246	10,080	$835	$1,082	29	696	0.47
Oct-09	23.2	$186	8,240	$658	$843	30	720	0.49
Nov-09	17.2	$138	6,080	$540	$677	31	744	0.48
Dec-09	16.4	$131	6,320	$515	$646	31	744	0.52
Jan-10	17.6	$141	6,000	$584	$725	33	792	0.43
Feb-10	14.8	$118	5,440	$578	$696	29	696	0.53
Avg./Totals:	**20.5**	**$1,968**	**87,680**	**7,404**	**$9,372**	**366**	**8,784**	**0.49**

Energy Intensity (kWh/sq.ft.):	**28.65**	**Avg. Cost/kWh:**	**$0.084**
Blended Cost (inc.demand)/kWh:	**$0.107**	**Avg. Cost/kW:**	**$8.00**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



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SERVICE FOR
TOWN OF HAMBURG - TOWN PARK CASINO
4420 LAKE SHORE RD
HAMBURG NY 14075

BILLING PERIOD
Dec 2, 2009 to Jan 4, 2010

ACCOUNT NUMBER	PLEASE PAY BY	AMOUNT DUE
12449-01103	Jan 30, 2010	$ 1,370.68

C & I BUSINESS TEAM M-F 8-5
1-800-664-6729

AUTOMATED SERVICES
1-888-932-0301

GAS OR ELECTRIC EMERGENCIES
1-800-892-2345
(Does not replace 911 emergency medical service)

POWER OUTAGE OR DOWNED LINE
1-800-867-5222

ADDRESS
300 Erie Blvd West
Syracuse, NY 13202

DATE BILL ISSUED
Jan 6, 2010

Enrollment Information

To enroll with a supplier or change to another supplier, you will need the following information about your account:
Loadzone Frontier
Acct No: 12449-01103 Cycle: 5, TOWN

Electric Usage History

Month	kWh	Month	kWh
Jan 09	7080	Aug 09	11360
Feb 09	7880	Sep 09	10080
Mar 09	7120	Oct 09	8240
Apr 09	6120	Nov 09	6080
May 09	6440	Dec 09	6320
Jun 09	5360	Jan 10	6000
Jul 09	9120		

Billed Demand Last 12 months

Minimum	18.4
Maximum	32.8
Average	20.7666

▶ DID YOU FORGET? ◀

The total amount due includes an unpaid balance from a previous bill. If you have already paid this balance, please disregard this message. Thank You.

ACCOUNT BALANCE

Previous Balance	646.00
Payment Received *No payments have been received during this billing period*	- 0.00
Balance Forward	**646.00**
Current Charges	+ 724.68
Amount Due ▶	**$ 1,370.68**

To avoid late payment charges of 1.5%, $ 1,370.68 must be received by Jan 30 2010.

SUMMARY OF CURRENT CHARGES

	DELIVERY SERVICES	SUPPLY SERVICES	OTHER CHARGES/ ADJUSTMENTS	TOTAL
Electric Service	385.23	329.76		714.99
Other Charges/Adjustments			9.69	9.69
Total Current Charges	**$ 385.23**	**$ 329.76**	**$ 9.69**	**$ 724.68**

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★ **WILL WE BE ABLE TO REACH YOU DURING A POWER OUTAGE?:** During a power outage, phones with a direct link to a local phone line are able to operate. Phones that are not directly linked (for example, wireless phones with answering machines) need electricity to make/receive calls. If you would like to register another phone number, such as a cell phone, as your account's primary phone number, please go to www.nationalgridus.com/myaccount to update your information so that we may be able to reach you with important information during power outages.

KEEP THIS PORTION FOR YOUR RECORDS.

RETURN THIS PORTION WITH YOUR PAYMENT.

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ACCOUNT NUMBER	PLEASE PAY BY	AMOUNT DUE
12449-01103	Jan 30, 2010	$ 1,370.68 *includes amount past due*

▶ DID YOU FORGET ? ◀

300 Erie Blvd West
Syracuse NY 13202

ENTER AMOUNT ENCLOSED
$ 1,370.68

Write account number on check and make payable to National Grid

***AUTO**SCH 3-DIGIT 140
TOWN OF HAMBURG - TOWN PARK
CASINO
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

05365

NATIONAL GRID
PO BOX 1303
BUFFALO NY 14240

000072468 1244901103100013706 8030

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www.nationalgridus.com/paperless

▶ For Your Information

The following charges are already included in the "Delivery Services" portion of your bill. If you were to choose an alternate supplier, billing charges may be included, instead, in that suppliers' charges.

Billing Services

Billing	.53
Total Billing Services	**$.53**

Your Account: Electric History

Name: TOWN OF HAMBURG - TOWN PARK
Account Number: 1244901103 [VIEW ANOTHER ACCOUNT]
Service Address: 4420 LAKE SHORE RD HAMBURG NY 14075

Details | Electric History | Processed Payment History

Read Date & Days	Read Type	Total kWh	Utility Charges	Supplier Charges	Late Payment Charges	Total Charges	Metered Peak kW	Billed Peak kW	Load Factor
02/02/2010 29 days	Actual	5,440	$696.12	$0.00	$0.00	$696.12	14.80	14.80	0.5281
01/04/2010 33 days	Actual	6,000	$714.99	$0.00	$9.54	$724.53	17.60	17.60	0.4304
12/02/2009 33 days	Actual	6,320	$635.84	$0.00	$10.16	$646.00	16.40	16.40	0.4865
10/30/2009 29 days	Actual	6,080	$677.34	$0.00	$0.00	$677.34	17.20	17.20	0.5078
10/01/2009 30 days	Actual	8,240	$843.20	$0.00	$0.00	$843.20	23.20	23.20	0.4932
09/01/2009 29 days	Actual	10,080	$1,081.52	$0.00	$0.00	$1,081.52	30.80	30.80	0.4702
08/03/2009 32 days	Actual	11,360	$1,152.55	$0.00	$0.00	$1,152.55	32.80	32.80	0.4509
07/02/2009 30 days	Actual	9,120	$940.61	$0.00	$0.00	$940.61	24.40	24.40	0.5191
06/02/2009 29 days	Actual	5,360	$582.36	$0.00	$0.00	$582.36	16.40	16.40	0.4695
05/04/2009 32 days	Actual	6,440	$654.23	$0.00	$0.00	$654.23	18.40	18.40	0.4557
04/02/2009 30 days	Actual	6,120	$604.32	$0.00	$0.00	$604.32	16.40	16.40	0.5182
03/03/2009 29 days	Actual	7,120	$769.18	$0.00	$0.00	$769.18	17.60	17.60	0.5812
02/02/2009 31 days	Actual	7,680	$976.48	$0.00	$0.00	$976.48	18.00	18.00	0.5734
01/02/2009 31 days	Actual	7,080	$871.09	$0.00	$12.05	$883.14	17.60	17.60	0.5406
12/02/2008 33 days	Actual	6,680	$862.16	$0.00	$0.00	$862.16	18.80	18.80	0.4486
10/30/2008 30 days	Actual	5,600	$738.43	$0.00	$0.00	$738.43	16.00	16.00	0.4861
09/30/2008 28 days	Actual	5,960	$858.53	$0.00	$0.00	$858.53	19.60	19.60	0.4525
09/02/2008 33 days	Actual	9,720	$1,360.00	$0.00	$0.00	$1,360.00	24.80	24.80	0.4948
07/31/2008 31 days	Actual	10,040	$1,617.24	$0.00	$0.00	$1,617.24	26.00	26.00	0.5190
06/30/2008 31 days	Actual	7,800	$1,172.36	$0.00	$0.00	$1,172.36	19.60	19.60	0.5348
05/30/2008 30 days	Actual	5,000	$711.32	$0.00	$0.00	$711.32	14.80	14.80	0.4692
04/30/2008 29 days	Actual	4,760	$725.44	$0.00	$0.00	$725.44	14.80	14.80	0.4621
04/01/2008 29 days	Actual	5,880	$850.86	$0.00	$0.00	$850.86	16.40	16.40	0.5151
03/03/2008 31 days	Actual	6,360	$850.11	$0.00	$0.00	$850.11	17.20	17.20	0.4969

Table View
Chart View
Download Detailed Usage

Main Menu

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Your Account | For Your Home | For Your Business

Your Account: Electric History

Name: TOWN OF HAMBURG - TOWN PARK
Account Number: 1244901103 VIEW ANOTHER ACCOUNT
Service Address: 4420 LAKE SHORE RD HAMBURG NY 14075

Details | Electric History | Processed Payment History

Read Date & Days	Read Type	Total kWh	Utility Charges	Supplier Charges	Late Payment Charges	Total Charges	Metered Peak kW	Billed Peak kW	Load Factor
10/01/2009 30 days	Actual	8,240	$843.20	$0.00	$0.00	$843.20	23.20	23.20	0.4932
09/01/2009 29 days	Actual	10,080	$1,081.52	$0.00	$0.00	$1,081.52	30.80	30.80	0.4702
08/03/2009 32 days	Actual	11,360	$1,152.55	$0.00	$0.00	$1,152.55	32.80	32.80	0.4509
07/02/2009 30 days	Actual	9,120	$940.61	$0.00	$0.00	$940.61	24.40	24.40	0.5191
06/02/2009 29 days	Actual	5,360	$582.36	$0.00	$0.00	$582.36	16.40	16.40	0.4695
05/04/2009 32 days	Actual	6,440	$654.23	$0.00	$0.00	$654.23	18.40	18.40	0.4557
04/02/2009 30 days	Actual	6,120	$604.32	$0.00	$0.00	$604.32	16.40	16.40	0.5182
03/03/2009 29 days	Actual	7,120	$769.18	$0.00	$0.00	$769.18	17.60	17.60	0.5812
02/02/2009 31 days	Actual	7,680	$976.48	$0.00	$0.00	$976.48	18.00	18.00	0.5734
01/02/2009 31 days	Actual	7,080	$871.09	$0.00	$12.05	$883.14	17.60	17.60	0.5406
12/02/2008 33 days	Actual	6,680	$862.16	$0.00	$0.00	$862.16	18.80	18.80	0.4486
10/30/2008 30 days	Actual	5,600	$738.43	$0.00	$0.00	$738.43	16.00	16.00	0.4861
09/30/2008 28 days	Actual	5,960	$858.53	$0.00	$0.00	$858.53	19.60	19.60	0.4525
09/02/2008 33 days	Actual	9,720	$1,360.00	$0.00	$0.00	$1,360.00	24.80	24.80	0.4948
07/31/2008 31 days	Actual	10,040	$1,617.24	$0.00	$0.00	$1,617.24	26.00	26.00	0.5190
06/30/2008 31 days	Actual	7,800	$1,172.36	$0.00	$0.00	$1,172.36	19.60	19.60	0.5348
05/30/2008 30 days	Actual	5,000	$711.32	$0.00	$0.00	$711.32	14.80	14.80	0.4692
04/30/2008 29 days	Actual	4,760	$725.44	$0.00	$0.00	$725.44	14.80	14.80	0.4621
04/01/2008 29 days	Actual	5,880	$850.86	$0.00	$0.00	$850.86	16.40	16.40	0.5151
03/03/2008 31 days	Actual	6,360	$850.11	$0.00	$0.00	$850.11	17.20	17.20	0.4969
02/01/2008 29 days	Actual	9,040	$1,113.21	$0.00	$0.00	$1,113.21	20.80	20.80	0.6244
01/03/2008 31 days	Actual	5,400	$816.31	$0.00	$0.00	$816.31	18.40	18.40	0.3944
12/03/2007 33 days	Actual	5,960	$827.70	$0.00	$0.00	$827.70	16.00	16.00	0.4703
10/31/2007 30 days	Actual	5,160	$726.78	$0.00	$0.00	$726.78	15.20	15.20	0.4714

Table View
Chart View
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Account Management
- Account Details
- Update Contact Info.

Your Bill

View Bill
- View My Bills
- Paperless Billing

Pay My Bill
- Make a One Time Payment
- Make a Credit/DebitCard Payment - New
- Payments to be Processed
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- Report Energy Theft
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2
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For Your Home | For Your Business

Your Account: Electric History

Name: TOWN OF HAMBURG - TOWN PARK

Account Number: 1244901103 VIEW ANOTHER ACCOUNT

Service Address: 4420 LAKE SHORE RD HAMBURG NY 14075

Details | Electric History | Payment History

Read Date & Days	Read Type	Total kWh	Utility Charges	Supplier Charges	Late Payment Charges	Total Charges	Metered Peak kW	Billed Peak kW	Load Factor
04/01/2008 29 days	Actual	5,880	$850 86	$0 00	$0 00	$850.86	16 40	16.40	0 5151
03/03/2008 31 days	Actual	6,360	$850.11	$0.00	$0 00	$850.11	17 20	17 20	0 4969
02/01/2008 29 days	Actual	9,040	$1,113 21	$0 00	$0.00	$1,113 21	20.80	20 80	0 6244
01/03/2008 31 days	Actual	5,400	$816 31	$0.00	$0.00	$816.31	18.40	18.40	0 3944
12/03/2007 33 days	Actual	5,960	$827.70	$0.00	$0 00	$827.70	16.00	16 00	0 4703
10/31/2007 30 days	Actual	5,160	$726 78	$0.00	$0.00	$726 78	15.20	15.20	0 4714
10/01/2007 31 days	Actual	6,960	$1,029 73	$0.00	$0.00	$1,029.73	27 60	27 60	0 3389
08/31/2007 29 days	Actual	10,800	$1,511.40	$0.00	$0.00	$1,511.40	32 80	32 80	0.4730
08/02/2007 30 days	Actual	9,880	$1,477 77	$0.00	$0.00	$1,477.77	36 80	36 80	0.3728
07/03/2007 29 days	Actual	9,080	$1,277 58	$0.00	$0 00	$1,277.58	27.60	27 60	0.4726
06/04/2007 33 days	Actual	6,640	$935.61	$0.00	$12 76	$948.37	18.00	18.00	0 4657
05/02/2007 29 days	Actual	5,800	$850.34	$0.00	$0.00	$850 34	16 80	16.80	0.4960
04/03/2007 32 days	Actual	7,280	$996 81	$0.00	$15.53	$1,012 34	18 80	18.80	0.5042
03/02/2007 29 days	Actual	7,360	$1,035 60	$0.00	$0.00	$1,035.60	17.20	17.20	0 6148
02/01/2007 29 days	Actual	9,040	$1,205.37	$0.00	$0.00	$1,205.37	20 80	20.80	0.6244
01/03/2007 30 days	Actual	5,400	$746.66	$0.00	$0.00	$746.66	18.40	18.40	0.4076
12/04/2006 33 days	Actual	5,960	$788 43	$0.00	$0.00	$788.43	16.00	16.00	0.4703
11/01/2006 30 days	Actual	5,160	$698.85	$0.00	$0.00	$698.85	15.20	15 20	0 4714
10/02/2006 31 days	Actual	6,680	$893.95	$0 00	$0 00	$893.95	18 80	18 80	0.4775
09/01/2006 30 days	Actual	9,120	$1,254 04	$0 00	$0.00	$1,254.04	27.60	27.60	0.4589
08/02/2006 28 days	Actual	10,400	$1,433.58	$0.00	$0 00	$1,433 58	32.80	32.80	0.4718
07/05/2006 33 days	Actual	9,160	$1,276.89	$0.00	$0 00	$1,276.89	32.40	32.40	0.3569
06/02/2006 30 days	Actual	6,080	$845.08	$0.00	$0.00	$845.08	19 60	19.60	0.4308
05/03/2006 29 days	Actual	6,440	$834.63	$0.00	$0.00	$834 63	17.20	17.20	0 5379

Table View

Chart View

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Password: (Forgot?)

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- Update Contact Info.

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- Pay In Person
- DirectPay
- Budget Plan

Service Orders
- Start Service
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Other Online Options
- Street Lighting
- Report Energy Theft
- New Choices

2

Privacy Policy

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Project Name: Town of Hamburg - Adult Day Care
Project Address: 353 Pleasant Avenue
Hamburg, NY 14075
Facility Area: 4,500 sq.ft.

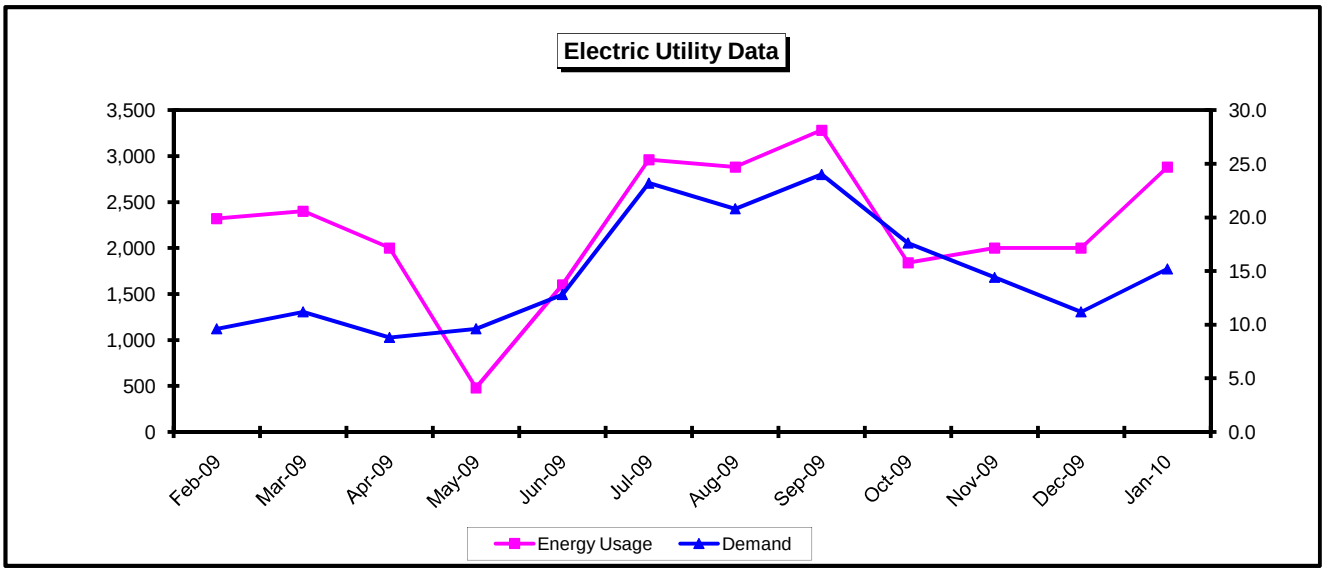
Utility Company: NYSEG
Acct. No.: 1001-1114-393
Date: 8/19/2010

ANNUAL ELECTRIC UTILITY DATA

	A		B		C	D	E	F
Billing Period	Demand Total (kW)	Demand Cost	Usage Total (kWh)	Usage Cost	Total Cost	Billing Days	Hours per month	Load Factor
2009-2010								
Feb-09	9.6	$77	2,320	$192	$269	30	720	0.34
Mar-09	11.2	$90	2,400	$158	$248	28	672	0.32
Apr-09	8.8	$70	2,000	$124	$195	30	720	0.32
May-09	9.6	$77	480	$112	$189	31	744	0.07
Jun-09	12.8	$102	1,600	$112	$214	28	672	0.19
Jul-09	23.2	$186	2,960	$215	$400	35	840	0.15
Aug-09	20.8	$166	2,880	$215	$381	25	600	0.23
Sep-09	24.0	$192	3,280	$239	$431	34	816	0.17
Oct-09	17.6	$141	1,840	$140	$280	29	696	0.15
Nov-09	14.4	$115	2,000	$153	$269	32	768	0.18
Dec-09	11.2	$90	2,000	$155	$244	29	696	0.26
Jan-10	15.2	$122	2,880	$232	$354	33	792	0.24
Avg./Totals:	**14.9**	**$1,427**	**26,640**	**2,047**	**$3,474**	**364**	**8,736**	**0.22**

Energy Intensity (kWh/sq.ft.):	**5.92**	**Avg. Cost/kWh:**	**$0.077**
Blended Cost (inc.demand)/kWh:	**$0.130**	**Avg. Cost/kW:**	**$8.00**

Table Formulas: Hours per Month = D x 24 Load Factor = B/(A x E)



NYSEG
Reliable. Essential

	TOWN OF HAMBURG
Account Number:	1001-1114-393
Statement Date:	January 20, 2010
Amount Due:	$353.66

Adult Day Care

Service Address: 353 PLEASANT AVE, HAMBURG NY 14075
Next Scheduled Read Date: On or about February 17, 2010

Account Summary

Previous invoice	$244.14
Payments received as of 01/19/10	-244.14
Balance forward	0.00
Energy charges	353.66
Payment due upon receipt.	$353.66

To avoid a 1.5% late payment charge, please make payment by the "Last Day to Pay" date displayed below.

Municipal

See details beginning on page 3

See messages on page 2

Contribute to Project SHARE by adding $1, $2 or $5 to the full amount of your payment. Your charitable gift is tax-deductible.

Please return bottom portion with your payment. Make checks payable to NYSEG.

NYSEG
Reliable. Essential

NYSEG
P.O. Box 5600
Ithaca, NY 14852-5600

Account Number
10011114393
Last Day to Pay
02/12/10
Amount Due
$353.66
Amount Paid
$

TOWN OF HAMBURG
2718 LAKEVIEW RD
LAKE VIEW NY 14085-9612

Please do not write below this li

501001111439300000353660000035366

NYSEG
Reliable. Essential

TOWN OF HAMBURG
Account Number: 1001-1114-393
Statement Date: January 20, 2010

Service Address: 353 PLEASANT AVE, HAMBURG NY 14075

NYSEG DETAILED ACCOUNT ACTIVITY

Electricity Service - *Nonresidential*
Electricity Rate - *12002 NYSEG Supply Service*

Service from: *12/17/09 - 01/18/10*
PoD ID: *N01000000152223*

Meter Number	Current Meter Read Date	Reading	Previous Meter Read Date	Reading	Reading Difference	Meter Multr	Billed Usage	Billing Period
82724081	01/18/10	6366 A	12/17/09	6330 A	36	80	2880 kwh	33 days
82724081	01/18/10	36.99 A	12/17/09	36.80 A	0.19	80	15.20 kw	33 days

Type of read: A - Actual, E - Estimate, C - Customer and N - No read

Electricity Delivery Charges

Basic service charge						5.66
Bill issuance charge						0.89
Meter charge						2.03
Meter service charge						2.84
Meter data service charge						2.58
Demand charge - Dec	15.2000	kw	@	8.61	@ 0.454545	59.49
Demand charge - Jan	15.2000	kw	@	8.00	@ 0.545455	66.33
Delivery charge - Dec	1280	kwh	@	0.00448		5.73
Delivery charge - Jan	1600	kwh	@	0.00416		6.66
Transition charge	2880	kwh	@	0.00203364		5.86
NY state assessment	1600	kwh	@	0.00238		3.81
SBC/RPS charge - Dec	1280	kwh	@	0.0038		4.86
SBC/RPS charge - Jan	1600	kwh	@	0.0042		6.72
Subtotal Electricity Delivery						$173.46

Electricity Supply Charges

Variable supply charge	2880	kwh	@	0.05845494	168.35
Merchant function charge - Dec	1280	kwh	@	0.003	3.84
Merchant function charge - Jan	1600	kwh	@	0.0028	4.48
Subtotal Electricity Supply					$176.67

Electricity Taxes and Surcharges

Taxes on delivery charges	@	1.0101%	1.75
Taxes on supply charges	@	1.0101%	1.78
Subtotal Electricity Taxes and Surcharges			$3.53

Total Electricity Cost **$353.66**

Total Energy Charges **$353.66**

NYSEG Billing History

Account Number 1001-1114-393
Customer Name TOWN OF HAMBURG
Service Address 353 PLEASANT AVE
Service Address HAMBURG NY 14075

Electric Meter NGE0082724081

Read Date	Previous Read	kWh Usage	kW Usage	Tax	Usage Amount w/ Tax
1/18/2010	12/17/2009	2880	15.2	$3.53	$353.66
12/16/2009	11/18/2009	2000	11.2	$2.44	$244.14
11/17/2009	10/17/2009	2000	14.4	$2.69	$268.59
10/16/2009	9/18/2009	1840	17.6	$2.80	$280.37
9/17/2009	8/15/2009	3280	24.0	$4.31	$431.26
8/14/2009	7/21/2009	2880	20.8	$3.81	$381.08
7/20/2009	6/16/2009	2960	23.2	$4.00	$400.10
6/15/2009	5/19/2009	1600	12.8	$2.14	$214.11
5/18/2009	4/18/2009	480	9.6	$1.89	$189.03
4/17/2009	3/19/2009	2000	8.8	$1.95	$194.82
3/18/2009	2/19/2009	2400	11.2	$2.48	$247.82
2/18/2009	1/20/2009	2320	9.6	$2.69	$268.99
1/19/2009	12/19/2008	2400	9.6	$2.96	$295.56
12/18/2008	11/19/2008	2800	10.4	$3.28	$327.53
11/18/2008	10/16/2008	2480	8.8	$2.84	$283.69
10/15/2008	9/18/2008	1760	13.6	$2.76	$276.84
9/17/2008	8/19/2008	4000	24.0	$5.85	$584.66
8/18/2008	7/19/2008	4000	24.0	$6.43	$642.22
7/18/2008	6/17/2008	4000	24.0	$7.11	$710.13
6/16/2008	5/20/2008	3360	24.8	$5.83	$582.96
5/19/2008	4/17/2008	2400	9.6	$3.16	$316.44
4/16/2008	3/20/2008	2320	8.8	$3.22	$321.53
3/19/2008	2/20/2008	2800	9.6	$3.66	$366.61
2/19/2008	1/20/2008	2880	10.4	$3.70	$369.38
	Totals	29040	N/A	$37.69	$3,769.53

Appendix B

Product Literature

TYPES used MH 400 / MH 1000 > RINK

High Bay Luminaire

HS **Series**

Features

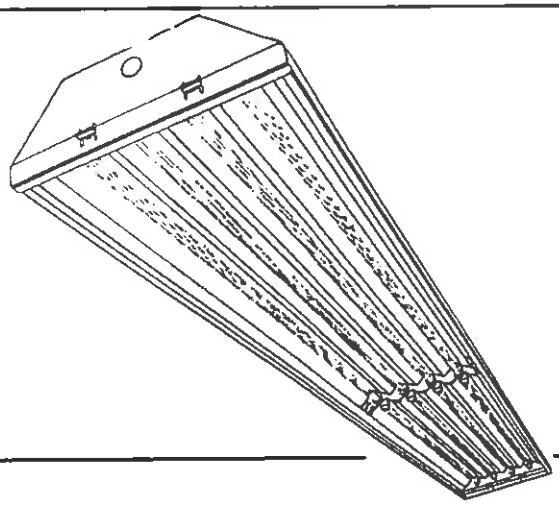
A Breakthrough Alternative to HID High-Bay Systems

Superior Light Quality, Maximum Photometric Efficiency

Available in T8 and T5 lamp configurations

Hinged reflector allows tool-free ballast maintenance with lamps installed

Available with optional lens or wire guard



Technical Data

Housing: 20ga. (0.032") pre-painted steel die formed with sufficient knockouts for mounting and electrical supply.

Finish: All cold rolled steel parts are painted with a smooth, glossy, highly reflective white paint.

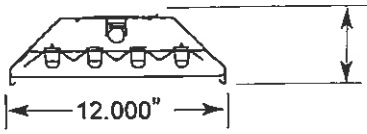
Reflector: Can be ordered with a 95% specular, a 85% specular, or a 92% diffuse white enamel. Substrate is 0.020" high quality aluminum. The reflector profile is optimized using computer analysis and manufactured using state of the art CNC equipment. A protective premask is applied to all reflective surfaces prior to manufacture.

Construction: The solid body provides added rigidity. The socket bars attach to the body with a locking tab and quarter-turn fastener. Reflector is secured to the socket-bars with screws.

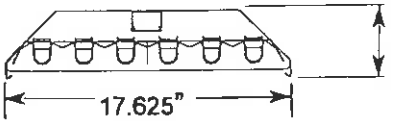
Mounting: Fixture is designed for surface, pendant mount, or suspended applications

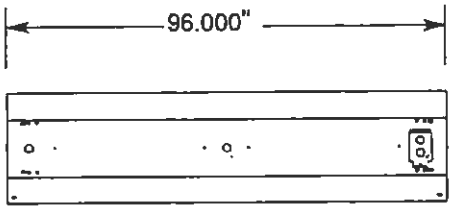
Installation

1x4 Profile
(4 - 8 Lamps)

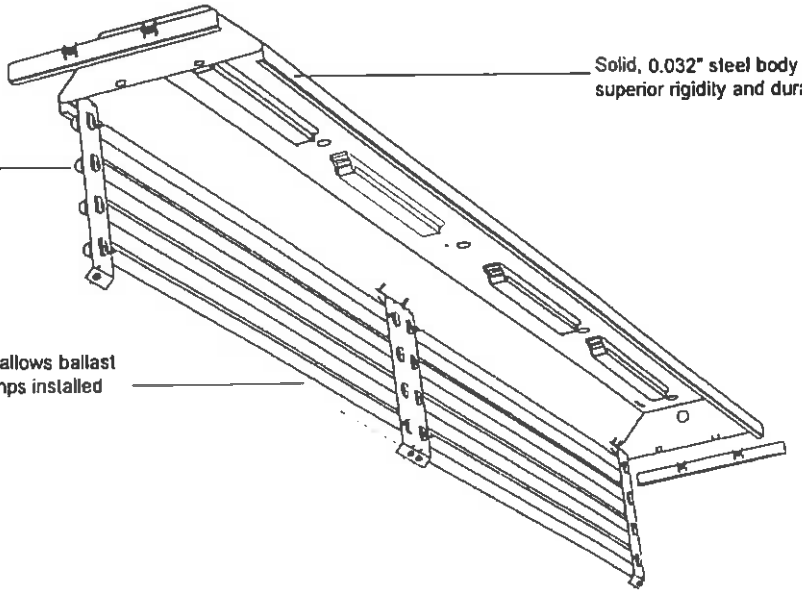


2x4 Profile
(8 - 12 Lamps)





Highlights



Energy Solutions INTERNATIONAL, INC

Meets or Exceeds UL 1598 Standard

Energy Solutions International

High Bay Luminaire

HS Series

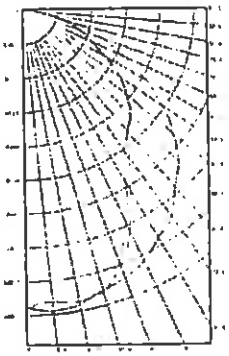
Photometrics

Energy Solutions
Premium Lighting without the Premium Price

Energy Solutions International, Inc
1305 Mendota Heights Road
Saint Paul, MN 55120

ENERGY SOLUTIONS 1 X 8 FLUORESCENT LUMINAIRE
WITH WHITE INTERIOR AND SPECULAR REFLECTOR

EIGHT T5 LINEAR FLUORESCENT 54 WATT LAMPS, LUMEN RATING 5000 LMS. TWO SYLVANIA QTP
4x54T5HO BALLAST OPERATING AT 277 VAC AND 488 WATTS

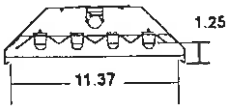


CANDLEPOWER SUMMARY

	0.00	22.50	45.00	67.50	90.00
0.00	14153	14153	14153	14153	14153
5.00	13929	14104	14533	14339	14470
10.00	14083	14382	14453	14392	14215
15.00	13834	14115	13869	13750	13997
20.00	13543	13592	13533	13038	12739
25.00	12976	13109	12597	11572	11324
30.00	12535	12511	11232	9864	9490
35.00	12080	11650	9822	9484	8782
40.00	11001	10447	8393	7565	7523
45.00	10316	9256	7010	7070	7102
50.00	9166	7800	6288	6293	6236
55.00	7985	6364	5562	5552	5440
60.00	6664	5132	4676	4474	4374
65.00	5210	3971	3691	3579	3597
70.00	3812	2882	2671	2867	2966
75.00	2501	1911	1903	2020	1986
80.00	1435	1040	1007	883	763
85.00	637	437	234	335	152
90.00	258	146	53.4	3.82	1.53

ZONAL LUMENS AND PERCENTAGES

Zone	Lumens	%Lamp	%Fixt
0- 30	30832	27.3	30.5
0- 40	47595	42.0	49.7
0- 60	70748	71.9	81.4
0- 90	95598	85.0	99.4
90-120	127	0.3	0.4
90-120	127	0.3	0.4
90-180	129	0.3	0.4
90-180	129	0.3	0.4
0-180	95598	85.3	100.0



** EFFICIENCY = 88.3% **

LUMINANCE SUMMARY - CD./SQ M

	0	45	90
0	[illegible]	[illegible]	[illegible]
45	[illegible]	[illegible]	[illegible]
55	[illegible]	[illegible]	[illegible]
65	[illegible]	[illegible]	[illegible]
75	[illegible]	[illegible]	[illegible]
85	[illegible]	[illegible]	[illegible]
90	[illegible]	[illegible]	[illegible]
95	[illegible]	[illegible]	[illegible]
105	[illegible]	[illegible]	[illegible]
115	[illegible]	[illegible]	[illegible]
125	[illegible]	[illegible]	[illegible]
135	[illegible]	[illegible]	[illegible]

PAINT REFLECTANCE = 0.78 S/MH = 1.05
SC (ALONG) = 1.32 SC (ACROSS) = 1.05
PREPARED IN PHOTOPIA FOR
ENERGY SOLUTIONS
ST. PAUL, MN

Ordering Information

Part Number = Fixture Size + Reflector Material + # Lamps + Lamp Wattage + Voltage + Ballast Type + Options

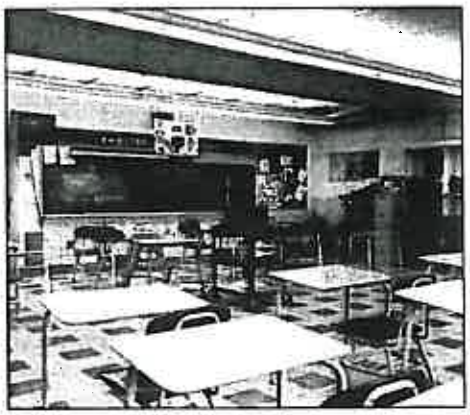
(Example F-18HSEA854UNV = 1'x8' HS Series High Bay with an 95% alum. reflector, 8-54W lamps, and a universal voltage ballast)

F18HS	EA	4 - 8 -	54	UNV	WG-CL
Size	**Reflector**	**# Lamps**	**Lamp Watts**	**Voltage**	**Options**
F-18HS - 1' x 8'	EA - 95%Enhanced Alum	4 - 12	32	120	N - Normal
F-28HS - 2' x 8'	AA - 85% Anodized Alum		54	277	H - High Ballast Factor
	WR - 92% White Enamel			UNV	L - Low Ballast Factor
					WG - Wire Guard
					CL - Clear Lens
					PR - Prismatic Lens

8C4

8' CORD
TWISTLOCK

GE Consumer & Industrial
Lighting



F32T8/SXL/SPX/ECO

Super X-tra Life T8 Lamp

Up to 47% Longer Life than standard F32T8s

Provides 50 more lumens than standard F32T8s

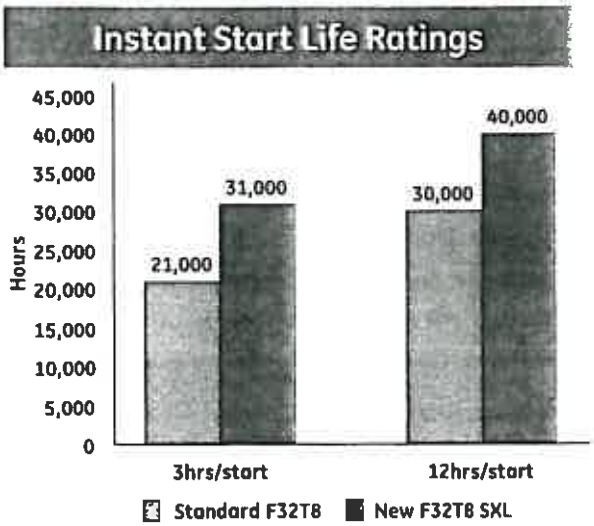
Reduces maintenance costs

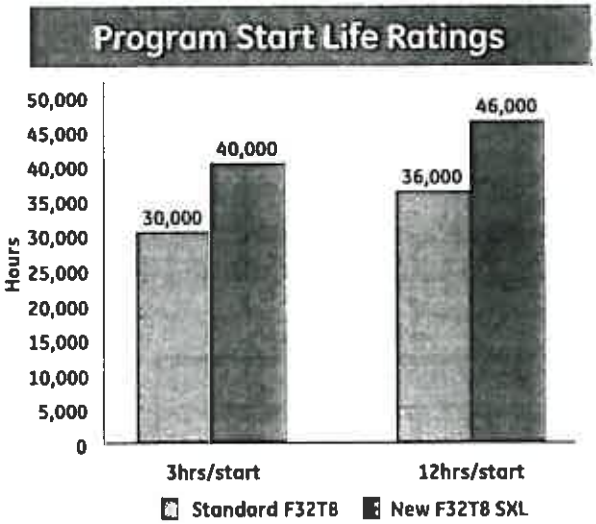
Extends relamp cycle

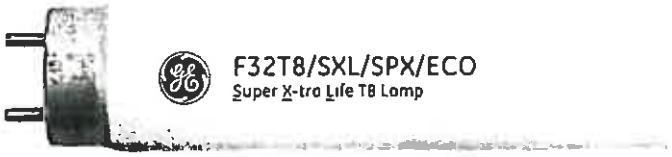
TCLP compliant

High Quality Color Rendering:
- 84 (SPX30)
- 83 (SPX35)
- 81 (SPX41)
- 80 (SPX50)

Designed for Use on:
- Instant Start Ballasts
- Programmed Start Ballast





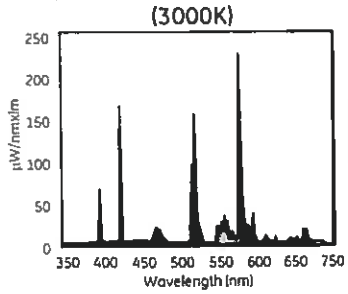


imagination at work

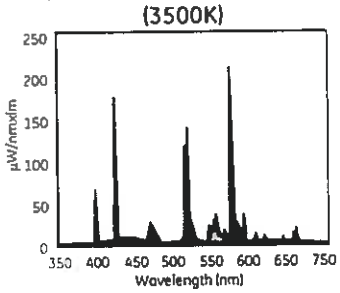
F32T8/SXL/SPX/ECO Specs

Product Description	F32T8/SXL/SPX30/ECO	F32T8/SXL/SPX35/ECO	F32T8/SXL/SPX41/ECO	F32T8/SXL/SPX50/ECO
Product Code	73093	73094	73095	73096
Case Quantity	36	36	36	36
Physical Characteristics				
Bulb Designation	T8	T8	T8	T8
Bulb Material	Soda Lime	Soda Lime	Soda Lime	Soda Lime
Max Bulb Diameter (D)	1.10" (27.9mm)	1.10" (27.9mm)	1.10" (27.9mm)	1.10" (27.9mm)
Nominal Bulb Diameter (D)	1" (25.4mm)	1" (25.4mm)	1" (25.4mm)	1" (25.4mm)
Base Type	Medium Bipin (G13)	Medium Bipin (G13)	Medium Bipin (G13)	Medium Bipin (G13)
Max Face to End of Opposing Pin (B)	47.50" (1206.5mm)	47.50" (1206.5mm)	47.50" (1206.5mm)	47.50" (1206.5mm)
Min Face to End of Opposing Pin (B)	47.40" (1204.0mm)	47.40" (1204.0mm)	47.40" (1204.0mm)	47.40" (1204.0mm)
Max Overall Length (C)	47.78" (1213.6)	47.78" (1213.6)	47.78" (1213.6)	47.78" (1213.6)
Nominal Overall Length (C)	48"	48"	48"	48"
TCLP Compliant	Yes	Yes	Yes	Yes
Low Mercury	Yes	Yes	Yes	Yes
Electrical Characteristics				
Nominal Lamp Watts (W)	32	32	32	32
Nominal Lamp Voltage (V)				
Nominal Lamp Current (A)				
Photometric Characteristics				
Reference - Initial Lumens	2850	2850	2850	2800
- Mean Lumens (40% rated life)	2675	2675	2675	2630
Nominal Efficacy (Lumens/Watt)	89	89	89	88
Avg Rated Life (hrs) 3 hr cycle - IS ballast	31000	31000	31000	31000
Avg Rated Life (hrs) 12 hr cycle - IS ballast	40000	40000	40000	40000
Avg Rated Life (hrs) 3 hr cycle - RS ballast	40000	40000	40000	40000
Avg Rated Life (hrs) 12 hr cycle - RS ballast	46000	46000	46000	46000
Color Rendering Index (Ra) CRI	84	83	81	80
Correlated Color Temperature (Kelvin)	3000	3500	4100	5000

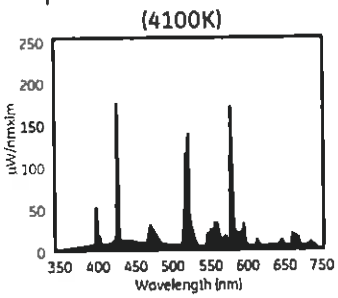
Spectral Power Distribution (3000K)



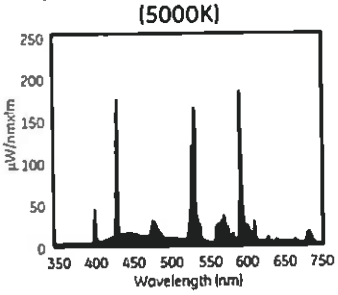
Spectral Power Distribution (3500K)



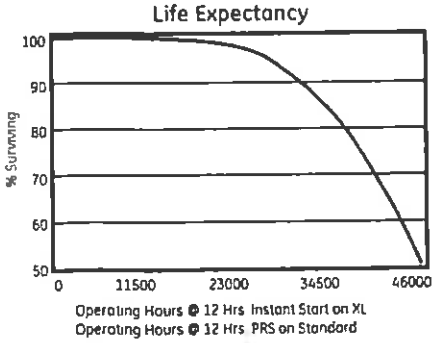
Spectral Power Distribution (4100K)



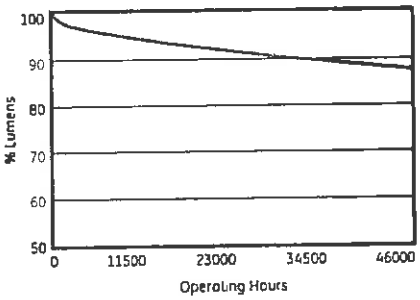
Spectral Power Distribution (5000K)



Life Expectancy



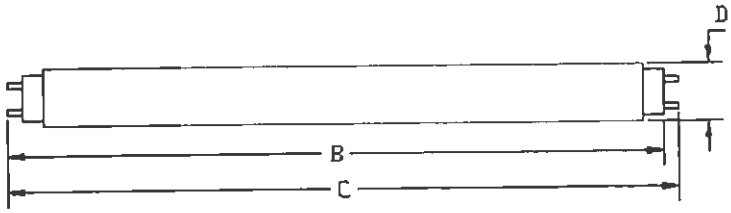
Lumen Maintenance



F32T8/SXL Specifier Statement:
Lamp(s) shall be Starcoat T8 SXL Ecolux lamp(s) having medium bi-pin bases. Lamp(s) shall be designed to pass the Federal TCLP test in force at the time of manufacture. Lamp(s) shall have an average rated life of 40,000 hours at 3 hours per start when operated on T8 Programmed Start ballasts. Lamps shall have 2850 initial lumens (2800 for 5000K), and a correlated color temperature of (3000K, 3500K, 4100K or 5000K) and a CRI of 84 (SPX30), 83 (SPX35), 81 (SPX41), 80 (SPX50).

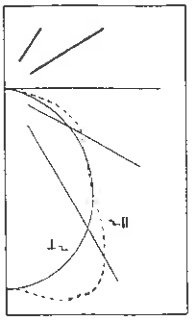
Information provided is subject to change without notice. Please verify all details with GE. All values are design or typical values when measured under laboratory conditions, and GE makes no warranty or guarantee, express or implied, that such performance will be obtained under end-use conditions.

For additional product and application information, please consult GE's Website: www.gelighting.com



Watt-Miser and Ecolux are registered trademarks and UltraMax is a trademark of the General Electric Company.

PHOTOMETRICS



2HBHT-632-CL
(2) Electronic Ballasts
(6) F32T8/TL835 lamps
3000 lumens
Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.2 x mounting height
Efficiency 68.1%
Test Report: 2HBHT632CL.IES
LER =75
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.22

Candela

Angle	Along II	45°	Across ⊥
0	4538	4538	4538
5	4601	4543	4510
10	4787	4628	4442
15	4869	4705	4319
20	4999	4740	4160
25	4938	4685	3958
30	4514	4559	3711
35	3882	4262	3434
40	3100	3739	3121
45	2696	3118	2782
50	2392	2414	2420
55	2169	1992	2035
60	2008	1643	1838
65	1762	1377	1235
70	1400	1131	843
75	875	772	485
80	355	360	211
85	77	76	48
90	0	0	0

Coefficients of Utilization

Effective floor cavity reflectance 20%

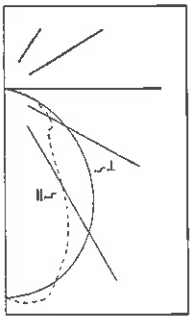
rc	80%				70%				50%			30%			10%			0%
rw	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	81	81	81	81	79	79	79	79	76	76	76	72	72	72	69	69	69	68
1	75	72	69	66	73	70	68	65	67	65	63	65	63	61	62	61	60	58
2	68	63	58	55	66	62	58	54	59	56	53	57	54	52	55	53	51	49
3	62	56	50	48	61	54	50	46	52	48	45	51	47	44	49	46	43	42
4	57	49	44	39	56	48	43	39	47	42	38	45	41	38	44	40	37	36
5	53	44	38	34	51	44	38	34	42	37	34	41	37	33	40	36	33	31
6	49	40	34	30	48	39	34	30	38	33	30	37	33	29	36	32	29	28
7	45	36	31	27	44	36	30	26	35	30	26	34	29	26	33	29	26	25
8	42	33	28	24	41	33	27	24	32	27	24	31	27	23	30	26	23	22
9	40	31	25	21	39	30	25	21	29	25	21	29	24	21	28	24	21	20
10	37	28	23	19	36	28	23	19	27	23	19	27	22	19	26	22	19	18

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixture
0-30	3768	20.9	30.7
0-40	6124	34.0	50.0
0-60	10121	56.2	82.6
0-90	12258	68.1	91.5
0-180	12258	68.1	100.0

Typical VCP Percentages

Room Size (Ft.)	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	35	43	41	46
30 x 30	33	34	39	40
30 x 60	35	33	40	38
60 x 30	39	39	43	42
60 x 60	40	36	43	40



2HBHT-654T5-CL
(3) Electronic Ballasts
(6) F54T5/841HO 54W lamps
4400 lumens
Spacing criterion: (II) 1.0 x mounting height, (⊥) 1.2 x mounting height
Efficiency 52.9%
Test Report: 2HBHT654T5CL.IES
LER =40
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $6.03

Candela

Angle	Along II	45°	Across ⊥
0	8058	8058	8058
5	8298	8228	8014
10	8281	8222	7894
15	7647	8038	7681
20	6853	7410	7382
25	5872	6624	7000
30	4611	5867	6542
35	3428	4902	6018
40	2751	3736	5440
45	2431	2770	4810
50	2365	2164	4141
55	2227	1806	3435
60	1957	1671	2715
65	1577	1388	1998
70	1358	1043	1309
75	818	734	707
80	416	394	270
85	87	84	48
90	0	0	0

Coefficients of Utilization

Effective floor cavity reflectance 20%

rc	80%				70%				50%			30%			10%			0%
rw	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	70	70	70	70	69	69	69	69	66	66	66	63	63	63	60	60	60	59
1	65	63	61	59	64	61	59	58	59	57	56	57	55	54	55	54	53	51
2	60	56	52	49	59	55	51	49	53	50	47	51	48	46	49	47	45	44
3	55	50	45	42	54	49	45	42	47	44	41	46	43	40	44	42	40	38
4	51	45	40	38	50	44	40	36	42	39	36	41	38	35	40	37	35	34
5	47	40	36	32	46	40	35	32	39	35	31	37	34	31	36	33	31	30
6	44	37	32	28	43	36	32	28	35	31	28	34	31	28	33	30	28	27
7	41	34	29	26	40	33	29	25	32	28	25	32	28	25	31	27	25	24
8	38	31	26	23	38	31	26	23	30	26	23	28	26	23	29	25	23	22
9	36	29	24	21	35	28	24	21	28	24	21	27	23	21	27	23	21	20
10	34	27	22	19	33	26	22	19	26	22	19	25	22	19	25	21	19	18

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixture
0-30	5876	22.3	37.6
0-40	8802	33.3	56.3
0-60	13385	50.7	85.7
0-90	15627	59.2	75.3
0-180	15627	59.2	100.0

Typical VCP Percentages

Room Size (Ft.)	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	37	44	39	42
30 x 30	34	35	37	37
30 x 60	35	33	39	37
60 x 30	40	39	42	40
60 x 60	40	36	42	39

ORDERING INFORMATION

SAMPLE NUMBER: 2HBHT-654T5-A-UNV-EBT2-U

Width
2=24"

Series
HBHT=High Bay Hose Down w/Tented Top

No. of Lamps
4=4 Lamps
6=6 Lamps

Lamp Type
28T5=28W T5 Lamps (48")
32=32W T8 Lamps (48")
49T5=49W T5HO Lamps (48")
51T5=51W T5HO Lamps (48")
54T5=54W T5HO Lamps (48")

Distribution
Blank=Medium (Specular Aluminum)
G=Wide (High Reflectance White)

Shielding
A=Prismatic Acrylic Lens & Steel Door Frame
CL=Clear Acrylic Lens & Steel Door Frame
93=Prismatic Tempered Glass & Steel Door Frame
94=Clear Tempered Glass & Steel Door Frame

Voltage[1]
UNV=Universal 120/277 Voltage
UNC=Universal 347/480 Voltage[2]
120V=120 Volt
277V=277 Volt
347V=347 Volt

Options
Lamps Installed
L8830=T8 Lamp, 85CRI 3000K
L8835=T8 Lamp, 85CRI 3500K
L8841=T8 Lamp, 85CRI 4100K
L8850=T8 Lamp, 85CRI 5000K
L5830=T5 Lamp, 85CRI 3000K
L5835=T5 Lamp, 85CRI 3500K
L5841=T5 Lamp, 85CRI 4100K
L5850=T5 Lamp, 85CRI 5000K
HL=Add HL at end of lamp for high lumen lamps, T8 only
GL=Single Element Fuse
GM=Double Element Fuse
EL=Emergency Installed[1]

Ballast Type[1]
T8 Systems
EB8__=T8 Electronic Instant Start. Total Harmonic Distortion < 10%
No. of Ballast: 1 or 2
EB8__/PLUS=T8 Electronic Instant Start.[2] High Ballast Factor >1.15. Total Harmonic Distortion < 10%
No. of Ballast: 1 or 2
ER8__=T8 Electronic Program Rapid Start. Total Harmonic Distortion < 10%
No. of Ballast: 1 or 2
ER8__/PLUS=T8 Electronic Program Start. High Ballast Factor >1.15. Total Harmonic Distortion < 10%
No. of Ballast: 1 or 2
T5 Systems
EHT__=T5 Linear Electronic Start High Ambient[2] Total Harmonic Distortion < 10%
No. of Ballast: 1, 2 or 3

Options
PM=Pendant Mount Stem[4]
C3=3' Power Cord[5]
C6=6' Power Cord[5]
PC3-=3' Power Cord & Plug (Specify Voltage)[1][3]
PC6-=6' Power Cord & Plug (Specify Voltage)[1][3]
SSN=Brushed Stainless Steel Door Finish
SHN=Brushed Stainless Steel Housing Finish

Accessories (order separately)
Y-Hook=(2) Snap Hooks, #2 Cable (Specify 10' or 30'), order 2 per fixture
HBHT-Chain/Set=(2) 6ft. Stainless Steel Chains, (4) large S-Hooks

Packaging
U=Unit Pack
PAL=Pallet Pack
PALC=Job Pack In Carton

SHIPPING INFORMATION

Catalog No.	Wt
2HBHT-654T5	50 lbs.
2HBHT-454T5	48 lbs.

NOTES [1]Voltage must be specified when ordered with plugs, motion sensors or emergency ballasts [2]2 lamp ballast configurations only for T5 UNC versions 2/3 lamp ballast configurations in EB8/PLUS only for T8 UNC versions [3]3/4" stem only, supplied by others. Power supply fed through stem during installation. [4]Always supplied with a 6 ft. 3-wire cord as standard through pendant stem hub [5]Available for chain or cable mount options only

FAIL-SAFE®

DESCRIPTION

The 2HBHT Series is designed for use in high mounting height applications where periodic cleaning with high pressure is required. This pendant mounted luminaire with optional stem mount available, has a hole-free design and is enclosed and gasketed to protect against infiltration of particles and airborne bacteria. The sealed housing and door frame allow relamping without contamination of the clean areas. These luminaires are U.L. listed and C.S.A. certified for wet locations and are manufactured in accordance with U.S.D.A., F.D.A., N.S.F. and Federal Standard 209E. **800 PSI hosedown rating is standard.**

Catalog #		Type	
Project			
Comments		Date	
Prepared by			

SPECIFICATION FEATURES

A · Lens

One-piece, clear extruded lens with choice of prismatic or clear acrylic. Optional glass shielding available.

B · Fasteners

Flush mounted, stainless steel machine screws secure through captive cage nuts in housing. Screw locations are evenly spaced to compress gasketing on all sides.

C · Housing

Die-formed, CRS housing with seam welded and sealed end caps. Tented top to facilitate water run-off. Contains no exposed holes that would allow air or moisture passage. Standard white high reflectance polyester powder coat finish. Gloss: 85%; Reflectance: 93%; Hardness: 2H; Salt Spray: 500 Hours. Optional brushed stainless steel finish for corrosive chemical environments.

D · Optics

Die formed reflectors are faceted for 4 and 6 lamp configurations with two optical distributions – medium and wide. Medium beam optics utilizes 95% specular substrate while the wide distribution utilizes a high performance 95% reflective polyester powder coated finish.

E · Lens Retention & Gasket

Unique, Particulock™ lens retention system utilizes continuous, 18 ga. clampdowns to sandwich gasketing between lens, and door frame. Closed cell, one piece gasketing surrounds perimeter of lens and door for an even environmental seal to the housing.

F · Door/Shielding

(Must be specified.) One-piece, 18 ga., fully gasketed, outside door with die-formed and beveled edges eliminates seams which could entrap microscopic contaminants. Two braided, stainless steel cables on one side of door provide hinging.

G · Ballast

Standard, Class P, CBM/ETL ballast.

H · Mounting

Standard pendant mount via chain or cable. Fixture comes with standard grommeted cord or cord & plug. Mounting hardware ordered separately.

I · Stem Mount

Optional 3/4" stem mount available on housing using integrated hub (stems are not provided).

Labels

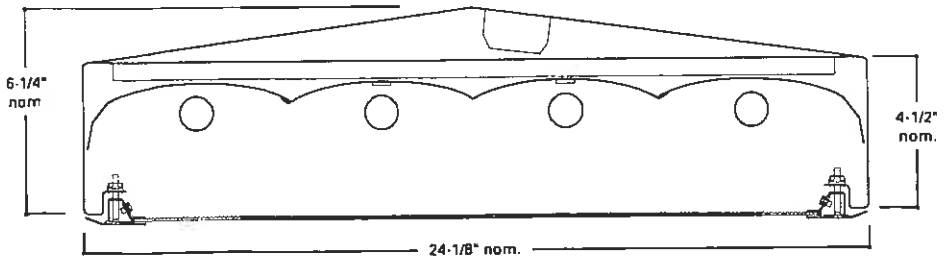
U.L./cUL certified.

F-BAY 2HBHT SERIES

2' x 4' Hosedown Fluorescent High-Bay 4 or 6 Lamp

FLUORESCENT PENDANT
ONE-PIECE DOOR
T5 LAMP TECHNOLOGY
T8 LAMP TECHNOLOGY

F-BAY™ FLUORESCENT HIGH-BAY



ENERGY DATA

Input Watts:

EB Ballasts
432 = 109W
632 = 167W

EB/Plus Ballasts
432 = 147W
632 = 221W

ER Ballasts
432 = 112W
454 = 229W
632 = 169W
654 = 346W

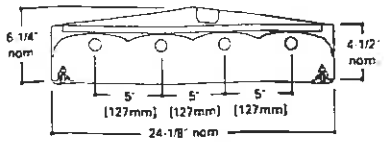
ER/Plus Ballasts
432 = 144W
632 = 218W

* Reference the lamp/ballast data in the Technical Section for specific lamp/ballast requirements

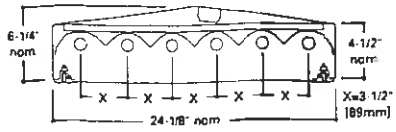
** Consult Pre Sales Technical Support

LAMP CONFIGURATIONS

4-lamp

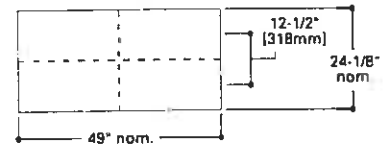


6-lamp

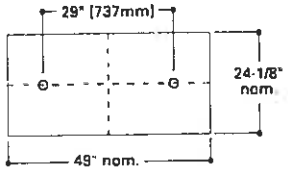


MOUNTING DIMENSIONS

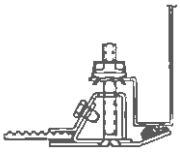
Chain/Cable Mount



Stem Mount



DOOR FRAME



LAMPS CONTAIN MERCURY. DISPOSE ACCORDING TO LOCAL, STATE OR FEDERAL LAWS

LINEAR DISCONNECT
Safe and convenient means of disconnecting power

ADC08024B

ER SERIES

Economy Industrial

PHOTOMETRIC DATA

Catalog Number: ER24048-BE1BS
Lamps: **Two F40T12/CW Each Rated at 3150 Lumens**

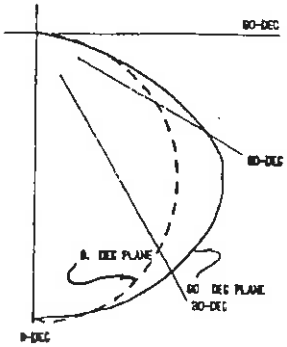
Total Luminaire Efficiency: 90.9%

Coefficients of Utilization - Zonal Cavity Method
Effective Floor Reflectance 20%

RC	80%				70%				50%			30%			10%			0%
RW	70%	50%	30%	10%	70%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0%
0	108	108	108	108	106	106	106	106	101	101	101	97	97	97	93	93	93	91
1	99	95	91	88	97	93	89	86	89	86	83	86	83	81	83	80	78	77
2	90	82	77	71	88	81	76	71	78	73	68	75	71	67	73	69	66	64
3	82	73	66	59	80	71	64	59	68	63	58	65	61	57	64	60	56	54
4	75	64	56	50	73	63	56	50	60	54	49	58	53	48	55	52	47	46
5	68	56	48	41	66	55	47	41	53	46	41	51	46	40	50	44	40	39
6	63	50	41	35	60	49	41	35	47	40	35	46	39	35	44	39	34	33
7	57	44	35	30	56	44	36	30	42	35	30	41	35	30	40	34	30	29
8	53	40	32	26	51	39	31	26	38	31	26	37	29	22	36	30	26	24
9	48	36	28	22	47	35	27	22	34	27	23	33	26	22	32	26	22	20
10	45	32	23	18	44	32	24	19	31	24	19	30	24	18	29	23	19	17

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-30	1337	21.2	23.4
0-40	2258	35.8	39.4
0-60	4325	68.6	75.6
0-90	5724	90.9	100.0
90-180	0	0.0	0.0
0-180	5724	90.9	100.0



Plane:	0-Deg	90-Deg
Spacing Criteria:	1.3	1.6

ORDERING GUIDE

ER 2 40 48 - BE 1 BS [ ]

Series	No. Lamps	Lamp Style	Fixture Size	Ballast	Volts	Package* Reflector	Options
ER	1, 2, 3	28	48	EO	1	BS	
ER	1, 2, 3	32	48	EO, OT	1	BS	
ER	1, 2	40	48	BE, ET	1	BS	
ER	1, 2	48	48	JA, JT	1	BS	
ER	1, 2	48	48	KA, TA	1	BS	
ER	1, 2, 3	54	48	EO	1	BS	
ER	2, 4, 6	28	96	EO	1	BS	
ER	2, 4, 6	32	96	CO, EO, OT	1	BS	
ER	2, 4	40	96	BE, ET	1	BS	
ER	2, 4, 6	54	96	EO	1	BS	
ER	1, 2, 3	59	96	EO, CO	1	BS	
ER	1, 2	86	96	EO	1	BS	
ER	1, 2	96	96	JA, JE, JT	1	BS	
ER	1, 2	96	96	KA, KC, KE, KT	1	BS	
ER	1, 2	96	96	TA	1	BS	
ER	2, 4	96	T8	TA	1	BS	

*Fixtures bulk packed (2 per Carton). For single packed, substitute *U* for *B*.

LAMPS:
28 - 26 Watt T5
32 - 32 Watt T8
40 - 40/34 Watt ES T12
48 - 38 Watt T12 Slimline, 60 Watt HO, 100 Watt VHO/SHO or T17 110 Watt Power Groove
54 - 54 Watt T5 HO
59 - 59 Watt T8
86 - 86 Watt T8
96 - 75 Watt T12 Slimline, 110 Watt HO, 215 Watt VHO/SHO or 215 Watt T17 Power Groove

BALLASTS:
BE - 430 ma Rapid Start Energy Saving
CO - 265 ma Electronic (3 or 4 lamp)
EO - 265 ma Electronic
ET - 430 ma Electronic
JA - 425 ma Slimline
JE - 425 ma Energy Saving Slimline
JT - 425 ma Electronic Slimline
KA - 800 ma High Output
KC - 800 ma High Output (-20 F.)
KE - 800 ma Energy Saving High Output
KT - 800 ma Electronic High Output
OT - 265 ma Magnetic
TA - 1500 ma VHO/SHO/PG

Note: On 3 or 4 lamp electronic fixtures, CO designates a single 3 or 4 lamp ballast in fixture. ET and EO designate 2 ballasts in fixture wired inboard/outboard.

VOLTS:
1 - 120 Volts
4 - 277 Volts
9 - Universal Voltage

REFLECTORS:
BA - Reflector, 10% uplight aperture
BS - Reflector, solid
AAR - Anodized Aluminum Reflector
SFR - Specular silver film on steel reflector

OPTIONS:
Use the following suffix for:
-F1 Fusing, one per fixture
-F2 Fusing, one per ballast
-RF1 Radio Interference Filter, one per fixture
-RF2 Radio Interference Filter, one per ballast
-CLRS Clear lens, steel door frame
-FARS Prismatic lens, steel door frame
-MEP Full metal end plates

See Options section of catalog for Male-N-Lock pre-wired quick connect system for labor-saving continuous row installation.

Emergency Ballast - Please consult Options page for complete listings.

Dimming Ballast - Please consult the factory

ACCESSORIES:
2179P - Standard Channel Hanger for RS and SL fixture, flush to T-Bar ceiling
2180P - 1.5" Spacer Channel Hanger for RS and SL fixtures
2182P - 1.5" Spacer Channel Hanger for 800 & 1500 ma fixtures

Note: 800 & 1500 ma fixtures not suitable for flush mounting (use spacer hanger).

ERWG48 - Wireguard 48" length, plated steel

JC - Jack Chain Kit

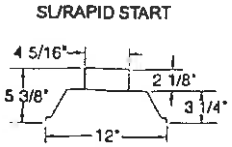
Reflector aligners for continuous row mounting

Stems and Canopies - consult Options section of catalog

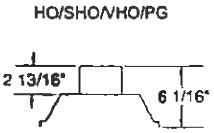
DIMENSIONS

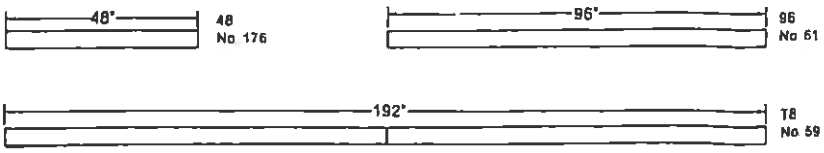
specifications and dimensional data subject to change without notice

SL/RAPID START



HO/SHO/VHO/PG





Number shown indicates mounting / knockouts diagram - see Options & Accessories section of catalog.

LUMAX INDUSTRIES, INC.
ER.0701

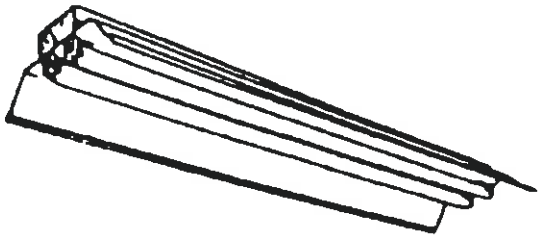
Job _____

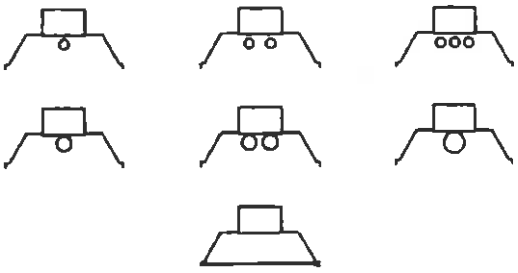
Type I100RIA,HPS250,

Catalog# ER13248-EO9BA-N

ER SERIES

Economy Industrial





APPLICATION

- Designed for general purpose applications that require a dependable, efficient light source, such as manufacturing areas, warehouses and individual work stations.
- Broad selection of lamp styles, 4 and 8 foot sizes, 16 foot tandem units.
- Can be surface, pendant mounted, chain hung or hung in continuous rows using the supplied coupler.

CONSTRUCTION

- Die-formed code gauge cold rolled steel housing. Knockouts provided on housing back and ends for mounting and electrical connections.
- Reflector formed, embossed and rigidified for strength and uniformity. Reflectors held in place by quarter-turn fasteners and are available in solid and aperture versions.
- Optional door frame.

FINISH

- All metal parts pretreated with a phosphate bonding process and post-painted with an electrostatically-applied high temperature baked white enamel for superior quality and durability. While interior surfaces have reflectance factor in excess of 89%.

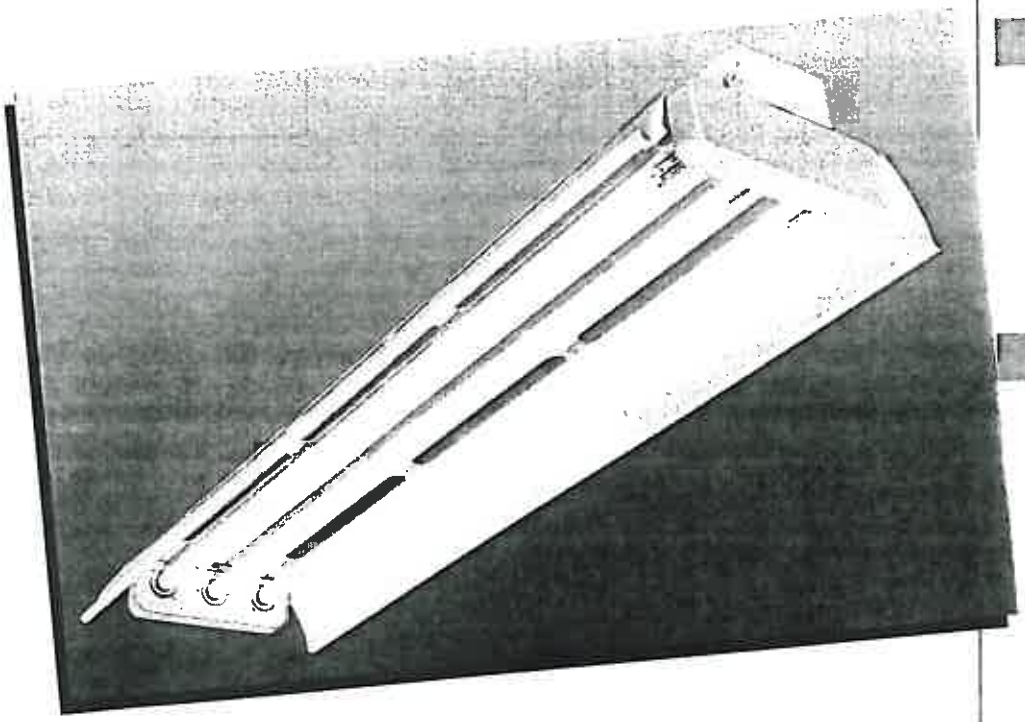
ELECTRICAL

- Energy-saving and electronic Class P, CBM/ETL certified, HPF ballasts comply with Federal Energy Efficiency Standards. (E)
- UL listed and UL listed.
- I.B.E.W. labeled.

LUMAX INDUSTRIES, INC. Chestnut Avenue & Fourth Street
Altoona, PA 16603-0991 814-944-2537 Fax 814-944-6413
www.lumaxlighting.com

TS SERIES

Heavy Duty Turret Industrial



APPLICATION

- Designed for heavy duty applications that require a dependable, efficient light source, such as manufacturing areas, warehouses and individual work stations.
- Broad selection of lamp styles, 4 and 8 foot sizes, 16 foot tandem units.
- Surface/pendant mounting, chain hung, or hung in continuous rows.

CONSTRUCTION

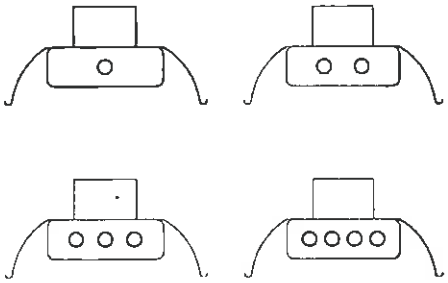
- Die-formed code gauge cold rolled steel housing. Knockouts provided on housing back and ends for mounting and electrical connections.
- Reflector formed, embossed and rigidified for strength and uniformity. Reflectors held in place by quarter-turn fasteners and are available in solid and aperture versions.
- Heavy-duty lampholder end brackets with spring-loaded turret sockets for safe lamp retention.

FINISH

- All metal parts pretreated with a phosphate bonding process and post-painted with an electrostatically applied high temperature baked white enamel for superior quality and durability. While interior surfaces have reflectance factor in excess of 89%.

ELECTRICAL

- Magnetic and electronic Class P, CBM/ETL certified, HPF ballasts comply with Federal Energy Efficiency Standards.
- UL listed and UL listed. E
- I.B.E.W. labeled.



CAUTION Variances in tube guard lengths can cause improper socket seating. Use voids fixture warranty.

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Altoona, PA 16603-0991 814-944-2537 Fax 814-944-6413
www.lumaxlighting.com

TS SERIES
Heavy Duty Turret Industrial

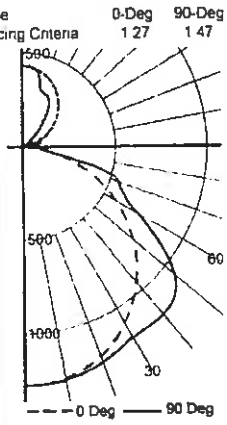
PHOTOMETRIC DATA

Catalog Number: **TS23248-EO9BA**
Lamps: Two F32T8 Rated @ 2850 Lumens Each

Total Luminaire Efficiency: 90.8%

Coefficients of Utilization - Zonal Cavity Method
Effective Floor Reflectance 20%

RC	80%				70%				50%			30%			10%			0%
RW	70%	50%	30%	10%	70%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0%
0	105	105	105	105	100	100	100	100	93	93	93	85	85	85	79	79	79	76
1	95	90	86	82	91	87	83	80	80	77	75	74	72	70	68	67	65	62
2	86	78	71	66	82	75	69	64	69	65	60	64	60	57	59	56	53	51
3	78	68	60	54	74	65	58	53	60	55	50	56	51	47	52	48	45	42
4	71	60	52	45	67	57	50	44	53	47	42	49	44	40	46	41	38	35
5	65	53	45	38	62	51	43	38	47	41	36	44	39	34	41	36	33	30
6	60	47	39	33	57	46	38	33	43	36	31	40	34	30	37	32	28	26
7	55	43	35	29	53	41	34	29	39	32	27	36	30	26	34	29	25	23
8	51	39	31	26	49	38	30	25	35	29	24	33	27	23	31	26	22	20
9	48	35	28	23	46	34	27	22	32	26	22	30	25	21	28	23	20	18
10	45	33	25	21	43	32	25	20	30	24	19	28	22	19	26	21	18	16



Zonal Lumen Summary

Zone	Lumens	%Lamp	%Flxt
0-30	1015 3	17 8	19 6
0-40	1701 8	29 9	32 9
0-60	3233 2	56 7	62 5
60-90	1092 9	19.2	21.1
0-90	4326 0	75 9	83 6
90-180	847 9	14 9	16 4
0-180	5173 9	90 8	100 0

Luminance in Candela Per Square Meter

Angle in Deg	Average 0 - Deg	Average 45 - Deg	Average 90 - Deg
0	4006	4006	4006
45	3857	4464	5107
55	3738	5028	4930
65	3531	4740	4487
75	3149	4736	4905
85	2590	3381	2805

ORDERING GUIDE

TS	2	32	48	- EO	9	BA	
Series	Nbr. of Lamps	Lamp Style	Fixture Size	Ballast	Volts	Reflector	Options
TS	2, 3, 4	28	48	EO	9	BA	
TS	2, 3, 4	32	48	EO	9	BA	
TS	2, 3, 4	54	48	EO	9	BA	
TS	4, 6, 8	28	96	EO	9	BA	
TS	4, 6, 8	32	96	CO, EO	9	BA	
TS	4, 6, 8	54	96	CO, EO	9	BA	
TS	2, 3, 4	59	96	JT	9	BA	
TS	2, 3, 4	86	96	KT	9	BA	

* Fixtures bulk packaged (2 per carton)

Caution If tube guards are used, ensure lamp pins are completely seated in sockets and sockets return flush with edge of turret can Use of tube guards voids fixture warranty

LAMPS:
28 - 28 Watt T5
32 - 32 Watt T8
54 - 54 Watt T5 HO
59 - 59 Watt T8 Slimline
86 - 86 Watt T8 HO

BALLASTS:
CO - Electronic (3 or 4 lamp) T5 & T12
EO - Electronic T5 & T12
JT - Electronic Slimline T8
KT - Electronic High Output T12

Note: On 3 or 4 lamp electronic fixtures, CO designates a single 3 or 4 lamp ballast in fixture EO designates 2 ballasts in fixture wired inboard/outboard

VOLTS:
1 - 120 Volts
4 - 277 Volts
9 - Universal Voltage

REFLECTORS:
BA - Reflector, 20% uplight aperture
BS - Reflector, solid

OPTIONS:
Use the following suffix for
-RF1 Radio Interference Filter, one per fixture
-RF2 Radio Interference Filter, one per ballast

See Options section of catalog for Male-N-Lock pre wired quick connect system for labor-saving continuous row installation

Emergency Ballast - Please consult Options page for complete listings

ACCESSORIES:
2179P - Standard Hanger for 2-1/8" channel mounted flush to T-Bar ceiling
2180P - 1.5" Spacer/Hanger for 2-1/8" channel
2182P - 1 5" Spacer/Hanger for 2-13/16" channel (High Output fixtures)

Note: High Output fixtures not suitable for flush mounting (use 2182P Spacer/Hanger).

TRWG48 - Wireguard 48", plated steel

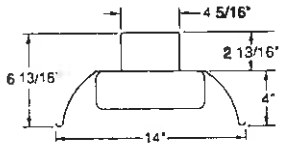
JC - Jack Chain Kit

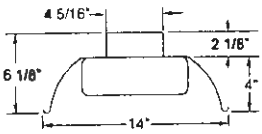
Reflector aligners for continuous row mounting

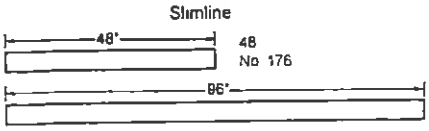
Stems and Canopies - consult Options section of catalog

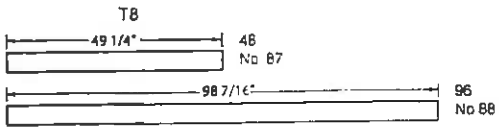
DIMENSIONS

specifications and dimensional data subject to change without notice









Number shown indicates mounting / knockouts diagram - see Options & Accessories section of catalog

COOPER LIGHTING - METALUX®

DESCRIPTION

The Micro-Bay is a functional and multi-purpose narrow profile fluorescent High-Bay that incorporates premium performance with durabile construction. Designed for T8 fluorescent technology, the MBF series offers both high performance and application versatility with three optical configurations for general and aisle applications. Illumination solution in commerical, industrial and retail applications, MBF series can be used in warehouses and retail store distribution centers.

Catalog #		Type
Project		
Comments		Date
Prepared by		

SPECIFICATION FEATURES

A···Construction

Die formed channel from 20 gauge prime cold rolled steel. Numerous KOs for ease of installation. End plate quickly converts to snap-in channel connector for continuous row alignment. Push-in style lampholders snap in to installed tracks. Channel/wireway cover positively secured with mechanical fastener.

B···Electrical*

Ballasts are Class "P" and are positively secured. Rotor-lock lampholders ensure positive lamp retention. Optional pre-wired factory installed multiple circuit plug-in connectors. UL/CUL listed. Suitable for damp locations.

C···Finish

Multistage iron phosphate pretreatment ensures maximum bonding and rust inhibitor.

D···Channel/Wireway Cover

Heavy gauge prime cold rolled steel. Tight fit for ease of maintenance.

E···Reflector

Specular reflectors for precise light control minimum 95% total reflectivity. Three optical distribution patterns are available:

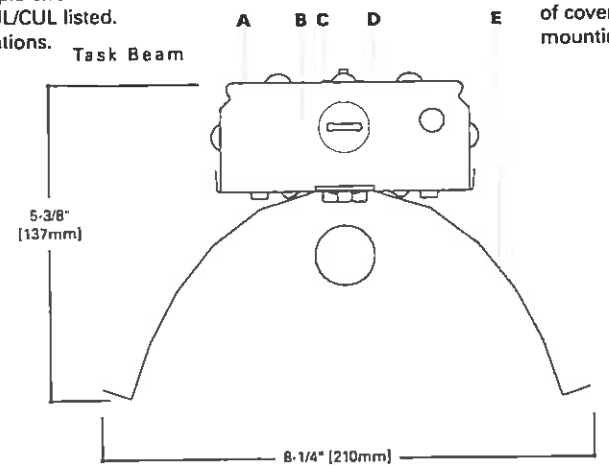
Focus - SC < .5
Task - .5 ≤ SC < .9
Normal - .9 ≤ SC ≤ 1.2

Mounting

Suspension is convenient and flexible with the SS Aircraft Cable "Y" Toggle Mounting Kits. Adjustment for luminaire mounting height is provided at luminaire rather than structure. Order a rigid exterior connector/coupling with pre-punched holes to facilitate easy installation of coupled sections up to 32' long.

Option

Integral occupancy sensor available and provides from 600 sq. ft. up to 1250 sq. ft. of coverage in a maximum mounting height of 40'.



MBF
132
232

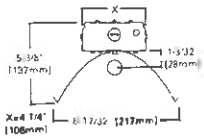
4' OR 8' MICROBAY®
1 OR 2 LAMP

T8 Lamp Technology
Task Beam
Focus Beam
Normal Beam

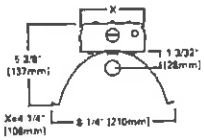
F-BAY™ FLUORESCENT HIGH-BAY

LAMP CONFIGURATIONS

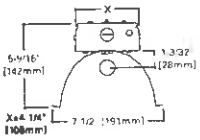
Focus Beam, 1 T8 Lamp



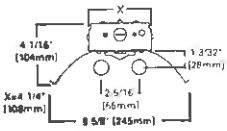
Task Beam, 1 T8 Lamp



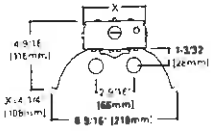
Normal Beam, 1 T8 Lamp



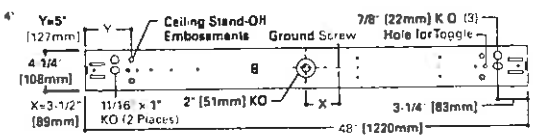
Focus Beam, 2 T8 Lamps

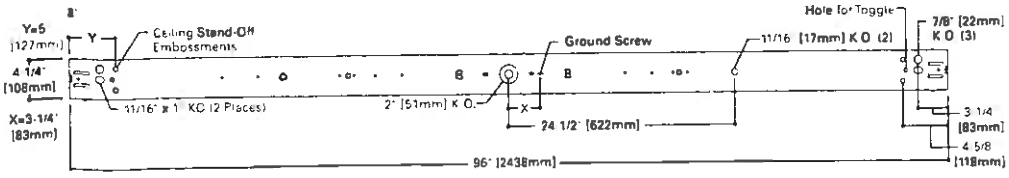


Normal Beam, 2 T8 Lamps



MOUNTING DATA





ENERGY DATA

Input Watts @ 120V.

Electronic Ballast
132 (28), 232 (58), 432 (109),
BT132 (58), BT232 (109)

Electronic Ballast/Plus
132 (46), 232 (73), 432 (147)
BT132 (73), BT232 (147)

ER Ballast
132 (36), 232 (57), 432 (112)
BT132 (57), BT232 (112)

ER Ballast/Plus
132 (46), 232 (74), 432 (144)
BT132 (74), BT232 (144)

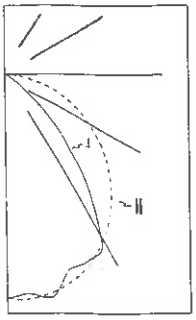
Reference the lamp/ballast data in the Technical Section for specific lamp/ballast requirements

LAMPS CONTAIN MERCURY. DISPOSE ACCORDING TO LOCAL, STATE OR FEDERAL LAWS

LINEAR DISCONNECT
Safe and convenient means of disconnecting power

*Patent Pending

ADF070947



MBF-132NB
(1) Electronic Ballast
(1) 32WT8 lamp
3100 lumens
Spacing criterion: (∥) 1.3 x mounting height, (⊥) 1.2 x mounting height
Efficiency 95.9%
Test Report: MBF-132NB.IES
LER =FL75
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.20

Candela

Angle	Along ∥	45°	Across ⊥
0	1460	1460	1460
5	1470	1449	1435
10	1460	1447	1481
15	1433	1456	1394
20	1389	1359	1331
25	1331	1285	1320
30	1259	1232	1249
35	1175	1186	964
40	1079	1051	652
45	974	785	427
50	863	517	215
55	746	319	74
60	625	145	0
65	502	29	0
70	378	3	0
75	258	2	0
80	146	2	0
85	49	2	0
90	0	0	0

Coefficients of Utilization

Effective floor cavity reflectance 20%

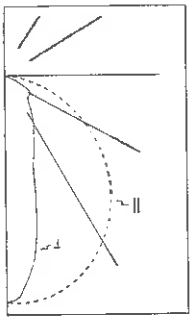
rc	80%				70%				50%			30%			10%			0%
rw	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	114	114	114	114	111	111	111	111	107	107	107	102	102	102	98	98	98	96
1	107	103	100	97	104	101	98	95	97	95	93	93	91	90	90	88	87	85
2	99	93	87	83	97	91	86	82	88	84	80	85	81	78	82	79	77	75
3	92	83	77	72	89	82	76	71	78	74	70	77	72	69	74	71	68	66
4	85	75	68	63	83	74	67	62	72	66	61	70	65	61	68	63	60	58
5	79	68	61	55	77	67	60	55	65	59	54	63	58	54	62	57	53	51
6	73	62	55	49	72	61	54	49	60	53	48	58	52	48	57	52	48	46
7	68	57	49	44	67	56	49	44	55	48	44	53	48	43	52	47	43	41
8	64	52	45	40	63	52	45	40	50	44	39	48	43	39	48	43	39	37
9	60	48	41	36	59	48	41	36	47	40	36	46	40	36	45	39	36	34
10	56	45	38	33	55	44	38	33	43	37	33	42	37	33	42	36	33	31

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixture
0-30	1147	37.0	38.6
0-40	1841	59.4	61.9
0-60	2760	88.0	92.8
0-90	2973	95.9	100.0
0-180	2973	95.9	100.0

Luminance Data

Angle In Deg	Average 0-Deg cd/sm	Average 45-Deg cd/sm	Average 90-Deg cd/sm
45	6841	5583	2999
55	6459	2762	641
65	5899	341	0
75	4950	38	0
85	2782	114	0



MBF-132FB
(1) Electronic Ballast
(1) 32WT8 lamp
3100 lumens
Spacing criterion. (∥) 1.3 x mounting height, (⊥) 0.5 x mounting height
Efficiency 99.8%
Test Report: MBF-132FB.IES
LER =FL78
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.08

Candela

Angle	Along ∥	45°	Across ⊥
0	2514	2514	2514
5	2526	2419	2341
10	2507	2159	1927
15	2459	1771	1268
20	2382	1262	830
25	2280	835	752
30	2150	778	646
35	2001	635	534
40	1834	541	430
45	1647	438	366
50	1449	342	353
55	1245	281	354
60	1032	263	280
65	816	253	128
70	601	141	1
75	395	13	0
80	208	3	0
85	81	3	0
90	0	0	0

Coefficients of Utilization

Effective floor cavity reflectance 20%

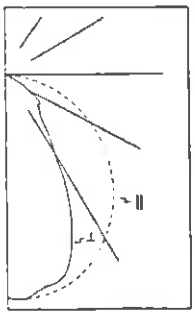
rc	80%				70%				50%			30%			10%			0%
rw	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	119	119	118	119	116	116	116	116	111	111	111	108	108	108	102	102	102	100
1	111	107	103	100	108	105	101	99	100	98	96	97	95	93	93	91	90	88
2	102	96	90	85	100	94	88	84	90	86	82	87	83	80	84	81	79	77
3	95	86	79	73	92	84	78	73	81	76	71	79	74	70	76	72	69	67
4	88	78	70	64	86	76	69	64	74	68	63	72	66	62	70	65	61	59
5	82	71	63	57	80	70	62	57	68	61	56	66	60	56	64	59	55	53
6	76	65	57	51	75	64	56	51	62	55	50	60	55	50	59	54	50	48
7	72	60	52	46	70	59	51	46	57	51	46	56	50	46	55	49	45	43
8	67	55	48	42	66	54	47	42	53	47	42	52	46	42	51	46	42	40
9	63	51	44	39	62	51	44	39	50	43	39	48	43	38	48	42	38	37
10	60	48	41	36	59	47	41	36	46	40	36	46	40	36	45	39	36	34

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixture
0-30	1298	41.9	42.0
0-40	1843	59.5	59.6
0-60	2718	87.7	87.8
0-90	3094	99.8	100.0
0-180	3094	99.8	100.0

Luminance Data

Angle In Deg	Average 0-Deg cd/sm	Average 45-Deg cd/sm	Average 90-Deg cd/sm
45	8846	2352	1966
55	8243	1861	2344
65	7333	2273	1150
75	5796	191	0
85	2658	131	0



MB-132TB
(1) Electronic Ballast
(1) 32WT8 lamp
2850 lumens
Spacing criterion: (∥) 1.3 x mounting height, (⊥) 0.9 x mounting height
Efficiency 96.7%
Test Report: MBF-132TB.IES
LER =FL76
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.16

Candela

Angle	Along ∥	45°	Across ⊥
0	1784	1784	1784
5	1791	1802	1788
10	1778	1743	1718
15	1745	1688	1670
20	1692	1625	1483
25	1621	1467	1156
30	1532	1218	786
35	1429	943	552
40	1312	631	406
45	1185	450	350
50	1049	324	341
55	808	271	217
60	762	247	74
65	613	126	0
70	462	13	0
75	316	3	0
80	178	3	0
85	58	3	0
90	0	0	0

Coefficients of Utilization

Effective floor cavity reflectance 20%

rc	80%				70%				50%			30%			10%			0%
rw	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	115	115	115	115	112	112	112	112	107	107	107	103	103	103	99	99	99	97
1	108	104	101	98	105	102	99	96	98	96	93	94	92	91	91	89	88	86
2	100	94	88	84	98	92	87	83	89	85	81	86	82	79	83	80	78	76
3	93	84	78	73	91	83	77	72	80	75	71	78	73	70	75	72	69	67
4	86	76	69	64	84	75	69	64	73	67	63	71	66	62	69	65	61	59
5	80	70	62	57	78	69	62	56	67	61	56	65	60	55	63	59	55	53
6	75	64	56	51	73	63	56	51	61	55	50	60	54	50	58	53	50	48
7	70	59	51	46	69	58	51	46	56	50	46	55	50	45	54	49	45	43
8	66	54	47	42	64	54	47	42	52	46	42	51	45	41	50	45	41	39
9	62	50	43	38	61	50	43	38	49	42	38	48	42	38	47	42	38	36
10	58	47	40	35	57	46	40	35	45	39	35	45	39	35	44	39	35	33

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixture
0-30	1297	41.8	43.3
0-40	1905	61.5	63.5
0-60	2755	88.9	81.9
0-90	2999	96.7	100.0
0-180	2999	96.7	100.0

Luminance Data

Angle In Deg	Average 0-Deg cd/sm	Average 45-Deg cd/sm	Average 90-Deg cd/sm
45	7462	2834	2204
55	7048	2104	1684
65	6458	1327	0
75	5438	52	0
85	2963	102	0

ORDERING INFORMATION

SAMPLE NUMBER: MBF-132-NB-UNV-EB81-U

Tandem
Blank= 4' Length
8T= 8' Length

Series
MBF=Micro-Bay

Number of Lamps
(Not included)
1=1 Lamp
2=2 Lamps

Lamp Types
32=32W T8 (48")

Reflector
FB=Focus Beam
TB=Task Beam (Medium -1 lamp only)
NB=Normal Beam

Voltage[1]
120V=120 Volt
277V=277 Volt
347V=347 Volt
UNV=Universal 120-277 Voltage
UNC=Universal 347/480 Voltage[7]

Options
GL=Single Element Fuse
GM=Double Element Fuse
EL=Emergency Installed[2]

Ballast Type[1]
T8 Systems
EB8__=T8 Electronic Instant Start.[4]
Total Harmonic Distortion < 10%
No. of Ballast
1 or 2

EB8__/PLUS=T8 Electronic Instant Start[4]
High Ballast Factor >1.15
Total Harmonic Distortion < 10%
No. of Ballast
1 or 2

ER8__=T8 Electronic Program Rapid Start.[4]
Total Harmonic Distortion < 10%
No. of Ballast
1 or 2

ER8__/PLUS=T8 Electronic Program Start.[4]
High Ballast Factor >1.15
Total Harmonic Distortion < 10%
No. of Ballast
1 or 2

DIM=Dimming (ballast must be specified)

Options
PI/CPI=Plug-In (1, 2 or 3)
C3=3' Power Cord
C6=6' Power Cord
PC3-=3' Power Cord & Plug (Specify Voltage)[3]
PC6-=6' Power Cord & Plug (Specify Voltage)[3]

Packaging
U=Unit Pack

Accessories (order separately)
AYC-CHAIN/SET/U=(2) Hooks, 36" Chain Sets w/S-Hooks
Y-TOGGLE=Y Mounting Toggle, #2 Cable (Specify 10' or 30')[6]
TOGGLE- =Single Toggle, #2 Cable (Specify 10' or 30')
SSF-EXT-LONG-CONN-KIT-U=Rigid Connector Support for Continuous Channel Installation
MB-SENSOR-KIT-CTR/MT-U=Aisle Coverage Motion Sensor, Center Mount Hardware, 120/277V[3, 5]
MB-SENSOR-KIT-END/MT-U=Aisle Coverage Motion Sensor, End Mount Hardware, 120/277V[3, 5]
MB-SENSOR-KIT-END/480V-U=Aisle Coverage Motion Sensor, End Mount Hardware, 480V
ATG-SSF-4-U=Tong Hanger

NOTES [1]Products also available in non-US voltages and frequencies for international markets [2]Voltage to be specified with emergency ballast option [3]Voltage must be specified when ordered with plugs, motion sensor or emergency ballasts. [4]ER8 and EB8 ballast systems suitable for operation in ambient environments up to 50°C [5]Must ship separately. [6]Use with continuous row mount at fixture joint only. [7]2/3 lamp ballast configurations in EB8/PLUS for T8 UNC version [8]Recommended when utilizing motion sensor option.

PI OPTION ORDERING INFORMATION

Catalog Number Suffix	Number of Circuits	Circuit Wired To Ballast
PI 1 BLK	1	Black
PI 2 BLU	2	Blue
PI 2 BLK	2	Black
PI 3 RED	3	Red
PI 3 BLU	3	Blue
PI 3 BLK	3	Black

Catalog Numbering System

The PI System is available in sections up to 8' in length for continuous row wiring by simply plugging the sections together. Each PI section is factory wired to the ballast leads. Color coding of wires is as follows:

PI-1 = One Circuit - 2 Wires: one black, one white
PI-2 = Two Circuits - 3 Wires: one black, one blue, one white
PI-3 = Three Circuits - 4 wires: one black, one blue, one red, one white

When ordering the PI2/PI3 System it is necessary to specify the number of fixtures required for each circuit. Each circuit in fixture must be ordered as a separate line item, with a different hot wire color specified. All wiring to external feeds, using cord or cord & plug, are responsibility of installing licensed contractor. Cord and cord & plug sets must be ordered separately if PI option is chosen.

PI1 - Single Circuit Plug-In

SAMPLE NUMBER: PI1BLK-WG

PI1= Single Circuit
BLK=Black Hot
NG= No Ground (ground provided by fixture body)
WG= With Ground (separate ground wire in harness)

PI2 - Two Circuit Plug-In

SAMPLE NUMBER: PI2BLK-WG

PI2= Two Circuit
BLK=Black Hot
BLU=Blue Hot
Leave Blank=Single Neutral
/WHT=White Neutral
/GRY=Gray Neutral
Leave Blank=Single Neutral
2NEU=Two Neutrals
NG= No Ground (ground provided by fixture body)
WG= With Ground (separate ground wire in harness)

PI3 - Three Circuit Plug-In

SAMPLE NUMBER: PI3BLK-WG

PI3= Three Circuit
BLK=Black Hot
BLU=Blue Hot
RED=Red Hot
Leave Blank=Single Neutral
/WHT=White Neutral
/GRY=Gray Neutral
Leave Blank=Single Neutral
2NEU=Two Neutrals
NG= No Ground (ground provided by fixture body)
WG= With Ground (separate ground wire in harness)

For complete product data, reference the Fluorescent Specification binder. Specifications & dimensions subject to change without notice. Consult your Cooper Lighting Representative for availability and ordering information.

SHIPPING INFORMATION

Catalog No.	Wt.
MBF-132	6 lbs

RHEEM RESIDENTIAL TANKLESS

95 TANKLESS SERIES

Continuous hot water for 3 bathroom homes*

RTG-95DV indoor direct vent and RTG-95X outdoor natural and LP models – 11,000 - 199,900 BTU max.
9.5 gal./min at 35° F rise max., 7.4 gal./min. at 45° F rise

Limited Warranty:
12-Year on heat exchanger, 5-Year on parts, 1-Year on labor
See Residential Warranty Information Brochure for complete warranty information.

- **New!** 3"/5" Concentric Vent System with Integrated Condensate Collector
- Connects to Metal Fab Inc., 3"/5" Concentric Venting without an adapter
- **New!** Next Generation Burner Technology
- **Industry Best!** .26 GPM Minimum Flow Rate, .40 GPM Minimum Activation Flow Rate
- UMC-117 remote control and 10 ft. of thermostat wire is included
- EZ-Link™ cable available for high demand applications to connect two tankless units to operate as one
- **New!** Manifold up to 6 units with an optional MIC-6 manifold control board
- **Exclusive!** All Rheem models can be linked in up to 20 unit manifold installations by using the optional MIC-180 and MICS-180 manifold control assembly
- High-altitude capability – up to 9,840 ft. elevation above sea level (no chip required)
- **Exclusive!** Guardian OFW™ overheat film wrap
- All Rheem tankless models are third-party efficiency certified by GAMA
- Continuous hot water, energy saving and compact, space saving design
- Intelligent electronic controls designed to increase energy efficiency and safety
- Self Diagnostic System
- Digital display shows temperature setting and maintenance codes
- Built-in electric blower
- Supplied with a 120 volt power cord
- Environmentally friendly Low NOx burner meets SCAQMD rule 1146 requirements
- Freeze protection to -30° F

199,900 BTU
INDOOR DIRECT VENT

199,900 BTU
OUTDOOR

Product appearance may differ.

* Based on simultaneous showers using 2.5 gallons per minute. Flow rates vary depending on temperature of cold water supply.

The 95 Series Tankless models can be converted for Commercial Installations
See Commercial Warranty Brochure for details.

Tankless water heaters
Continuous hot water

Rheem®

relax
It's Rheem®

Eco-Friendly

energy
LEARN MORE AT
energystar.gov

See reverse for specifications.

95 TANKLESS SERIES

Specifications

DESCRIPTION			FEATURES				ROUGHING IN DIMENSIONS (SHOWN IN INCHES)							ENERGY INFO.	
MODEL NUMBER	GAS INPUT BTU/HR.	TYPE	TEMP. RANGE	WATER FLOW RATE GPM @ 77° RISE MAX.	GPM @ 45° RISE MAX.	GPM @ 35° RISE MAX.	CONNECTION WATER	CONNECTION GAS	HEIGHT	WIDTH	DEPTH	VENT DIAMETER (INCHES)	SHIP. WEIGHT (LBS.)	ENERGY FACTOR	D.O.E. ANN. OP. COST NAT/LP
RHEEM TANKLESS WATER HEATERS FOR 3 BATHROOM HOMES															
RTG-95DVN*	11,000-199,900	Indoor Direct Vent	85° to 140° F*	4.3	7.4	9.5	3/4	3/4	26-5/8	13-7/8	9-7/8	3 by 5 CONCENTRIC	54	.82	$223/$374
RTG-95XN*	11,000-199,900	Outdoor	85° to 140° F*	4.3	7.4	9.5	3/4	3/4	23-5/8	13-7/8	8-7/8	N/A	54	.82	$223/$374

All models are available in Natural Gas and Propane (LP).
For Propane replace the N with P when ordering.

- Factory set maximum temperature is 120° F. See Use and Care Manual for setting
- Consult factory for information on sizing the application

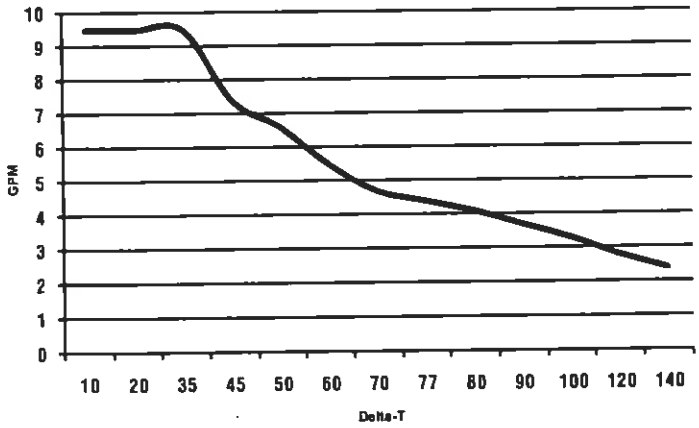
Vent Termination Kits are required for Direct Vent models. Contact your distributor for details.

Proper gas pressure must be ensured to supply tankless gas water heaters – up to 199,900 BTU for RTG-95 models (Consult your gas supplier)

	Temperature Rise (° F)								
Model Number	35°	45°	50°	60°	70°	77°	80°	90°	100°
RTG-95 Water Flow (GPM)	9.5	7.4	6.6	5.5	4.7	4.3	4.1	3.7	3.3

Above estimates are for sizing purposes only.

Water Heater Flow Rate Curves



These units are designed to meet or exceed ANSI (American National Standards Institute) requirements and have been tested according to D.O.E. test procedures and meet or exceed the energy efficiency requirements of NAECA, ASHRAE standard 90, ICC Code and all state energy efficiency performance criteria for energy consuming appliances.

Before purchasing this appliance, read important energy cost and efficiency information available from your supplier.

In keeping with its policy of continuous progress and product improvement, Rheem reserves the right to make changes without notice.

***COMMERCIAL OPERATION AVAILABLE WITH CONVERSION KITS:**
RTG20214A FOR RTG-95DVN
RTG20214B FOR RTG-95DVP
RTG20214C FOR RTG-95XN
RTG20214D FOR RTG-95XP
Temperature range for commercial: 85° to 185° F.

Energy Factor and Average Annual Operating Costs based on D.O.E (Department of Energy) test procedures. D.O.E. national average fuel rate natural gas $1.218/therm, LP $1.87/gallon.

Rheem Water Heating and Heating & Cooling Products
101 Bell Road • Montgomery, AL 36117-4305
1-866-720-2076 • www.rheem.com

Rheem Canada Ltd./Ltée • Water Heater Division
125 Edgeware Road, Unit 1, Brampton, Ontario L6Y 0P5

Printed in U.S.A. 01/10 WP Form No. 101-50-95

Proposed

AdvantagePlus Sealed-Combustion Gas-Fired Commercial Water Heaters

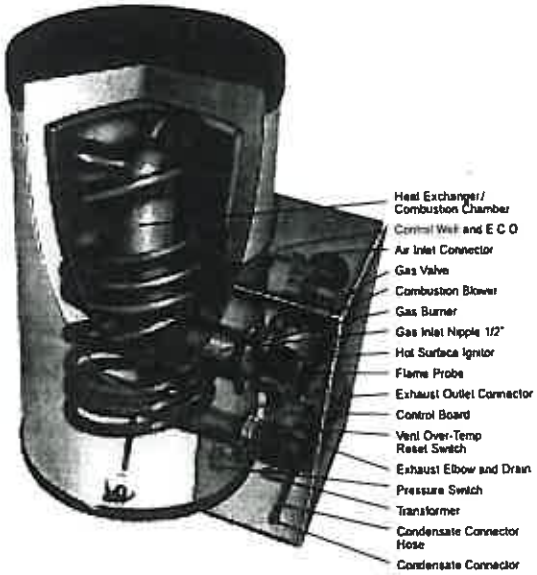
Available in Sizes Ranging From 45 - 119 Gallon Models

▶ **100,000 BTU/Hr. thru 199,000 BTU/Hr.**

Rheem-Ruud AdvantagePlus™ Gas Commercial Water Heaters are specifically designed to provide customers with maximum savings on operation, space and installation. Designed with the most advanced technology available, these products optimize efficiency and operating reliability.

Construction Features:

- 316L stainless steel tank construction (requires no anode rods).
- No chimney required; direct vent using plastic pipe.
- Thermal efficiency of 95% dramatically reduces operating costs.
- 85 equivalent feet of vent length.
- Low NO_X emissions. Meets SCAQMD Rule 1146.2.
- High impact plastic jacket eliminates dents.
- 2" of non-CFC, polyurethane foam insulation.
- Less than 1/2 degree per hour heat loss (R17).
- Corrosion resistant, high efficiency 90/10 cupronickel heat exchanger.
- Self-diagnostic electronic control with digital readout for water temperature, set point and differential.
- Removable front cover allows easy access to equipment (24" service clearance recommended).
- Temperature range from 70°F to 160°F (maximum temperature setting of 180°F available on HE45-160 and HE45-199 booster models only).
- Zero clearance to all combustible surfaces.
- Factory installed AGA/ASME rated T&P relief valve.
- Booster installation kit provided with HE45-160 and HE45-199 booster models.



No Chimney Required

Vents Up To 40 Feet Using 3" Schedule 40 PVC, CPVC or ABS Pipe

100,000 BTU and 130,000 BTU Models Are Certified To Vent With 2" Schedule 40 PVC, CPVC or ABS Pipe

Certifications and Ratings:

The water heaters are UL/ULC listed and meet or exceed thermal efficiency and standby loss requirements of current ASHRAE standards. All water heaters are supplied with an AGA/ASME rated temperature and pressure relief valve. The control panel is an integrated solid state temperature and ignition control device with integral diagnostics, LED fault display capability and a digital display of temperature settings. All models are North Carolina Code compliant. Meet all safety and construction requirements of ANSI Z21.10.3. CERTIFIED **FOR A 150 PSI MAXIMUM WORKING PRESSURE.**

Continued next page.

RECOVERY CAPACITIES

Recovery in U.S. Gallons/Hr. (GPH) and Liters/Hr. (LPH) at Various Temperature Rises

MODEL NUMBER	INPUT (BTU/HR) NAT. & LP	THERMAL EFFICIENCY	UNITS	40°F (22°C)	50°F (28°C)	60°F (33°C)	70°F (39°C)	80°F (45°C)	90°F (50°C)	100°F (56°C)	110°F (61°C)	120°F (67°C)	130°F (72°C)	140°F (78°C)
HE45-100	100,000	95%	GPH	288	230	192	165	144	128	115	105	96	N/A	N/A
			LPH	1090	872	726	623	545	484	436	396	363	N/A	N/A
HE45-130 HE80-130 HE119-130	130,000	95%	GPH	374	299	249	214	187	166	150	136	125*	N/A	N/A
			LPH	1417	1133	944	809	708	630	567	515	472	N/A	N/A
HE80-160 HE119-160	160,000	95%	GPH	461	368	307	263	230	205	184	167	154	N/A	N/A
			LPH	1744	1395	1162	996	872	775	697	634	581	N/A	N/A
HE80-199 HE119-199	199,000	95%	GPH	573	458	382	327	286	255	229	208	191	N/A	N/A
			LPH	2169	1735	1446	1239	1084	964	867	789	723	N/A	N/A
BOOSTER MODELS														
HE45-160	160,000	95%	GPH	461	368	307	263	230	205	184	167	154	142	132
			LPH	1744	1395	1162	996	872	775	697	634	581	536	498
HE45-199	199,000	95%	GPH	573	458	382	327	286	255	229	208	191	176	164
			LPH	2169	1735	1446	1239	1084	964	867	789	723	667	620

Recovery rating is based on thermal efficiencies obtained in an UL certified laboratory

MAXIMUM DELIVERY

In U.S. Gallons and Liters (Includes useable storage and recovery for indicated times)

MODEL NUMBER	GALLONS	LITERS	INPUT (BTU/HR) NAT. & LP	TEMP. RISE	UNITS	5 MIN.	10 MIN.	15 MIN.	20 MIN.	30 MIN.	45 MIN.	1 HR.	2 HR.	3 HR.	MIN. TO RECOVER CONTENTS
HE45-100	45	170	100,000	100°F	GAL.	41	51	60	70	89	118	147	262	377	23
				37.7°C	LTR.	156	192	228	265	337	446	555	991	1427	
HE45-130	45	170	130,000	100°F	GAL.	44	56	69	81	106	144	181	331	481	18
				37.7°C	LTR.	166	214	261	308	403	544	686	1253	1819	
HE80-130	80	303	130,000	100°F	GAL.	68	81	93	106	131	168	206	355	505	32
				37.7°C	LTR.	259	306	354	401	495	637	779	1345	1912	
HE119-130	119	450	130,000	100°F	GAL.	96	108	121	133	158	196	233	383	532	48
				37.7°C	LTR.	363	410	457	504	599	750	882	1449	2015	
HE45-160	45	170	160,000	100°F	GAL.	47	62	78	93	124	170	216	400	584	15
				37.7°C	LTR.	177	235	294	352	468	642	817	1514	2211	
HE80-160	80	303	160,000	100°F	GAL.	71	87	102	117	148	194	240	424	609	26
				37.7°C	LTR.	270	328	386	444	561	735	909	1607	2304	
HE119-160	119	450	160,000	100°F	GAL.	99	114	129	145	175	221	268	452	636	39
				37.7°C	LTR.	373	432	490	548	664	838	1013	1710	2408	
HE45-199	45	170	199,000	100°F	GAL.	51	70	89	108	146	203	261	490	719	12
				37.7°C	LTR.	192	264	336	408	553	770	987	1854	2721	
HE80-199	80	303	199,000	100°F	GAL.	75	94	113	132	171	228	285	514	743	21
				37.7°C	LTR.	284	357	429	501	646	863	1079	1947	2814	
HE119-199	119	450	199,000	100°F	GAL.	102	121	141	160	198	255	312	542	771	31
				37.7°C	LTR.	338	460	532	604	749	966	1183	2050	2918	

All models have a maximum setpoint of 160°F with the exception of the HE45-160 and HE45-199 booster models. The HE45-160 and HE45-199 have a maximum setpoint of 180°F.

DIMENSIONAL INFORMATION

All dimensions shown in English and Metric

MODEL NUMBER	UNITS	A	B	C	D	E	F	G	H	VENT	WATER CONNECTIONS INLET	WATER CONNECTIONS OUTLET	APPROX SHIPPING WT.
HE45-100 HE45-130	inches	42	23 1/2	32	35	5	25 1/4	27 9/16	5 7/8	2	1	1	175 lbs.
	mm	1067	597	813	889	127	641	700	149	51	25	25	79 kgs
HE45-160 HE45-199	inches	42	23 1/2	32	35	5	25 1/4	27 9/16	5 7/8	3	1	1	175 lbs
	mm	1067	597	813	889	127	641	700	149	76	25	25	79 kgs
HE80-130 HE80-160 HE80-199	inches	72	23 1/2	32	65	5	25 1/4	20 1/4	7 3/4	3*	1-1/2	1-1/2	235 lbs
	mm	1854	597	813	1651	127	641	514	197	76	38	38	106 kgs
HE119-130 HE119-160 HE119-199	inches	73	27	36	66 3/4	6 3/4	28 7/8	22	9 1/2	3*	1-1/2	1-1/2	405 lbs.
	mm	1854	686	914	1695	171	733	559	241	76	38	38	184 kgs

* 130,000 BTU models are certified to be installed with 2" venting

All models require a 120V power source

See use and care manual for venting details

0" CLEARANCE TO COMBUSTIBLES ON ALL ADVANTAGE PLUS UNITS, HOWEVER, A 24" CONTROL PANEL SERVICE CLEARANCE IS RECOMMENDED.

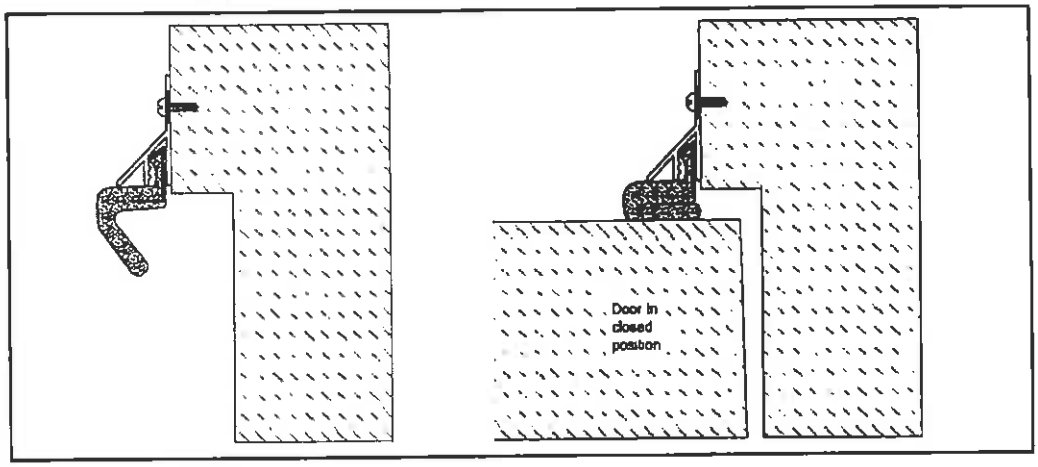
MODELS WITH INPUTS OF 100,000 BTU AND 130,000 BTU ARE CERTIFIED TO VENT WITH 2" SCHEDULE 40 PVC, CPVC OR ABS PIPE

Door and Window Weatherstripping and Seals

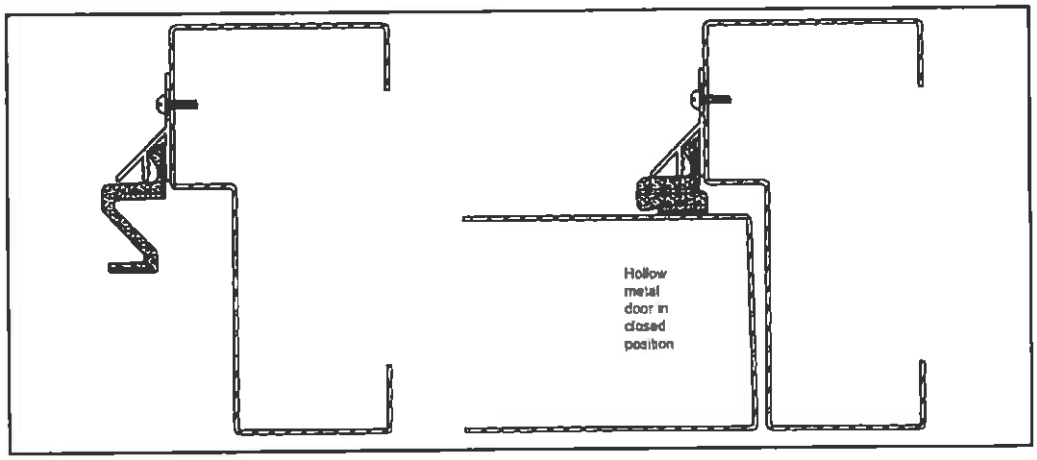
Details:
As Referred In Specifications

1. SPEC ITEM 2.2.1.1
2. SPEC ITEM 2.2.1.2
3. SPEC ITEM 2.2.1.3
4. SPEC ITEM 2.2.1.4
5. SPEC ITEM 2.2.1.5
6. SPEC ITEM 2.2.1.6
7. SPEC ITEM 2.2.1.7
   SPEC ITEM 2.2.2.1
8. SPEC ITEM 2.2.1.8
   SPEC ITEM 2.2.2.2
9. SPEC ITEM 2.2.1.9
   SPEC ITEM 2.2.2.3
10. SPEC ITEM 2.2.1.10
    SPEC ITEM 2.2.2.4
11. SPEC ITEM 2.2.1.11
    SPEC ITEM 2.2.2.5

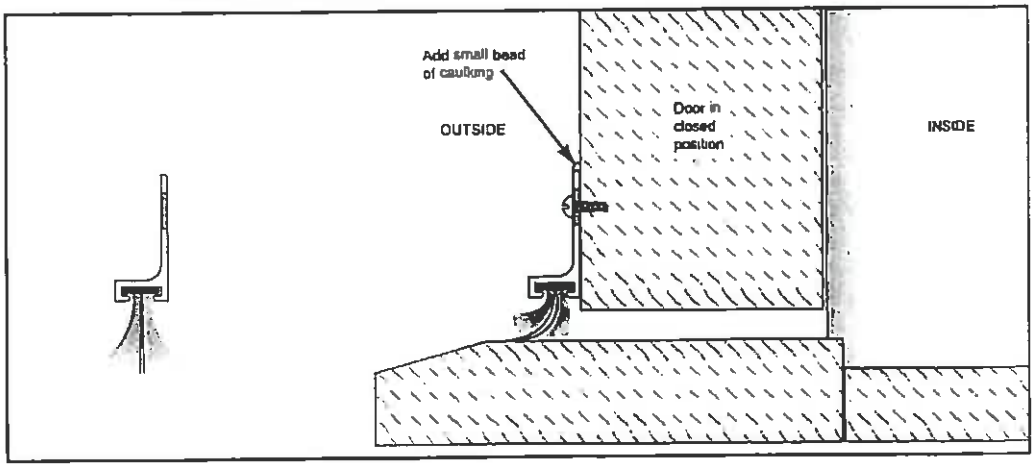
1. SPEC ITEM 2.2.1.1 - DOORSET DX-1000



2. SPEC ITEM 2.2.1.2 - DOORSET MX-1500



3. SPEC ITEM 2.2.1.3 - DOORSWEEP DSS-10914



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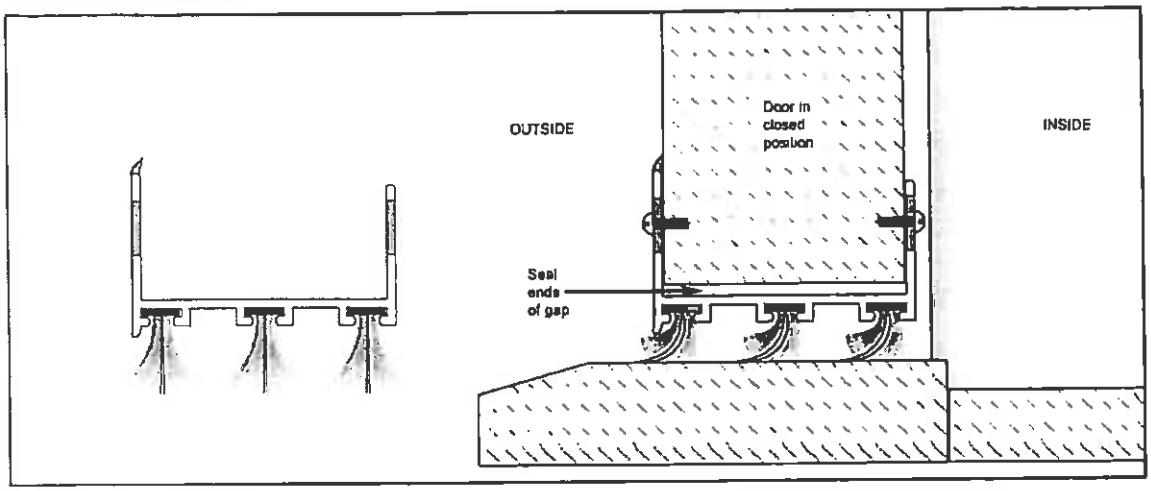
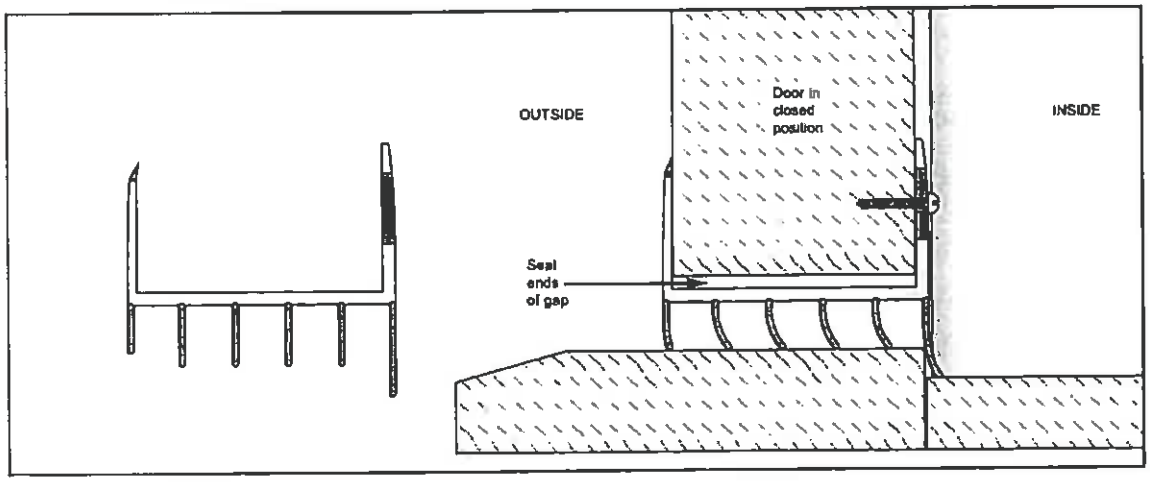
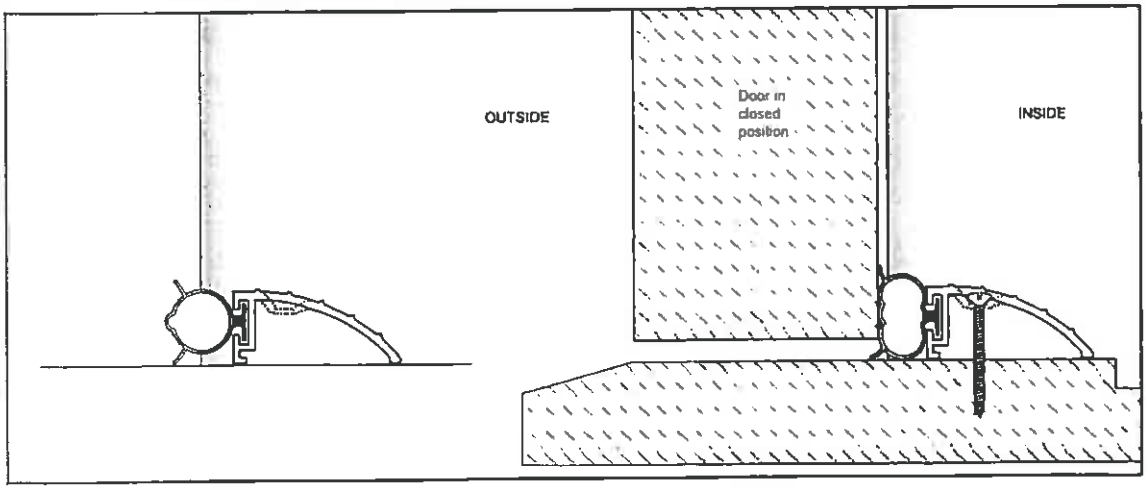
4. SPEC ITEM 2.2.1.4 - DOORSWEEP DSS-44-914



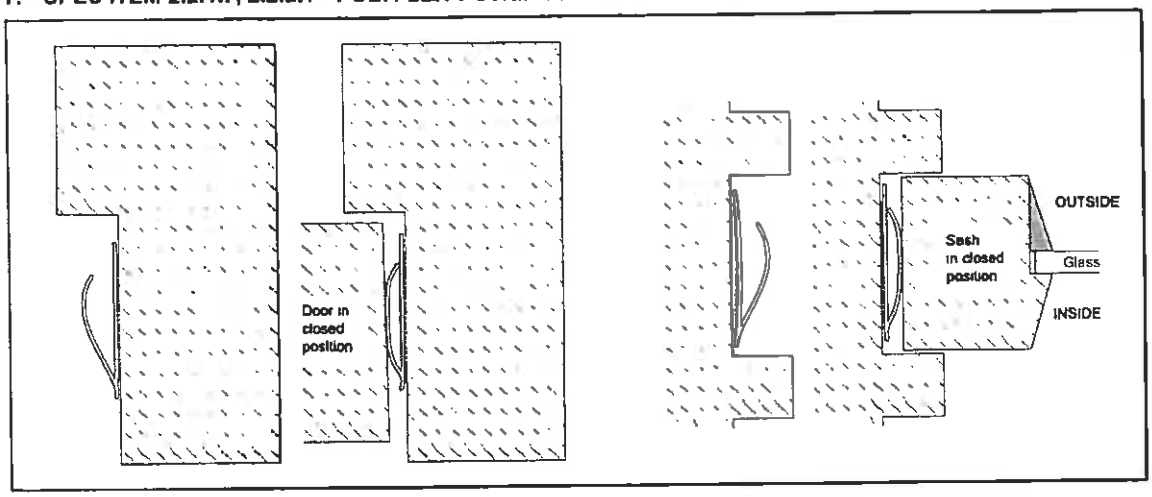
5. SPEC ITEM 2.2.1.5 - - DOORSWEEP VSS-44-914



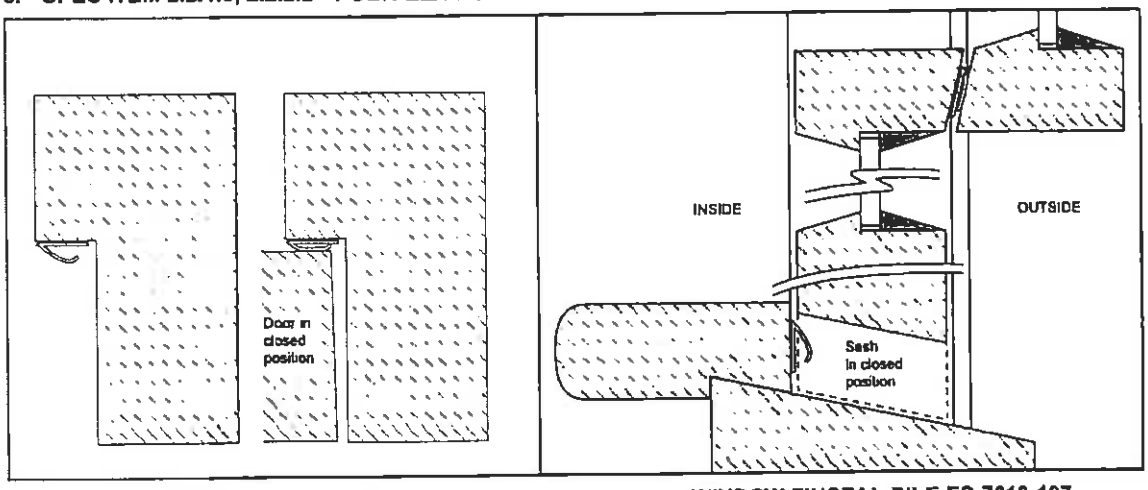
6. SPEC ITEM 2.2.1.6 - THRESHOLD T-2000-B



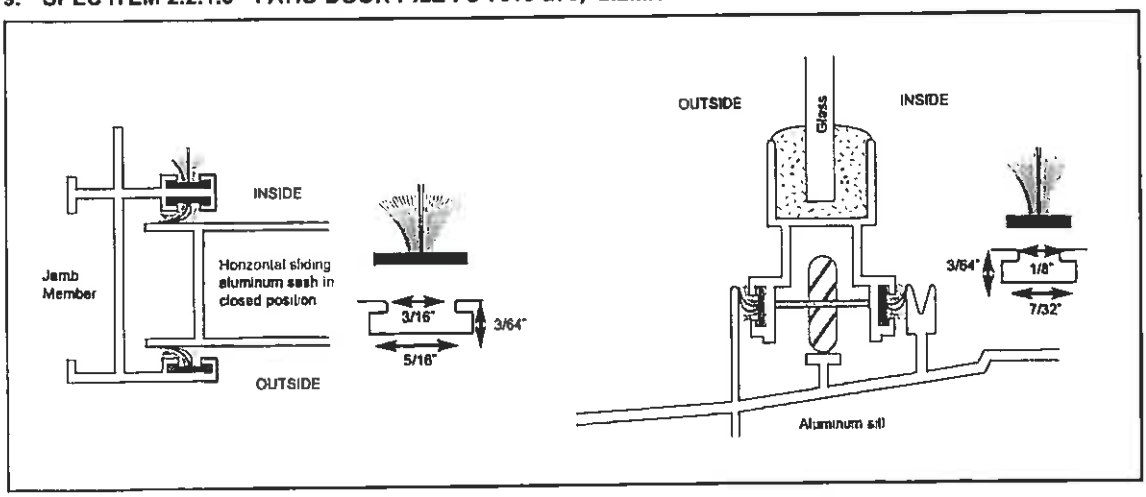
7. SPEC ITEM 2.2.1.7, 2.2.2.1 - POLYFLEX V-STRIP PF-512-AB



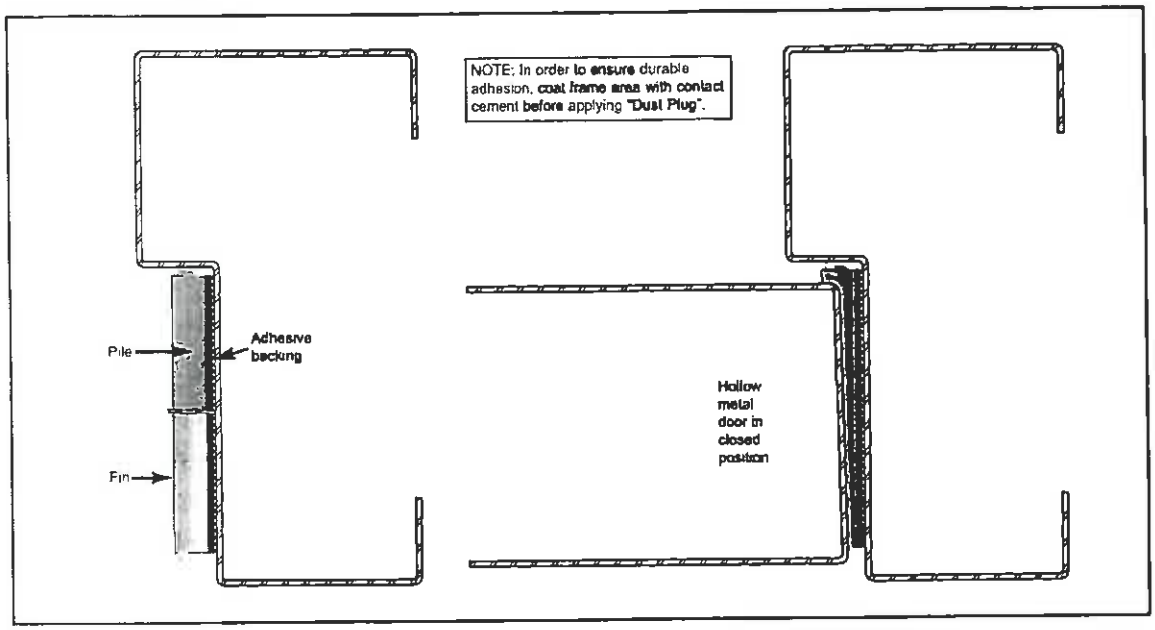
8. SPEC ITEM 2.2.1.8, 2.2.2.2 - POLYFLEX V-STRIP PF-524-AB



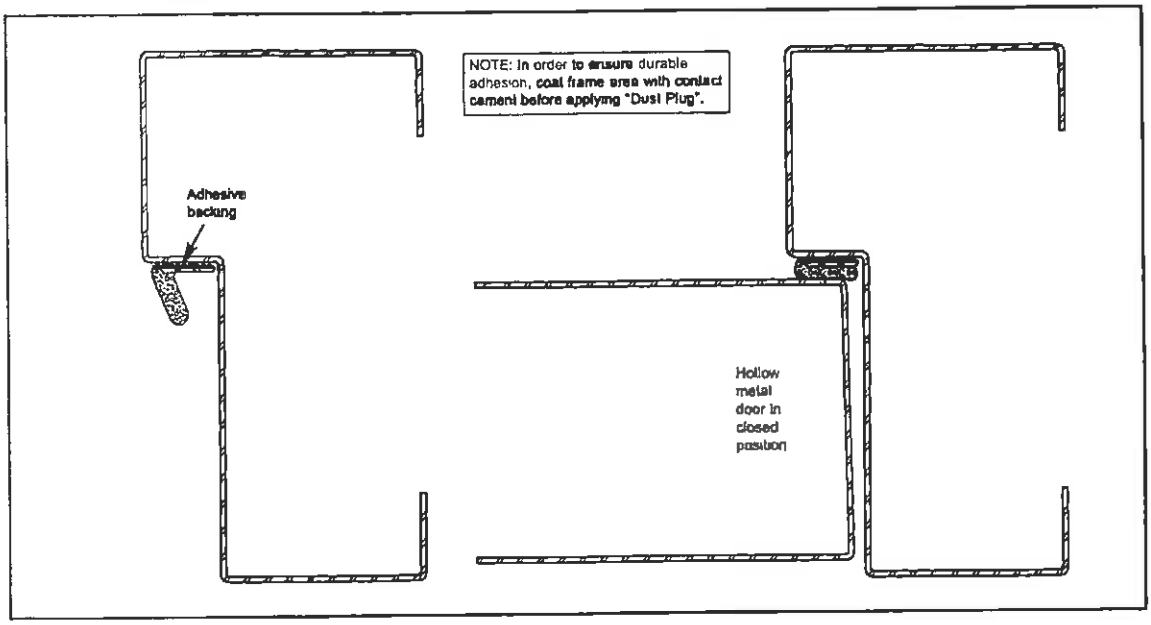
9. SPEC ITEM 2.2.1.9 - PATIO DOOR PILE FS-7515-270, 2.2.2.3 - WINDOW FINSEAL PILE FS-7613-187



10. SPEC ITEM 2.2.1.10, 2.2.2.4 - DUST PLUG CORNER SEAL



11. SPEC ITEM 2.2.1.11, 2.2.2.5 - C-FOLD AB DOOR & WINDOW FOAM



ZERODRAFT
Professional Weatherization Materials

125 Traders Boulevard East, Unit 4, Mississauga, Ontario L4Z 2H3
Tel.: (905) 890-5866 Toll Free: 1-877-272-2626 Fax: (905) 890-8114 www.zerodraft.com

Product Data Sheet
INSULATING AIR SEALANT
Two-Component Polyurethane

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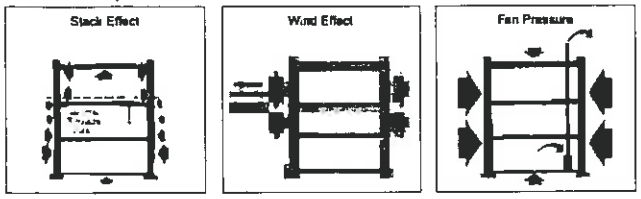
EXPLANATION

Buildings with gaps, cracks, and "holes" in them that suffer from uncontrolled air flow (air leakage) cost more money to heat and air condition, are drafty and uncomfortable, have poorer quality indoor air, deteriorate faster, and generate more occupant complaints than buildings where air leakage is properly controlled.

Air leakage through openings in the building envelope is caused by air pressure differences due to stack effect, wind and ventilation. Alone, or in combination, the three effects typically represent 15 to 40% of the building's thermal load, or roughly 4 – 8% of the total energy requirement (ASHRAE Handbook).



Uncontrolled air flow is responsible for the corrosion and decay of building materials (thereby reducing life expectancy), increased maintenance costs, poor appearance – and in the event of a fire – the rapid spread of flames and smoke.

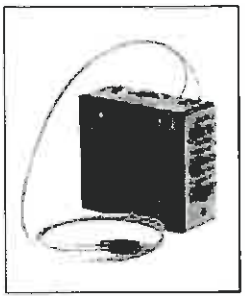
Zerodraft Insulating Air Sealant seals gaps, cracks, and holes in walls, roof-wall connections, the perimeter of door and window openings, mechanical and electrical penetrations, and similar locations to help provide a continuous, impermeable barrier to air infiltration or loss.

DESCRIPTION

Zerodraft Insulating Air Sealant is a polyurethane foam consisting of a mix of chemicals (MDI Monomer and Isobutane/Propane propellant) in a pressurized container and is formulated so that it will react and cure chemically in ambient air.

Zerodraft Insulating Air Sealant being applied at roof-wall junction.

The material mix is ejected from a portable/disposable self-contained applicator with an advanced metering system that controls foam flow, prevents over-application and reduces waste. Zerodraft Insulating Air Sealant also provides high yield and quick curing. For application purposes, the gun foam system is the most efficient means of dispensing foam, offers the greatest control, optimum accuracy and unlimited range of applicator motion – an installer convenience when going up and down ladders, around corners, or moving from room to room.



Z2-200 A B

Zerodraft Insulating Air Sealant is available in two convenient size containers – Z2-200 and Z2-600, and the gun applicator is available with three types of accessory nozzles i.e. Fan, High Velocity, and Pour-In-Place, to suit a variety of installer requirements.

Z2-600 A

USES

Zerodraft Insulating Air Sealant is intended to be installed at junctions between different building elements, in voids, and around penetrations in a building assembly to control air leakage.

Zerodraft Insulating Air Sealant is dispensed as a high yield foam for filling "holes" over 50mm (2") width in size. Zerodraft Is generally used where appearance is not critical however the foam sealant can be trimmed and painted.

Z2-600 B

Note: Zerodraft Foam Sealant – another Zerodraft product – is dispensed as a bead for crack and gap filling. A "gap" is generally between 6 mm (1/4") and 50 mm (2") wide. A "crack" is less than 6 mm (1/4") wide.

Example areas of use for Zerodraft Insulating Air Sealant include:

- drill and inject applications, e.g. window and curtainwall mullions, beam and column enclosures, and other hidden cavities.
- voids in walls and at roof-wall connections.
- at beams and columns to eliminate thermal bridging.
- perimeter of door and window openings.
- spray application for continuity in other insulation

systems i.e. gaps in board insulation and surrounding surfaces.

- mechanical and electrical penetrations in walls, floors and roofs (pipe, duct, conduit, etc.).
- similar locations, to provide a continuous impermeable barrier to air infiltration or loss.

Zerodraft Insulating Air Sealant being applied behind window frame.

In addition to general construction, other industries where Zerodraft Insulating Air Sealant is used include agricultural, boating and marine, cold storage, mining, petrochemical, pools and spas, refrigeration, transportation, and utilities.

LIMITATIONS

Do not use Zerodraft Insulating Air Sealant:

- where subject to a continuous service temperature outside the range of -60°C to +80°C (-47°F to 176°F) such as in contact with chimneys, heater vents, steam pipes, etc. unless the sealant has been designed for use at other service temperatures as specified by Zerodraft.
- on or in the vicinity of heat emitting devices such as recessed lighting fixtures, at a lesser distance than 75 mm (3") or as specified by the authority having jurisdiction.
- inside electrical outlets or junction boxes.
- left exposed to continuous ultraviolet light.
- immersed in water for long periods of time.

FEATURES

High yield; expands 3 times from initial application or injection. See Packaging on back page.

Quick cure; cures in 45 seconds.

Fire retardant; self-extinguishing in absence of flame. Produces Flame Spread Rating of less than 25 and Smoke Developed Rating of less than 50 when tested to CAN/ULC-S102 and ASTM E-84 in a range of bead sizes. (Not a fire stop; see Zerodraft Air Seal/Fire Stop Systems literature).

Safe formula; does not contain ureaformaldehyde, CFC's (chlorofluorocarbons), or hazardous solvents.

Excellent insulating properties; over 90% closed cell content provides RSI Value of 1.057 per 305 mm thickness (R Value of 6.0 per 1" thickness) which helps in reducing heating and cooling costs.

STANDARDS CONFORMANCE

Zerodraft Insulating Air Sealant conforms to:

CAN/ULC-S711.1 Standard For Thermal Insulation – Bead Applied Two-Component Polyurethane Air Sealant Foam, Part 1: Material Specification.

CAN/ULC-S711.2 Standard For Thermal Insulation – Bead Applied Two-Component Polyurethane Air Sealant Foam, Part 2: Application.

INSTALLATION

Storage/Shelf Life: Do not expose to heat or store above 50°C (120°F). Do not leave in vehicle. Shelf life is 12 months.

Surface Preparation: Apply to clean substrates free of oil, grease or excessive moisture.

Application: Zerodraft Insulating Air Sealant is applied only by accredited Zerodraft applicators.

Essentially, these specialist contractors seal gaps, cracks and holes with appropriate materials and systems thereby ensuring a continuous plane of airtightness in the building envelope.

In addition, the specialist contractors are familiar with the need for "decoupling" and "compartmentalization" within buildings. Floors are decoupled from each other to prevent vertical leakage while other areas of the building are compartmentalized to help equalize pressure differences.

For example, at the top of the building mechanical rooms are isolated and compartmentalized by weatherstripping doors, fire stopping relevant penetrations through fire rated walls, reducing the size of cable holes in the elevator shafts and door controller cable penetrations, as well as busbar and other electrical penetrations through the floor of the elevator rooms. At the bottom of the building, the many penetrations found in the underground parking areas are effectively sealed. Doors are weatherstripped. Open cable, conduit, duct, and pipe penetrations and gaps between block infill and slabs are sealed. Vertical shafts, where fire doors with large gaps – some up to 50 mm (2") – are weatherstripped, thereby decoupling floor to floor areas and reducing stack effect pressures.

Other areas to consider include fire cabinets, garbage disposal rooms, electrical rooms and other service shafts.

Zerodraft Insulating Air Sealant is also effective in sealing and insulating thermal "bridges" at roof-wall junctions, beam penetrations, and other interruptions affecting the integrity of wall and roof systems.

Zerodraft Insulating Air Sealant is only one product used in the air leakage sealing process. Zerodraft Foam Sealant for smaller holes (cracks and gaps), Zerodraft Air Seal/Fire Stop Systems, and Zerodraft Door and Window Weatherstripping are all employed for sealing, decoupling and compartmentalization work. See other Zerodraft literature.

TECHNICAL DATA*

PROPERTY	TEST METHOD (ASTM)	RESULT
Density	D-1622	1.75 ± 0.2 pcf
K- Factor	C-177	0.144
R-Factor	C-177	6.9/in
Compressive Strength 10%, parallel 10%, perpendicular	D-1621	 19 psi 13.4 psi
Tensile Strength parallel perpendicular	D-1623	 34 psi 24.1 psi
Dimensional Stability -40°F, 2-wks 158°F, 100% RH 2-wks	D-2126	 +0.88%, vol. change +14%, vol. change
Water Absorption	D-2842	1 – 3.5%
Closed Cell Content	D-2856	90%, min.

* Test reports are available upon request.

Finishing: Zerodraft Insulating Air Sealant, a cream coloured product, is typically covered up with interior finishes such as plaster, drywall, paneling, trim or other finish. Alternatively the sealant may be cut smooth (trimmed) and painted. In plenum or other areas not exposed to ultraviolet radiation, where it is used strictly as an air sealant, Zerodraft Insulating Air Sealant may be left exposed.

Building Codes: Zerodraft Insulating Air Sealant complies with the following Sections of the National Building Code:

- 3.1.5.2 Minor Combustible Components (Zerodraft Insulating Air Sealant is permitted in buildings required to be of non-combustible construction).
- 5.4.1.2 Air Barrier System Properties (Zerodraft Insulating Air Sealant falls within the maximum allowable air leakage rate of 0.02 $l/s \cdot m^2$) measured at an air pressure difference of 75 Pa. (See Appendix A reference following).
- A-6.4.1.2 (1) and (2) Air Leakage Through The Air Barrier System (Zerodraft Insulating Air Sealant falls within the recommended maximum allowable leakage rates as related to warm and cold side temperatures and humidity conditions).

Health/Safety: A Material Safety Data Sheet is provided with every Zerodraft Insulating Air Sealant kit. Instructions for the safe handling, use and disposal of the materials and/or containers are provided on the label of each container.

WARRANTY

Normal 1 year construction warranty.

MAINTENANCE

No maintenance required.

AVAILABILITY & BUDGET PRICING

Zerodraft products and services are available throughout North America. Zerodraft will review drawings (and/or the building for retrofit work) and provide budget pricing on a project-by-project basis. Ultimately, the cost of sealing is estimated on a lineal metre, square metre and/or unit cost basis for doors, windows and different types of penetrations.

TECHNICAL SERVICES

Zerodraft provide air leakage control advisory services from preliminary design through to application, including the following:

- Air sealing recommendations and technical advice for both new work and retrofit applications (asset protection).
- Design and specification assistance.
- Air leakage investigation/testing, including energy audits and pay back projections.

RELATED DATA

- Zerodraft Foam Sealant literature (for smaller cracks and gaps).
- Zerodraft Air Seal/Fire Stop Systems literature (for ULC fire rated assemblies).
- Zerodraft Door and Window Weatherstripping literature.
- CSC (Construction Specifications Canada) Air Barriers "Digest" and "Master Specification", March 1990.
- "Does Your Building Suck?", CONDOBUSINESS Magazine, September 2001.
- "Sealing the Envelope", Canadian Property Management Magazine, September 2001.

Packaging:

CONTAINER SIZE	YIELD				CONTAINER DIMENSIONS (L x W x H)		KITS PER PALLET
	Cubic m	Board m*	Board Ft.	Cubic Ft.	mm (Nominal)	Inches (Nominal)	
Z2-200	0.47	5.66	200	16.67	380 x 190 x 368	15 x 7-1/2 x 14-1/2	36
Z2-600 (1A + 1B)	1.400	16.99	600	50.00	318 x 305 x 432	12-1/2 x 12 x 17	16 (8A + 8B)

* Board metres = board feet x 0.02832

- "Urethane Foams as Insulating Sealants", Construction Canada Magazine, March/April 1997.
- "Urethane Foams and Air Leakage Control", Home Energy Magazine, July/August 1995.

SPECIFICATION (Short Form)

SPEC NOTE: Zerodraft Insulating Air Sealant is often used with Zerodraft Foam Sealant, Zerodraft Air Seal/Fire Stop Systems and Zerodraft Door and Window Weatherstripping. Collectively, with the main air barrier, these products provide a complete system to achieve a continuous impermeable barrier to air infiltration or loss. Refer to the respective Zerodraft literature and Zerodraft Insulating Air Seal/Fire Stop Master Specification.

Insulating air sealant: Zerodraft Insulating Air Sealant bead applied gun foam two-component polyurethane sealant to CAN/ULC-S711.1 (Material Specification) as manufactured and distributed by Zerodraft (Division of Canam Building Envelope Specialists Inc.), 125 Traders Blvd. E., Unit # 4, Mississauga, ON, L4Z 2H3 Tel. 1-877-272-2626.

Sealant to be installed by accredited Zerodraft applicators in accordance with manufacturer's instructions and CAN/ULC-S711.2 (Application Standard). Install sealant where indicated on the drawings and/or as specified in the Air Barrier Section (07270) of the Specification.

FAMILY AT THE LAKE 2010

Sunday, July 25th, 2010 (rain or shine)
From 10:00 AM until whenever
We will provide hamburgers, hotdogs, and the fixings
Bring whatever beverages, munchies, hors d'oeuvres, or desserts you want
Remember to bring a bathing suit and towel

8060C County Road 49 (Hillcrest Road)
Rushford
Cottage phone = 585-437-2951 (we do not have an answering machine so you may have to keep calling until we happen to be in the cottage)
Cell phones don't work very well around the cottage.

Approximately 1 hour 20 minute drive (with normal speeding)

Directions:
Take Route 400 off the I-90 just before the tollbooths
Route 400 dead ends into Route 16
Take Route 16 to Route 39 shortly after Earl's Restaurant in Chaffee
(Don't take a right on 39 west that intersects 16 a couple miles before 39 east)
Turn left onto Route 39 going east just after the Rite Aid on the corner
Take Route 39 east through Arcade to Route 98 south just after the Attica-Arcade Railroad Station
Follow Route 98 to Route 243
Continue straight on Route 243 when Route 98 turns right towards Franklinville
Follow Route 243 past the town of Rushford
Turn right on County Road 49 (Hillcrest Road) where you will see a lot of trailers on the creek that feeds Rushford Lake
Follow Hillcrest around the lake, past the southern tip of the lake where the public beach is, and north on the east side of the lake. It will be 0.6 miles past the southern tip of the lake, after the 2nd guard rail on the left, and just before a 45 mile per hour sign on the right. Some say that the road changes from Hillcrest to Sunset as you pass the southern tip, but it remains county road 49.

Turn left at the Arthur's sign at 8060C Hillcrest (there are a few cottages on the same road that all have the 8060 address). The dirt road levels out after a short decline coming off the road. Go straight past the dirt road that goes to the right and you will see our blue/gray barn-shaped house down the dirt road off to the right.

Park on the grass anywhere that looks flat and not mushy.

Product Details

Incentive Details		
Replace Existing Technology	With Energy Efficient Technology	Incentive
Ice Rink	Low Emissivity Ceiling	$10000/sheet
The incentive applies to adding a foil faced radiant barrier ceiling material rated for ice arena applications to the ceiling of an ice rink.		
Curling Rink	Low Emissivity Ceiling	$1250/sheet
The incentive applies to adding a foil faced radiant barrier ceiling material rated for ice arena applications to the ceiling of a curling rink.		

Poly-Tech Radiant - Foil Bubble Bubble Foil - 96IN x 125FT

Manufacturer:	Poly-Tech Radiant
Brand Name:	AYR-FOIL
Product Name:	Foil Bubble Bubble Foil - 96IN x 125FT
Model:	A2A96125
Short Description:	Reflective Insulation for ice rinks

Description
Low-e ceiling reflective insulation used for ice arena applications

Details	
Emissivity	0.03-0.04
R-Value	Depends on the installation
Reflectivity	0.96-0.97
Temperature	-50 to 93 deg C/ -50 to 200 deg F

NXS
Variable Frequency Drives

c UL US LISTED

CE

Variable Frequency Drives (VFD) accept a control input and then output tailored control signal(s) to operate as many as six devices (fans, pumps, etc.) with maximum efficiency. The VFD can be field-programmed without any extra devices or computer connections.

SPECIFICATIONS

Wiring:
- ❑ Wire Type and Size is Model and Application Dependant.
- ❑ For NXS details, see form 63-2600.

Power Supply:
- ❑ 208-240 Vac, 45-66 Hz, +10%, -15%.
- ❑ 380-500 Vac, 45-66 Hz, +10%, -15%.
- ❑ 525-690 Vac, 45-66 Hz, +10%, -15%.

Ambient Ratings:
- ❑ Temperature Ranges:
  - ❑ Operating: 14°F to 104°F (-10°C to 40°C).
  - ❑ Storage: -40°F to 140°F (-40°C to 60°C).
- ❑ Humidity Range: 5 to 95% RH (non-condensing).

Control Inputs:
- ❑ Voltage (Analog): 0-10 Vdc, 200k ohm differential.
  - ❑ Resolution: 0.1%, ±1% accuracy.
- ❑ Current (Analog): 4-20 mA, 250 ohm differential.
- ❑ Digital: up to six, 24 Vdc, positive or negative logic.

Control Output:
- ❑ Reference Voltage: 10V, +3%; maximum load 10 mA.
- ❑ Auxiliary Voltage: 24V, ±15%; maximum 250 mA.
- ❑ Current (Analog): 0-20 mA, 500 ohm maximum.
  - ❑ Resolution: 10 bit.
  - ❑ Accuracy: ±2%.
- ❑ Relay: Two programmable changeover relay outputs.
  - ❑ Switching Capacity: 24 Vdc, 8A; 250 Vac, 8A; 125 Vdc, 0.4A.
- ❑ Digital: Open collector output, 50 mA, 48V.

Motor Connection:
- ❑ Continuous Output Overload Current:
  - ❑ Low: Maximum ambient temperature: 104°F (40°C); 1.1 x I_L (low overload current).
  - ❑ High: Maximum ambient temperature: 122°F (50°C); 1.5 x I_H (high overload current).
- ❑ Starting Torque:
  - ❑ Low Overload: 150%.
  - ❑ High Overload: 200%.
- ❑ Starting Current: 2.0 x I_H 2 seconds every 20 seconds if output frequency is less than 30 Hz and temperature of heatsink is less than 140°F (up to 400k W).
- ❑ Frequency:
  - ❑ Range: 0-320 Hz.
  - ❑ Resolution: 0.01 Hz.

Switching Frequency Range:
- ❑ Up to and including 40 HP: 1 to 16 KHz (default: 10 kHz).
- ❑ 50 HP and higher: 1 to 10 KHz (default: 3.6 kHz).

SPECIFICATION DATA

FEATURES

- **Seven configurable applications built in.**
- **Easy commissioning through software or control panel.**
- **Devices can be wall-mounted or panel-mounted.**
- **Eleven protective functions (see Form 63-2600, Users Manual, Technical Data section).**
- **Compact Size.**
- **Insulated gate bi-polar transistor (IGBT) technology.**

Mounting:
- ❑ Mount vertically on a wall or other flat surface using four screws or bolts sized for the particular unit.

Approvals (Model Dependant):
- ❑ NEMA1.
- ❑ NEMA12.
- ❑ Underwriters Laboratories, Inc. (UL)
- ❑ Canadian Underwriters Laboratories, Inc. (CUL).
- ❑ CE.

Accessories:
- ❑ 32006627-001 RFI Filter for NXL units up to 3HP, 460V.
- ❑ 32006628-001 Panel Mount Kit, NEMA12, 6 ft.
- ❑ 32006629-001 Blank Display.
- ❑ 32006629-002 Alphanumeric Display.
- ❑ 32006629-003 Seven-Segment Display for NXL.
- ❑ 32006630-001 Lonbus Card.
- ❑ 32006630-002 Modbus Card.
- ❑ 32006630-003 I/O Expander Card, 2RO (NO/NC).
- ❑ 32006630-004 I/O Expander Card, 6DI/DO Programmable.
- ❑ 32006630-005 I/O Expander Card, 6DI, 1DO, 2AI, 1AO.
- ❑ 32006630-006 I/O Expander Card, 1RO (NO/NC), 1RO (NO).
- ❑ 32006630-007 I/O Expander Card, 3RO (NO/NC), 1RO (NO).
- ❑ 32006630-008 I/O Expander Card, 1AI (mA), 2AO (mA).
- ❑ 32006662-001 NXL Demo Case.
- ❑ 32006662-002 NXS Demo Case.
- ❑ 32006803-001 Control Module, NXS.
- ❑ 32006803-002 Fan Assembly, up to 7.5HP.
- ❑ 32006803-003 Fan Assembly, 10-20HP.
- ❑ 32006803-004 Fan Assembly, 25-40HP.
- ❑ 32006803-005 Fan Assembly, 50-75HP.
- ❑ 32006803-006 Fan Assembly, 100-150HP.
- ❑ 32006803-007 Power Module, 1.5HP, 460V.
- ❑ 32006803-008 Power Module, 2HP, 460V.
- ❑ 32006803-009 Power Module, 3HP, 460V.
- ❑ 32006803-010 Power Module, 4HP, 460V.
- ❑ 32006803-011 Power Module, 5HP, 460V.
- ❑ 32006803-012 Power Module, 7.5HP, 460V.
- ❑ 32006803-013 Power Module, 10HP, 460V.
- ❑ 32006803-014 Power Module, 15HP, 460V.
- ❑ 32006803-015 Power Module, 20HP, 460V.

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Accessories (continued):

- ❑ 32006803-016 Power Module, 25HP, 460V.
- ❑ 32006803-017 Power Module, 30HP, 460V.
- ❑ 32006803-018 Power Module, 40HP, 460V.
- ❑ 32006803-019 Power Module, 50HP, 460V.
- ❑ 32006803-020 Power Module, 60HP, 460V.
- ❑ 32006803-021 Power Module, 75HP, 460V.
- ❑ 32006803-022 Power Module, 100HP, 460V.
- ❑ 32006803-023 Power Module, 125HP, 460V.
- ❑ 32006803-024 Power Module, 150HP, 460V.

Dimensions [in in. (mm)]:

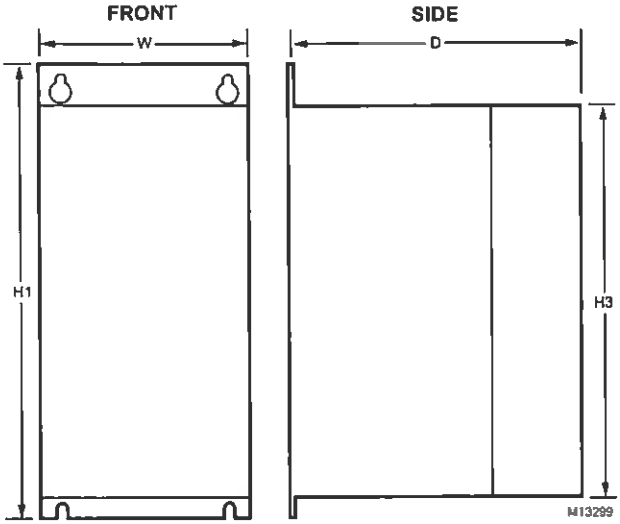


Fig. 1. Dimensions of the NXS Variable Frequency Drives (See Table 1).

Table 1. NXS VFD Dimension Details.

Model Number	HP	Weight (lbs)	H1 (inches)	W (inches)	D (inches)	H3 (inches)	Motor Terminal Torque Rating (lb-in.)	Volts AC
NXS0015A	1.5	53	12-7/8	5-1/16	7-1/2	11-1/2	18 - 20	480
NXS0020A	2							
NXS0030A	3							
NXS0040A	4							
NXS0050A	5							
NXS0075A	7.5	68						
NXS0100A	10	70	16-1/2	5-11/16	8-7/16	15-3/8		
NXS0150A	15							
NXS0200A	20	98						
NXS0250A	25	98	22	7-11/16	9-5/16	20-7/16	32 -35	
NXS0300A	30							
NXS0400A	40	150						
NXS0500A	50	150	24-13/16	9-5/16	10-1/8	23-1/4	45 - 50	
NXS0600A	60							
NXS0010B	1	53	12-7/8	5-1/16	7-1/2	11-1/2	18 - 20	230
NXS0015B	1.5							
NXS0020B	2							
NXS0030B	3	68						
NXS0040B	4							
NXS0050B	5	70	16-1/2	5-11/16	8-7/16	15-3/8		
NXS0075B	7.5							
NXS0100B	10	98						
NXS0150B	15	98	22	7-11/16	9-5/16	20-7/16	32 -35	
NXS0200B	20	150						
NXS0250B	25	150	24-13/16	9-5/16	10-1/8	23-1/4	45 - 50	
NXS0300B	30							

Dimensions [in in. (mm)]:

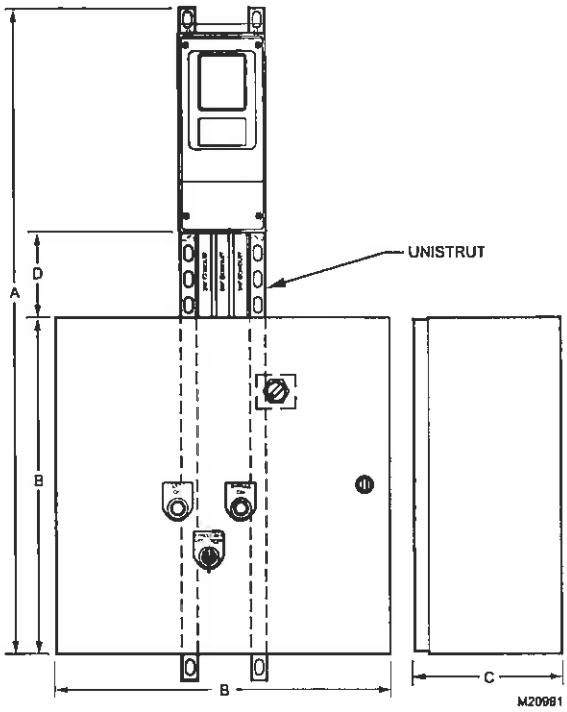


Fig. 2. Dimensions of the NXS NEMA1 Assemblies (See Table 2).

Table 2. NXS/Bypass Assembly Dimension Details.

Model Number	HP	Weight (lbs)	A (inches)	B (inches)	C (inches)	D (inches)	Motor Terminal Torque Rating (lb-in.)	Volts AC
NXS0015J	1.5	53	33-1/2	16	7	5	18 - 20	480
NXS0020J	2							
NXS0030J	3							
NXS0040J	4							
NXS0050J	5							
NXS0075J	7.5	68						
NXS0100J	10	70						
NXS0150J	15	70	37-1/2	16	9			
NXS0200J	20	98	41-1/2	20				
NXS0250J	25	98	41-1/2	20	9	5	32 -35	
NXS0300J	30	98	46-1/2					
NXS0400J	40	150	46-1/2	24				
NXS0500J	50	150	46-1/2	24	9	6	45 - 50	
NXS0600J	60	150	49-1/2					
NXS0010S	1	53	33-1/2	16	7	5	18 - 20	230
NXS0015S	1.5							
NXS0020S	2							
NXS0030S	3	68						
NXS0040S	4							
NXS0050S	5	70	33-1/2					
NXS0075S	7.5	70	37-1/2	16	9			
NXS0100S	10	98	41-1/2	20				
NXS0150S	15	98	41-1/2	20	9	5	32 -35	
NXS0200S	20	150	46-1/2	24				
NXS0250S	25	150	46-1/2	24	9	6	45 - 50	
NXS0300S	30	150	49-1/2					
NXS0010K	1	53	33-1/2	16	7	5	18 - 20	200 / 208
NXS0015K	1.5							
NXS0020K	2							
NXS0030K	3	68						
NXS0040K	4							
NXS0050K	5	70						
NXS0075K	7.5	98	41-1/2	20	9			
NXS0100K	10	98	41-1/2	20	9	5	32 -35	
NXS0150K	15	150	46-1/2	24				
NXS0200K	20	150	46-1/2	24	9	6	45 - 50	
NXS0250K	25	150	49-1/2					
NXS0300K	30							

Models:

NXS	Variable Frequency Drive; includes standard RFI filter			
	0007	Motor Power	0.75 HP	No choke
	0010		1.0 HP	
	0015		1.5 HP	
	0020		2.0 HP	
	0030		3.0 HP	Includes AC line choke
	0040		4.0 HP	
	0050		5.0 HP	
	0075		7.5 HP	
	0100		10 HP	
	0150		15 HP	
	0200		20 HP	
	0250		25 HP	
	0300		30 HP	
	0400		40 HP	
	0500		50 HP	
	0600		60 HP	
	0750		75 HP	
	1000		100 HP	
	1250		125 HP	
	1500		150 HP	
	1750		175 HP	
	2000		200 HP	
		A	460V, three-phase circuitry	
		B	208/230V, three-phase circuitry	
		C	575V, three-phase circuitry	
		J	460V, with bypass	
		K	208V with bypass	
		S	230V, with bypass	
			10	NEMA 1 Enclosure
			12	NEMA 12 Enclosure
			XX	Varies by model

NXS	0100	A	10	XX

NOTE: Refer also to the Quick Selection Guide (form 63-9251)

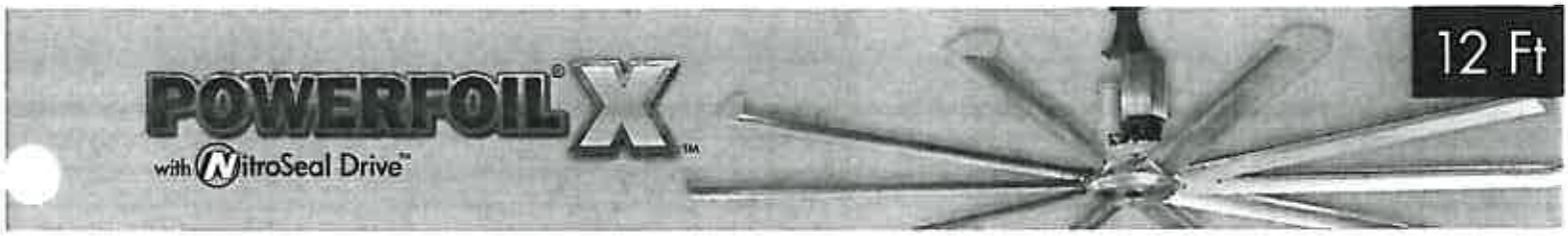
TYPICAL SPECIFICATION

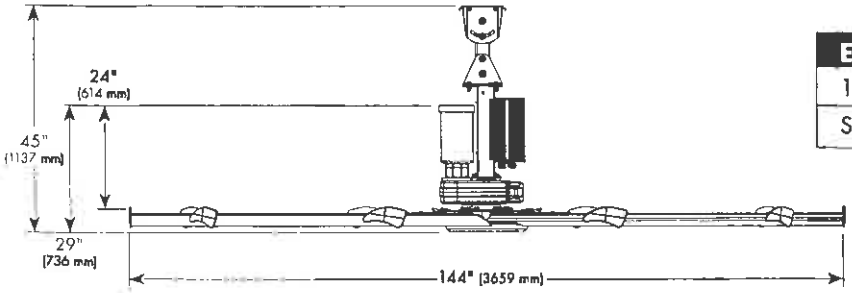
Alternating current (AC) motors with squirrel-cage rotors require a variable frequency control. The variable frequency drive (VFD) shall generate the required variable frequency through three main input voltage lines connected to an LC filter and diode bridge. This shall produce a DC voltage for an insulated gate bi-polar transistor (IGBT) bridge. The IGBT bridge shall produce a pulse-width modulated (PWM) AC voltage for the motor. A microprocessor shall control the motor according to measured signals and control commands set from the VFD control panel.

The VFD shall have seven programmable applications which can be modified using a personal computer-based commissioning tool with an optional software package, or a control panel with either an alpha-numeric or graphic LCD.

The VFD shall be UL and CE approved. The VFD shall be include built-in RFI filters and all models with 3 HP or more shall include an AC choke.

Printed in U.S.A. on recycled paper containing at least 10% post-consumer paper fibers.





Extension Tubes
1 ft to 10 ft in stock
Standard 1 ft shown

Technical Specifications

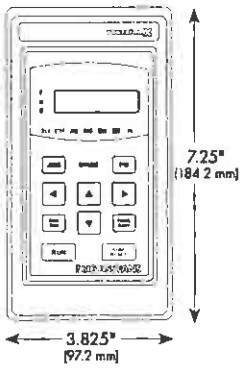
Model number	PFX12
Number and type of airfoils	10 Patented[1] Powerfoil® airfoils
Airfoil finish	Mill finish aluminum or custom color finish
Winglet (standard color)	Patented[2] Powerfoil winglet (Safety Yellow)
Controller	X-Series wall key pad
Controller connection	Cat 5
Input power and required breaker	200–250 VAC, 50/60 Hz, 3 Φ, 15 A 400–480 VAC, 50/60 Hz, 3 Φ, 10 A
Motor	1.0 HP
Custom STOBER Drives HVLS gearbox	NitroSeal Drive™ with <11 arc minutes backlash HeliCamber® gear technology, SKF® tapered roller bearings, 2-½" hollow output shaft, Simrit® double lipped output seals, lifetime synthetic oil, Nitrogen filled and permanently sealed
Maximum speed	84 RPM
Maximum amps	3.4 A @ 200–250 VAC 1.7 A @ 400–480 VAC
Maximum air displacement[3]	103,460 CFM
Sound level (maximum speed)[4]	<55 dBA
Fan weight (as shown)	305 lbs
Minimum airfoil clearances required	2 ft on sides, 3 ft below ceiling deck

[1] *U.S. Patent #7,284,970*

[2] *U.S. Patent #7,252,478*

[3] *There is currently no standard method for measuring airflow rates from HVLS Fans. Comparisons between fan manufacturers or with standard ceiling fans using airflow rates are not valid due to differences in testing methods. Contact Big Ass Fans for more information.*

[4] *Sound level measured at a blade height of 20 ft and 20 ft horizontally from center of fan*



POWERFOIL X FEATURES

- 10 year, full warranty with factory installation*
- NitroSeal Drive™ custom gearbox for increased durability, cooler operation and no maintenance
- Patented Powerfoil™ airfoil and winglet
- Effective coverage up to 20,000 square feet depending on fan size

POWERFOIL X OPTIONS

- 100 W Halide light
- Security camera
- VESDA (Very Early Smoke Detection) by Xtralis®
- 8-ft – 24-ft diameter

*10 year parts, 1 year labor warranty, certain exclusions apply. See complete warranty for details

BIG ASS FANS
WWW.BIGASSFANS.COM
An ISO 9001:2000 certified company
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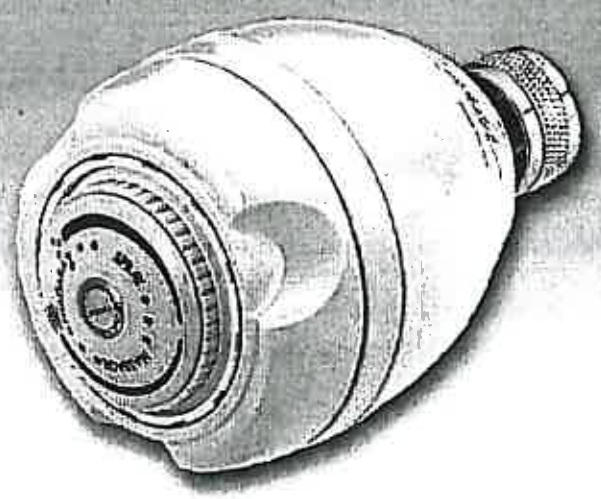
SHOWER

The Earth™ Massage Showerhead



New Design and New Flow Rate!

- Water & Energy Saver
- Greater Force at Lower Pressure
- Updated Design
- Adjustable Setting from Needle Spray to Coarse
- Corrosion Resistant
- 5-year Warranty

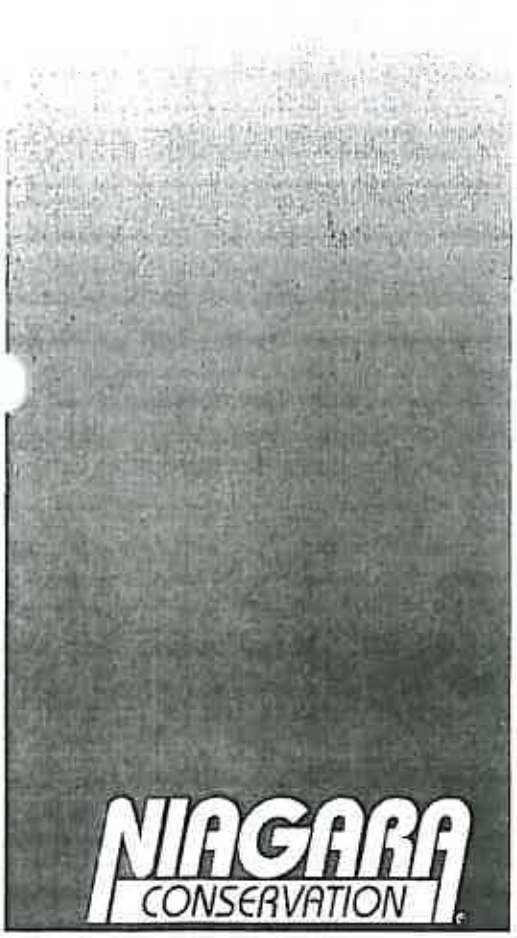
NIAGARA CONSERVATION

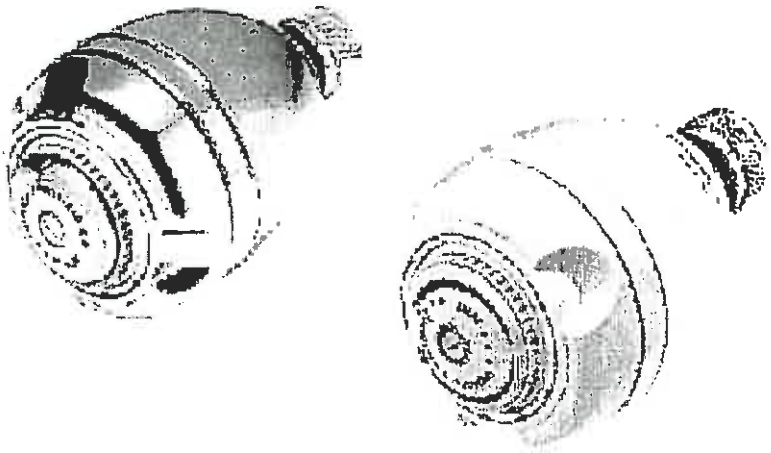
45 Horsehill Road
Cedar Knolls, NJ 07927
(800) 831-6383
Fax: (973) 629-0800
www.niagaraconservation.com

The Earth™ Massage Showerhead

Features

- Rated #1 showerhead by leading industry organization
- Conserves water and saves money while enhancing pressure, performance and appearance!
- 9-Jet Turbo Massage is adjustable: gentle needle spray to forceful jet
- Non-aerating spray means less temperature loss with maximum energy savings
- Pressure-enhancing Niagara Power
- Consistent flow rate regardless of water pressure
- Non-removable flow compensator
- Self-Cleaning and maintenance free
- Installs easily by hand
- Meets or exceeds ANSI specifications
- California Energy Commission Certified
- 5-year Warranty





Style#	Flow Rate	Description	Qty.
N2917	1.75 GPM	White	[50/case]
N2920	2.0 GPM	White	[50/case]
N2920CH	2.0 GPM	Chrome	[50/case]
N2925N	2.35 GPM	White	[50/case]

45 Horsehill Road
Cedar Knolls, NJ 07927
(800) 831-8383
Fax: (973) 829-1400
www.niagaraconservation.com

Atlas GA 7VSD Technical Information

PACK UNIT FEATURES:

- Solid state variable frequency drive converter and control transformer
- Dry type inlet air filter
- High efficiency EPAct TEFC motor
- Differential pressure oil system with aluminium block oil cooler and thermostatic bypass valve
- Air/oil separator with oil level sight glass
- Spin-on type oil filter with factory oil fill
- Aluminium block aftercooler with dedicated axial cooling fan
- V-belt drive with mechanical belt tensioning system
- Sound attenuating enclosure
- Elektronikon® MKIV controller with comprehensive system of monitoring, controlling and regulating compressor operation
- Emergency stop button
- Moisture separator with automatic and manual drains
- CSA/UL approved control cubicle
- Sound attenuating enclosure
- Available as base mounted or tank mounted

FULL FEATURE UNITS ALSO HAVE:

- Integrated refrigerated air dryer
- Elektronikon® dryer dew point temperature monitoring
- CSA/UL approved dryer

1600 Commerce Parkway • Lancaster NY 14086 • Ph: 716-681-1234 • Fax: 716-681-0715 • www.glauber.com

ELEKTRONIKON® MKV CONTROL MODULE:

The MK V Elektronikon® control system provides energy efficient load/no load control. The graphic based controller has a 3.5" HD color display and uses icons for navigation. The unit can programmed in 2 languages from a choice 32 and has a processor speed of 300 MIPS. The high speed microprocessor within the unit automatically regulates, controls, and monitors compressor operations. The unit includes a built in web-server that can display real-time operating data on any desktop browser when unit is connected to the customer's Local Area Network.

A partial description for the module's capabilities include*:

Compressor Status indication

- Automatic operation
- Voltage on
- General alarm/shutdown

Graphic Display & I/O Connections

- 1 Ethernet & 2 CAN connections
- Remote control and connectivity
- 10 digital inputs
- 5 temperature and 2 pressure analog inputs
- 9 digital outputs
- RS485 connection
- IO expansion connection

Available Data

- Element outlet temperature
- Delivery air pressure
- Running hours and hours to next service
- Loaded hours
- Elektronikon® regulator hours
- Motor overload status
- Oil separator differential pressure

Full Feature Only

- Outlet dew point
- Dryer monitoring
- Dryer inlet pressure
- Vessel Pressure

Algorithms & Features

- Delayed second stop
- Continuous pressure follow up
- Dryer Saver cycle
- Fan Saver cycle
- Numerous advanced timers

Service Indicators

- Air filter
- Oil filter
- Oil separator
- Oil lifetime

Configuration Parameters

- Time
- Date
- Format of date
- Multiple language display
- Units for pressure
- Units for temperature
- Auto restart after power failure (factory disabled)
- Motor start mode
- Extra digital input
- Pressure band

Shutdown and/or Warning Indications

- High element outlet temperature
- Drive motor overload
- Dew point (full feature units only)

*More detailed information is available upon request

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Atlas Copco **Technical Data Sheet**

Model: GA 7 VSD T-AFF

	58 psi	102 psi	138 psi	185 psi	Unit
Inlet conditions					
1. Barometric pressure	14.5	14.5	14.5	14.5	psi(g)
2. Ambient air temperature	68	68	68	68	°F
3. Relative humidity	0	0	0	0	%
Limitations for operations					
1. Discharge pressure	109	109	145	189	psi(g)
2. Capacity delivered @ min rpm	15.9	15.3	14.0	12.5	cfm
3. Capacity delivered @ max rpm	43.0	42.8	36.0	28.6	cfm
4. Pkg power input @ min rpm	4.7	6.2	7.2	8.2	bhp
5. Pkg power input @ max rpm	11.4	14.1	14.1	13.7	bhp
6. Sound level	66	66	66	66	dB(A)
Cooling data					
1. Cooling air flow	953	953	953	953	cfm
2. Discharge air temperature	102	102	102	102	°F
3. Aftercooler approach temperature	2	2	2	2	°F
Electrical data(1)					
1. Motor	7.5	7.5	7.5	7.5	kW
2. Motor type	Induction, Inverter Duty	Induction, Inverter Duty	Induction, Inverter Duty	Induction, Inverter Duty	
3. Enclosure	TEFC	TEFC	TEFC	TEFC	
4. Volts/Ph/Hz	460/3/60	460/3/60	460/3/60	460/3/60	
5. Manufacturer	Siemens	Siemens	Siemens	Siemens	
6. Bearing	Anti-friction	Anti-friction	Anti-friction	Anti-friction	
7. Insulation	F w/ B rise	F w/ B rise	F w/ B rise	F w/ B rise	
Starter data					
1. Type	Soft start	Soft start	Soft start	Soft start	
Physical data					
1. Length	40	40	40	40	inches
Width	26	26	26	26	inches
Height	70	70	70	70	inches
Weight	794	794	794	794	lbs
2. Connections					
Air Discharge	½	½	½	½	inches
Condensate drain	.31	.31	.31	.31	Inches
Oil sump capacity	1.26	1.26	1.26	1.26	gal

1. GA Series units are tested to PNEUROP/CAGI PN2CPT2 an guaranteed to be within ± 4% in capacity, ± 5% in specific power.
2. Operating Sound Level: Operating sound levels for machines equipped with recommended standard motors and enclosures are guaranteed ±3 dB(A) when measured in free field conditions at a distance of 1 meter according to CAGI PNEUROP Test Code.

ALBANY DOOR SYSTEMS
A company of Albany International Corp.

ULTRATOUGH M&I

The Ultimate in High Speed Rubber Doors

Albany Door Systems' UltraTough M&I Re-Coil-Away, "The World's Toughest High Speed Rubber Door", provides dependable performance in the most rugged industrial applications. The heavy duty side frames, thick rubber curtain and patented windlok design form a near airtight seal and can resists high wind pressures. The UltraTough M&I is designed to last. It is durable, safe, low cost to maintain and can take a hit.

TOUGH

The UltraTough M&I is built to withstand the harshest environments.

SPEED

The UltraTough M&I opens at speeds up to 60" per second.

WIRELESS SAFETY SYSTEM

Albany's patent pending Wireless Safety System eliminates costly repairs and downtime associated with coil cords.

PANEL MATERIAL

Two layers of thick SBR and polyester fabric provides superb durability and has a lifetime warranty.

CONTROLS

Albany's ACS-50 controller is reliable, easy to use and includes self testing and self monitoring safety features.

WIND RESISTANT

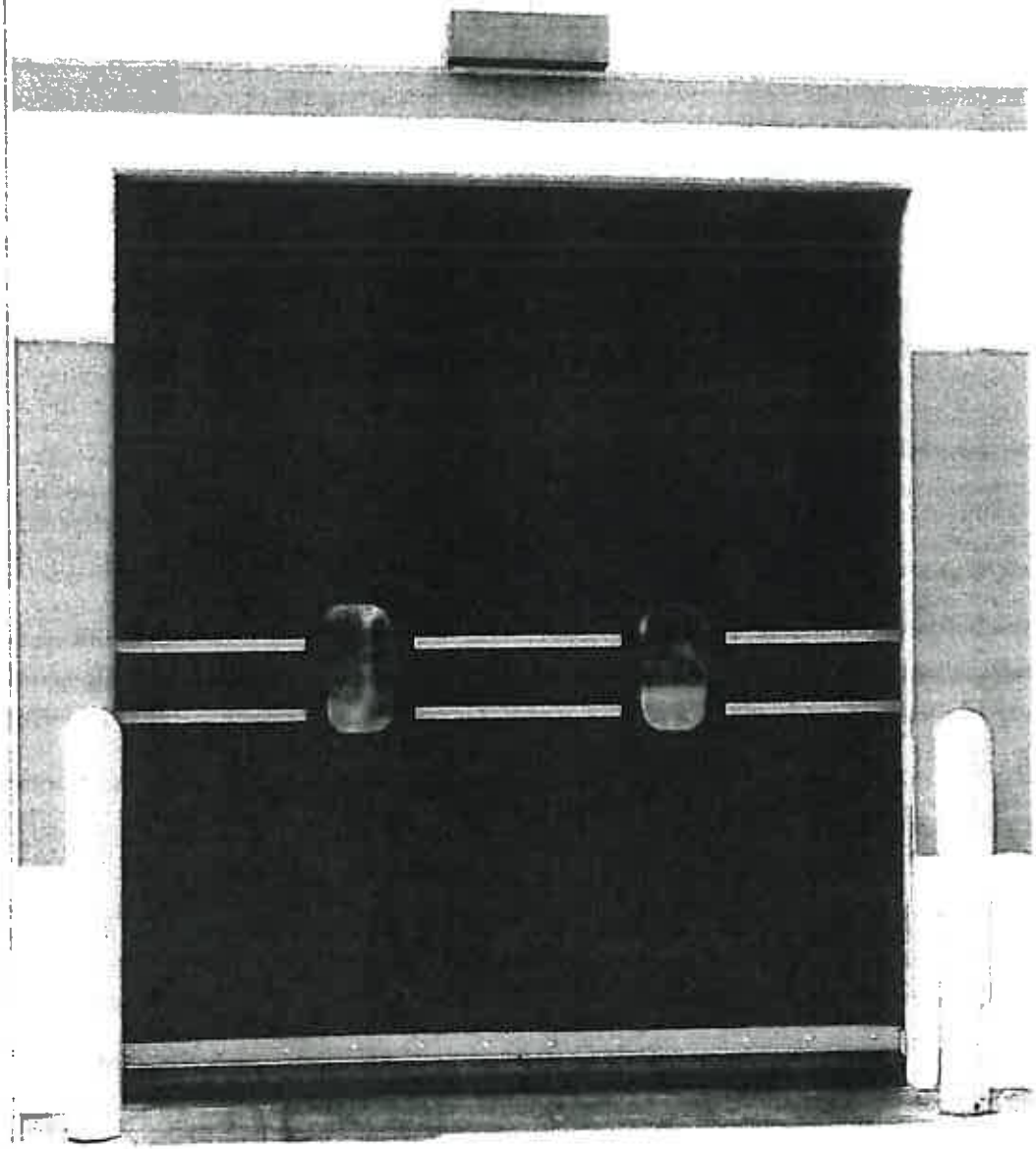
Patented Windlok design enables the UltraTough M&I to resist high wind pressures.

TRUCKGUARD SAFETY SYSTEM

Intelligent safety light system eliminates contact with objects in the doorway. (Optional)

MAINTENANCE

The UltraTough M&I is designed with a direct drive system that uses a minimum number of moving parts, decreasing maintenance costs and increasing door life.



ALBANY DOOR SYSTEMS • 975-A Old Norcross Road • Lawrenceville, GA 30045-4321
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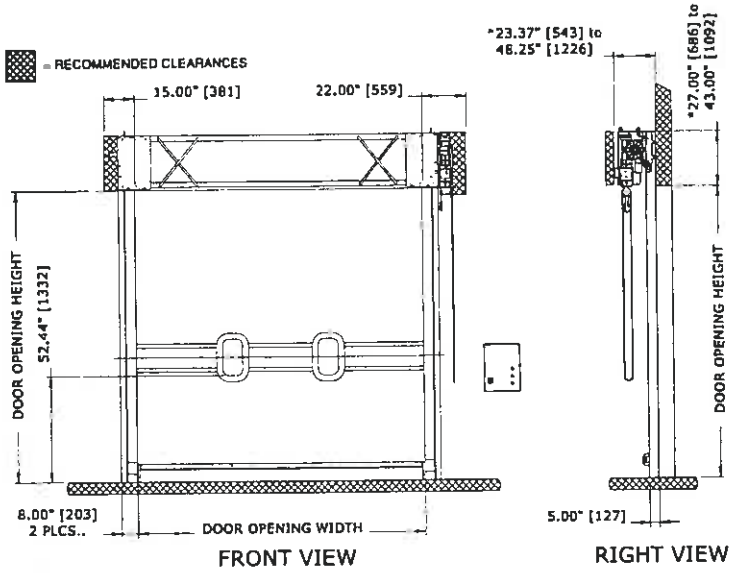
ULTRATOUGH M&I

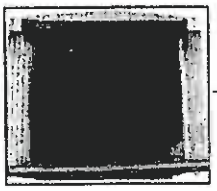
Albany's UltraTough M&I high speed rubber doors are fast, built to last, and engineered to cycle hundreds of thousands of times.



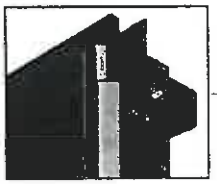
NOTE
1. * INDICATES A RANGE OF SIZES. THE FINAL DIMENSION DEPENDS ON FINAL DOOR SIZE FOR COUNTER BALANCED DOOR CLEARANCES CONSULT FACTORY

Springless Design
Springless door design uses a direct drive system that eliminates the need for chains and sprockets, resulting in lower maintenance costs.

UltraStrong Curtain
The thick two layer SBR and high tensile strength polyester fabric provides superb resilience in harsh environments and has a lifetime warranty.

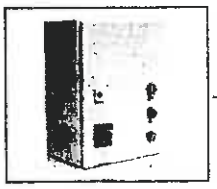


TruckGuard Safety System (Optional)
Intelligent safety light system eliminates contact with objects in the doorway. Mounted on the side guides, Albany's light system prevents activation due to curtain wind deflection.

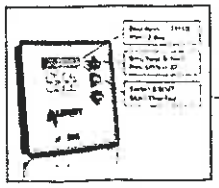


Patented Continuous Windlok Design
Albany's continuous windlok design produces near airtight seals and delivers more resiliency against damage, extreme weather, and high windloads.

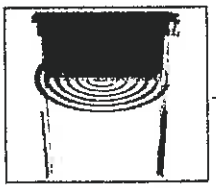
Heavy Duty Construction
Heavy duty 1/4" structural steel side columns and header. No aluminum.



ACS-50 Controller
The ACS-50 is NEMA-4 rated and CUL listed. LED indicators make trouble shooting simple. Includes self testing and self monitoring safety features, and a rotary disconnect on the enclosure cover.



UltraSmart™ Controller (Optional)
UltraSmart™ walks you through problems on the control screen. Modular design minimizes cost, improves reliability, and offers scalability for future upgrades.



Wireless Safety System
Albany's patent pending Wireless Safety System eliminates costly repairs and downtime associated with coil cords.

ALBANY DOOR SYSTEMS • 975-A Old Norcross Road • Lawrenceville, GA 30045-4321
Phone: 800-252-2691(ALBANY1) • Fax: 770-338-5024 • sales@albanydoors.com • www.albanydoors.com

Silicon Irradiance Sensors

for Measurement of Solar Irradiance

IMT SOLAR

Application

IMT Solar is a world leader for both the development and production of silicon irradiance sensors used for solar irradiance measurement. Since 1994, we have manufactured thousands of sensors supporting applications for Photovoltaic (PV) installation monitoring, PV cell research and development, PV IV curve measurement, solar thermal installation monitoring and meterological stations. Like other IMT equipment, the success of our silicon irradiance sensors is due to our dedication to deliver a product that is cost-effective, reliable, durable and accurate.

Function

Our sensors use a high-quality monocrystalline solar cell connected to a high accuracy shunt. The low shunt resistance causes the cell to operate close to the short-circuit point. To compensate for any possible measurement shifts caused by the temperature co-efficient relationship with the Isc., all of our silicon sensors with the part number extension of "TC" employ active temperature compensation.

The compensation is realized by using a specific temperature sensor laminated to the rear side of the solar cell. One of the key elements of the electronic compensation circuit design is very low power consumption. The current consumption of our Si-01TC sensor which is powered by an internal Lithium battery is only about 15 µA.

IMT silicon sensors are manufactured in many different configurations to meet the monitoring requirements of almost any system. Sensors are available with an internal or external power supply, with both analog and digital (RS-485) output signals and with or without a sensor output for cell temperature. Sensors can also be purchased with a pre-connected cable or with standard industry connectors for a range of applications.

All sensors are calibrated in simulated sunlight against a reference cell of the same type. The reference cell calibration is periodically verified using a reference cell calibrated by Fraunhofer ISE, Freiburg.

Temperature Compensated Solar Irradiance Sensor
Model Si01TC-T-K. *See additional models available on reverse.*

Mechanical Construction

Our sensors are built using a powder-coated aluminum case sealed to IP 65. The solar cell is embedded in Ethylen-Vinyl-Acetate (EVA) between glass and Tedlar™. The laminated cell is integrated into a powder-coated aluminum case. This configuration of the sensor is comparable to that of a standard PV module making the sensor an ideal choice for irradiance monitoring of commercial PV installations.

The electrical connection for the sensor is realized by an integrated cable or an IP67 rated connector. A cable length of 3 meters is standard for most of our sensors, however other cable lengths can be provided.

Cell Temperature Measurement

Our silicon sensors with a "-T" extension to the part number provide an additional signal output representing cell temperature.

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North Tonawanda, NY 14120
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www.ib-mut.de

www.imtsolar.com

Silicon Irradiance Sensor Specifications

General Information

- Solar cell: Monocrystalline Silicon (50 mm x 33 mm)
- Current shunt: 0.1 Ω (TC = 20 ppm / K) for 1 V and 20 mA output sensors
  0.12 Ω (TC = 20 ppm / K) for 10 V output sensors, 0.1 Ω (TC = 30 ppm / K) for digital output sensors
- Operating temperature: – 20 °C to 70 °C
- Electrical connection via shielded cable, length 3 m standard, or IP 67 rated connector
- Case, protection mode: Powder-coated aluminum, IP 65
- Dimension,Weight: 145mm x 86mm x 39mm, 340 g

Accuracy

Irradiance

- Error with temperature compensation compared to pyranometer within the operating range of -20 °C to 70 °C and vertically beam of irradiance: ± 5 %
- Non-linearity of the electronic circuit: ± 0.3 % from reading for 50 to 1300 W/m2

Temperature

- Accuracy at 25 °C: ± 1.5 °C
- Non-linearity: ± 0.5 °C
- Error (over operating temperature range of -20 to -70°C): ± 2.0 °C

Options

- Silicon sensor with shielded cable, 0.14 mm 2, UV- and temperature resistant
- Custom cable length
- Version with waterproof connector (Si-01TC always with connector)

Available Sensor Types

Part Number	Power Supply	Temp Comp	Output Format	Cell Temp Output
Si-01TC	Internal, battery	Yes	0-1V, 0-1000W/m²	No
Si-01TCext-K	5-28V DC	Yes	0-1V, 0-1000W/m²	No
Si-01TC-T-K	5-28V DC	Yes	0-1V, 0-1000W/m²	Yes
Si-02-K	12-28V DC	No	~60mV/1000W/m²	No
Si-02-PT100-K	Not required	No	~60mV/1000W/m²	Yes, PT100
Si-02-T-K	Not required	No	~60mV/1000W/m²	Yes, KTY-81-210
Si-02-PT1000-K	Not required	No	~60mV/1000W/m²	Yes, PT-1000
Si-10TC-K	Not required	Yes	0-10V, 0-1000W/m²	No
Si-420-TC-K	12-28V DC	Yes	4-20mA/0-1200W/m²	No
Si-420TC-T-K	12-28V DC	Yes	4-20mA/0-1200W/m²	Yes
Si-13TC-K	12-28V DC	Yes	0-10V, 0-1300W/m²	No
Si-13TC-T-K	12-28V DC	Yes	0-10V, 0-1300W/m²	Yes
Si-RS485-TC-T	12-28V DC	Yes	RS-485	Yes

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www.ib-mut.de

www.imtsolar.com

042009

SHARP

solar electricity

240 WATT

MULTI-PURPOSE MODULE

NEC 2008 Compliant

NU-U240F1

MULTI-PURPOSE 240 WATT MODULE FROM THE WORLD'S TRUSTED SOURCE FOR SOLAR.

Using breakthrough technology, made possible by nearly 50 years of proprietary research and development, Sharp's NU-U240F1 solar module incorporates an advanced cell surface texturing process to increase light absorption and improve efficiency. Common applications include commercial and residential grid-tied roof systems as well as ground mounted arrays. Designed to withstand rigorous operating conditions, this module offers high power output per square foot of solar array.

Sharp's most powerful commercial module manufactured today.

ENGINEERING EXCELLENCE
High module efficiency for an outstanding balance of size and weight to power and performance.

DURABLE
Tempered glass, EVA lamination and weatherproof backskin provide long-life and enhanced cell performance.

RELIABLE
25-year limited warranty on power output.

HIGH PERFORMANCE
This module uses an advanced solar cell surface texturing process to increase light absorption and improve efficiency.

INNOVATIVE
156 mm pseudo-square monocrystalline solar cells provide high power output. Ideal for large commercial rooftops where space is a premium.

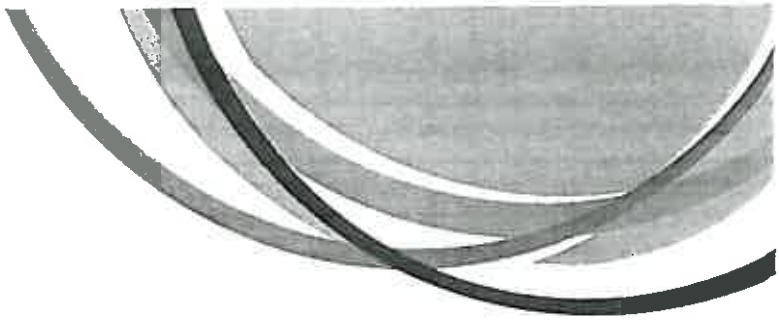
The NU-U240F1 offers industry-leading performance for a variety of applications.

Improved Frame Technology

SHARP: THE NAME TO TRUST

When you choose Sharp, you get more than well-engineered products. You also get Sharp's proven reliability, outstanding customer service and the assurance of our 25-year limited warranty on power output. A global leader in solar electricity, Sharp powers more homes and businesses than any other solar manufacturer worldwide.

BECOME POWERFUL



240 WATT

NU-U240F1

NEC 2008 Compliant
Module output cables: 12 AWG with locking connectors

ELECTRICAL CHARACTERISTICS

Maximum Power (Pmax)*	240 W
Tolerance of Pmax	+10%/-5%
Type of Cell	Monocrystalline silicon
Cell Configuration	60 in series
Open Circuit Voltage (Voc)	37.4 V
Maximum Power Voltage (Vpm)	30.1 V
Short Circuit Current (Isc)	8.65 A
Maximum Power Current (Ipm)	7.98 A
Module Efficiency (%)	14.7%
Maximum System (DC) Voltage	600 V
Series Fuse Rating	15 A
NOCT	47.5°C
Temperature Coefficient (Pmax)	-0.485%/°C
Temperature Coefficient (Voc)	-0.351%/°C
Temperature Coefficient (Isc)	0.053%/°C

*Measured at (STC) Standard Test Conditions 25°C, 1 kW/m² insolation, AM 1.5

MECHANICAL CHARACTERISTICS

Dimensions (A x B x C below)	39.1" x 64.6" x 1.8" /994 x 1640 x 46 mm
Cable Length (I)	43.3"/1100 mm
Output Interconnect Cable**	12 AWG with MC4 Locking Connector
Weight	44.1 lbs / 20.0 kg
Max Load	50 psf (2400 Pascals)
Operating Temperature (cell)	-40 to 194°F / -40 to 90°C

**A safety lock clip (Multi Contact part number PV-SSH4) may be required in readily accessible locations per NEC 2008 690.33 (C)

QUALIFICATIONS

UL Listed	UL 1703
Fire Rating	Class C

WARRANTY

25-year limited warranty on power output
Contact Sharp for complete warranty information

Design and specifications are subject to change without notice.
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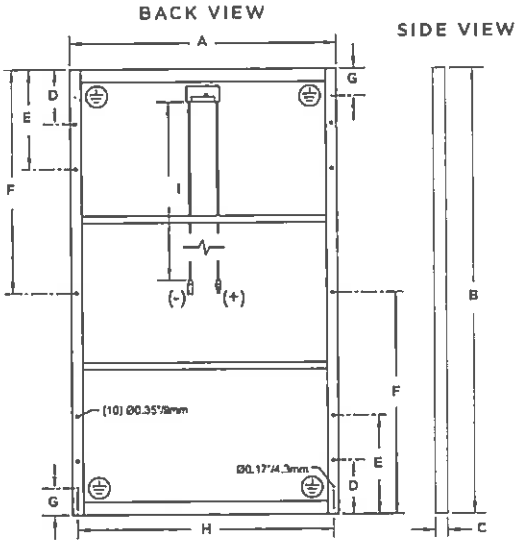
DIMENSIONS



A	B	C	D	E
39.1"/994 mm	64.6"/1640 mm	1.8"/46 mm	7.9"/200 mm	14.4"/365 mm

F	G	H	I
32.3"/820 mm	3.9"/100 mm	37.7"/958 mm	43.3"/1100 mm

Contact Sharp for tolerance specifications

"BUY AMERICAN"

Sharp solar modules are manufactured in the United States and Japan, and qualify as "American" goods under the "Buy American" clause of the American Recovery and Reinvestment Act (ARRA).

SHARP

SHARP ELECTRONICS CORPORATION
5901 Bolsa Avenue, Huntington Beach, CA 92647
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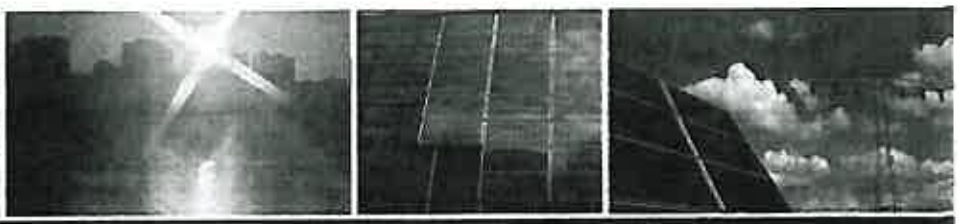
PV Powered™



PVP1100 to PVP5200 String Inverters

Proven Reliability – With Integrated AC and DC PV System Disconnect Listed to the UL 98 Standard

PV Powered, Inc. continues to deliver industry-leading reliability and technical innovations that lower the total cost of PV systems installation. PV Powered is now the only manufacturer of a residential inverter-integrated AC/DC PV System Disconnect that is listed to the UL 98 Standard. The UL 98 Standard, called "Enclosed and Dead-front Switches," ensures the integrated PV Powered disconnect meets all installation and inspection requirements of a PV System Disconnect.

Housed within an NEC Compliant wire raceway, PV Powered's innovative disconnect consists of one enclosure with generous working room for installation. In addition to providing for a single point of connection from the utility service and PV array, the wire raceway's optimized knockout locations also provide options for side, bottom and back entry with minimized conduit bending. The wire raceway enables flush side-by-side mounting, eliminating the need for extra equipment and resulting in a cleaner, less expensive installation.

PV Powered's string inverters are backed by the industry's first nation-wide ten year warranty and equipment replacement program. Optional performance monitoring is available which includes low cost, secure web-based access to inverter status and performance history.

NATIONWIDE 10 YEAR WARRANTY

FEATURES

Industry-Leading Reliability

- Endurance tested to 20 year operating life
- Lowest part counts and fewest interconnects eliminate common failure points
- Field-proven technology with thousands of units installed nationwide

Integrated AC and DC PV System Disconnect

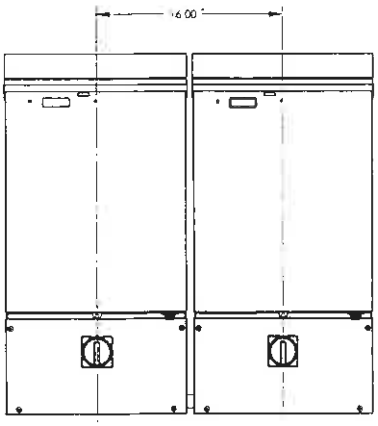
- Listed to UL 98 Standard for use with PV Powered UL 1741 Listed string inverters
- Robust testing of switch mechanism to UL 98 Standard
- Single AC/DC switch visible and lockable in the OFF position
- NEC Compliant internal wire raceway enables side-by-side mounting
- Direct-to-wall surface enclosure design allows for easy access and installation

Easy Installation

- Factory integrated inverter and PV System Disconnect eliminates the need for extra equipment
- Integrated disconnect reduces conduit connection points saving installation time and material cost
- Field-configurable positive ground applications with simple jumper selection
- Optimally placed knockouts for a variety of conduit routing options

Installer-Focused Support

- No special purchase requirements to get the best technical support in the industry
- Live technical phone support
- Economical performance monitoring options



Example of Side-by-side Mounting on Standard Stud Spacing

All PV Powered products are designed and manufactured in the U.S., are fully compliant with the Buy American Act, and qualify for projects funded by the federal stimulus package.

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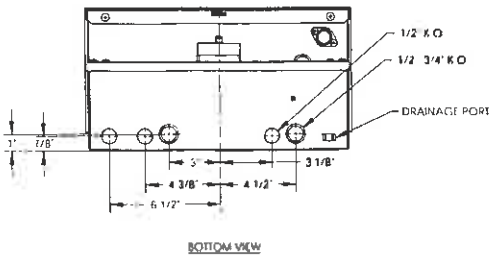
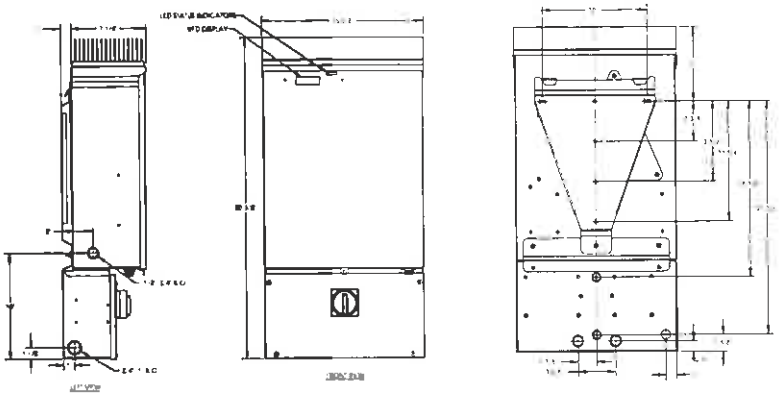
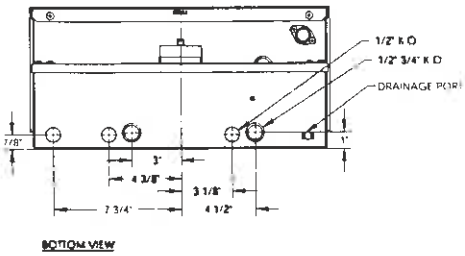
DIMENSIONS

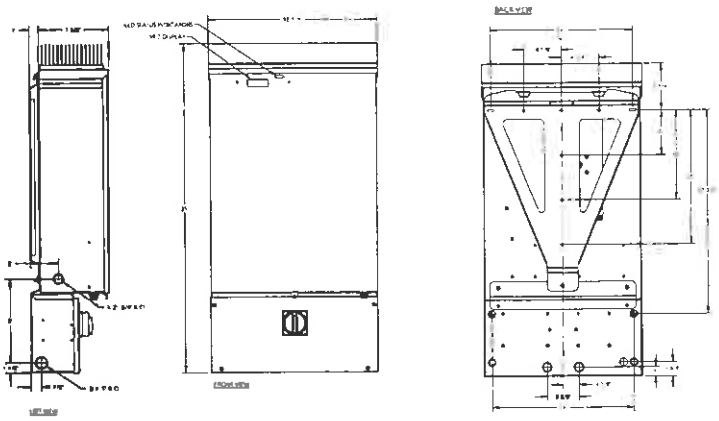
PVP1100 to PVP3500





PVP4600, PVP4800, PVP5200





Intertek

ELECTRICAL SPECIFICATIONS

MODEL	PVP1100	PVP2000	PVP2500	PVP2800	PVP3000	PVP3500	PVP4600	PVP4800	PVP5200
Continuous Output Power (watts)	1100	2000	2500	2800	3000	3500	4600	4800	5200
Weighted CEC Efficiency (%)	90.5	92	94.5	92	93.5	95.5	95.5	96	96
Maximum DC Input Voltage (VOC)	500	500	500	500	500	500	500	500	500
DC Voltage Operating Range (V)	115-450	115-450	140-450	180-450	170-450	200-450	205-450	200-450	240-450
DC Minimum Start Voltage (V)	130	130	155	195	185	215	220	215	255
DC Maximum Current (A)	10	17.5	18	20	18	17.5	22.5	24	22
AC Maximum Continuous Current (A)	10	9	11	13	13	15	23	21	23
AC Nominal Voltage (V)	120	240	240	208	240	240	208	240	240
AC Output Voltage Range (V)	105.6-132.5	211-264	211-264	183-229	211-264	211-264	183-229	211-264	211-264
AC Frequency Range (Hz)	59.3-60.5	59.3-60.5	59.3-60.5	59.3-60.5	59.3-60.5	59.3-60.5	59.3-60.5	59.3-60.5	59.3-60.5

MECHANICAL SPECIFICATIONS

MODEL	PVP1100	PVP2000	PVP2500	PVP2800	PVP3000	PVP3500	PVP4600	PVP4800	PVP5200
	Inverter with Factory-Integrated AC and DC PV System Disconnect NEMA 3R Steel Enclosure, Wall Mounted with Bracket Included								
Temperature	-25°C to 40°C								
Weight (lbs) with Disconnect	84.5	92.5	106.5	106.5	106.5	120.5	162	162	162
Inverter with Disconnect Dimensions	30 3/8" H x 15 5/8" W x 8 1/4" D	30 3/8" H x 15 5/8" W x 8 1/4" D	30 3/8" H x 15 5/8" W x 8 1/4" D	30 3/8" H x 15 5/8" W x 8 1/4" D	30 3/8" H x 15 5/8" W x 8 1/4" D	30 3/8" H x 15 5/8" W x 8 1/4" D	35" H x 18 1/8" W x 8 5/8" D	35" H x 18 1/8" W x 8 5/8" D	35" H x 18 1/8" W x 8 5/8" D

AGENCY APPROVALS

MODEL	PVP1100	PVP2000	PVP2500	PVP2800	PVP3000	PVP3500	PVP4600	PVP4800	PVP5200
	UL 98 13th Edition, UL 1741 Nov 2005 Revision, CSA C22.2 107.1 2006 Revision, IEEE 1547 Compliant, FCC Class A & B								

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