NORTH BERGEN HOUSING AUTHORITY
LAWLER TOWERS APARTMENTS
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

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1.0 INTRODUCTION & BACKGROUND

The North Bergen Housing Authority (NBHA) Edward A. Lawler Towers (Towers) is a 191,100 square foot facility located in North Bergen, New Jersey. The facility was built in 1967 and consists of two 15 floor towers, including the basement, with a connecting ground level Community Room situated between the two buildings. There are 253 senior citizen apartments in the complex, designated as Tower A and Tower B. Approximately 28 apartments, equaling slightly over 10%, were surveyed as part of the energy audit.

Tower A houses senior housing apartments, laundry room, boiler room in the basement, and the Community Room kitchen. Tower B consists of the NBHA Administrative Offices on the ground floor and senior housing apartments. The Community Room connects the south side of Tower A to the north of Tower B. NBHA Administrative Offices are comprised of a general work area with low partitions, conference room, server room, and five offices. An addition was recently constructed to the south side of the Tower B to expand the Administrative Offices.

New Jersey's Clean Energy Program, funded by the New Jersey Board of Public Utilities, supports energy efficiency and sustainability for Municipal and Local Government Energy Audits. Through the support of a utility trust fund, New Jersey is able to assist state and local authorities in reducing energy consumption while increasing comfort.

This report covers the energy audit for the North Bergen Housing Authority, Lawler Towers.

2.0 EXECUTIVE SUMMARY

This report details the results of the North Bergen Housing Authority's Lawler Towers, a 191,100 square foot senior housing complex in North Bergen, New Jersey. The facility consists of two 15 story buildings and a connecting Community Room. The following areas were evaluated for energy conservation measures:

- Lighting replacements
- Light bulb exchange
- Water conservation
- Thermostat and control valves for steam radiators
- Door seal replacement
- Insulation upgrade
- Air conditioner changeout
- Night setback
- Boiler replacement
- Window replacement
- Exhaust fan controls
- Energy Star appliances

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Measures which are recommended for implementation have a payback of 10 years or less. This threshold is considered a viable return on investment. Potential annual savings of $181,100 for the recommended ECMs may be realized with a payback of 4.1 years.

The ECMs identified in this report will allow for the building to reduce its energy usage and if all the recommended ECMs are pursued has the opportunity to qualify for the New Jersey Pay For Performance Program. A summary of the costs, savings, and paybacks for the recommended ECMs follows:

ECM – 1c Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
147,400	25	195,100	0	27,800	0.9	13,600	5.3	4.5

* Incentive is based on the New Jersey Smart Start Prescriptive Lighting Measures.

ECM – 2 Light Bulb Exchange

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		#2 Oil	Total				
$	kW	kWh	gallons	$		$	Years	Years
6,000	48.1	24,054	0	11,600	8.68	NA	0.5	NA

* No incentive available.

ECM -3c Install Low Flow Showerheads

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
17,300	850	7,600	5.6	NA	2.3	NA

* No incentive available.

ECM – 4 Thermostats and Control Valves for Steam Radiators

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
114,700	0	0	10,400	11,500	0.5	18,700	10	8.4

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM – 5 Install Door Seals

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,700	0	0	210	200	(0.4)	400	7.2	5.6

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM – 6 Insulate Steam and Condensate Piping

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
17,300	0	0	20,700	23,000	25.6	11,800	0.8	0.3

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program

ECM – 7 Air Conditioner Changeout

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
NA	0.0	16,900	0	2,500	NA	NA	NA	NA

* No incentive available.

ECM- 8 Night Setback for Offices and Community Room

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,100	0.0	20,000	0	3,000	40	400	0.4	0.1

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM- 9 Boiler Replacement

Budgetary Cost	Annual Utility Savings				ROI	New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
335,900	0	0	35,100	39,000	1.3	63,300	8.6	7.0

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM-11a Insulate the NBHA Office Walls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
8,300	0.0	41,100	0	6,200	21.4	4,200	1.3	0.7

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM-11b Insulate Area Below the NBHA Offices and Community

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
26,900	0.0	47,150	0	7,100	6.9	8,500	3.8	2.6

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM-12a Install On/Off Controls for Apartment Exhaust Fans

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
11,800	0.0	6,537	14,200	16,700	20.2	5,900	0.7	0.4

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM-12b Install On/Off Controls for Common Area Exhaust Fans

Budgetary Cost	Annual Utility Savings				ROI	New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
7,600	0.0	2,179	1,575	2,100	3.1	3,200	3.6	2.1

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM – 13 Energy Star Appliances

Budgetary Cost	Annual Utility Savings				ROI	New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
177,200	0.0	106,600		16,000	0.4	19,200	11.1	9.9

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

3.0 EXISTING CONDITIONS

3.1 Building – General

Lawler Towers, 191,100 square feet, is comprised of two 15 story (including the basement) towers for senior housing. A large Community Room connects Tower A and B. The ground floor of Tower B houses the NBHA Administrative Offices. The building's exterior is composed of face brick and concrete with some metal fascia on a concrete foundation. The Community Room's exterior on the east and west is a 4 inch insulated panel and double pane windows, with a precast slab floor over a large open crawl space. The crawl space provides access to the steam, condensate, and domestic hot water piping fed from Tower A to Tower B. The roof of both Towers is a flat built up with drains original to the construction. The roof over the Community Room is a series of pitched built ups. The basement of Tower A houses the boiler/ electrical room, storage, and compactor room. The basement of Tower B houses the electrical room, storage rooms, and compactor room.

Heat to Towers A and B is provided by fintube radiators in the apartments fed from the two 125 BHP Kewanee low pressure fire tube steam boilers located in the basement of Tower A. The domestic hot water heating is supplied through three PVI gas fired condensing water heaters. The diesel fired emergency generator for the entire complex is located on the west side of the Community Room, and is automatically tested once per week for one hour. It is used for emergency power only.

Apartment toilets and kitchens, and common elevators and hallways are ventilated by seven exhaust fans located on the roofs of each tower. There is no active means of makeup air to the building. The laundry room is located on the ground floor of Tower A and operates with ten washing machines and ten 146,000 BTUH gas-fired dryers.

The Towers are occupied continually, with the exception of the Administrative Offices, which are operational approximately eight to ten hours per day, five days a week. Other multi-use spaces such as the Community Room can be occupied into the evening hours.

An inventory of equipment for all energy consuming units is provided in Appendix Y.

3.2 Utility Usage

The building uses electricity, natural gas, and diesel fuel. Water for boiler make up and potable uses is delivered by a public municipal water system, and sewer water is discharged to a municipal wastewater treatment system.

Electricity and natural gas are supplied and delivered by PSE&G. Electricity is delivered via one meter (#778003748), and natural gas is delivered via two meters (#2415033, #2600157). From July 2008 through June 2009, the building had an annual electric consumption of 1,650,800 kWh, with a demand peak of approximately 398.3 kW (occurring in July 2008), and an annual electric cost of $247,800. This resulted in a blended electric unit cost of $0.1501 per kWh. Natural gas consumption during the same period was 171,300 therms, for an annual cost of $189,800. This resulted in a natural gas unit cost of $1.108 per therm.

The building's 230 kW Cummins Model No. DFAB-5632283 emergency generator is fired by diesel fuel, and has a dedicated storage tank. The generator is run periodically for testing.

A summary of the monthly electricity and natural gas usages and charges for the past year is provided in Appendix A.

Electricity and natural gas commodity supply and delivery are presently purchased from PSE&G. The delivery component for electricity and natural gas will always be the responsibility of the utility that connects the facility to the power grid or natural gas distribution network; however, electrical and natural gas commodity supply can be purchased from a third party organization. Traditionally, the electrical and natural gas commodity supply entity will require one to three years of past energy bills to submit a contract. Contract terms can vary by supplier; therefore, all aspects of contract terms should be carefully considered before making a selection. A list of approved electrical and natural gas energy commodity suppliers is provided in Appendix A.

After a review of PSE&G tariffs, based on existing usage has been concluded that the building is in the correct utility rate structure for both natural gas and electricity. Electricity is billed under the Large Power and Lighting Tariff and natural gas is billed under the Large Volume Service.

3.3 HVAC Systems

3.3.1 Low Pressure Steam Heating System

Low pressure steam for the fintube radiation system is provided by two 125 BHP Kewanee fire tube boilers. The steam is fed to central vertical steam risers on the north, east, west, and south walls of Towers A and B. The low pressure steam feeds into the fintube radiation through a thermostatic trap, and into condensate risers to the left and right of the baseboard fintube. The condensate risers are ¾" lines that run the entire 15 floors.

The condensate return system was designed as a vacuum return system. Due to the season, the system was not in use; therefore, it could not be determined if the vacuum system portion of the condensate return was operational. However, through visual observation, it appeared to be in disrepair. At a minimum, the system operates as a basic condensate return system. Each Tower has a dedicated condensate pump return system. All condensate is pumped into a 7' long x 3' diameter receiver tank. Makeup water and boiler chemicals are also fed into the receiver tank. Two feedwater pumps supply makeup water to the respective Kewanee boiler.

There are no temperature control valves on any of the low pressure steam fintubes. Low pressure steam fills the fintube and condenses through the thermostatic valve as heat is transferred to the fintube. The entire heating system operates in this manner. Almost 60% of the condensate return lines are not insulated. This includes the ¾" return lines from the Towers, return lines from area unit heaters, condensate pumps, receiver tank, and feed pumps. There is no ductwork into the boiler room to supply combustion makeup air to the Kewanee boilers and PVI water heaters. There is a propeller fan in the northwest corner of the boiler room that looks like it was to be used for room ventilation or makeup air. The fan was missing drive belts.

3.3.2 Domestic Hot Water Heating System

The domestic hot water heating for the building is supplied through three PVI power VT gas fired condensing water heaters. Each system is designed for 1 MMBH capacity. Two systems usually carry the load with the third unit as a backup. The system contains a mixing valve and small recirculation pump. The heaters are located in the basement of Tower A.

3.3.3 Direct Expansion Air Conditioning Units

The NBHA Administrative Offices' mechanical air conditioning systems are comprised of six split direct expansion systems with remote condensers and ceiling mounted fan coil units. The fan coil units consist of the DX evaporator coil and electric reheat coil. Five of the systems are York split systems with condensers on the west side of the building. A sixth system is a Trane split system with the condenser located on the roof of the NBHA Director's Office. A small Sanyo split system conditions the server room. All systems have wall mounted thermostats for heating and cooling control.

The Community Room is heated and cooled by four Daiken heat pumps. The evaporator/fan sections are mounted in the ceiling, the associated condenser units are outside on the west side of the area.

Two ceiling radiant panels are mounted above the two doors leading outside on the east side of the Community Room to address the infiltration load from the doors opening and closing. It was unclear if the panels are operational since they were not being utilized during the site visit.

The Community Room has a Honeywell carbon dioxide (CO_2) detection system, with the CO_2 sensor located on the wall near the thermostats. The Daiken heat pumps do not have the capacity to bring in outside air; therefore, the CO_2 system was installed to bring in fresh air based upon CO_2 concentrations in the room. The system has a small muffin fan; isolation damper, and 6" round ductwork that pulls fresh air from a wall louver on the west wall above the ceiling and sends it to one of the Daiken units.

The document storage room on the first floor of Tower B has two Mitsubishi split AC units, with condensers mounted on the west side of the building. The room is heated with steam fintube radiation.

Tower A has 159 window air conditioning units, Tower B has 155. The units range from 5000 BTUH to 10,000 BTUH in capacity. Almost all observed units had an EER below 10.

3.3.4 Exhaust Fans

Tower A and B each has seven roof exhaust fans for exhausting the apartments' bathrooms and kitchen hoods, and common hallways. During the site visit, the majority of the 14 exhaust fans were observed to be operational; two were observed to be off; and two were running but without any exhaust air, it is likely they had broken or missing drive belts.

The Community Room kitchen has a wall mounted exhaust fan near the range. The restrooms in the Office Conference Room and Director's Office are exhausted to the outside through individual small ceiling exhaust fans.

3.4 Lighting/Electrical

Most of the lighting was specified for efficiency in the late 1960s. By today's standards the building's lighting fixtures and controls are inefficient and can be upgraded. A majority of the lighting is provided by inefficient T-12 fixtures with magnetic ballasts. Most of the lighting in the NBHA Administrative Offices consists of inefficient T-12 fixtures with magnetic ballast which hang from the ceiling; however, in some of the recently renovated office areas square U-Tube efficient T-8 lighting fixtures were observed. Occupancy sensors were observed in the restrooms of the Administrative Offices.

Most of the observed apartments located on the top 13 floors of both Towers had enclosed T-8 ceiling mounted fixtures; T-12 under-cabinet lighting; and incandescent bulbs, ranging in size from 40 watts to 150 watts, located in ceiling fixtures and lamps. Some apartments also had screw-in compact fluorescent

light bulbs (CFL) in ceiling fixtures and lamps. Most of the original incandescent lighting fixtures in the apartments owned by NBHA have been replaced with efficient CFLs. No occupancy sensors were observed in the apartments. Most of the existing exit signs presently do not utilize high efficiency LED technology.

Outdoor lighting consists of high pressure sodium (HPS) and mercury vapor (MV) fixtures utilizing timers which allow for the fixtures to de-energize at a specific time to shut off fixtures during daylight hours. Outdoor lighting fixtures that are connected to timers turn on and off at a certain time each day. All observed outdoor lighting fixtures were observed to be off during our site visit.

3.5 Control Systems

There is no centralized building management system. All cooling and reheat systems are controlled with wall mounted dual function thermostats or separate heating and cooling thermostats. The domestic hot water system is managed from controls on the PVI boilers, and there are no sequencing controls on the Kewanee fire tube boilers. Each boiler operates off the water column and pressure controller.

There is no individual control of the heating in the apartments. The perimeter radiation provides heat and condenses back through the thermostatic trap. In the summer time, individual apartment cooling is provided with window air conditioners placed in the living room and/or bedroom.

4.0 ENERGY CONSERVATION MEASURES

The TREAT (Targeted Retrofit Energy Analysis Tool) modeling software was selected to perform the majority of the building energy analyses for this project. TREAT, designed and funded by the New York State Energy Research and Development Authority with software protocols specific to public housing projects, integrates fuel bill analysis, weather data, and building modeling information into a database environment. TREAT allows energy efficiency programs to track actual savings relative to predicted savings, and is designed to support Total Quality Management techniques.

TREAT integrates room-by-room heat loss analysis for public housing structures with an hourly energy model developed by the United States Department of Energy National Renewable Energy Lab. Combined, these tools provide enhanced whole building energy saving packages. It is also approved by USDOE for use in Weatherization Assistance Programs.

Cost estimates were performed using vendor quotes, RS Means costing guides, and industry experience. Costs were developed as lump sums while taking in account the existing conditions and project requirements. It is understood that any project greater than $10,000 needs to follow Davis/Macon wages rates to comply with Federal Public contract requirements.

4.1 ECM-1 Lighting Upgrades

4.1.1 ECM-1a Lighting Replacements

A comprehensive fixture survey was conducted of common areas and approximately 10% of the apartments. The existing base case lighting energy consumption was calculated and compared to the proposed lighting replacements.

The following lighting upgrades were also considered where appropriate:

- Retrofit existing hallway and lobby T-12 fixtures (2' x 2' U-Tube) to 17 watt 2' lamps with reflector kits
- Replace apartment level hallway T-12 fixtures with T-8 fixtures.
- Retrofit existing T-12 34-watt 2 & 4 fixtures with T-8 28-watt lamps and electronic ballasts
- Replace incandescent exit signs with LED technology
- Retrofit outdoor incandescent wall mounted fixtures with outdoor rated efficient compact fluorescent fixtures

The above measures will allow the facility to stock only T-8 fixtures in the future. Presently, the facility has a mixture of T-12 and T-8 lamps with multiple ballast combinations. In the future, the facility should only purchase low wattage super T-8s and ballasts, such as the low wattage 4 ft 28 watt units. These lamps may be directly installed into any existing 34 watt fixture when lamps fail. This will provide optimal energy efficiency and decrease confusion when performing lighting fixture maintenance.

Lighting has an expected lifetime of 20 years, according to IEEE, and the estimated annual energy savings is 163,200 kWh for a total energy savings of 3,264,000 kWh ($480,000) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix B and summarized as follows:

ECM – 1a Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity			Total				
$	kW	kWh	Therms	$		$	Years	Years
111,300	25	163,200	0	24,000	3.3	16,200	4.7	4.0

*Incentive is based on the New Jersey Smart Start Prescriptive Lighting Measures.

This measure is not recommended in lieu of ECM-1c.

NBHA is considering replacing all T-12 fixtures located in the hallways of the senior housing apartment floors with new T-8 fixtures. Each floor has nine fixtures, and the fixture have 2 x 48" T-12 lamps with Mag-STD ballast, and would be replaced with 2 x 48" T-8 lamps with electronic ballast. For this study, a cost of $250 per fixture was assumed for the replacements. Therefore, the payback for this replacement will be 7.5 years, or 6.7 years if the New Jersey Smart Start Prescriptive Lighting Measure incentive of $25 per fixture is included.

4.1.2 ECM-1b Install Lighting Occupancy Sensors

In many areas of the Towers, occupancy varies based on usage and time of day. A lighting survey was conducted of all fixtures to determine the average time lights are presently on in each space. It is proposed that occupancy sensors be installed in selected rooms to turn off lights when the area is unoccupied.

Ceiling mounted lighting sensors were considered for the Community Room, NBHA's conference rooms and offices, as well as apartment kitchens and bathrooms. Occupancy sensors were not considered in mechanical areas and stairways due to safety concerns. Other areas were not considered due to the proposed location of the occupancy sensor. If a sensor does not have a clear view of the occupant's room or hallway, it may darken even with people in the space, creating an unsafe condition.

Occupancy sensors have an expected lifetime of 10 years, according to IEEE, and the estimated annual energy savings is 35,900 kWh for a total energy savings of 359,000 kWh ($43,000) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM – 1b Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
36,100	0.0	35,900	0	4,300	0.2	6,100	8.4	7.0

* Incentive is based on the New Jersey Smart Start Prescriptive Lighting Measures.

This measure is recommended in lieu of ECM-1c.

4.1.3 ECM-1c Lighting Replacements with Occupancy Sensors

This measure is a combination of ECMs 1a and 1b to allow for maximum energy and demand reduction. Due to interactive effects, the energy and cost savings for occupancy sensors and lighting upgrades are not cumulative. Presently, the facility has numerous fixtures that contain T-8, T-12 lamps with magnetic and electric ballasts. To increase reliability and ease of maintenance, all fixtures with the older technology should be upgraded so that NBHA has common T-8 lamps with electronic ballasts throughout the facility. Stocking low wattage 28 watt T-8s 4-foot lamps to replace the existing 32 watt lamps when they fail should be considered. These lamps can be installed in the existing efficient T-8 electronic ballasted fixtures and increase the energy efficiency of the system.

This type of system has an expected lifetime of 10 years and the estimated annual energy savings is 195,100 kWh for a total energy savings of 1,951,000 kWh ($278,000) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix D and summarized below:

ECM – 1c Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
147,400	25	195,100	0	27,800	0.9	13,600	5.3	4.5

* Incentive is based on the New Jersey Smart Start Prescriptive Lighting Measures.

This measure is recommended.

4.2 ECM-2 Light Bulb Exchange

Approximately 28 apartments were surveyed as part of this energy audit. It is estimated that approximately 1,100 incandescent light bulbs are presently used in various tenant-owned lamps and plug-in lighting fixtures. For this ECM, the energy savings that could be realized if the NBHA initiated a bulb exchange program to replace tenant owned incandescent bulbs with higher efficient CFL bulbs was determined. This measure has less than a one year of payback, assuming an estimated cost of $5 per bulb replaced.

Light bulbs have an expected lifetime of about five years and the estimated annual energy savings is 24,054 kWh for a total energy savings of 120,270 kWh ($58,000) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix E and summarized as follows:

ECM – 2 Light Bulb Exchange

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		#2 Oil	Total				
$	kW	kWh	gallons	$		$	Years	Years
6,000	48.1	24,054	0	11,600	8.68	NA	0.5	NA

* No incentive available.

This measure is recommended.

4.3 ECM-3 Water Conservation

4.3.1 ECM-3a Replace Urinals and Flush Valves with Low Flow Types

There are two urinals in the Lawler complex, which would be replaced with low flow flush valves.

This measure is not recommended due to the long payback. However, when the urinals have to be replaced, it is recommended that the low flow fixtures be considered.

The implementation cost and savings related to this ECM are presented in Appendix F and summarized below:

ECM -3a Replace Urinals and Flush Valves with Low Flow Types

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
1,300	11	100	NA	NA	13.0	NA

* No incentive available.

This measure is not recommended.

4.3.2 ECM-3b Replace Toilets and Flush Valves with Low Flow Types

There are 260 toilets in the Lawler complex. Approximately half have been replaced over the years with low flow fixtures. This measure considers replacing the remaining toilets with new low flow fixtures.

The implementation cost and savings related to this ECM are presented in Appendix G and summarized as follows:

ECM -3b Replace Toilets and Flush Valves with Low Flow Types

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
59,000	541	4,900	NA	NA	12.1	NA

* No incentive available.

This measure is not recommended.

4.3.3 ECM-3c Install Low Flow Showerheads

There are 252 showers in the apartments in the Lawler complex. The showers have the standard showerhead that is nominally rated at 2.5 gallons per minute. LEED information indicates that an average shower last for approximately five minutes. This measure would install new 1.6 GPM showerheads to replace the existing 2.5 GPM showerheads.

Showerheads have an expected lifetime of about 15 years and the estimated annual water and sewer savings are 850 Kgal for a total savings of 12,750 Kgal ($114,000) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix I and summarized below:

ECM -3c Install Low Flow Showerheads

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
17,300	850	7,600	5.6	NA	2.3	NA

* No incentive available.

This measure is recommended.

4.4 ECM-4 Thermostats and Control Valves for Steam Radiators

The apartments are heated with low pressure steam. The steam is supplied from two Kewanee 125 BHP low pressure steam boilers. The steam heating system is comprised of the steam supply main, fintube radiation that transfers heat to the apartment, and the condensate return headers. Each Tower has a series of steam headers that run from the basement to the top floor.

The apartments have no temperature control thermostats to regulate the heat from the fintube. Heat is given off the fintube into the surrounding space. If the space becomes too hot, the windows are opened to cool the space.

This measure evaluates installing a self contained, temperature control valve on each leg of the fintube in each apartment. The control valve would have a capillary tube that would extend from the control valve to a wall mounted thermostat to allow the tenant to set and control to a particular space temperature with a temperature limit. This would not allow the occupant to raise the temperature above a set maximum

temperature limit, which for the purposes of this study is assumed to be 72°F, unless it is approved by NBHA. The maintenance staff would be able to change the temperature limit for occupants that need a higher temperature. A cutsheet of a proposed control valve and thermostat is presented in Appendix J.

Thermostats and control valves have an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings is 10,400 therms for a total energy savings of 156,000 ($172,500) therms over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix J and summarized below:

ECM – 4 Thermostats and Control Valves for Steam Radiators

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
114,700	0	0	10,400	11,500	0.5	18,700	10	8.4

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

This measure is recommended.

4.5 ECM-5 Install Door Seals

Some of the door seals on the outside doors at the Towers are worn, and some maintenance access doors have no door seals. This has caused issues in the past with fire protection pipes in the basement of Tower B freezing during winter. This measure recommends new door seals be installed to eliminate infiltration and potential pipe freezing.

Door seals have an expected lifetime of a door seal is about 5 years and the estimated annual energy savings is 210 therms for a total energy savings of 1,050 therms ($1,150) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix K and summarized below:

ECM – 5 Install Door Seals

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,700	0	0	210	230	(0.4)	400	7.2	5.6

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

This measure is recommended.

4.6 ECM-6 Insulate Steam and Condensate Piping

Lawler Tower A houses the two Kewanee 125 BHP low pressure steam boilers along with the condensate return pump for Tower A, the condensate heatwell tank, and the boiler feed pumps. Each Tower has 14

condensate return lines that are ¾" and 1-1/4" in line size. They return the condensate from the fintube radiators in the apartments. All lines feed back to a condensate return pump, and the pumped condensate from each system goes to the heatwell tank where it is fed to the boilers.

The condensate return lines from the steam radiators and unit heaters and the two condensate receivers are uninsulated. The pumped condensate lines are partially insulated. The 3' diameter x 7' long heatwell tank is uninsulated.

The heat released by these uninsulated lines and vessels has to be made up in the boilers. The hotter the condensate coming back to the boiler, the less energy is required to boil the water to make steam.

The expected lifetime of piping insulation is about 20 years and the estimated annual energy savings is 20,700 therms for a total energy savings of 414,000 therms ($460,000) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix L and summarized below:

ECM – 6 Insulate Steam and Condensate Piping

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
17,300	0	0	20,700	23,000	25.6	11,800	0.8	0.3

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

This measure is recommended.

4.7 ECM- 7 Air Conditioner Changeout

Lawler Towers has 314 window air conditioners ranging in capacity from 5,000 BTUH to 10,000 BTUH. The operational EER is estimated at between 8 to 9. All of these units are owned by the tenants who pay a monthly fee for the operational cost of the units. The rated EER on typical newer units is 10 to 12. Some of the newer units were observed to be higher efficiency units.

The available cooling capacity of the existing units is around 2,000,000 BTUH. The TREAT Model indicates that only about 25% of this capacity is used during a typical cooling hour. This measure proposes that new tenants to North Bergen Housing Authority buildings be required to use only Energy Star rated air conditioners with an EER above 10. Most EPA Energy Star rated window air conditioners are in this category. Energy Star rated air conditioners use at least 10% less energy than conventional models as published by the U.S. Environmental Protection Agency and the U.S. Department of Energy. For this ECM, it was assumed that the air conditioners used with average an EER of 12.

There is no implementation cost to this ECM. The savings related to this ECM are presented in Appendix M. The savings for an eventual change out over time are as follows:

ECM – 7 Air Conditioner Changeout

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
NA	0.0	16,900	0	2,500	NA	NA	NA	NA

* No incentive available.

This ECM is recommended.

4.8 ECM- 8 Night Setback for Offices and Community Room

The 3,200 SF Community Room is heated and cooled using four Daiken ceiling mounted heat pumps. Currently, the units operate to maintain a specified setpoint.

NBHA offices, conference room, and server room are air conditioned by five York air conditioning systems. These units range in cooling capacity from 2 to 5 tons, and have remote condensers located on the west side of the building. The fan coil units are mounted in the ceiling with air distribution to multiple diffusers in the respective rooms. Heating is provided by electric reheats. The Director's Office is heated and cooled from a roof mounted Trane unit.

All the systems have programmable thermostats for controlling space temperature. This measure proposes that the existing programmable thermostats be programmed for night setback of the heating and cooling space temperatures to save energy. As part of this measure, all air cooled condensers should be cleaned to reduce the operating head pressure of the compressors, improving system efficiency.

Night setback has an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings is 20,000 kWh for a total energy savings of 300,000 kWh ($45,000) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix N and summarized below:

ECM- 8 Night Setback for Offices and Community Room

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,100	0.0	20,000	0	3,000	40	400	0.4	0.1

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

This measure is recommended.

4.9 ECM- 9 Boiler Replacement

Lawler Towers A and B are heated by two 125 BHP Kewanee horizontal fire tube boilers. Each boiler consists of a three pass boiler with a Coen MicroNOx, low NOx burner assembly that utilizes flue gas recirculation (FGR). The FGR burner assembly takes exhaust from the boiler stack and mixes it with

fresh combustion air to arrive at a low NOx emission. These systems are very effective at delivering a low NOx output (< 30 part per million) but do not allow for high turn down boiler modulation. This lack of modulation at low fire causes the boiler to shut down and restart continuously. When a boiler shuts down, it has to go through a pre-purge and heat up cycle that wastes energy and lowers the overall system efficiency, particularly in the spring and fall months.

Replacing the two existing burners with newer technology burners would allow for some higher turn down and continued low NOx operation, but would not result in substantially higher boiler efficiency.

This measure recommends replacing the two Kewanee boilers with four new high efficiency (> 84%) boilers and control system. The newer high efficiency designs allow for maintained boiler efficiencies above 84% despite the turn down. A conservative efficiency rating of 65% was used to perform energy saving calculations. A comprehensive boiler plant study should be performed before entering into a full capital project. Capital cost of the four boilers could be reduced if it was determined that the implementation of ECM-4 (Thermostats and Control Valves for Fintube Radiation) and ECM-6 (Insulate Steam and Condensate Piping) saved sufficient energy to feasibly reduce boiler plant size. A cutsheet of a proposed high efficiency low pressure steam boiler is presented in Appendix O.

Boilers have an expected lifetime of about 20 years, according to ASHRAE, and the estimated annual energy savings is 31,100 therms for a total energy savings of 622,700 ($780,000) therms over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix O and summarized below:

ECM- 9 Boiler Replacement

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
335,900	0	0	35,100	39,000	1.3	63,300	8.6	7.0

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

This measure is recommended.

4.10 ECM-10 Window Replacements

The existing double pane aluminum framed slider windows in both of the Lawler Towers were replaced in 1990. As part of the study, NBHA requested an assessment of replacing the windows with triple panes. To replace the existing windows would result in a total utility savings of approximately $5,000. The cost to replace one 3' x 5' window is approximately $450.

The implementation cost and savings related to this ECM are presented in Appendix P and summarized as follows:

ECM- 10 Window Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,178,400	0	0	4,500	5,000	NA	8,120	> 30	> 30

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program

This measure is not recommended.

4.11 ECM-11 Insulation Addition

4.11.1 ECM-11a Insulate NBHA Office Walls

The new NBHA Administrative Offices were constructed in an area formerly used as an open balcony. The area was enclosed with new outside walls and interior walls and finishes. According to NBHA staff, due to budgetary constraints at the time of construction, the outside walls were not adequately insulated. These walls face west and are impacted by the prevailing winds. Therefore, the offices with windows are colder than other NBHA office space during the winter months.

This measure would use blown-in insulation to insulate the estimated 3-1/2" interior walls. The existing outside window wall panels would be repaired and resealed to eliminate infiltration. The walls would potentially be insulated from the outside. All wall panels would be capped and painted to match existing finishes at completion of the insulation work.

The insulation has an expected lifetime of over 30 years, according to ASHRAE, and the estimated annual energy savings is 41,100 kWh for a total energy savings of 1,233,000 kWh ($186,000) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix Q and summarized below:

ECM-11a Insulate NBHA Office Walls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
8,300	0.0	41,100	0	6,200	21.4	4,200	1.3	0.7

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

This measure is recommended.

4.11.2 ECM-11b Insulate Area Below the NBHA Offices and Community Room

The area below the Community Room and NBHA Administrative Offices consists of a crawl space for utilities, steam condensate pump, and a former chiller room. The floor of the Community Room and offices is an uninsulated concrete slab. The total affected area is approximately 8,000 SF. There are also

several louvered grilles in the basement wall for ventilation. During the winter months, the offices and Community Room are cold from the heat lost through the floor slabs.

This measure would insulate the floor slabs of the Community Room and NBHA Offices with 3" board insulation (R-19).

Insulation has an expected lifetime of over 30 years, according to ASHRAE, and the estimated annual energy savings is 47,150 kWh for a total energy savings of 1,414,500 kWh ($213,000) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix R and summarized below:

ECM-11b Insulate Area Below the NBHA Offices and Community Room

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
26,900	0.0	47,150	0	7,100	6.9	8,500	3.8	2.6

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

This measure is recommended.

4.12 ECM-12 Exhaust Fan Controls

Lawler Tower A and B have seven roof exhaust fans each. The exhaust airflow for the facility is 24,000 CFM. The exhaust fans ventilate the common areas (hallways); and apartment stove exhaust and bathroom exhaust. The fans run continuously.

4.12.1 ECM-12a Install On/Off Controls for Apartment Exhaust Fans

The apartment exhaust constitutes approximately 6,000 CFM for each tower, for a total of 12,000 CFM.

This measure would install a stand alone controller and relay panel to turn the common area and apartment fans off for eight hours a day. This measure would reduce the combined motor horsepower of the fans, and heating and cooling of the makeup air.

Per New Jersey building code, for intermittent operation 100 cfm of exhaust is required in kitchens and 50 cfm in bathrooms. For continuous operation, 25 cfm is required in kitchens and 20 cfm in bathrooms.

A modification of this ECM that may have equal savings is to re-balance the system to meet the current code requirements. A review of past documentation reveals exhaust rates higher than code currently requires.

The controls have an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings is 6,500 kWh and 14,200 therms for a total energy savings of 98,000 kWh and 213,000 therms ($250,500) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix S and summarized below:

ECM-12a Install On/Off Controls for Apartment Exhaust Fans

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
11,800	0.0	6,500	14,200	16,700	20.2	5,900	0.7	0.4

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

This measure is recommended.

4.12.2 ECM-12b Install On/Off Controls for Common Area Exhaust Fans

The common area exhausts for the general areas constitute 7,500 CFM for each tower.

This measure would install a stand alone controller and relay panel to turn off the common area fans for a period of eight hours per day to reduce the combined motor horsepower and heating and cooling of makeup air.

A modification of this ECM that may have equal savings is to re-balance the system to meet the current code requirements. A review of past documentation reveals exhaust rates higher than code currently requires.

Controls have an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings is 2,200 kWh and 1,575 therms for a total energy savings of 32,7005 kWh and 23,600 therms ($31,500) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix T and summarized below:

ECM-12b Install On/Off Controls for Common Area Exhaust Fans

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
7,600	0.0	2,200	1,575	2,100	3.1	3,200	3.6	2.1

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

This measure is recommended.

4.13 ECM-13 Energy Star Appliances

There are 253 apartments in the Towers, each with a standard refrigerator; size ranges between 15.5 to 17 cubic feet.

This measure evaluates replacement of the existing refrigerators with new Energy Star units. Energy Star qualified refrigerators are required by the U.S. Department of Energy to use 20% less energy than models not labeled "ENERGY STAR".

Refrigerators have an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings is 106,600 kWh for a total energy savings of 1,599,000 kWh ($247,500) over the life of the project.

The implementation cost and savings related to this ECM are presented in Appendix U and summarized below:

ECM – 13 Energy Star Appliances

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
177,200	0.0	106,600		16,000	0.4	19,200	11.1	9.9

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

This measure is recommended.

4.14 North Bergen Housing Authority Building Incentives

The North Bergen Housing Authority's energy conservation project will be eligible for various incentives by the New Jersey Office of Clean Energy.

The largest incentives available will be for the New Jersey Pay for Performance P4P Program. The P4P program is designed for qualified energy conservation projects in facilities that consume a minimum average electric demand of 200 kW per month (total of 12 months peak demand/12). Facilities that meet this criterion must also achieve a minimum performance target of 15% by using the EPA portfolio manager benchmarking tool before and after construction. Incentives for this program are in three parts.

Incentive #1 energy reduction plan pays $0.05 per square foot to a maximum of $25,000 or 25% of facility annual energy cost paid after approval of application. Incentive #2 is paid after installation of recommended measures; base incentives deliver $0.11/kWh and $1.10/therm not to exceed 30% of total project cost. Incentive #3 post-construction benchmarking is paid after acceptance of a report proving energy savings over one year utilizing the EPA portfolio manager benchmarking tool. Incentive #3 base incentives deliver $0.07/ kWh and $0.70/therm not to exceed 20% of total project cost. Combining incentives #2 and #3 will deliver a total of $0.18/ kWh and $1.8/therm not to exceed 50% of total project cost. Additional incentives for #2 and #3 are increased by $0.005/kWh and $0.05/therm for each percentage increase above the minimum performance target calculated with the EPA portfolio manager benchmarking tool not to exceed 50% of total project cost.

A new incentive structure has been announced for projects exceeding 20% in energy savings utilizing the required EPA portfolio manager benchmarking tool. The new incentive structure will double incentives #2 and #3, therefore providing a total of $0.36/kWh and a $3.60/ therm for projects exceeding 20%.. Incentive #1 for application and energy reduction plan has not changed yet the maximum incentive has now been raised to 80% of project costs. The 200 kW/month average minimum has been dropped so any structure can apply. This new incentive structure will be in effect until December 31st, 2009.

For detailed description of the (P4P) program see Appendix T.

Lighting energy reduction incentives were calculated utilizing the New Jersey SmartStart Building prescriptive lighting measures and incentive program. This program includes incentives dependent upon the existing fixture type and proposed lighting retrofit measure. Prescriptive lighting incentives were utilized for this report to demonstrate potential savings if only lighting was selected for implementation.

If the North Bergen Housing Authority energy conservation project qualifies and enters into the New Jersey Pay for Performance Program, lighting savings will be included in total building energy usage and savings; applicants cannot apply for both programs in the same project.

Pay for Performance projects for the five customer classes listed below will be eligible for increased incentive levels:

- Hospitals
- Non-profits
- Public colleges/universities
- Governmental entities not receiving Energy Efficiency and Conservation Block Grants (EECBG)
- Affordable multifamily housing ("affordable" is defined as low income, subsidized, HUD, etc.)

Increased incentive levels are as follows:

- Incentive #2: If a reduction in energy consumption of 20% or more is projected, above listed customers will be eligible for an additional $0.11/kWh and $1.10/therm
- Incentive #3: If a reduction in energy consumption of 20% or more is achieved, above listed customers will be eligible for an additional $0.07/kWh and $0.70/therm
- Incentive #2 and #3 combined may not exceed 80% of the total project cost
- Incentive cap is $2 million per gas account and $2 million per electric account
- 200kW threshold is not required

In order to take advantage of this opportunity Partners must submit the following by December 31, 2009:

- A signed P4P Initial Application, including
  - W9
  - 12 months utility bills
- Copy of Partner-Participant Contract
- EPA Portfolio Benchmarking results (may be print out)
- Cover letter indicating
  - Modeling software to be used in developing ERP
  - Type of customer class

Partners that have already submitted Initial Applications for eligible customer classes will be allowed to take advantage of the increased incentive levels.

5.0 ALTERNATIVE ENERGY EVALUATION

5.1 Geothermal

Geothermal heat pumps (GHP) transfer heat between the constant temperature of the earth and the building to maintain the building's interior space conditions. Below the surface of the earth throughout New Jersey the temperature remains in the low 50°F range throughout the year. With GHP systems, water is circulated between the building and the piping buried in the ground. The ground heat exchanger in a GHP system is made up of a closed or open loop pipe system. Most common is the closed loop, in which high density polyethylene pipe is buried horizontally at 4-6 feet deep or vertically at 100 to 400 feet deep. These pipes are filled with an environmentally friendly antifreeze/water solution that acts as a heat exchanger. In the summer, the water picks up heat from the building and moves it to the ground. In the winter the system reverses and fluid picks up heat from the ground and moves it to the building. Heat pumps make the collection and transfer of this heat to and from the building possible.

At present, there is no central chiller system or heat pump system from which to reject heat. The heating system is low pressure steam with a high condensate return percentage (> 90%). NBHA's property is in a city environment and consists mainly of buildings and parking area. Due to the limited green space, installation of a buried ground loop may not be possible.

Geothermal is not recommended due to the lack of opportunity to take advantage of any generated geothermal heat transfer, and unavailability of green space to install a buried ground loop system.

5.2 Solar

5.2.1 Photovoltaic (PV) Rooftop Solar Power Generation

The roof of Lawler Apartment Towers A and B were evaluated for the potential to install rooftop photovoltaic (PV) solar panels for the purpose of power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC Current is converted to alternating current (AC) with the use of an electrical device called an inverter. The roof of both Lawler Towers have room to install a small solar cell array between the edge of the roof and the roof exhaust fans in the center of the structure. The roof would be the most feasible location for any installation since it is has a south face with no obstructions and has minimum rooftop obstructions such as rooftop units and exhaust fans.

To calculate the PV power generation, the PVWatts™ solar power generation model was utilized. The New Jersey clean power estimator that is provided by the NJCEP is presently going through updates, therefore they recommend using the PVWatts™ Version 1 calculator. The closest city available in the model is Newark, NJ and a fixed tilt array type was utilized to calculate energy production. PVWatts™ solar power generation model and satellite image of roof area may be found in Appendix V.

The incentive in the State of New Jersey for nonresidential solar PV applications is $1.00 /Watt up to 50 kW of installed PV array. Federal tax credits are also available for renewable energy projects up to 30% of installation costs. NBHA does not pay Federal taxes, and, therefore, would not be able to utilize the Federal tax credit incentive.

Installation of PV arrays in the State of New Jersey will allow the owner to participate in the New Jersey Solar Renewable Energy Certificate (SREC) program. This is a program that has been set up to allow entities with large amounts of environmental emissions to purchase credits from zero emission PV solar-

producers. An Alternative Compliance Penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1,000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. The cost of the APC penalty for 2009 is $689; this is the amount that must be paid per SREC by the high emission producers. The dollar amount that will be paid to the PV producer for 2009 is expected to be $600/SREC credit. Payments that will be received from the PV producer will change from year to year dependent upon supply and demand. As stated above, there is no definitive way to calculate an exact price that will be received by the PV producer per SREC over the next 15 years. R & R Renewable Energy Consultants, a third party SREC broker that has been approved by the NJCEP, estimated an average of $487/ SREC per year and this number was utilized in the cash flow for this report.

Lawler Apartments has a maximum kW demand of 398.3 kW and a minimum kW of 212.5 kW. The monthly average over the year observed was 280.8 kW. The existing load would justify the use of a large PV solar array. A 20 kW system was selected for the calculations based on available roof area. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Authority) estimates of total cost of system installation. It should be noted that the cost of installation is now $10.00 per watt or $10,000 per kW of installed system. This has increased in the past few years due to the great national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have a multiple decade life span yet the inverter device that converts DC electricity to AC has a planned life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

This measure is not recommended at this time due to the long payback period; however, could be a potentially viable renewable measure for the NBHA to consider in the future if electricity rates continue to increase above $0.15/kWh and if PV installation costs decline below $10 per Watt.

Photovoltaic solar panels have an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings was 23,700 kWh for a total energy savings of 355,000 kWh ($53,250) over the life of the project. The implementation cost and savings related to this ECM are presented in Appendix V and summarized below:

ECM-14 Photovoltaic (PV) 20 kW Rooftop Solar Power Generation

Budgetary Cost	Annual Utility Savings				ROI	New Jersey Renewable Energy Incentive*	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		#2 Oil	Total					
$	kW	kWh	gallons	$		$	$	Years	Years
200,000	0	23,700	0	3,550	(0.7)	20,000	11,515	> 30	11.9

*Incentive based on New Jersey Renewable Energy Program for non-residential applications of $1.00 per Watt of installed capacity
** Estimated Solar Renewable Energy Certificate Program (SREC) for 15 years at $487/1000 kWh

This is a potentially viable renewable measure that the North Bergen Housing Authority may want to consider investigating further in the future.

5.2.2 Solar Thermal Domestic Hot Water Plant

Active solar thermal systems use solar collectors to collect the sun's energy to heat water, another fluid, or air. The heart of a solar collector is an absorber that converts the sun's energy into heat. The heat is then transferred by circulating water, antifreeze, or sometimes air to another location for immediate use or

storage for later use. Applications for active solar thermal energy include providing hot water, heating swimming pools, space heating, and preheating air in both residential and commercial buildings.

A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Solar radiation is absorbed by the collector, and the heat collected is commonly used to heat or preheat water or air. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed on the roof of the building, oriented south, and tilted around the site's latitude, so as to maximize the amount of radiation collected on a yearly basis.

There are several options for using active solar thermal systems for space heating; most common method involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system). The most practical system for Lawler Towers would be to transfer the heat from the panels to thermal storage tanks in the basement and transfer solar-produced thermal energy for domestic hot water production.

Currently, there are no incentives available for installation of thermal solar systems. There is a Federal tax credit of 30% of installation cost for the thermal applications; however, NBHA does not pay Federal taxes and, therefore, would not benefit from this program.

This is not recommended due to the proximity of the proposed solar collectors to the location of the existing domestic hot water system, consisting of 15 stories of housing and two subbasements of mechanical, electrical, and storage areas, with no easy route for the piping. The existing PVI condensing hot water heaters are already over 90% efficient. The area on the roof that would be used for the solar collectors is the same area that would be used for photovoltaic panels, which have a more direct potential payback.

5.3 Wind

Wind energy is a form of solar energy created by the uneven heating of the earth's surface by the sun. Most small wind turbines use a horizontal axis propeller, or rotor, to capture the kinetic energy of the wind and convert it into rotary motion to drive a generator which usually is designed specifically for the wind turbine. The rotor consists of two or three blades, usually made from wood or fiberglass. These materials give the turbine the required strength and flexibility, and have the added advantage of not interfering with television signals. The structural backbone of the wind turbine is called the mainframe, and it includes the "slip-rings" that connect the wind turbine, which rotates as it points into changing wind directions, and the fixed tower wiring. The tail aligns the rotor into the wind.

To avoid turbulence and capture greater wind energy, most turbines are mounted on towers. As a rule of thumb, turbines should be mounted at least 30 feet above any structures or natural features within 300 feet of the installation. Smaller turbines can go on shorter towers. For example, a 250-watt turbine may be mounted on a 30-50 foot tower, while a 10 kW turbine will usually need a tower of 80-120 feet. Towers are available in a variety of designs, including tubular or latticed, guyed or self-supporting. Wind turbine manufacturers also offer towers, and can verify that the tower meets required building and safety specifications as well as being compatible with the turbine.

The New Jersey Clean Energy Program for small wind installations has assigned numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine installations are based on kilowatt hours saved in the first year. Systems size under 16,000 kWh per year of production will receive a $3.20 per kWh incentive. Systems producing over 16,000 kWh will receive $51,200 for the

first 16,000 kWh of production with an additional $0.50 per kWh up to a maximum cap of 750,000 kWh per year. These incentives can make a project like this very cost effective. Federal tax credits are also available for renewable energy projects up to 30% of installation cost for systems less than 100 kW.

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. Due to the height of the Lawler Towers (15 stories), a vertical wind turbine could be located on the roof of the building and potentially attached to the elevator penthouse. A structural review of the roof and elevator penthouse would have to be performed to evaluate the effect of wind loads on the existing structure. A previous evaluation was performed for NBHA for this type of turbine; however, the potential savings were not attractive and the study was not progressed. A wind resource map downloaded from the AWS Truewind Corporation indicates that that mean annual wind speed at 30 meters in the North Bergen area is greater than 10.1 miles per hour of annual wind speed. Most small wind turbines become financially viable over 10 miles per hour of mean annual wind speed; therefore, the ASW Truewind model indicates that installation of a wind turbine may be applicable at this location. The NBHA site may have the minimum average wind speed needed to install a land based wind turbine but due to the city environment there is no open area that would allow the use of a ground based system.

An aerial satellite depiction of the Lawler Apartments location and a wind resource map may be found in Appendix V.

This is not recommended due to the complexity of the installation and the liabilities of operation, a roof top vertical wind turbine may have ice buildup that may become a safety hazard to the buildings in the surrounding area. There is not available land to consider a land based system.

5.4 Combined Heat and Power Generation (CHP)

Combined heat and power also known as "cogeneration" is self-production of electricity on-site with beneficial recovery of the heat byproduct from the electrical generator. Common CHP equipment includes reciprocating engine-driven generators, micro-turbines, steam turbines, and fuel cells. Typical CHP customers include industrial, commercial, institutional, educational institutions and multifamily residential facilities. CHP systems that are commercially viable at the present time are sized approximately 50 kW and above, with numerous options in blocks grouped around 300 kW, 800 kW, 1,200 kW and larger. Typically CHP systems are used to produce a portion of the electricity needed by a facility some or all of the time, with the balance of electric needs satisfied by purchase from the grid.

Any proposed CHP project will need to consider many factors such as existing system load, use of thermal energy produced, system size, natural gas fuel availability, and proposed plant location. Lawler has the need for electrical generation but no easy way to use the thermal byproduct of the cogeneration. The heating system is low pressure steam so the heat cannot be easily used the way it could with a hot water heating system. Thermal usage during the summer months would require a different cooling system incorporating an absorption chiller and cooling tower to convert hot water to chilled water. Due to the fact that the building cooling is done by window air conditioners and split systems, it would not be practical to install this type of cooling system with the existing HVAC equipment; therefore, thermal energy produced by the CHP plant in the warmer months will be wasted.

This is not recommended due to not having a practical use for the thermal production in the summer and winter months.

5.5 Biomass Power Generation

Biomass power generation is a process in which waste organic materials are used to produce electricity or thermal energy that otherwise would be sent to the landfill or expelled to the atmosphere. To participate in NJCEP's Customer On-Site Renewable Energy (CORE) program, participants must install an on-site sustainable biomass or fuel cell energy generation system. Incentives for bio-power installations are available to support up to 1MW-DC of rated capacity.

*Class I organic residues are eligible for funding through the NJCEP CORE program. Class I wastes include- uses a renewable supply of organic material:

- Wood wastes not adulterated with chemicals, glues or adhesives,
- Agricultural residues (corn stover, rice hulls or nut shells, manures, poultry litter, horse manure, etc) and/or methane gases from landfills,
- Food wastes
- Municipal tree trimming and grass clipping wastes
- Paper and cardboard wastes
- Non adulterated construction wood wastes, pallets
- NJDEP evaluates biomass resources not identified in the RPS

*From NJOCE website

Examples of eligible facilities for a CORE incentive include:

- Digestion of sewage sludge
- Landfill gas facilities
- Combustion of wood wastes to steam turbine
- Gasification of wood wastes to reciprocating engine
- Gasification or pyrolysis of bio-solid wastes to generation equipment

This is not recommended due to the building not having a waste stream or an external source that can be utilized for the production of electricity or thermal energy. The proximity of such a system in the surrounding neighborhood of North Bergen would create issues with environmental airborne discharge limits.

5.6 Demand Response Curtailment

Presently, NBHA has electricity delivered and supplied by PSE&G. Utility curtailment is an agreement with the regional transmission organization and an approved Curtailment Service Providers (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a facility utilizing an emergency generator, therefore reducing the electrical demand on the utility grid. This program is to benefit the utility company during high demand periods and PSE&G offers incentives to the CSP to participate in this program. Enrolling in the program will require program participants to drop electrical load or turn on their emergency generators during high electrical demand conditions or during emergencies. Part of the program also will require that program participants reduce their required load or run their emergency generators with notice to test the system. A minimum of 100 kW of curtailable load is required to enter the program. Discussions with the EnerNoc Corporation, an approved CSP, indicate that existing emergency generators will not pass the emissions requirements to enter the program.

Presently, Lawler Apartments has back up generation and an average kW demand during the observed period of 280.8 kW/month. Lawler has a 230 kW Cummins emergency generator that runs on diesel fuel. The bulk of the electricity usage is controlled by the tenants and will not be able to be curtailed by NBHA staff; therefore, there is no ability to drop electrical load.

This is not recommended because the emergency generator cannot meet air emissions standards in the State of New Jersey and the building load cannot be curtailed for Demand Response Curtailment.

6.0 EPA PORTFOLIO MANAGER

The United State Energy Protection Agency (EPA) is a federal agency in charge of regulating environment waste and policy in the United States. The EPA has released a building energy program called the EPA Portfolio Manager for public use. This program is designed to allow property owners and managers to share, compare and improve upon their facility's energy consumption. Inputting such parameters at electricity, heating fuel, building characteristics and location into the website-based program generates a naturalized energy rating score out of 100. Once an account is registered, monthly utility data can be entered to track the savings progress and retrieve an updated energy rating score on a monthly basis.

Due to the facility having more than 10% of the total floor space allocated to "other" per the EPA Portfolio Manger benchmarking tool, the NBHA Lawler Towers Apartments is unable to acquire an Energy Rating. The "other" allocation is indicative of the Portfolio Manager not having a floor characteristic for a senior housing facility. An alternative method that can be utilized to compare the facility to similar buildings is the Source Energy Intensity designation, which measures energy per square foot per year. Lawler's Current Source Energy Intensity is 193.1 kBTU/ft^2/year.

A full EPA Energy Star Portfolio Manager Report is located in Appendix W.

7.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Lawler Towers complex of the New Jersey Housing Authority in North Bergen, New Jersey identified potential ECMs for lighting replacements, light bulb exchange, faucet aerators, low flow showerheads, exhaust fan control, boiler replacement, door seal upgrades, insulation upgrades, air conditioner changeout, night setback, and Energy Star appliances. Potential annual savings of $181,100 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM – 1c Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
147,400	25	195,100	0	27,800	0.9	13,600	5.3	4.5

* Incentive is based on the New Jersey Smart Start Prescriptive Lighting Measures.

ECM – 2 Light Bulb Exchange

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		#2 Oil	Total				
$	kW	kWh	gallons	$		$	Years	Years
6,000	48.1	24,054	0	11,600	8.68	NA	0.5	NA

* No incentive available.

ECM -3c Install Low Flow Showerheads

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
17,300	850	7,600	5.6	NA	2.3	NA

* No incentive available.

ECM – 4 Thermostats and Control Valves for Steam Radiators

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
114,700	0	0	10,400	11,500	0.5	18,700	10	8.4

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM – 5 Install Door Seals

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
1,700	0	0	210	200	(0.4)	400	7.2	5.6

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM – 6 Insulate Steam and Condensate Piping

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
17,300	0	0	20,700	23,000	25.6	11,800	0.8	0.3

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program

ECM – 7 Air Conditioner Changeout

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
NA	0.0	16,900	0	2,500	NA	NA	NA	NA

* No incentive available.

ECM- 8 Night Setback for Offices and Community Room

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
1,100	0.0	20,000	0	3,000	40	400	0.4	0.1

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM- 9 Boiler Replacement

Budgetary Cost	Annual Utility Savings					New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
335,900	0	0	35,100	39,000	1.3	63,300	8.6	7.0

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM-11a Insulate the NBHA Office Walls

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
8,300	0.0	41,100	0	6,200	21.4	4,200	1.3	0.7

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM-11b Insulate Area Below the NBHA Offices and Community

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
26,900	0.0	47,150	0	7,100	6.9	8,500	3.8	2.6

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM-12a Install On/Off Controls for Apartment Exhaust Fans

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
11,800	0.0	6,537	14,200	16,700	20.2	5,900	0.7	0.4

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM-12b Install On/Off Controls for Common Area Exhaust Fans

Budgetary Cost	Annual Utility Savings					New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
7,600	0.0	2,179	1,575	2,100	3.1	3,200	3.6	2.1

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

ECM – 13 Energy Star Appliances

Budgetary Cost	Annual Utility Savings					New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
177,200	0.0	106,600		16,000	0.4	19,200	11.1	9.9

* Incentive based on New Jersey Office of Clean Energy Pay for Performance Program.

APPENDIX A

Utility Usage Analysis

New Jersey BPU Energy Audit Program
CHA #20241
North Bergen Housing Authority
Lawler Towers

Account Number: 2100695134
PSE&G - Electric Service

Meter #: 778003748

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/3/2008	161,676	**398.3**	$27,505.83	$6,794.13	$20,711.70	0.1701	0.1281	17.06
8/4/2008	198,280	380.2	$32,288.12	$6,596.85	$25,691.27	0.1628	0.1296	17.35
9/3/2008	158,087	320.5	$27,573.79	$5,946.19	$21,627.60	0.1744	0.1368	18.55
10/2/2008	132,462	333.5	$20,541.90	$3,529.97	$17,011.93	0.1551	0.1284	10.58
10/31/2008	119,970	253.2	$16,682.92	$3,287.33	$13,395.59	0.1391	0.1117	12.98
12/3/2008	147,737	283.4	$19,255.47	$3,384.74	$15,870.73	0.1303	0.1074	11.94
12/30/2008	115,143	243.7	$15,670.42	$3,256.69	$12,413.73	0.1361	0.1078	13.36
1/27/2009	119,739	236.7	$16,646.34	$3,277.77	$13,368.57	0.1390	0.1116	13.85
2/23/2009	109,558	235.0	$16,214.98	$3,273.91	$12,941.07	0.1480	0.1181	13.93
3/30/2009	140,558	214.3	$19,264.34	$3,207.14	$16,057.20	0.1371	0.1142	14.97
4/29/2009	123,854	258.3	$17,433.00	$3,349.06	$14,083.94	0.1408	0.1137	12.97
6/1/2009	123,694	212.5	$18,752.60	$4,858.09	$13,894.51	0.1516	0.1123	22.86
Most Recent Yr	1,650,758	398.3	$247,829.71	$50,761.87	$197,067.84	0.1501	0.1194	15.03

New Jersey BPU Energy Audit Program
CHA #20241
North Bergen Housing Authority
Lawler Towers

Account Number: 2100695134
PSE&G - Natural Gas Service

	Meter #: 2415033			Meter #: 2600157		
Date	Therms	Cost	($/Therm)	Therms	Cost	($/Therm)
7/3/2008	1,813	$3,025.86	1.669	0	$91.89	-
8/4/2008	1,674	$2,912.63	1.740	0	$91.89	-
9/3/2008	1,646	$2,218.57	1.348	0	$91.89	-
10/2/2008	1,812	$2,283.42	1.260	0	$91.89	-
11/3/2008	2,414	$3,158.14	1.308	10,761	$15,834.83	1.471
12/3/2008	2,602	$3,181.99	1.223	22,647	$28,109.11	1.241
12/30/2008	2,705	$3,444.33	1.273	22,379	$28,867.97	1.290
1/27/2009	2,847	$3,392.90	1.192	25,071	$30,365.35	1.211
2/23/2009	2,965	$3,092.47	1.043	21,928	$23,593.63	1.076
3/30/2009	3,684	$2,932.24	0.796	26,570	$20,435.55	0.769
4/29/2009	2,869	$2,099.50	0.732	12,291	$8,617.46	0.701
6/1/2009	2,586	$1,812.46	0.701	0	$93.66	-
Most Recent Yr	29,617	$33,554.51	1.133	141,647	$156,285.12	1.103

Total (both meters)

Date	Therms	Cost	($/Therm)
7/3/2008	1,813	$3,117.75	1.720
8/4/2008	1,674	$3,004.52	1.795
9/3/2008	1,646	$2,310.46	1.404
10/2/2008	1,812	$2,375.31	1.311
11/3/2008	13,175	$18,992.97	1.442
12/3/2008	25,249	$31,291.10	1.239
12/30/2008	25,084	$32,312.30	1.288
1/27/2009	27,918	$33,758.25	1.209
2/23/2009	24,893	$26,686.10	1.072
3/30/2009	30,254	$23,367.79	0.772
4/29/2009	15,161	$10,716.96	0.707
6/1/2009	2,586	$1,906.12	0.737
Most Recent Yr	171,264	$189,839.63	1.108

New Jersey BPU Energy Audit Program
CHA #20241
North Bergen Housing Authority
Lawler Towers

Account #: 10000997823060
United Water - Domestic Water Service

Date	Gallons	Cost	($/kgal)
8/13/2008	933,504	$3,721.21	3.986
9/13/2008	1,132,472	$4,465.45	3.943
10/11/2008	902,836	$3,606.50	3.995
11/10/2008	917,048	$3,659.60	3.991
12/8/2008	921,536	$3,676.44	3.989
1/12/2009	1,151,172	$4,535.40	3.940
2/11/2009	1,047,200	$4,146.49	3.960
3/13/2009	1,024,760	$4,062.55	3.964
4/16/2009	1,173,612	$4,952.99	4.220
5/12/2009	884,884	$4,160.21	4.701
6/11/2009	981,376	$4,584.45	4.671
7/17/2009	1,225,224	$5,656.57	4.617

Most Recent Yr	12,295,624	$51,227.86	4.166

United Water - Sewage Service

Date	Gallons	Cost	($/Gal)
9/30/2008	3,130,380	$16,403.19	5.240
12/31/2008	3,218,644	$16,865.69	5.240
3/31/2009	2,741,420	$15,086.50	5.503
6/30/2009	3,223,132	$17,727.15	5.500

Most Recent Yr	12,313,576	$66,082.53	5.367

ELECTRIC MARKETERS LIST

The following is a listing of marketers/suppliers/brokers that have been licensed by the NJ Board of Public Utilities to sell electricity to residential, small commercial and industrial customers served by the Public Service Electric and Gas Company distribution system. **This listing is provided for informational purposes only and PSE&G makes no representations or warranties as to the competencies of the entities listed herein or to the completeness of this listing.**

American Powernet Management
867 Berkshire Blvd, Suite 101
Wyomissing, PA 19610
www.americanpowernet.com

BOC Energy Services
575 Mountain Avenue
Murray Hill, NJ 07974
www.boc-gases.com

Commerce Energy Inc.
535 Route 38, Suite 138
Cherry Hill, NJ 08002
(888) 817-8572 or
(858) 910-8099
www.commerceenergy.com

ConEdison Solutions
701 Westchester Avenue
Suite 201 West
White Plains, NY 10604
(800) 316-8011
www.ConEdSolutions.com

Constellation NewEnergy, Inc.
1199 Route 22 East
Mountainside, NJ 07092
908 228-5100
www.newenergy.com

Credit Suisse (USA), Inc.
700 College Road East
Princeton, NJ 08450
www.creditsuisse.com

Direct Energy Services, LLC
One Gateway Center, Suite 2600
Newark, NJ 07102
(973) 799-8568
www.directenergy.com

FirstEnergy Solutions
395 Ghent Road Suite 407
Akron, OH 44333
(800) 977-0500
www.fes.com

Gerdau Ameristeel Energy Co.
North Crossman Road
Sayreville, NJ 08872

Gexa Energy LLC New Jersey
20 Greenway Plaza, Suite 600
Houston, TX 77046
(866) 304-GEXA
Beth.miller@gexaenergy.com

Glacial Energy of New Jersey
2602 McKinney Avenue, Suite 220
Dallas, TX 75204
www.glacialenergy.com

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095
www.hess.com

Integrys Energy Services, Inc
99 Wood Avenue, Suite 802
Iselin, NJ 08830
www.integrysenergy.com

Liberty Power Delaware, LLC
1901 W Cypress Road, Suite 600
Fort Lauderdale, FL 33309
(866) Power-99
(866) 769-3799
www.libertypowercorp.com

Liberty Power Holdings, LLC
1901 W Cypress Creek Road, Suite 600
Fort Lauderdale, FL 33309
(866) Power-99
(866) 769-3799
www.libertypowercorp.com

Pepco Energy Services, Inc.
d/b/a Power Choice
23 S. Kinderkamack Rd Ste D
Montvale, NJ 07645
(800) 363-7499
www.pepco-services.com

PPL EnergyPlus, LLC
Energy Marketing Center
Two North Ninth Street
Allentown, PA 18101
1-866-505-8825
http://www.pplenergyplus.com/

Sempra Energy Solutions
The Mac-Cali Building
581 Main Street, 8th Floor
Woodbridge, NJ 07095
(877) 273-6772
www.SempraSolutions.com

South Jersey Energy Company
1 South Jersey Plaza, Route 54
Folsom, NJ 08037
(800) 756-3749
www.sjindustries.com

Strategic Energy, LLC
6 East Main Street, Suite 6E
Ramsey, NJ 07446
(888) 925-9115
www.sel.com

Suez Energy Resources NA
333 Thornall Street FL6
Edison, NJ 08818
866.999.8374(toll free)
www.suezenergyresources.com

UGI Energy Services, Inc.
d/b/a POWERMARK
1 Meridian Blvd. Suite 2C01
Wyomissing, PA 19610
(800) 427-8545
www.ugienergyservices.com

Jan 14, 2009

GAS MARKETERS LIST

The following is a listing of marketers/suppliers/brokers that have been licensed by the NJ Board of Public Utilities to sell natural gas to residential, small commercial and industrial customers served by the Public Service Electric and Gas Company distribution system. **This listing is provided for informational purposes only and PSE&G makes no representations or warranties as to the competencies of the entities listed herein or to the completeness of this listing.**

Gateway Energy Services
44 Whispering Pines Lane
Lakewood, NJ 08701
(800) 805-8586
www.gesc.com

Metro Energy Group, LLC
14 Washington Place
Hackensack, NJ 07601
www.metroenergy.com

RPL Holdings, Inc
601 Carlson Pkwy
Minnetonka, MN 55305

Great Eastern Energy
3044 Coney Island Ave. PH
Brooklyn, NY 11235
888-651-4121
www.greateasterngas.com

Metromedia Energy, Inc.
6 Industrial Way
Eatontown, NJ 07724
(800) 828-9427
www.metromediaenergy.com

South Jersey Energy Company
One South Jersey Plaza, Rte 54
Folsom, NJ 08037
(800) 756-3749
www.sjindustries.com/sje.htm

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095
(800) 437-7872
www.hess.com

Mitchell- Supreme Fuel
(NATGASCO)
532 Freeman Street
Orange, NJ 07050
(800) 840-4GAS
www.mitchellsupreme.com

Sprague Energy Corp.
Two International Drive, Ste 200
Portsmouth, NH 03801
800-225-1560
www.spragueenergy.com

Hudson Energy Services, LLC
545 Route 17 South
Ridgewood, NJ 07450
(201) 251-2400
www.hudsonenergyservices.com

MxEnergy Inc.
P.O. Box 177
Annapolis Junction, MD 20701
800-375-1277
www.mxenergy.com

Stuyvesant Energy LLC
642 Southern Boulevard
Bronx, NY 10455
(718) 665-5700
www.stuyfuel.com

Intelligent Energy
7001 SW 24th Avenue
Gainesville, FL 32607
Sales: 1 877 I've Got Gas
(1 877 483-4684)
Customer Service:
1 800 927-9794
www.intelligentenergy.org

Pepco Energy Services, Inc.
23 S Kinderkamack Rd, Suite D
Montvale, NJ 07645
(800) 363-7499
www.pepco-services.com

Tiger Natural Gas, Inc.
1422 E. 71st Street, Suite J.
Tulsa, OK 74136
1-888-875-6122
www.tigernaturalgas.com

Systrum Energy
877-SYSTRUM
(877-797-8786)
www.systrumenergy.com

Plymouth Rock Energy, LLC
165 Remsen Street
Brooklyn, NJ 11201
866-539-6450
www.plymouthrockenergy.com

UGI Energy Services, Inc.
d/b/a GASMARK
704 E. Main Street, Suite I
Moorestown, NJ 08057
856-273-9995
www.ugienergyservices.com

Macquarie Cook Energy, LLC
10100 Santa Monica Blvd, 18th
Fl
Los Angeles, CA 90067

PPL EnergyPlus, LLC
Energy Marketing Center
Two North Ninth Street
Allentown, PA 18101
1-866-505-8825
www.pplenergyplus.com/natural+gas/

Woodruff Energy
73 Water Street
P.O. Box 777
Bridgeton, NJ 08302
(856) 455-1111
www.woodruffenergy.com

NORMALIZED MODEL TO BILLING COMPARISON

Project name: NBHA Lawlwer Apts
For : NBHA
By :
Date: 8/17/2009

Billing Period Name: BillingPeriod1
Model Package Name: Base Building

Natural gas

	Model		Billing Data	
	Consumption Therm	Cost $	Consumption Therm	Cost $
January	37184.50	41287	35687.99	39626
February	28842.35	32027	28619.43	31780
March	24228.44	26906	24732.90	27466
April	15479.22	17194	16708.97	18559
May	6731.72	7484	6987.92	7769
June	1978.83	2209	1931.00	2155
July	2044.80	2282	1995.37	2227
August	2044.80	2282	1995.37	2227
September	3783.89	4212	3471.56	3865
October	10952.99	12170	11295.79	12550
November	20430.60	22690	19875.67	22074
December	29923.53	33227	28698.41	31867
Total	183625.67	203968	182000.37	202164
Daily Base Load	65.96	73	64.37	71

Electricity

	Model		Billing Data	
	Consumption kWh	Cost $	Consumption kWh	Cost $
January	126095.88	18924	131624.19	19754

February	113893.05	17094	118886.37	17843
March	126095.88	18924	131624.19	19754
April	122028.27	18314	127378.25	19117
May	126095.88	18924	131624.19	19754
June	145569.05	21845	140932.60	21150
July	150421.35	22573	155966.69	23405
August	150421.35	22573	149051.21	22368
September	122028.27	18314	127378.25	19117
October	126095.88	18924	131624.19	19754
November	122028.27	18314	127378.25	19117
December	126095.88	18924	131624.19	19754
Total	1556869.00	233650	1605092.57	240884
Daily Base Load	4067.61	610	4245.94	637

Notes:

1. The report compares model energy consumption with the consumption calculated using the billing analysis slope and reference temperature. The usage is for normalized thirty year average weather conditions.
2. Monthly fuel cost includes heating, cooling and base load usage and monthly flat meter fee entered on Fuels/Rates screen.

HEATING ENERGY SCORECARD

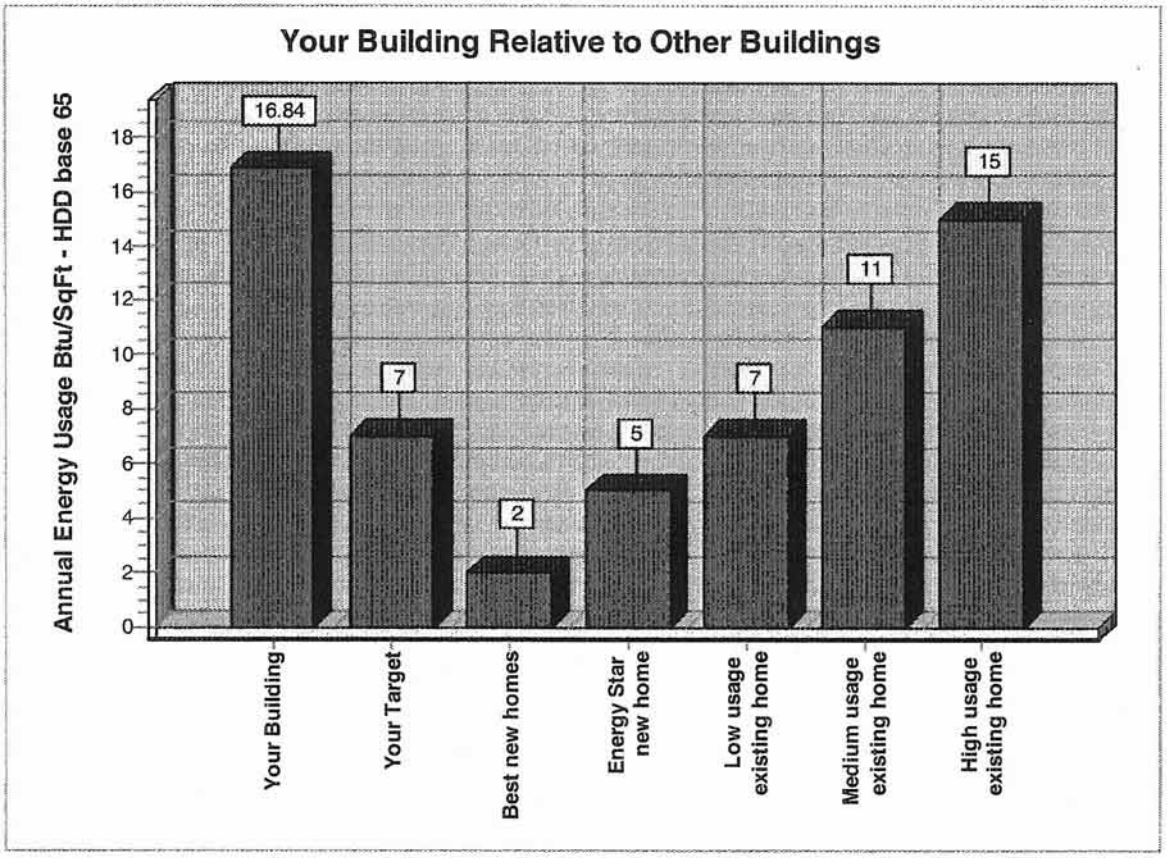
Project name: NBHA Lawlwer Apts

For : NBHA

By :

Date: 8/17/2009

Billing Period Name: BillingPeriod1



Heating Slope: 15.31

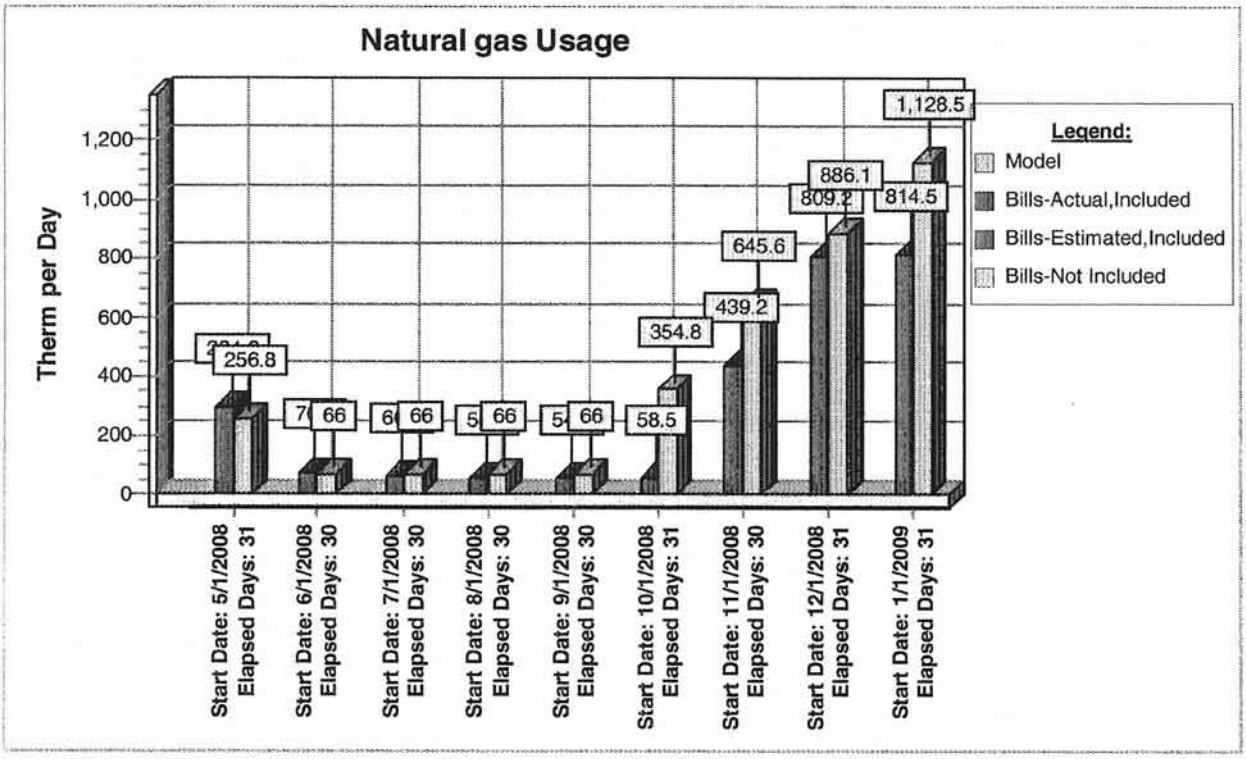
Reference temperature: 67

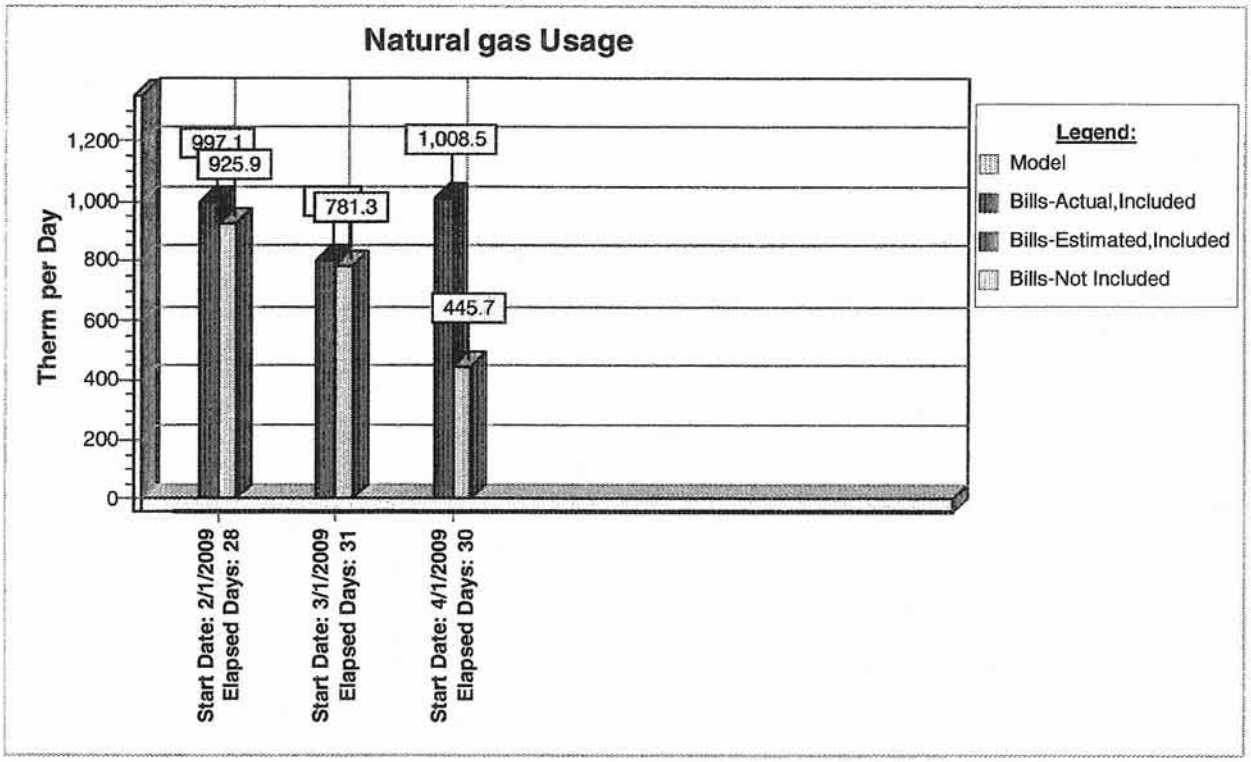
Note: Annual energy usage of your building shown on the chart is calculated by multiplying the building slope by the ratio of heating degree days for the actual reference temperature to heating degree days base 65F. The building gets credit for low reference temperature.

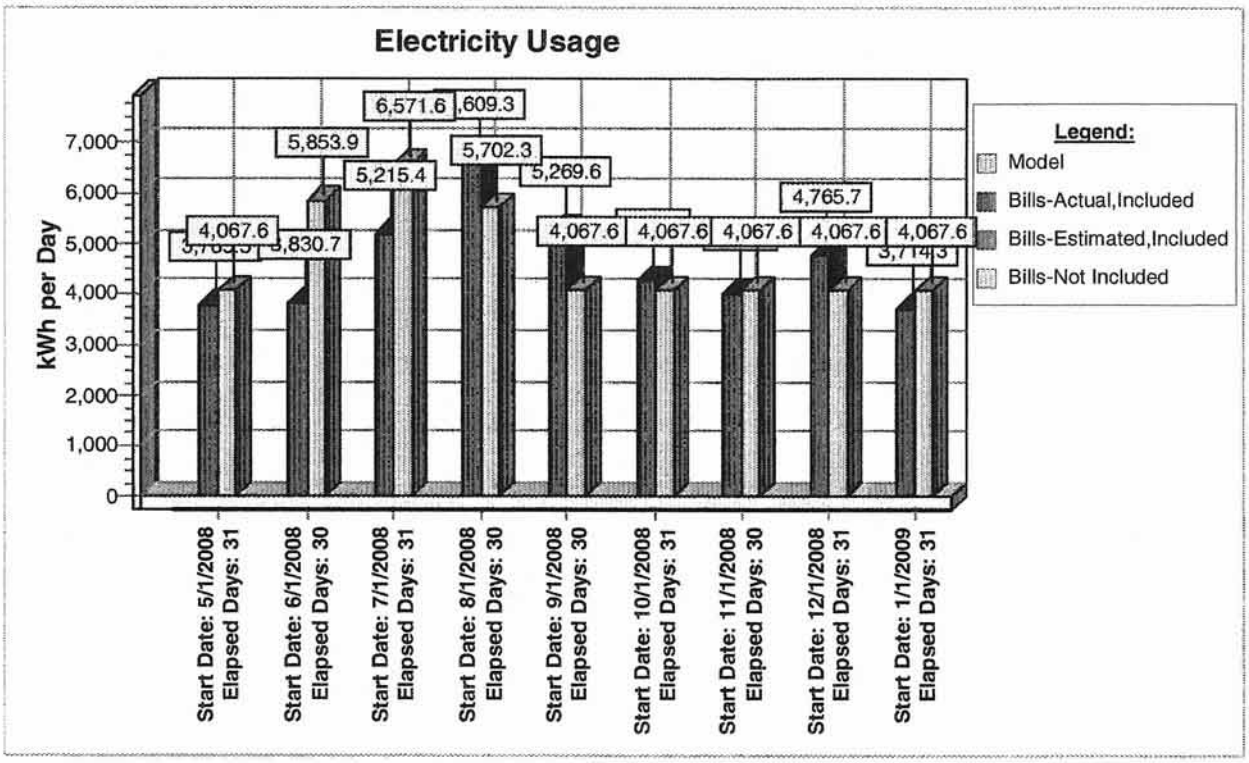
ACTUAL BILLING TO MODEL COMPARISON REPORT

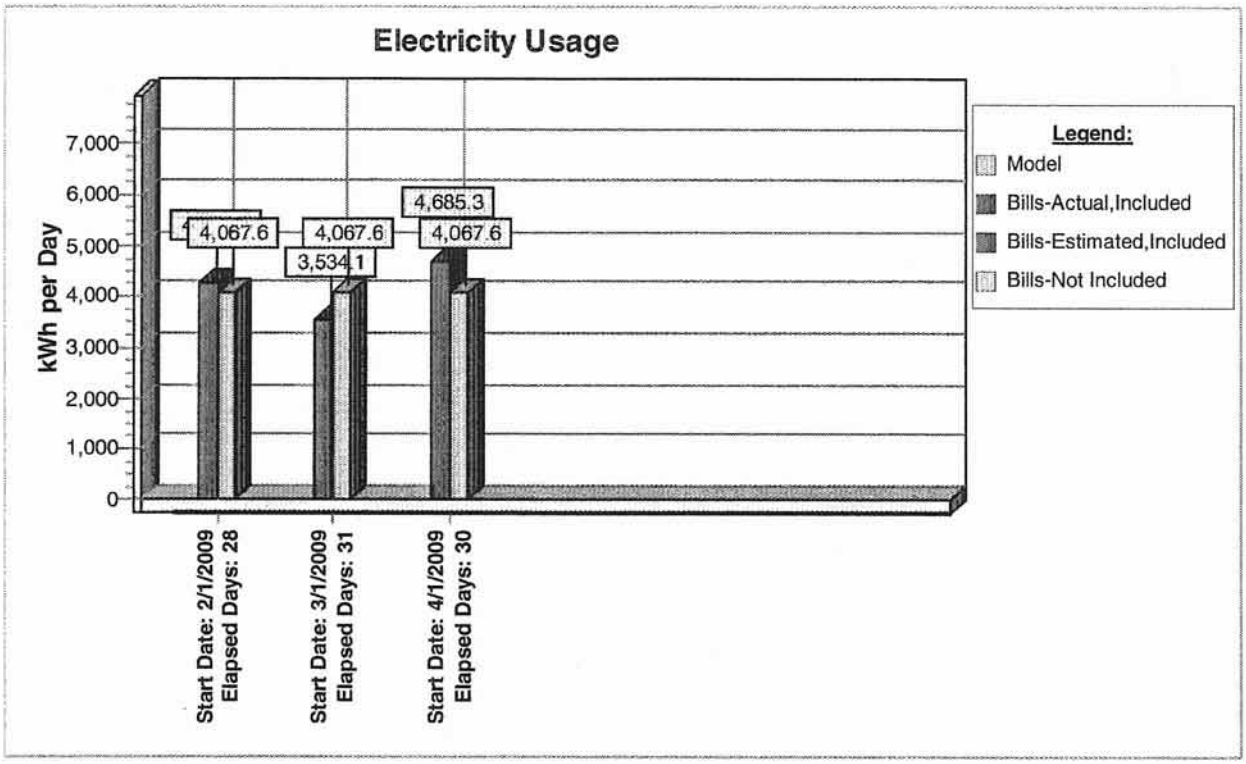
Project name: NBHA Lawlwer Apts
For : NBHA
By :
Date: 8/17/2009

Billing Period Name: BillingPeriod1
Model Package Name: Base Building




Natural gas Usage
Therm per Day
1,200
1,000
800
600
400
200
0
997.1
925.9
781.3
1,008.5
445.7
Start Date: 2/1/2009
Elapsed Days: 28
Start Date: 3/1/2009
Elapsed Days: 31
Start Date: 4/1/2009
Elapsed Days: 30
Legend:
Model
Bills-Actual,Included
Bills-Estimated,Included
Bills-Not Included


Electricity Usage
kWh per Day
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
4,067.6
5,853.9
5,215.4
6,571.6
5,702.3
5,269.6
4,765.7
Start Date: 5/1/2008
Elapsed Days: 31
Start Date: 6/1/2008
Elapsed Days: 30
Start Date: 7/1/2008
Elapsed Days: 31
Start Date: 8/1/2008
Elapsed Days: 30
Start Date: 9/1/2008
Elapsed Days: 30
Start Date: 10/1/2008
Elapsed Days: 31
Start Date: 11/1/2008
Elapsed Days: 30
Start Date: 12/1/2008
Elapsed Days: 31
Start Date: 1/1/2009
Elapsed Days: 31
Legend:
Model
Bills-Actual,Included
Bills-Estimated,Included
Bills-Not Included



Notes:

1. Only bills that are completely within the analysis period are included in the report.
2. Bills for the "Whole building" metered space are included in the report.
3. If there are multiple metered spaces for the fuel, then only the usage for the dates for which utility bills are available for ALL metered spaces is included in the report. The start date and elapsed days of all such bills must be exactly the same. The restriction allows TREAT to calculate the total building energy consumption for the time period.
4. The billing bar is color-coded as Not Included if utility bill for at least one individually metered space for the time period was entered as not to be included in the Billing Analysis (Include the Bill in Analyais field was set to No on the Utility Bills screen for this bill).
5. The billing bar is color-coded as Estimated if there is at least one estimated utility bill for at least one individually metered space for the time period (Bill Type field is set to Estimated on the Utility Bills screen for this bill) and all the bills for the time period are included in the billing analysis.
6. The billing bar is color-coded as Actual if utility bill for all individually metered spaces for the time period are actual.
7. Model data is only shown if the billing period is compared to the model with valid calculation results.
8. Model heating and cooling usage is calculated using model heating/cooling slope and reference temperature and weather data available in Daily Weather Data library for the period covered by utility bill.

Base Load Report

Customer Information

Customer Name: NBHA

Address: 6121/3131 Grand Avenue
North Bergen, NJ 07047

Billing Period: 5/2008 - 4/2009

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 8/17/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Base Building

Billing Period Name: BillingPeriod1

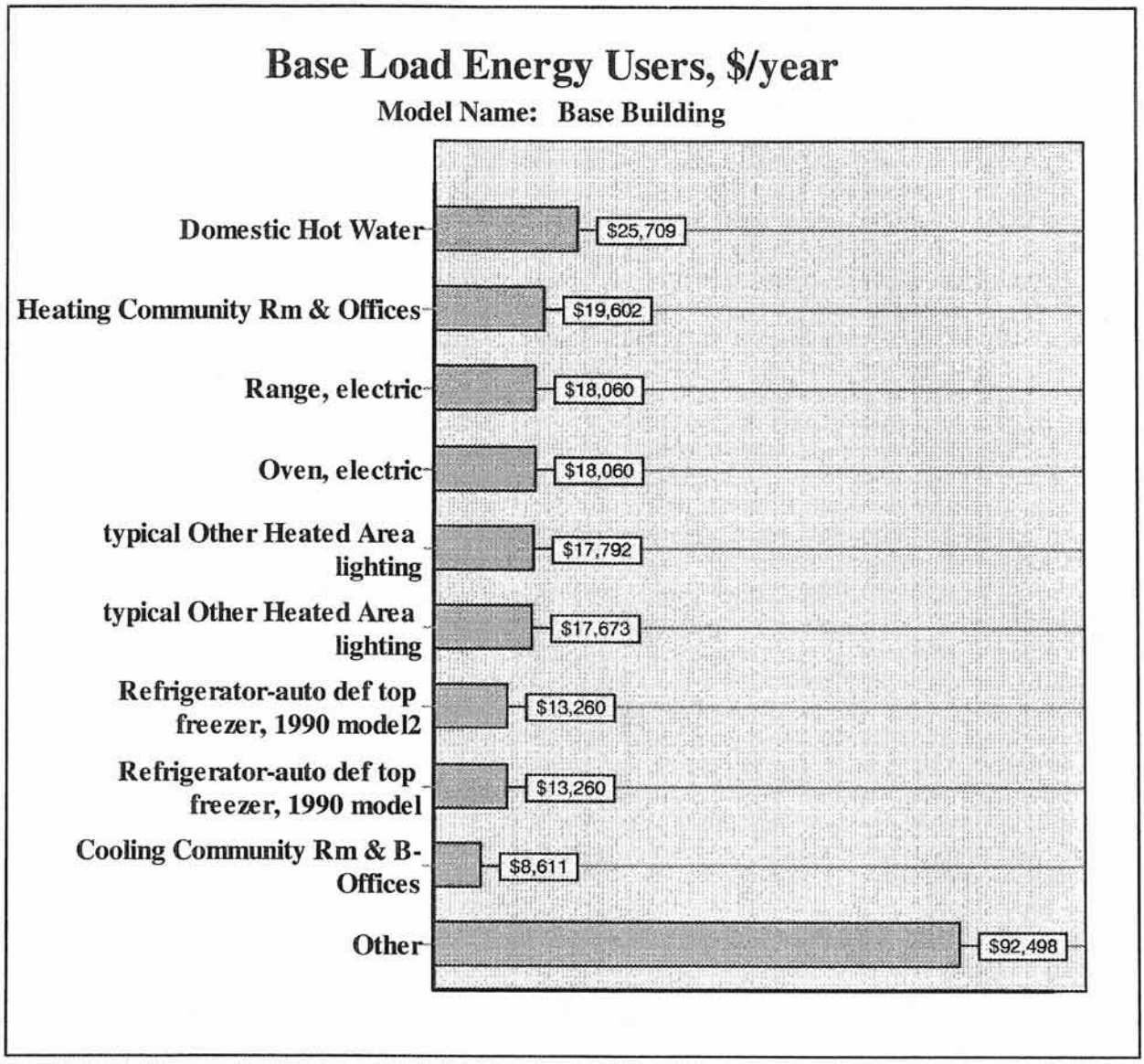
	Electricity		Natural gas			
	kWh	$	Therm	$		
Model	1,484,677	222,702	24,076	26,724		
Billing	1,549,769	226,409	23,494	31,740		
% Difference	4	2	-2	16		

Note: Actual billing data is adjusted to reflect a full year's usage.

Annual Use of Domestic Hot Water, Appliances, and Lighting

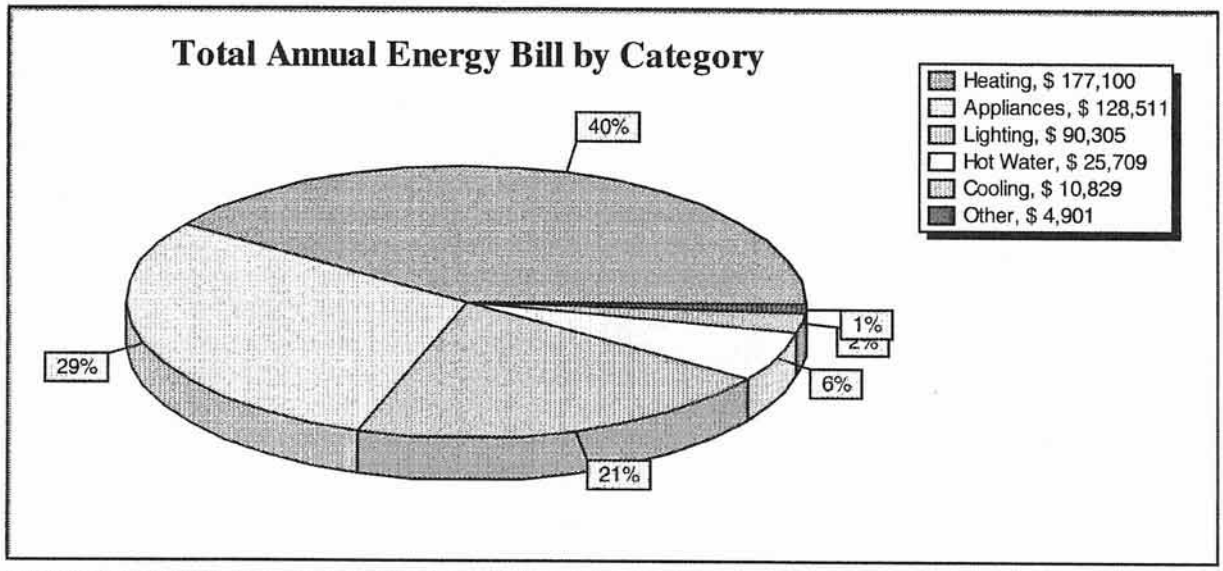
Model Name: Base Building

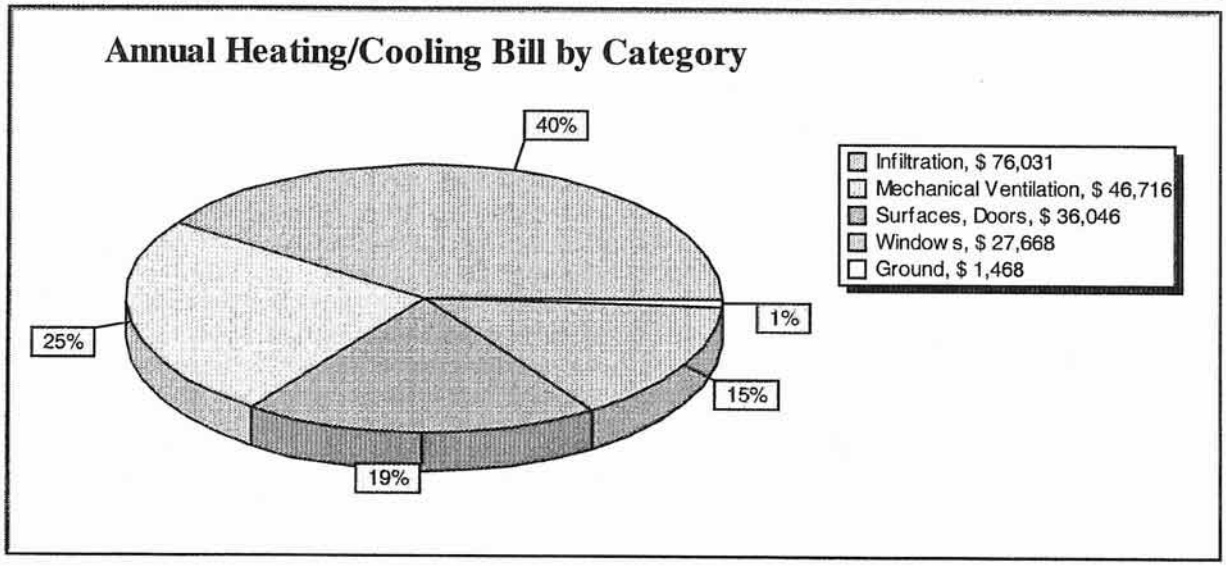
	Electricity $0.15 per kWh		Natural gas $1.11 per Therm				Total
	kWh	$	therms	$			$
1. Domestic Hot Water	0	0	23,161	25,709			25,709
2. Heating Community Rm & Offices	130,680	19,602	0	0			19,602
3. Range, electric	120,400	18,060	0	0			18,060
4. Oven, electric	120,400	18,060	0	0			18,060
5. typical Other Heated Area lighting	118,610	17,792	0	0			17,792
6. typical Other Heated Area lighting	117,822	17,673	0	0			17,673
7. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
8. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
9. Cooling Community Rm & B-Offices	57,408	8,611	0	0			8,611
10. Other	609,883	91,482	915	1,016			92,498
TOTAL	1,452,003	217,800	24,076	26,725			244,525


Base Load Energy Users, $/year
Model Name: Base Building
Domestic Hot Water
$25,709
Heating Community Rm & Offices
$19,602
Range, electric
$18,060
Oven, electric
$18,060
typical Other Heated Area lighting
$17,792
typical Other Heated Area lighting
$17,673
Refrigerator-auto def top freezer, 1990 model2
$13,260
Refrigerator-auto def top freezer, 1990 model
$13,260
Cooling Community Rm & B-Offices
$8,611
Other
$92,498

MODEL ENERGY REPORT FOR BASE BUILDING

NBHA Lawlwer Apts
For: NBHA
By:
Date: 8/17/2009





Note: Due to rounding, the sum of percentages may not be equal to 100.

DESIGN HEATING AND COOLING LOADS FOR BASE BUILDING

8/17/2009
Project Name: NBHA Lawlwer Apts

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
Gr Fl Common Tower A	166444	27	18.9	319
2nd Fl Apts Tower B	102364	19	11.6	196
3rd Fl Apts Tower B	105945	20	12.0	203
2nd Fl Commom Tower B	0	0	0.0	0
Community Room	205047	65	23.3	393
Mechanical Spaces T-A	396754	64	45.1	760
1st Fl Common Tower A	31227	13	3.5	60
1st- Apts Tower A	93445	26	10.6	179
Gr Fl Office B Tower	403732	52	45.9	773
Basement Tower B	19203	25	2.2	37
1st Fl Common Tower B	0	0	0.0	0
1st Fl Apts Tower B	88223	24	10.0	169
3rd Fl Commom	0	0	0.0	0
4th-13th Apts Tower B	1280775	27	145.6	2451
4th-13th Common Tower B	0	0	0.0	0
2nd Fl Apts Tower A	116662	22	13.3	224
2nd Fl Common Tower A	0	0	0.0	0
3rd Fl Apts Tower A	119730	23	13.6	230
3rd Fl Common Tower A	0	0	0.0	0
4th-13th Apts Tower A	1442561	30	164.0	2760
4th-13th Common Tower A	0	0	0.0	0

Required Heating Equipment Output Capacity: 5424734 Btu/hr
Available Heating Equipment Output Capacity: 6327100 Btu/hr
Total flow: 542.6 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 65 %
Calculated Distribution Efficiency: 93 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
Gr Fl Common Tower A	110762	4030
2nd Fl Apts Tower B	70500	2565
3rd Fl Apts Tower B	66013	2402
2nd Fl Commom Tower B	0	0
Community Room	87420	3180
Mechanical Spaces T-A	0	0
1st Fl Common Tower A	64367	2342
1st- Apts Tower A	57465	2091
Gr Fl Office B Tower	219345	7979
Basement Tower B	6271	229
1st Fl Common Tower B	130099	4733
1st Fl Apts Tower B	57589	2095
3rd Fl Commom	0	0
4th-13th Apts Tower B	822976	29937
4th-13th Common Tower B	0	0
2nd Fl Apts Tower A	51676	1880
2nd Fl Common Tower A	0	0
3rd Fl Apts Tower A	67962	2473
3rd Fl Common Tower A	0	0
4th-13th Apts Tower A	661186	24052
4th-13th Common Tower A	0	0

Required Cooling Equipment Output Capacity: 2672598 Btu/hr
Available Cooling Equipment Output Capacity: 290000 Btu/hr
Total flow: 88380 CFM
Cooling Equipment Efficiency: 9 SEER
Calculated Distribution Efficiency: 95%
Temperature Drop: 28 F
Cooling Safety Factor: 1.10
Distribution Safety Factor: 1.10
COOLING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED COOLING LOAD.

Notes:

1. The room heating/cooling loads do not include the equipment and distribution safety factor and distribution losses
2. The room distribution includes distribution safety factor.
3. The load on the room is the peak load for this room in a year.
4. Available equipment output capacity includes equipment efficiency.
5. Required equipment output capacity includes diversity, distribution losses and equipment safety factor.
6. Overall distribution CFM/GPM for heating/cooling includes equipment safety factor, distribution losses and diversity.

APPENDIX B

ECM-1a Lighting Replacements

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
ECM-1a Lighting Replacements

Cost of Electricity: $0.119 $/kWh
$15.03 $/kW

Field Code	Area Description	EXISTING CONDITIONS: No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	RETROFIT CONDITIONS: Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	COST & SAVINGS ANALYSIS: Annual kWh Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
Tower A																							
4	Lobby/Halls	19	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.4	Breaker	8760	11,984	19	2T 17 R F 2 (ELE)	F22ILL	33	0.6	Breaker	8,760	5,493	6,491	$ 908.60	$ 1,923.75	$190	2.1	1.9
4	Security Room	2	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2600	374	2	2T 17 R F 2 (ELE)	F22ILL	33	0.1	SW	2,600	172	203	$ 38.28	$ 202.50	$20	5.3	4.8
39	Vestibule	4	2' 17 W F 2 (ELE)	F22ILL	33	0.1	Breaker	8760	1,156	4	2' 17 W F 2 (ELE)	F22ILL	33	0.1	Breaker	8,760	1,156	-	$ -	$ -	$0		
33	Vestibule	7	13 W CF 1	CFQ13/1-L	15	0.1	Breaker	8760	920	7	13 W CF 1	CFQ13/1-L	15	0.1	Breaker	8,760	920	-	$ -	$ -	$0		
6	Kitchen	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2912	1,677	4	T 28 R F 4	F44SSILL	96	0.4	SW	2,912	1,118	559	$ 101.38	$ 525.00	$80	5.2	4.4
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 120.72	$ 513.00	$80	4.2	3.6
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 120.72	$ 513.00	$80	4.2	3.6
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 120.72	$ 513.00	$80	4.2	3.6
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 120.72	$ 513.00	$80	4.2	3.6
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 120.72	$ 513.00	$80	4.2	3.6
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 120.72	$ 513.00	$80	4.2	3.6
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 120.72	$ 513.00	$80	4.2	3.6
11	Maintenance Office	2	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2600	374	2	C 28 P F 2	F42SSILL	48	0.1	SW	2,600	250	125	$ 23.56	$ 212.50	$20	9.0	8.2
11	Men's Room 1	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2080	150	1	C 28 P F 2	F42SSILL	48	0.0	SW	2,080	100	50	$ 10.29	$ 106.25	$10	10.3	9.4
11	Women's Room 1	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2080	150	1	C 28 P F 2	F42SSILL	48	0.0	SW	2,080	100	50	$ 10.29	$ 106.25	$10	10.3	9.4
18	Laundry Room	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	OCC	1500	672	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	OCC	1,500	672	-	$ -	$ -	$0		
11	Storage Room	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	1000	72	1	C 28 P F 2	F42SSILL	48	0.0	SW	1,000	48	24	$ 7.19	$ 106.25	$10	14.8	13.4
33	Storage Room	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	1000	45	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	1,000	45	-	$ -	$ -	$0		
11	Janitor Closet	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	1000	72	1	C 28 P F 2	F42SSILL	48	0.0	SW	1,000	48	24	$ 7.19	$ 106.25	$10	14.8	13.4
11	Mech/Elect Room	10	S 34 P F 2 (MAG)	F42EE	72	0.7	Breaker	2000	1,440	10	C 28 P F 2	F42SSILL	48	0.5	Breaker	2,000	960	480	$ 100.60	$ 1,062.50	$100	10.6	9.6
11	Firepump Room	10	S 34 P F 2 (MAG)	F42EE	72	0.7	Breaker	2000	1,440	10	C 28 P F 2	F42SSILL	48	0.5	Breaker	2,000	960	480	$ 100.60	$ 1,062.50	$100	10.6	9.6
11	Garage	4	S 34 P F 2 (MAG)	F42EE	72	0.3	SW	2000	576	4	C 28 P F 2	F42SSILL	48	0.2	SW	2,000	384	192	$ 40.24	$ 425.00	$40	10.6	9.6
73	Garage	2	I 120	I120/1	120	0.2	SW	2000	480	2	CF 26	CFQ26/1-L	27	0.1	SW	2,000	108	372	$ 77.97	$ 13.50	$0	0.2	0.2
Tower B																							
4	Lobby/Halls	17	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.2	Breaker	8760	10,722	17	2T 17 R F 2 (ELE)	F22ILL	33	0.6	Breaker	8,760	4,914	5,808	$ 812.96	$ 1,721.25	$170	2.1	1.9
3	Stairways	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	8760	377	1	W 28 W F 1	F41SSILL	26	0.0	SW	8,760	228	149	$ 20.85	$ 114.75	$25	5.5	4.3
4	Office hall	9	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.6	SW	2600	1,685	9	2T 17 R F 2 (ELE)	F22ILL	33	0.3	SW	2,600	772	913	$ 172.27	$ 911.25	$90	5.3	4.8
33	Office hall	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	2600	117	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	2,600	117	-	$ -	$ -	$0		
5	Fileroom	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
5	Windowless office (northside)	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
5	Windowless office (by fileroom)	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
5	Small conf. room	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2,600	468	-	$ -	$ -	$0		
5	Small corner office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
5	Server room	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
5	Office w/ window	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2,600	468	-	$ -	$ -	$0		
5	Office w/ window	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	Dual SW	2600	468	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	Dual SW	2,600	468	-	$ -	$ -	$0		
5	Large Conference room	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2,600	780	-	$ -	$ -	$0		
20	Large Conference room	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2600	998	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2,600	998	-	$ -	$ -	$0		
71	Large Conference room bath	3	I 60	I60/1	60	0.2	OCC	1000	180	3	CF 26	CFQ26/1-L	27	0.1	OCC	1,000	81	99	$ 29.68	$ 20.25	$0	0.7	0.7
5	Large Corner Office	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2,600	780	-	$ -	$ -	$0		
20	Large Corner Office	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2600	998	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2,600	998	-	$ -	$ -	$0		
235	Large Corner Office	7	R 75 C Q 1	I75/1	75	0.5	SW	2600	1,365	7	CF 26	CFQ26/1-L	27	0.2	SW	2,600	491	874	$ 164.91	$ 47.25	$0	0.3	0.3
71	Large Corner Office bath	2	I 60	I60/1	60	0.1	OCC	1000	120	2	CF 26	CFQ26/1-L	27	0.1	OCC	1,000	54	66	$ 19.79	$ 13.50	$0	0.7	0.7
5	Center Office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
106	Center Office	3	SP 65 I	I65/1	65	0.2	SW	2600	507	3	CF 26	CFQ26/1-L	27	0.1	SW	2,600	211	296	$ 55.95	$ 20.25	$0	0.4	0.4
5	Center Office fileroom	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
5	Cubical Area (north side)	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	2600	1,248	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	2,600	1,248	-	$ -	$ -	$0		
182	Cubical Area (north side)	34	W 25 C F 2 (ELE) 3' T8	F32EE	66	2.2	SW	2600	5,834	34	W 25 C F 2 (ELE) 3' T8	F32EE	66	2.2	SW	2,600	5,834	-	$ -	$ -	$0		
106	Cubical Area (north side)	8	SP 65 I	I65/1	65	0.5	SW	2600	1,352	8	CF 26	CFQ26/1-L	27	0.2	SW	2,600	562	790	$ 149.20	$ 54.00	$0	0.4	0.4
5	Cubical Area (south side)	12	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.7	SW	2600	1,872	12	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.7	SW	2,600	1,872	-	$ -	$ -	$0		
182	Cubical Area (south side)	16	W 25 C F 2 (ELE) 3' T8	F32EE	66	1.1	SW	2600	2,746	16	W 25 C F 2 (ELE) 3' T8	F32EE	66	1.1	SW	2,600	2,746	-	$ -	$ -	$0		
106	Cubical Area (south side)	18	SP 65 I	I65/1	65	1.2	SW	2600	3,042	18	CF 26	CFQ26/1-L	27	0.5	SW	2,600	1,264	1,778	$ 335.71	$ 121.50	$0	0.4	0.4
182	Cubical nook	12	W 25 C F 2 (ELE) 3' T8	F32EE	66	0.8	SW	2600	2,059	12	W 25 C F 2 (ELE) 3' T8	F32EE	66	0.8	SW	2,600	2,059	-	$ -	$ -	$0		
106	Cubical nook	3	SP 65 I	I65/1	65	0.2	SW	2600	507	3	CF 26	CFQ26/1-L	27	0.1	SW	2,600	211	296	$ 55.95	$ 20.25	$0	0.4	0.4
5	Office Kitchen	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2,600	780	-	$ -	$ -	$0		
117	Office Men's Room	3	CF 23	CFS23/1	23	0.1	SW	2600	179	3	CF 23	CFS23/1	23	0.1	SW	2,600	179	-	$ -	$ -	$0		
117	Office Women's Room	3	CF 23	CFS23/1	23	0.1	SW	2600	179	3	CF 23	CFS23/1	23	0.1	SW	2,600	179	-	$ -	$ -	$0		
15	Elevator Motor Room	4	S 32 C F 2 (ELE)	F42LL	60	0.2	SW	2600	624	4	S 32 C F 2 (ELE)	F42LL	60	0.2	SW	2,600	624	-	$ -	$ -	$0		
4	File Storage Room (Twr. B)	3	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	2600	562	3	2T 17 R F 2 (ELE)	F22ILL	33	0.1	SW	2,600	257	304	$ 57.42	$ 303.75	$30	5.3	4.8
18	File Storage Room (Twr. B)	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	SW	2600	1,456	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	SW	2,600	1,456	-	$ -	$ -	$0		
18	File Storage Room (Twr. B)	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	2600	2,330	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	2,600	2,330	-	$ -	$ -	$0		
18	File Storage Room (Twr. B) bath	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2080	233	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2,080	233	-	$ -	$ -	$0		
11	Trash Compactor Room	3	S 34 P F 2 (MAG)	F42EE	72	0.2	SW	2000	432	3	C 28 P F 2	F42SSILL	48	0.1	SW	2,000	288	144	$ 30.18	$ 318.75	$30	10.6	9.6
117	Chiller Room	3	CF 23	CFS23/1	23	0.1	SW	2000	138	3	CF 23	CFS23/1	23	0.1	SW	2,000	138	-	$ -	$ -	$0		
Both Towers A and B																							
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
ECM-1a Lighting Replacements

Cost of Electricity: $0.119 $/kWh
$15.03 $/kW

			EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS					
	Field Code	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
		Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Exemple 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kWh/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Exemple 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kWh/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
Top Floor	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	28	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	948	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
8th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	28	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	948	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
9th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	28	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	948	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
10th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	28	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	948	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
11th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	28	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	948	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
12th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	28	0.1	Breaker	8,760	456	298	$ 41.69	$ 229.50	$50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	948	3,259	$ 456.14	$ 27.00	$0	0.1	0.1
Basements	217	W32CF4-E SW (T8, Occ)	252	W 32 C F 4 (ELE)	F44ILL/2	118	29.7	SW	2912	86,591	252	W 32 C F 4 (ELE)	F44ILL/2	118	29.7	SW	2,912	86,591	-	$ -	$ -	$0		
	126	2CF23 Wall Mt 1 SW EA (Occ)	756	DC 23 C CF 2	CFQ22/2	48	36.3	SW	2912	105,671	756	DC 23 C CF 2	CFQ22/2	48	36.3	SW	2,912	105,671	-	$ -	$ -	$0		
	222	W20CF1-Mag SW (T12)	252	W 20 CF1 (MAG)	F21SS	28	7.1	SW	2912	20,547	252	W 17 C F 1 (ELE)	F21ILL	18	4.0	SW	2,912	11,741	8,806	$ 1,596.80	$ 17,010.00	$6,300	10.7	6.7
	2	W34CF2-Mag SW (T12 Occ)	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	2912	233	1	W 28 W F 2	F42SSILL	48	0.0	SW	2,912	140	93	$ 16.90	$ 250.00	$25	14.8	13.3
	126	2CF23 Wall Mt Dual SW (Occ)	1	DC 23 C CF 2	CFQ22/2	48	0.0	SW	2912	140	1	DC 23 C CF 2	CFQ22/2	48	0.0	SW	2,912	140	-	$ -	$ -	$0		
	126	4CF23 SW (No Occ)	2	DC 23 C CF 2	CFQ22/2	48	0.1	SW	2912	280	2	DC 23 C CF 2	CFQ22/2	48	0.1	SW	2,912	280	-	$ -	$ -	$0		
	117	CF23 SW (Occ)	1	CF 23	CFS23/1	23	0.0	SW	2912	67	1	CF 23	CFS23/1	23	0.0	SW	2,912	67	-	$ -	$ -	$0		
Exterior	225	Outside Wallpacks	4	70 High Pressure Sodium	HPS70/1	95	0.4	Timer	4368	1,660	4	70 High Pressure Sodium	HPS70/1	95	0.4	Timer	4,368	1,660	-	$ -	$ -	$0		
	236	Outside Doors	6	MV 250	mv250/1	290	1.7	Timer	4368	7,600	6	MV 250	mv250/1	290	1.7	Timer	4,368	7,600	-	$ -	$ -	$0		
	237	Pole	18	WP 400 Po HPS	hps400/1	465	8.4	Timer	4368	36,560	18	WP 400 Po HPS	hps400/1	465	8.4	Timer	4,368	36,560	-	$ -	$ -	$0		
Other	93	Storage Rooms (tenant floors)	26	I 75	I75/1	75	2.0	Timer	4368	8,518	26	CF 26	CFQ26/1-L	27	0.7	Timer	4,368	3,066	5,451	$ 875.92	$ 162.50	$0	0.2	0.2
	3	Trash Rooms (tenant floors)	26	W 34 W F 1 (MAG)	F41EE	43	1.1	Timer	4368	4,883	26	W 28 W F 1	F41SSILL	28	0.7	Timer	4,368	2,953	1,931	$ 310.22	$ 2,983.50	$650	9.6	7.5
	189	Exit Signs (both towers)	124	X 7.0 W T	ECF7/1	10	1.2	Breaker	8760	10,862	124	X 1.5C LED	ELED1.5/1	1.5	0.2	Breaker	8,760	1,629	9,233	$ 1,292.39	$ 15,903.00	$1,240	12.3	11.3
		Total	2,135				138.3			995,493	2,136			5,823	114			432,323	163,171	$23,922	$111,254	$16,210		
																			Demand Savings		24.6	$4,442		
																			kWh Savings		163,171	$19,479		
																			Total savings			$23,922	4.7	4.0

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
ECM 1 - Fixture and Control Replacement Cost Lighting Analysis

Hours of Operation

Energy Audit of North Bergen Housing Auth	Hours/Day	Hours/Year	Proposed	Utilized
Hallways	24	8760	8760	Y
Offices	10	2600	1200	Y
Community Room	12	4368	2000	Y
Outdoor Lighting	12	4368	4368	Y
Stairway	24	8760	8760	Y
Laundry	12	4368	1500	Y
Storage Areas		1000	250	Y
Boiler Room		2000	2000	Y
Bath Room	8	2080	1000	Y
Cafeteria/Kitchen/Service	8	2912	1200	Y
Apartments (HA lights)	8	2912	2184	Y

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
ECM-1 - Fixture and Control Replacement Cost Lighting Analysis

COST TABLE

Notes	Field Code	Standard Code	NYSERDA Code	Watts per fixture	Retrofit	Standard Code	NYSERDA Code	Watts per fixture	Lamps/Fix	Ball/Fix	Fixture Replacement			Ballast Replacement			Lamp Replacement			O.P.& D	NJ Incentive	Retrofit Cost (inc. O&P)
											Material	Labor	Disposal	Material	Labor	Disposal	Material	Labor	Disposal			
	2	T 34 W F 2 (MAG) RL/RB	F42ES	80	RL/RB	W 28 W F 2	F42SSILL	48	2	1				$20.00	$45.00	INC	$10.00	$10.00	INC	$21.25	$10.00	$106.25
	3	W 34 W F 1 (MAG)	F41EE	43	RL/RB	W 28 W F 1	F41SSILL	26	1	1				$20.00	$45.00	INC	$10.00	$10.00	INC	$29.75	$25.00	$114.75
(1)	4	2B 34 R F 2 (u) (MAG)	FU2EE	72	Replace	2T 17 R F 2 (ELE)	F22ILL	33	2	1				$20.00	$45.00	INC	$5.00	$5.00	INC	$26.25	$10.00	$101.25
	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	NONE																	
	6	T 34 R F 4 (MAG)	F44EE	144	RL/RB	T 28 R F 4	F44SSILL	96	4	1				$20.00	$45.00	INC	$20.00	$20.00	INC	$26.25	$20.00	$131.25
	11	S 34 P F 2 (MAG)	F42EE	72	RL/RB	C 28 P F 2	F42SSILL	48						$20.00	$45.00	INC	$10.00	$10.00	INC	$21.25	$10.00	$106.25
	15	S 32 C F 2 (ELE)	F42LL	60	NONE															$0.00		$0.00
	18	T 32 R F 4 (ELE)	F44ILL	112	NONE																	$0.00
	20	S 32 C F 1 (ELE)	F41LL	32	NONE															$0.00		$0.00
	33	13 W CF 1	CFQ13/1-L	15	NONE															$0.00		$0.00
	39	2' 17 W F 2 (ELE)	F22ILL	33	NONE															$0.00		$0.00
	61	T 34 R F 3 (MAG)	F43EE	115	RL/RB	T 28 R F 3	F43SSILL	72	3	10				$20.00	$45.00	INC	$15.00	$15.00	INC	$33.25	$20.00	$128.25
	71	I 60	I60/1	60	Replace	CF 26	CFQ26/1-L	27	1								$5.00	INC	INC	$1.75	$0.00	$6.75
	73	I 120	I120/1	120	Replace	CF 26	CFQ26/1-L	27									$5.00	INC	INC	$1.75	$0.00	$6.75
	93	I 75	I75/1	75	Replace	CF 26	CFQ26/1-L	27	1								$5.00	INC	INC	$1.25	$0.00	$6.25
	106	SP 65 I	I65/1	65	Replace	CF 26	CFQ26/1-L	27									$5.00	INC	INC	$1.75	$0.00	$6.75
	117	CF 23	CFS23/1	23	NONE																	$0.00
	126	DC 23 C CF 2	CFQ22/2	48	NONE															$0.00		$0.00
	182	W 25 C F 2 (ELE) 3' T8	F32EE	66	NONE															$0.00		$0.00
	189	X 7.0 W 1	ECF7/1	10	Replace	X 1.5C LED	ELED1.5/1	1.5	1		$50.00	$45.00	INC							$33.25	$10.00	$128.25
	217	W 32 C F 4 (ELE)	F44ILL/2	118	NONE																	$0.00
	222	W 20 CF1 (MAG)	F21SS	28	Replace	W 17 C F 1 (ELE)	F21LL	16	1	1	$40.00	$10.00	INC							$17.50	$25.00	$67.50
	225	70 High Pressure Sodium	HPS70/1	95	NONE																	
	235	R 75 C Q 1	h75/1	75	RL/RB	CF 26	CFQ26/1-L	27	1								$5.00	INC	INC	$1.75	$0.00	$6.75
	236	MV 250	mv250/1	290	NONE																	
	237	WP 400 Po HPS	hps400/1	465	NONE																	
	OCC	OCCUPANCY SENSOR SWITCH									$50	$45	INC							$23.75	$20.00	$118.75
	C-OCC	OCC SENSOR W/ 20 FT. WIRE TO CEILING									$100	$50	INC							$52.50	$35.00	$202.50

Rebuild Notes:
(1) 2' x 2' U-Tube to 17 w 2' lamps with Reflector Kit Vendor Code RK(2F17t)

New Jersey Smart Start Prescriptive Lighting type	Watt/Fix	Lamps	$/Unit
New Hard Wired Compact Fluorescents	N/A	1	$25
New Hard Wired Compact Fluorescents	N/A	2	$30
For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts			
Retrofit T-12 to T-5,T-8 with Electronic Ballasts	N/A	1&2	$10
Retrofit T-12 to T-5,T-8 with Electronic Ballasts	N/A	3 & 4	$20
For replacement of fixtures with new T-5 or T-8 fixtures			
HID, T-12, Incandescent to T-8, T-5 with Electronic Ballasts	>1000	N/A	$284
HID, T-12, Incandescent to T-8, T-5 with Electronic Ballasts	400-999	N/A	$100
HID, T-12, Incandescent to T-8, T-5 with Electronic Ballasts	250--399	N/A	$50
HID Only to T-8, T-5 with Electronic Ballasts	175-249	N/A	$43
HID Only to T-8, T-5 with Electronic Ballasts	100-174	N/A	$30
HID Only to T-8, T-5 with Electronic Ballasts	75-99		$16
T-12 Only to T-8, T-5 with Electronic Ballasts (1&2 lamp)	<250	1&2	$25
T-12 Only to T-8, T-5 with Electronic Ballasts (3&4 lamp)	<250	3 & 4	$30
For retrofit of T-8 fixtures by permanent delamping & new reflectors	N/A	N/A	$20
New construction and complete renovation	N/A	N/A	Perf based only
LED Exit Signs (new fixtures only): For existing facilities with load <= 75 kW	N/A	N/A	$20
LED Exit Signs (new fixtures only): For existing facilities with load >= 75 kW	N/A	N/A	$10
Pulse Start Metal Halide (for fixtures >= 150 watts) - includes parking lot lighting	N/A	N/A	$25
Parking lot low bay - LED	N/A	N/A	$43
T-12 to T-8 fixtures by permanent delamping & new reflectors	N/A	N/A	$30
Controls			
OSW- Occupancy Sensor Wall Mounted (existing facilities only)	N/A	N/A	$20

OSR- Occupancy Sensor Remote Mounted (existing facilities only)	N/A	N/A	$35	
DLD-Fluorescent Daylight Dimming	N/A	N/A	$25	Per Fixture Controlled
OHLF-Occupancy controlled High-Low with Step Ballast	N/A	N/A	$25	Per Fixture Controlled
OSRH- Occupancy Sensor Remote Mounted	N/A	N/A	$35	
OHLH-Occupancy controlled High-Low with Step Ballast	N/A	N/A	$75	Per Fixture Controlled
DDH-Daylight Dimming	N/A	N/A	$75	Per Fixture Controlled

APPENDIX C

ECM-1b Install Lighting Occupancy Sensors

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
ECM-1b Install Occupancy Sensors

Cost of Electricity: $0.119 $/kWh
$15.03 $/kW

			EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS					
	Field Code	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
		Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
Tower A																								
Basement & Ground Floor	4	Lobby/Halls	19	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.4	Breaker	8760	11,983.7	19	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.4	None	8760	11,983.7	0.0	$0.00	$0.00	$0.00		
	4	Security Room	2	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2600	374.4	2	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	OCC	1200	172.8	201.6	$24.07	$118.75	$20.00	4.9	4.1
	39	Vestibule	4	2' 17 W F 2 (ELE)	F22ILL	33	0.1	Breaker	8760	1,156.3	4	2' 17 W F 2 (ELE)	F22ILL	33	0.1	None	8760	1,156.3	0.0	$0.00	$0.00	$0.00		
	33	Vestibule	7	13 W CF 1	CFQ13/1-L	15	0.1	Breaker	8760	919.8	7	13 W CF 1	CFQ13/1-L	15	0.1	None	8760	919.8	0.0	$0.00	$0.00	$0.00		
	6	Kitchen	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2912	1,677.3	4	T 34 R F 4 (MAG)	F44EE	144	0.6	OCC	2000	1,152.0	525.3	$62.71	$237.50	$40.00	3.8	3.1
	61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009.3	4	T 34 R F 3 (MAG)	F43EE	115	0.5	C-OCC	2000	920.0	1,089.3	$130.04	$405.00	$70.00	3.1	2.6
	61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009.3	4	T 34 R F 3 (MAG)	F43EE	115	0.5	C-OCC	2000	920.0	1,089.3	$130.04	$405.00	$70.00	3.1	2.6
	61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009.3	4	T 34 R F 3 (MAG)	F43EE	115	0.5	C-OCC	2000	920.0	1,089.3	$130.04	$405.00	$70.00	3.1	2.6
	61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009.3	4	T 34 R F 3 (MAG)	F43EE	115	0.5	C-OCC	2000	920.0	1,089.3	$130.04	$405.00	$70.00	3.1	2.6
	61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009.3	4	T 34 R F 3 (MAG)	F43EE	115	0.5	C-OCC	2000	920.0	1,089.3	$130.04	$405.00	$70.00	3.1	2.6
	61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009.3	4	T 34 R F 3 (MAG)	F43EE	115	0.5	C-OCC	2000	920.0	1,089.3	$130.04	$405.00	$70.00	3.1	2.6
	61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009.3	4	T 34 R F 3 (MAG)	F43EE	115	0.5	C-OCC	2000	920.0	1,089.3	$130.04	$405.00	$70.00	3.1	2.6
	11	Maintenance Office	2	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2600	374.4	2	S 34 P F 2 (MAG)	F42EE	72	0.1	OCC	1200	172.8	201.6	$24.07	$237.50	$40.00	9.9	8.2
	11	Men's Room 1	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2080	149.8	1	S 34 P F 2 (MAG)	F42EE	72	0.1	OCC	1000	72.0	77.8	$9.28	$237.50	$40.00	25.6	21.3
	11	Women's Room 1	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2080	149.8	1	S 34 P F 2 (MAG)	F42EE	72	0.1	OCC	1000	72.0	77.8	$9.28	$118.75	$20.00	12.8	10.6
	18	Laundry Room	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	OCC	1500	672.0	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	None	1500	672.0	0.0	$0.00	$0.00	$0.00		
	11	Storage Room	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	1000	72.0	1	S 34 P F 2 (MAG)	F42EE	72	0.1	None	1000	72.0	0.0	$0.00	$0.00	$0.00		
	33	Storage Room	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	1000	45.0	3	13 W CF 1	CFQ13/1-L	15	0.0	None	1000	45.0	0.0	$0.00	$0.00	$0.00		
	11	Janitor Closet	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	1000	72.0	1	S 34 P F 2 (MAG)	F42EE	72	0.1	None	1000	72.0	0.0	$0.00	$0.00	$0.00		
	11	Mech/Elect Room	10	S 34 P F 2 (MAG)	F42EE	72	0.7	Breaker	2000	1,440.0	10	S 34 P F 2 (MAG)	F42EE	72	0.7	None	2000	1,440.0	0.0	$0.00	$0.00	$0.00		
	11	Firepump Room	10	S 34 P F 2 (MAG)	F42EE	72	0.7	Breaker	2000	1,440.0	10	S 34 P F 2 (MAG)	F42EE	72	0.7	None	2000	1,440.0	0.0	$0.00	$0.00	$0.00		
	11	Garage	4	S 34 P F 2 (MAG)	F42EE	72	0.3	SW	2000	576.0	4	S 34 P F 2 (MAG)	F42EE	72	0.3	None	2000	576.0	0.0	$0.00	$0.00	$0.00		
	73	Garage	2	I 120	I120/1	120	0.2	SW	2000	480.0	2	I 120	I120/1	120	0.2	None	2000	480.0	0.0	$0.00	$0.00	$0.00		
Tower B																								
Basement & Ground Floor	4	Lobby/Halls	17	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.2	Breaker	8760	10,722.2	17	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.2	None	8760	10,722.2	0.0	$0.00	$0.00	$0.00		
	3	Stairways	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	8760	376.7	1	W 34 W F 1 (MAG)	F41EE	43	0.0	None	8760	376.7	0.0	$0.00	$0.00	$0.00		
	4	Office hall	9	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.6	SW	2600	1,684.8	9	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.6	None	2600	1,684.8	0.0	$0.00	$0.00	$0.00		
	33	Office hall	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	2600	117.0	3	13 W CF 1	CFQ13/1-L	15	0.0	None	2600	117.0	0.0	$0.00	$0.00	$0.00		
	5	Fileroom	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1200	144.0	168.0	$20.06	$118.75	$20.00	5.9	4.9
	5	Windowless office (northside)	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1200	144.0	168.0	$20.06	$118.75	$20.00	5.9	4.9
	5	Windowless office (by fileroom)	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1200	144.0	168.0	$20.06	$118.75	$20.00	5.9	4.9
	5	Small conf. room	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468.0	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	OCC	1200	216.0	252.0	$30.08	$118.75	$20.00	3.9	3.3
	5	Small corner office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1200	144.0	168.0	$20.06	$118.75	$20.00	5.9	4.9
	5	Server room	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1200	144.0	168.0	$20.06	$118.75	$20.00	5.9	4.9
	5	Office w/ window	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468.0	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	OCC	1200	216.0	252.0	$30.08	$118.75	$20.00	3.9	3.3
	5	Office w/ window	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	Dual SW	2600	468.0	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	OCC	1200	216.0	252.0	$30.08	$118.75	$20.00	3.9	3.3
	5	Large Conference room	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780.0	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	OCC	1200	360.0	420.0	$50.14	$118.75	$20.00	2.4	2.0
	20	Large Conference room	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2600	998.4	12	S 32 C F 1 (ELE)	F41LL	32	0.4	OCC	1200	460.8	537.6	$64.18	$118.75	$20.00	1.9	1.5
	71	Large Conference room bath	3	I 60	I60/1	60	0.2	OCC	1000	180.0	3	I 60	I60/1	60	0.2	None	1000	180.0	0.0	$0.00	$0.00	$0.00		
	5	Large Corner Office	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780.0	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	OCC	1200	360.0	420.0	$50.14	$118.75	$20.00	2.4	2.0
	20	Large Corner Office	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2600	998.4	12	S 32 C F 1 (ELE)	F41LL	32	0.4	OCC	1200	460.8	537.6	$64.18	$118.75	$20.00	1.9	1.5
	235	Large Corner Office	7	R 75 C Q 1	h75/1	75	0.5	SW	2600	1,365.0	7	R 75 C Q 1	h75/1	75	0.5	OCC	1200	630.0	735.0	$87.74	$118.75	$20.00	1.4	1.1
	71	Large Corner Office bath	2	I 60	I60/1	60	0.1	OCC	1000	120.0	2	I 60	I60/1	60	0.1	None	1000	120.0	0.0	$0.00	$0.00	$0.00		
	5	Center Office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1200	144.0	168.0	$20.06	$118.75	$20.00	5.9	4.9
	106	Center Office	3	SP 65 I	I65/1	65	0.2	SW	2600	507.0	3	SP 65 I	I65/1	65	0.2	OCC	1200	234.0	273.0	$32.59	$118.75	$20.00	3.6	3.0
	5	Center Office fileroom	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312.0	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1200	144.0	168.0	$20.06	$118.75	$20.00	5.9	4.9
	5	Cubical Area (north side)	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	2600	1,248.0	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	None	2600	1,248.0	0.0	$0.00	$0.00	$0.00		
	182	Cubical Area (north side)	34	W 25 C F 2 (ELE) 3' T8	F32EE	66	2.2	SW	2600	5,834.4	34	W 25 C F 2 (ELE) 3' T8	F32EE	66	2.2	None	2600	5,834.4	0.0	$0.00	$0.00	$0.00		
	106	Cubical Area (north side)	8	SP 65 I	I65/1	65	0.5	SW	2600	1,352.0	8	SP 65 I	I65/1	65	0.5	None	2600	1,352.0	0.0	$0.00	$0.00	$0.00		
	5	Cubical Area (south side)	12	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.7	SW	2600	1,872.0	12	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.7	None	2600	1,872.0	0.0	$0.00	$0.00	$0.00		
	182	Cubical Area (south side)	16	W 25 C F 2 (ELE) 3' T8	F32EE	66	1.1	SW	2600	2,745.6	16	W 25 C F 2 (ELE) 3' T8	F32EE	66	1.1	None	2600	2,745.6	0.0	$0.00	$0.00	$0.00		
	106	Cubical Area (south side)	18	SP 65 I	I65/1	65	1.2	SW	2600	3,042.0	18	SP 65 I	I65/1	65	1.2	None	2600	3,042.0	0.0	$0.00	$0.00	$0.00		
	182	Cubical nook	12	W 25 C F 2 (ELE) 3' T8	F32EE	66	0.8	SW	2600	2,059.2	12	W 25 C F 2 (ELE) 3' T8	F32EE	66	0.8	None	2600	2,059.2	0.0	$0.00	$0.00	$0.00		
	106	Cubical nook	3	SP 65 I	I65/1	65	0.2	SW	2600	507.0	3	SP 65 I	I65/1	65	0.2	None	2600	507.0	0.0	$0.00	$0.00	$0.00		
	5	Office Kitchen	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780.0	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	OCC	1200	360.0	420.0	$50.14	$118.75	$20.00	2.4	2.0
	117	Office Men's Room	3	CF 23	CFS23/1	23	0.1	SW	2600	179.4	3	CF 23	CFS23/1	23	0.1	None	2600	179.4	0.0	$0.00	$0.00	$0.00		
	117	Office Women's Room	3	CF 23	CFS23/1	23	0.1	SW	2600	179.4	3	CF 23	CFS23/1	23	0.1	None	2600	179.4	0.0	$0.00	$0.00	$0.00		
	15	Elevator Motor Room	4	S 32 C F 2 (ELE)	F42LL	60	0.2	SW	2600	624.0	4	S 32 C F 2 (ELE)	F42LL	60	0.2	None	2600	624.0	0.0	$0.00	$0.00	$0.00		
	4	File Storage Room (Twr. B)	3	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	2600	561.6	3	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.2	None	2600	561.6	0.0	$0.00	$0.00	$0.00		
	18	File Storage Room (Twr. B)	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	SW	2600	1,456.0	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	None	2600	1,456.0	0.0	$0.00	$0.00	$0.00		
	18	File Storage Room (Twr. B)	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	2600	2,329.6	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	None	2600	2,329.6	0.0	$0.00	$0.00	$0.00		
	18	File Storage Room (Twr. B) bath	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2080	233.0	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	1200	134.4	98.6	$11.77	$118.75	$20.00	10.1	8.4
	11	Trash Compactor Room	3	S 34 P F 2 (MAG)	F42EE	72	0.2	SW	2000	432.0	3	S 34 P F 2 (MAG)	F42EE	72	0.2	None	2000	432.0	0.0	$0.00	$0.00	$0.00		
	117	Chiller Room	3	CF 23	CFS23/1	23	0.1	SW	2000	138.0	3	CF 23	CFS23/1	23	0.1	None	2000	138.0	0.0	$0.00	$0.00	$0.00		
Both Towers A and B																								
1st Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
2nd Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
3rd Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
4th Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
5th Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
6th Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
7th Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
ECM-1b Install Occupancy Sensors

Cost of Electricity: $0.119 $/kWh
$15.03 $/kW

			EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS					
		Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
	Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
8th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
9th Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
10th Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
11th Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
12th Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
13th Floors	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614.4	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	None	8760	12,614.4	0.0	$0.00	$0.00	$0.00		
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753.4	2	W 34 W F 1 (MAG)	F41EE	43	0.1	None	8760	753.4	0.0	$0.00	$0.00	$0.00		
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,204.8	4	I 120	I120/1	120	0.5	None	8760	4,204.8	0.0	$0.00	$0.00	$0.00		
Apartments	217	W32CF4-E SW (T8, Occ)	252	W 32 C F 4 (ELE)	F44ILL/2	118	29.7	SW	2912	86,591.2	252	W 32 C F 4 (ELE)	F44ILL/2	118	29.7	OCC	2184	64,943.4	21,647.8	$2,584.32	$29,905.00	$5,040.00	11.6	9.6
	126	2CF23 Wall Mt 1 SW EA (Occ)	756	DC 23 C CF 2	CFQ22/2	48	36.3	SW	2912	105,670.7	756	DC 23 C CF 2	CFQ22/2	48	36.3	None	2912	105,670.7	0.0	$0.00	$0.00	$0.00		
	222	W20CF1-Mag SW (T12)	252	W 20 CF1 (MAG)	F21SS	28	7.1	SW	2912	20,547.1	252	W 20 CF1 (MAG)	F21SS	28	7.1	None	2912	20,547.1	0.0	$0.00	$0.00	$0.00		
	2	W34CF2-Mag SW (T12 Occ)	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	2912	233.0	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	OCC	2184	174.7	58.2	$6.95	$115.75	$20.00	17.1	14.2
	126	2CF23 Wall Mt Dual SW (Occ)	1	DC 23 C CF 2	CFQ22/2	48	0.0	SW	2912	139.8	1	DC 23 C CF 2	CFQ22/2	48	0.0	None	2912	139.8	0.0	$0.00	$0.00	$0.00		
	126	4CF23 SW (No Occ)	2	DC 23 C CF 2	CFQ22/2	48	0.1	SW	2912	279.6	2	DC 23 C CF 2	CFQ22/2	48	0.1	OCC	2184	209.7	69.9	$8.34	$115.75	$20.00	14.2	11.8
	117	CF23 SW (Occ)	1	CF 23	CFS23/1	23	0.0	SW	2912	67.0	1	CF 23	CFS23/1	23	0.0	None	2912	67.0	0.0	$0.00	$0.00	$0.00		
Exterior	225	Outside Wallpacks	4	70 High Pressure Sodium	HPS70/1	95	0.4	Timer	4368	1,659.8	4	70 High Pressure Sodium	HPS70/1	95	0.4	None	4368	1,659.8	0.0	$0.00	$0.00	$0.00		
	236	Outside Doors	6	MV 250	mv250/1	290	1.7	Timer	4368	7,600.3	6	MV 250	mv250/1	290	1.7	None	4368	7,600.3	0.0	$0.00	$0.00	$0.00		
	237	Pole	18	WP 400 Po HPS	hps400/1	465	8.4	Timer	4368	36,560.2	18	WP 400 Po HPS	hps400/1	465	8.4	None	4368	36,560.2	0.0	$0.00	$0.00	$0.00		
Other	93	Storage Rooms (tenant floors)	26	I 75	I75/1	75	2.0	Timer	4368	8,517.6	26	I 75	I75/1	75	2.0	None	4368	8,517.6	0.0	$0.00	$0.00	$0.00		
	3	Trash Rooms (tenant floors)	26	W 34 W F 1 (MAG)	F41EE	43	1.1	Timer	4368	4,883.4	26	W 34 W F 1 (MAG)	F41EE	43	1.1	None	4368	4,883.4	0.0	$0.00	$0.00	$0.00		
	189	Exit Signs (both towers)	124	X 7.0 W 1	ECF7/1	10	1.2	Breaker	8760	10,862.4	124	X 7.0 W 1	ECF7/1	10	1.2	None	8760	10,862.4	0.0	$0.00	$0.00	$0.00		
		Total	**2,135**				**138.3**			**595,493**	**2,135**				**138**				**559,635**	**35,859**	**4,281**	**$30,085**	**6,090**		
																			Demand Savings	**0.0**		**$0**			
																			kWh Savings	**35,859**		**$4,281**			
																			Total Savings			**$4,281**		**8.4**	**7.0**

APPENDIX D

ECM-1c Lighting Replacements with Occupancy Sensors

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
ECM-1c Lighting Replacements with Occupancy Sensors

Cost of Electricity: $0.119 $/kWh
$15.03 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS					
Field Code	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
Tower A																							
4	Lobby/Halls	19	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.4	Breaker	8760	11,984	19	2T 17 R F 2 (ELE)	F22ILL	33	0.6	None	8,760	5,493	6,491	$ 908.60	$ 1,923.75	$ 190	2.1	1.9
4	Security Room	2	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2600	374	2	2T 17 R F 2 (ELE)	F22ILL	33	0.1	OCC	1,200	79	295	$ 49.31	$ 321.25	$ 40	6.5	5.7
39	Vestibule	4	2' 17 W F 2 (ELE)	F22ILL	33	0.1	Breaker	8760	1,156	4	2' 17 W F 2 (ELE)	F22ILL	33	0.1	None	8,760	1,156	-	$ -	$ -	$ -		
33	Vestibule	7	13 W CF 1	CFQ13/1-L	15	0.1	Breaker	8760	920	7	13 W CF 1	CFQ13/1-L	15	0.1	None	8,760	920	-	$ -	$ -	$ -		
6	Kitchen	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2912	1,677	4	T 28 R F 4	F44SSILL	96	0.4	OCC	2,000	768	909	$ 143.19	$ 762.50	$ 120	5.3	4.5
61	Community Room	8	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	C-OCC	2,000	576	1,433	$ 202.14	$ 918.00	$ 150	4.5	3.8
61	Community Room	8	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	C-OCC	2,000	576	1,433	$ 202.14	$ 918.00	$ 150	4.5	3.8
61	Community Room	8	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	C-OCC	2,000	576	1,433	$ 202.14	$ 918.00	$ 150	4.5	3.8
61	Community Room	8	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	C-OCC	2,000	576	1,433	$ 202.14	$ 918.00	$ 150	4.5	3.8
61	Community Room	8	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	C-OCC	2,000	576	1,433	$ 202.14	$ 918.00	$ 150	4.5	3.8
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	C-OCC	2,000	576	1,433	$ 202.14	$ 918.00	$ 150	4.5	3.8
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	C-OCC	2,000	576	1,433	$ 202.14	$ 918.00	$ 150	4.5	3.8
11	Maintenance Office	2	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2600	374	2	C 28 P F 2	F42SSILL	48	0.1	OCC	1,200	115	259	$ 39.60	$ 450.00	$ 60	11.4	9.8
11	Men's Room 1	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2080	150	1	C 28 P F 2	F42SSILL	48	0.0	OCC	1,000	48	102	$ 16.48	$ 343.75	$ 50	20.9	17.8
11	Women's Room 1	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2080	150	1	C 28 P F 2	F42SSILL	48	0.0	OCC	1,000	48	102	$ 16.48	$ 225.00	$ 30	13.7	11.8
18	Laundry Room	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	OCC	1500	672	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	None	1,500	672	-	$ -	$ -	$ -		
11	Storage Room	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	1000	72	1	C 28 P F 2	F42SSILL	48	0.0	None	1,000	48	24	$ 7.19	$ 106.25	$ 10	14.8	13.4
33	Storage Room	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	1000	45	3	13 W CF 1	CFQ13/1-L	15	0.0	None	1,000	45	-	$ -	$ -	$ -		
11	Janitor Closet	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	1000	72	1	C 28 P F 2	F42SSILL	48	0.0	None	1,000	48	24	$ 7.19	$ 106.25	$ 10	14.8	13.4
11	Mech/Elect Room	10	S 34 P F 2 (MAG)	F42EE	72	0.7	Breaker	2000	1,440	10	C 28 P F 2	F42SSILL	48	0.5	None	2,000	960	480	$ 100.80	$ 1,062.50	$ 100	10.6	9.6
11	Firepump Room	10	S 34 P F 2 (MAG)	F42EE	72	0.7	Breaker	2000	1,440	10	C 28 P F 2	F42SSILL	48	0.5	None	2,000	960	480	$ 100.80	$ 1,062.50	$ 100	10.6	9.6
11	Garage	4	S 34 P F 2 (MAG)	F42EE	72	0.3	SW	2000	576	4	C 28 P F 2	F42SSILL	48	0.2	None	2,000	384	192	$ 40.24	$ 425.00	$ 40	10.6	9.6
73	Garage	2	I 120	I120/1	120	0.2	SW	2000	480	2	CF 26	CFQ26/1-L	27	0.1	None	2,000	108	372	$ 77.97	$ 13.50	$ -	0.2	0.2
Tower B																							
4	Lobby/Halls	17	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.2	Breaker	8760	10,722	17	2T 17 R F 2 (ELE)	F22ILL	33	0.6	None	8,760	4,914	5,808	$ 812.96	$ 1,721.25	$ 170	2.1	1.9
3	Stairways	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	8760	377	1	W 28 W F 1	F41SSILL	26	0.0	None	8,760	228	149	$ 20.85	$ 114.75	$ 25	5.5	4.3
4	Office hall	9	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.6	SW	2600	1,685	9	2T 17 R F 2 (ELE)	F22ILL	33	0.3	None	2,600	772	913	$ 172.27	$ 911.25	$ 90	5.3	4.8
33	Office hall	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	2600	117	3	13 W CF 1	CFQ13/1-L	15	0.0	None	2,600	117	-	$ -	$ -	$ -		
5	Fileroom	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1,200	144	168	$ 20.06	$ 118.75	$ 20	5.9	4.9
5	Windowless office (northside)	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1,200	144	168	$ 20.06	$ 118.75	$ 20	5.9	4.9
5	Windowless office (by fileroom)	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1,200	144	168	$ 20.06	$ 118.75	$ 20	5.9	4.9
5	Small conf. room	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	OCC	1,200	216	252	$ 30.08	$ 118.75	$ 20	3.9	3.3
5	Small corner office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1,200	144	168	$ 20.06	$ 118.75	$ 20	5.9	4.9
5	Server room	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1,200	144	168	$ 20.06	$ 118.75	$ 20	5.9	4.9
5	Office w/ window	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	OCC	1,200	216	252	$ 30.08	$ 118.75	$ 20	3.9	3.3
5	Office w/ window	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	Dual SW	2600	468	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	OCC	1,200	216	252	$ 30.08	$ 118.75	$ 20	3.9	3.3
5	Large Conference room	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	OCC	1,200	360	420	$ 50.14	$ 118.75	$ 20	2.4	2.0
20	Large Conference room	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2600	998	12	S 32 C F 1 (ELE)	F41LL	32	0.4	OCC	1,200	461	538	$ 64.18	$ 118.75	$ 20	1.9	1.5
71	Large Conference room bath	3	I 60	I60/1	60	0.2	OCC	1000	180	3	CF 26	CFQ26/1-L	27	0.1	None	1,000	81	99	$ 29.68	$ 20.25	$ -	0.7	0.7
5	Large Corner Office	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	OCC	1,200	360	420	$ 50.14	$ 118.75	$ 20	2.4	2.0
20	Large Corner Office	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2600	998	12	S 32 C F 1 (ELE)	F41LL	32	0.4	OCC	1,200	461	538	$ 64.18	$ 118.75	$ 20	1.9	1.5
235	Large Corner Office	7	R 75 C Q 1	h75/1	75	0.5	SW	2600	1,365	7	CF 26	CFQ26/1-L	27	0.2	OCC	1,200	227	1,138	$ 196.50	$ 166.00	$ 20	0.8	0.7
71	Large Corner Office bath	2	I 60	I60/1	60	0.1	OCC	1000	120	2	CF 26	CFQ26/1-L	27	0.1	None	1,000	54	66	$ 19.79	$ 13.50	$ -	0.7	0.7
5	Center Office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1,200	144	168	$ 20.06	$ 118.75	$ 20	5.9	4.9
106	Center Office	3	SP 65 I	I65/1	65	0.2	SW	2600	507	3	CF 26	CFQ26/1-L	27	0.1	OCC	1,200	97	410	$ 69.49	$ 139.00	$ 20	2.0	1.7
5	Center Office fileroom	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	OCC	1,200	144	168	$ 20.06	$ 118.75	$ 20	5.9	4.9
5	Cubical Area (north side)	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	2600	1,248	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	None	2,600	1,248	-	$ -	$ -	$ -		
182	Cubical Area (north side)	34	W 25 C F 2 (ELE) 3' T8	F32EE	66	2.2	SW	2600	5,834	34	W 25 C F 2 (ELE) 3' T8	F32EE	66	2.2	None	2,600	5,834	-	$ -	$ -	$ -		
106	Cubical Area (north side)	8	SP 65 I	I65/1	65	0.5	SW	2600	1,352	8	CF 26	CFQ26/1-L	27	0.2	None	2,600	562	790	$ 149.20	$ 54.00	$ -	0.4	0.4
5	Cubical Area (south side)	12	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.7	SW	2600	1,872	12	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.7	None	2,600	1,872	-	$ -	$ -	$ -		
182	Cubical Area (south side)	16	W 25 C F 2 (ELE) 3' T8	F32EE	66	1.1	SW	2600	2,746	16	W 25 C F 2 (ELE) 3' T8	F32EE	66	1.1	None	2,600	2,746	-	$ -	$ -	$ -		
106	Cubical Area (south side)	18	SP 65 I	I65/1	65	1.2	SW	2600	3,042	18	CF 26	CFQ26/1-L	27	0.5	None	2,600	1,264	1,778	$ 335.71	$ 121.50	$ -	0.4	0.4
182	Cubical nook	12	W 25 C F 2 (ELE) 3' T8	F32EE	66	0.8	SW	2600	2,059	12	W 25 C F 2 (ELE) 3' T8	F32EE	66	0.8	None	2,600	2,059	-	$ -	$ -	$ -		
106	Cubical nook	3	SP 65 I	I65/1	65	0.2	SW	2600	507	3	CF 26	CFQ26/1-L	27	0.1	None	2,600	211	296	$ 55.95	$ 20.25	$ -	0.4	0.4
5	Office Kitchen	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	OCC	1,200	360	420	$ 50.14	$ 118.75	$ 20	2.4	2.0
117	Office Men's Room	3	CF 23	CFS23/1	23	0.1	SW	2600	179	3	CF 23	CFS23/1	23	0.1	None	2,600	179	-	$ -	$ -	$ -		
117	Office Women's Room	3	CF 23	CFS23/1	23	0.1	SW	2600	179	3	CF 23	CFS23/1	23	0.1	None	2,600	179	-	$ -	$ -	$ -		
15	Elevator Motor Room	4	S 32 C F 2 (ELE)	F42LL	60	0.2	SW	2600	624	4	S 32 C F 2 (ELE)	F42LL	60	0.2	None	2,600	624	-	$ -	$ -	$ -		
4	File Storage Room (Twr. B)	3	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	2600	562	3	2T 17 R F 2 (ELE)	F22ILL	33	0.1	None	2,600	257	304	$ 57.42	$ 303.75	$ 30	5.3	4.8
18	File Storage Room (Twr. B)	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	SW	2600	1,456	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	None	2,600	1,456	-	$ -	$ -	$ -		
18	File Storage Room (Twr. B)	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	2600	2,330	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	None	2,600	2,330	-	$ -	$ -	$ -		
18	File Storage Room (Twr. B) bath	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2080	233	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	1,200	134	99	$ 11.77	$ 118.75	$ 20	10.1	8.4
11	Trash Compactor Room	3	S 34 P F 2 (MAG)	F42EE	72	0.2	SW	2000	432	3	C 28 P F 2	F42SSILL	48	0.1	None	2,000	288	144	$ 30.18	$ 318.75	$ 30	10.6	9.6
117	Chiller Room	3	CF 23	CFS23/1	23	0.1	SW	2000	138	3	CF 23	CFS23/1	23	0.1	None	2,000	138	-	$ -	$ -	$ -		
Both Towers A and B																							
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1

Energy Audit of North Bergen Housing Authority

CHA Project No. 20241 Lawler Towers

ECM-1c Lighting Replacements with Occupancy Sensors

Cost of Electricity: $0.119 $/kWh
$15.03 $/kW

			EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS					
		Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
	Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	($/kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
8th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RLRB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
9th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RLRB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
10th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RLRB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
11th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RLRB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
12th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RLRB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
13th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RLRB	F42ES	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	None	8,760	7,569	5,046	$ 706.28	$ 4,500.00	$ 450	6.4	5.7
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	None	8,760	456	298	$ 41.69	$ 229.50	$ 50	5.5	4.3
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	None	8,760	946	3,259	$ 456.14	$ 27.00	$ -	0.1	0.1
Apartments	217	W32CF4-E SW (T8, Occ)	252	W 32 C F 4 (ELE)	F44ELL/2	118	29.7	SW	2912	86,591	252	W 32 C F 4 (ELE)	F44LL/2	118	29.7	OCC	2,184	64,943	21,648	$ 2,584.32	$ 29,925.00	$ 5,040	11.6	9.6
	126	2CF23 Wall Mt 1 SW EA (Occ)	756	DC 23 C CF 2	CFQ22/2	48	36.3	SW	2912	105,671	756	DC 23 C CF 2	CFQ22/2	48	36.3	None	2,912	105,671	-	$ -	$ -	$ -	-	-
	222	W20CF1-Mag SW (T12)	252	W 20 CF1 (MAG)	F21SS	28	7.1	SW	2912	20,547	252	W 17 C F 1 (ELE)	F21LL	16	4.0	None	2,912	11,741	8,806	$ 1,596.80	$ 17,010.00	$ 6,300	10.7	6.7
	2	W34CF2-Mag SW (T12 Occ)	1	T 34 W F 2 (MAG) RLRB	F42ES	80	0.1	SW	2912	233	1	W 28 W F 2	F42SSILL	48	0.0	OCC	2,184	105	128	$ 21.07	$ 368.75	$ 45	17.5	15.4
	126	2CF23 Wall Mt Dual SW (Occ)	1	DC 23 C CF 2	CFQ22/2	48	0.0	SW	2912	140	1	DC 23 C CF 2	CFQ22/2	48	0.0	None	2,912	140	-	$ -	$ -	$ -	-	-
	126	4CF23 SW (No Occ)	2	DC 23 C CF 2	CFQ22/2	48	0.1	SW	2912	280	2	DC 23 C CF 2	CFQ22/2	48	0.1	OCC	2,184	210	70	$ 8.34	$ 118.75	$ 20	14.2	11.8
	117	CF23 SW (Occ)	1	CF 23	CFS23/1	23	0.0	SW	2912	67	1	CF 23	CFS23/1	23	0.0	None	2,912	67	-	$ -	$ -	$ -	-	-
Exterior	225	Outside Wallpacks	4	70 High Pressure Sodium	HPS70/1	95	0.4	Timer	4368	1,660	4	70 High Pressure Sodium	HPS70/1	95	0.4	None	4,368	1,660	-	$ -	$ -	$ -	-	-
	236	Outside Doors	6	MV 250	mv250/1	290	1.7	Timer	4368	7,600	6	MV 250	mv250/1	290	1.7	None	4,368	7,600	-	$ -	$ -	$ -	-	-
	237	Pole	18	WP 400 Po HPS	hps400/1	465	8.4	Timer	4368	36,560	18	WP 400 Po HPS	hps400/1	465	8.4	None	4,368	36,560	-	$ -	$ -	$ -	-	-
Other	93	Storage Rooms (tenant floors)	26	I 75	I75/1	75	2.0	Timer	4368	8,518	26	CF 26	CFQ26/1-L	27	0.7	None	4,368	3,066	5,451	$ 875.92	$ 182.50	$ -	0.2	0.2
	3	Trash Rooms (tenant floors)	26	W 34 W F 1 (MAG)	F41EE	43	1.1	Timer	4368	4,883	26	W 28 W F 1	F41SSILL	26	0.7	None	4,368	2,953	1,931	$ 310.22	$ 2,983.50	$ 650	9.6	7.5
	189	Exit Signs (both towers)	124	X 7.0 W 1	ECF7/1	10	1.2	Breaker	8760	10,862	124	X 1.5C LED	ELED1.5/1	1.5	0.2	None	8,760	1,628	9,233	$ 1,292.39	$ 15,903.00	$ 1,240	12.3	11.3
		Total	**2,155**				**139.3**			**595,493**	**2,135**				**113.7**				**400,372**		**27,736**	**147,339**	**22,300**	
																			Demand Savings		**24.6**	**$4,442**		
																			kWh Savings		**195,122**	**$23,294**		
																			Total Savings			**$27,736**		**5.3**	**4.5**

APPENDIX E

ECM-2 Light Bulb Exchange

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
ECM-2 Bulb Replacements (Apartment Lamps)

Cost of Electricity: $0.119 $/kWh
$15.03 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS					
	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
101	I40 (tenants' lamps)	37	I 40	I40/1	40	1.5	SW	500	740	37	CF 10	CFQ10/1	15	0.6	SW	500	278	463	$ 55.21	$ 199.80	$0	3.6	3.6
71	I60 (tenants' lamps)	1051	I 60	I60/1	60	63.1	SW	500	31,530	1051	CF 13	CFQ13/1	17	17.9	SW	500	8,934	22,597	$ 2,697.57	$ 5,875.40	$0	2.1	2.1
77	I150 (tenants' lamps)	17	I 150	I150/1	150	2.6	SW	500	1,275	17	CF 28	CFQ28/1	33	0.6	SW	500	281	995	$ 118.72	$ 91.80	$0	0.8	0.8
126	C2/CF23 (tenants' lamps)	2	DC 23 C CF 2	CFQ22/2	48	0.1	SW	500	48	2	DC 23 C CF 2	CFQ22/2	48	0.1	SW	500	48	-	$ -	$ -	$0		
88	CF13 (tenants' lamps)	1	CF 13 1 LAMP	CFQ13/1-L	15	0.6	SW	500	8	1	CF 13 1 LAMP	CFQ13/1-L	15	0.0	SW	500	8	-	$ -	$ -	$0		
	Total	1,108				67.2			33,801	1,108			128	19			9,547	24,054	$2,872	$5,967	$0		
																		Demand Savings		48.1	$8,679			
																		kWh Savings		24,054	$2,872			
																		Total savings			$11,550		0.5	0.5

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
ECM-2 Bulb Replacements (Apartment Lamps)

COST TABLE

Notes	Field Code	Standard Code	NYSERDA Code	Watts per fixture	Retrofit	Standard Code	NYSERDA Code	Watts per fixture	Lamps/Fix	Ball/Fix	Fixture Replacement			Ballast Replacement			Lamp Replacement			O.P.& D	NJ Incentive	Retrofit Cost (inc. O&P)
											Material	Labor	Disposal	Material	Labor	Disposal	Material	Labor	Disposal			
	71	I 60	I60/1	60	Replace	CF 13	CFQ13/1	17	1								$4.00	INC	INC	$1.40	**$0.00**	**$5.40**
	77	I 150	I150/1	150	Replace	CF 28	CFQ28/1	33	1								$4.00	INC	INC	$1.40	**$0.00**	**$5.40**
	88	CF 13 1 LAMP	CFQ13/1-L	15	NONE															$0.00		**$0.00**
	101	I 40	I40/1	40	Replace	CF 10	CFQ10/1	15	1								$4.00	INC	INC	$1.40	**$0.00**	**$5.40**
	126	DC 23 C CF 2	CFQ22/2	48	NONE															$0.00		**$0.00**

New Jersey Smart Start Prescriptive Lighting type	Watt/Fix	Lamps	$/Unit	
New Hard Wired Compact Fluorescents	N/A	1	$25	
New Hard Wired Compact Fluorescents	N/A	2	$30	
For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts				
Retrofit T-12 to T-5,T-8 with Electronic Ballasts	N/A	1&2	$10	
Retrofit T-12 to T-5,T-8 with Electronic Ballasts	N/A	3 & 4	$20	
For replacement of fixtures with new T-5 or T-8 fixtures				
HID, T-12, Incandescent to T-8, T-5 with Electronic Ballasts	>1000	N/A	$284	
HID, T-12, Incandescent to T-8, T-5 with Electronic Ballasts	400-999	N/A	$100	
HID, T-12, Incandescent to T-8, T-5 with Electronic Ballasts	250--399	N/A	$50	
HID Only to T-8, T-5 with Electronic Ballasts	175-249	N/A	$43	
HID Only to T-8, T-5 with Electronic Ballasts	100-174	N/A	$30	
HID Only to T-8, T-5 with Electronic Ballasts	75-99		$16	
T-12 Only to T-8, T-5 with Electronic Ballasts (1&2 lamp)	<250	1&2	$25	
T-12 Only to T-8, T-5 with Electronic Ballasts (3&4 lamp)	<250	3 & 4	$30	
For retrofit of T-8 fixtures by permanent delamping & new reflectors	N/A	N/A	$20	
New construction and complete renovation	N/A	N/A	Perf based only	
LED Exit Signs (new fixtures only): For existing facilities with load <= 75 kW	N/A	N/A	$20	
LED Exit Signs (new fixtures only): For existing facilities with load >= 75 kW	N/A	N/A	$10	
Pulse Start Metal Halide (for fixtures >= 150 watts) - includes parking lot lighting	N/A	N/A	$25	
Parking lot low bay - LED	N/A	N/A	$43	
T-12 to T-8 fixtures by permanent delamping & new reflectors	N/A	N/A	$30	
Controls				
OSW- Occupancy Sensor Wall Mounted (existing facilities only)	N/A	N/A	$20	
OSR- Occupancy Sensor Remote Mounted (existing facilities only)	N/A	N/A	$35	
DLD-Fluorescent Daylight Dimming	N/A	N/A	$25	Per Fixture Controlled
OHLF-Occupancy controlled High-Low with Step Ballast	N/A	N/A	$25	Per Fixture Controlled
OSRH- Occupancy Sensor Remote Mounted	N/A	N/A	$35	
OHLH-Occupancy controlled High-Low with Step Ballast	N/A	N/A	$75	Per Fixture Controlled
DDH-Daylight Dimming	N/A	N/A	$75	Per Fixture Controlled

CHA Project No. 20241 Lawler Towers
Existing Lighting - Apartment Lamps
ECM-2 Bulb Replacements (Apartment Lamps)

Hours of Operation

	Hours/Day	Hours/Year	Proposed	Utilized
Apartment (tenants' lamps)		500	500	Y

APPENDIX F

ECM-3a Replace Urinals and Flush Valves with Low Flow Units

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-3a Replace urinals and flush valves with low flow

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$9.00	$ / kGal
Urinals in Building	2	
Average Flushes / Urinal (per Day)	30	
Average Gallons / Flush	3.0	Gal

PROPOSED CONDITIONS		
Proposed Urinals to be Replaced	2	
Proposed Gallons / Flush	1.0	Gal
Proposed Material Cost	$360	
Proposed Installation Cost	$269	
Total cost of new urinals & valves	$1,258	

SAVINGS		
Current Urinal Water Use	66	kGal / year
Proposed Urinal Water Use	55	kGal / year
Water Savings	11	kGal / year
Cost Savings	$99	/ year
Simple Payback	12.8	years

APPENDIX G

ECM-3b Replace Toilets and Flush Valves with Low Flow Types

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-3b Replace toilets with low flow units

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$9.00	$ / kGal
Toilets in Building	130	
Average Flushes / Toilet (per Day)	6	
Average Gallons / Flush	3.5	Gal

PROPOSED CONDITIONS		
Proposed Toilets to be Replaced	130	
Proposed Gallons / Flush	1.6	Gal
Proposed Material Cost of new Flush Valves	$315	
Proposed Installation cost of new Flush Valves	$139	
Total cost of new toilets & valves	$58,988	

SAVINGS		
Current Toilet Water Use	996	kGal / year
Proposed Toilet Water Use	456	kGal / year
Water Savings	541	kGal / year
Cost Savings	$4,868	/ year
Simple Payback	12.1	years

Note:
Lawler has 261 toilets. This assumes that half of the toilets have been replaced with low flow toilets.

APPENDIX H

Not used

APPENDIX I

ECM-3c Install Low Flow Showerheads

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-3c Replace Showerheads

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$9.00	$ / kGal
Faucets in Building	513	
Average Uses / shower (per day)	1	
Time in shower	5	Minutes
Old Flow / Showerhead	2.50	GPM
Average Gallons / Use	13	Gal/Day

PROPOSED CONDITIONS		
Proposed showers to modify	513	
Proposed Flow / Showerhead	1.6	Gal
Proposed Average Gallons / Use	8.0	Gal/Day
Proposed Material Cost of new showerheads	$15	
Proposed Installation cost of new showerheads	$19	
Total cost of new showerheads	$17,314	

SAVINGS		
Current Shower Water Use	2,341	kGal / year
Proposed Shower Water Use	1,498	kGal / year
Water Savings	843	kGal / year
Cost Savings	$7,583	/ year
Simple Payback	2.3	years

APPENDIX J

ECM-4 Thermostats and Control Valves for Steam Radiators

YOUR SUMMARY

This report addresses the key recommendations for improving the comfort, safety and efficiency of your home. You should use it as a guide for deciding what work you want to have done. Remember, your Home Performance Contractor is ready to complete these projects promptly, and the work is guaranteed.

Selected Packages

Measure Description	Non-energy benefits	Package1	Package2	Package3
Temp Limiting T-Stats Not Office & Comm Rm: Install 6 non-programmable Heating only thermostats. Install 12 non-programmable heating/cooling thermostats.	Improve comfort, improve convenience.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 11,498		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		1,035.8		
Simple annual payback, years		NA		
Savings to Investment Ratio		NA		

The following fuel prices were used to estimate annual energy cost savings, payback and savings to investment ratio:

- Natural gas: 1.1100 $/Therm
- Electricity: 0.1500 $/kWh

Base Load Report

Customer Information

Customer Name: NBHA

Address: 6121/3131 Grand Avenue
North Bergen, NJ 07047

Billing Period: None

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 8/17/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Temp Limiting Thermostats

Billing Period Name: None

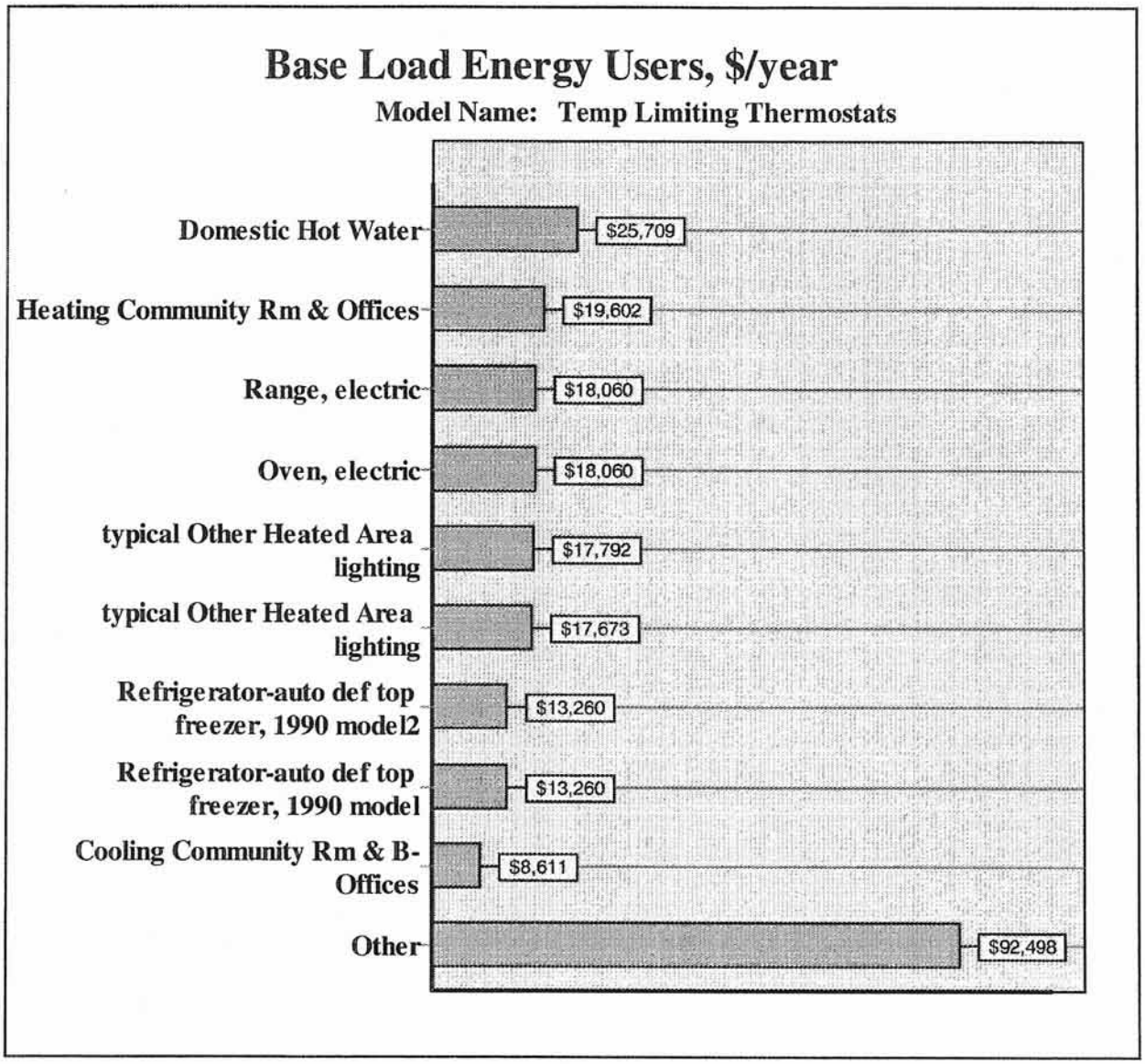
	Electricity		Natural gas			
	kWh	$	Therm	$		
Model	1,484,677	222,702	24,076	26,724		
Billing						
% Difference						

Note: No billing data is available because the model was not compared to a billing period

Annual Use of Domestic Hot Water, Appliances, and Lighting

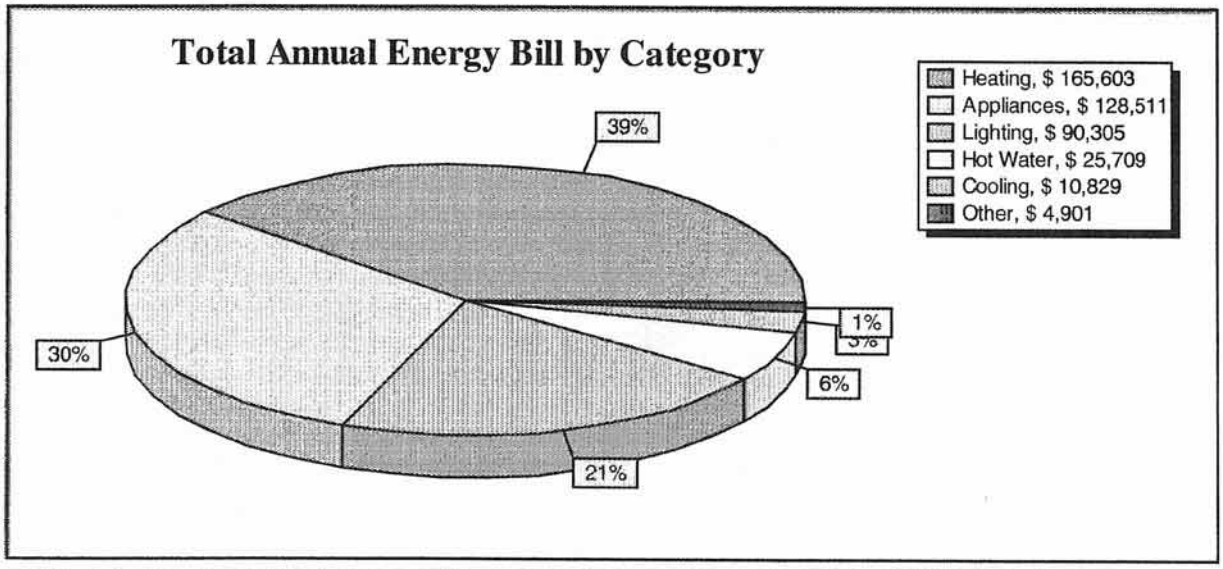
Model Name: Temp Limiting Thermostats

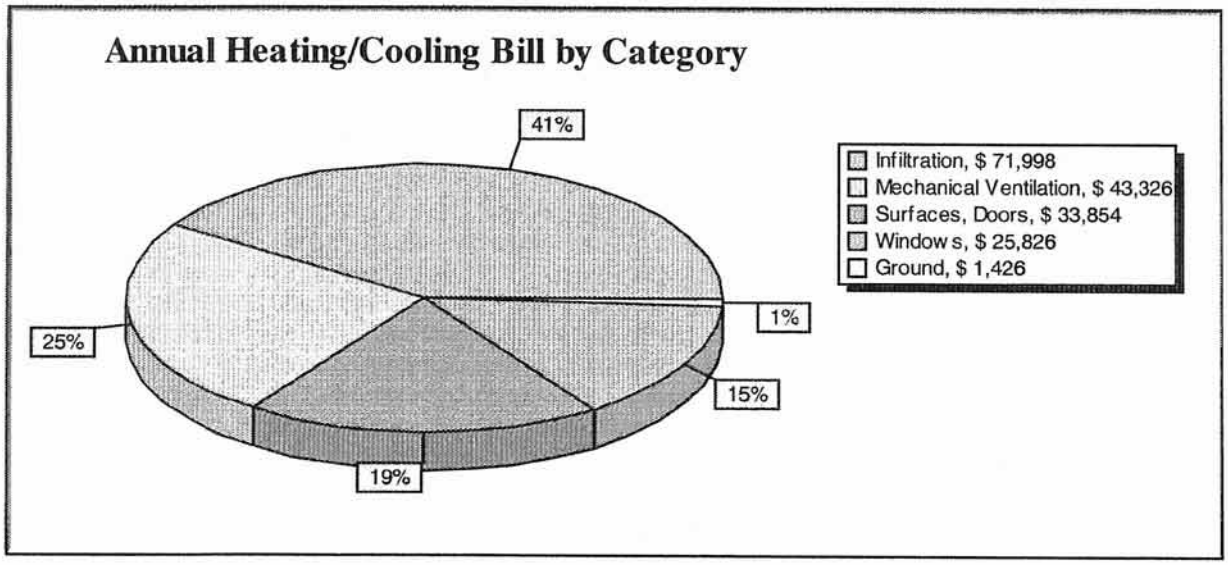
	Electricity $0.15 per kWh		Natural gas $1.11 per Therm				Total
	kWh	$	therms	$			$
1. Domestic Hot Water	0	0	23,161	25,709			25,709
2. Heating Community Rm & Offices	130,680	19,602	0	0			19,602
3. Range, electric	120,400	18,060	0	0			18,060
4. Oven, electric	120,400	18,060	0	0			18,060
5. typical Other Heated Area lighting	118,610	17,792	0	0			17,792
6. typical Other Heated Area lighting	117,822	17,673	0	0			17,673
7. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
8. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
9. Cooling Community Rm & B-Offices	57,408	8,611	0	0			8,611
10. Other	609,883	91,482	915	1,016			92,498
TOTAL	1,452,003	217,800	24,076	26,725			244,525


Base Load Energy Users, $/year
Model Name: Temp Limiting Thermostats
Domestic Hot Water
$25,709
Heating Community Rm & Offices
$19,602
Range, electric
$18,060
Oven, electric
$18,060
typical Other Heated Area lighting
$17,792
typical Other Heated Area lighting
$17,673
Refrigerator-auto def top freezer, 1990 model2
$13,260
Refrigerator-auto def top freezer, 1990 model
$13,260
Cooling Community Rm & B-Offices
$8,611
Other
$92,498

MODEL ENERGY REPORT FOR TEMP LIMITING THERMOSTATS

NBHA Lawlwer Apts
For: NBHA
By:
Date: 8/17/2009





Note: Due to rounding, the sum of percentages may not be equal to 100.

DESIGN HEATING AND COOLING LOADS FOR TEMP LIMITING THERMOSTATS

8/17/2009
Project Name: NBHA Lawlwer Apts

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
Gr Fl Common Tower A	160584	26	18.3	308
2nd Fl Apts Tower B	98753	19	11.2	189
3rd Fl Apts Tower B	102342	19	11.6	196
2nd Fl Commom Tower B	0	0	0.0	0
Community Room	205047	65	23.3	393
Mechanical Spaces T-A	396754	64	45.1	760
1st Fl Common Tower A	29864	12	3.4	58
1st- Apts Tower A	90322	25	10.3	173
Gr Fl Office B Tower	403732	52	45.9	773
Basement Tower B	18413	24	2.1	36
1st Fl Common Tower B	0	0	0.0	0
1st Fl Apts Tower B	85233	24	9.7	164
3rd Fl Commom	0	0	0.0	0
4th-13th Apts Tower B	1236371	26	140.6	2366
4th-13th Common Tower B	0	0	0.0	0
2nd Fl Apts Tower A	113059	21	12.9	217
2nd Fl Common Tower A	0	0	0.0	0
3rd Fl Apts Tower A	115703	22	13.2	222
3rd Fl Common Tower A	0	0	0.0	0
4th-13th Apts Tower A	1398161	29	158.9	2675
4th-13th Common Tower A	0	0	0.0	0

Required Heating Equipment Output Capacity: 5287735 Btu/hr
Available Heating Equipment Output Capacity: 6327100 Btu/hr
Total flow: 528.9 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 65 %
Calculated Distribution Efficiency: 93 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Temp Limiting Thermostats

NBHA Lawlwer Apts

For: NBHA

By:

Date:8/17/2009

Improvement Information:

1. Temp Limiting T-Stats Not Office & Comm Rm

Programmable Thermostat Installation

Install 6 non-programmable Heating only thermostats.
Install 12 non-programmable heating/cooling thermostats.

Non-Energy Benefits: Improve comfort, improve convenience.

Work Scope:

Comply with General Conditions. Submit product information and obtain Owner approval prior to ordering. Thermostat shall have a minimum of two setback periods per day and allow for 7-day programming. Remove existing thermostat and leave with Owner if requested, otherwise dispose off-site in compliance with state and local solid waste regulations, including compliance with hazardous waste regulations for thermostats which contain mercury. Patch and paint surface where existing thermostat was removed, to match existing. Terminate unused existing thermostat wires safely and hidden from view. For removed line-voltage thermostats, disconnect wiring at load and breaker panel, safely terminate wiring, and label disconnected wiring and breakers as "ABANDONED". Install new thermostat 60" above finished floor in location approved by Owner. Level the new thermostat, and ensure that it is securely fastened and installed according to the manufacturer's instructions. Adjust anticipator according to heating system instructions. Test thermostat by cycling it automatically through setup and setback periods. Program the thermostat (temperature and time periods) according to the Owner's instructions. Provide a written report of settings. Provide training to Owner in use of thermostat, including at a minimum: How to change thermostat temperature, how to change program periods, how to temporarily override programmed periods, how to change auto/fan setting (if applicable) and what this does, how to adjust anticipator, and other system-specific features.

Data sheet

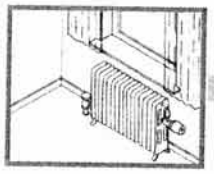
RA 2000 1PS
Thermostatic Radiator Valve
For Use on One-Pipe Low-Pressure Steam Systems

Typical Installation

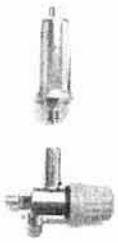
Sample

Dial / Operator / Sensor + Valve

FREE STANDING RADIATORS
The free-standing one-pipe low-pressure steam radiator is positioned where air continually passes freely over the operator



Use standard or tamper resistant model with combined dial/operator/ sensor. Always install the operator horizontally

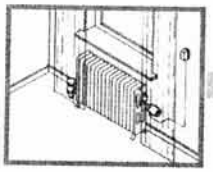


Use air vent

PLUS

1/8" one-pipe steam valve

FREE STANDING RADIATORS
The free-standing one-pipe low-pressure steam radiator is accessible, but air cannot continually pass freely over the operator



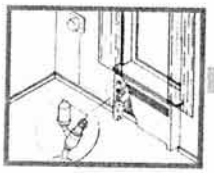
Use dial / operator with remote sensor. The sensor and capillary tube may be extended up to 6' and can be easily wall mounted.

Use air vent

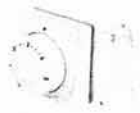
PLUS

1/8" one-pipe steam valve

CONVECTORS
The one-pipe low-pressure steam convector is inaccessible; room air cannot continually pass freely over the valve

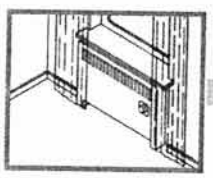


Use operator with combined remote dial / sensor. The dial/sensor and capillary tube may be extended up to 6' and are wall mounted.



Use air vent
PLUS
Two 45° elbows
PLUS
1/8" one-pipe steam valve

ENCLOSED RADIATORS
The cabinet enclosed radiator configuration requires that the dial and sensor be mounted separately, away from the valve



Use operator with separate remote dial and remote sensor. Place the remote sensor beneath the element or on a draft-free wall. The remote dial mounts on the enclosure or wall.

Use air vent

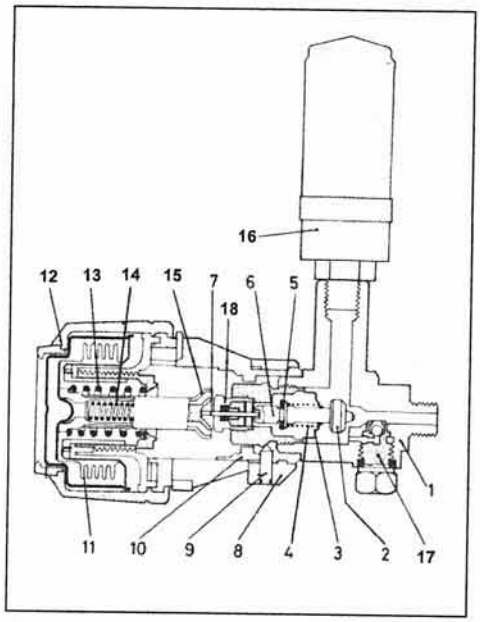
PLUS

1/8" one-pipe steam valve

Data sheet

RA 2000 1PS
Thermostatic Radiator Valve For Use on One-Pipe Low-Pressure Steam Systems

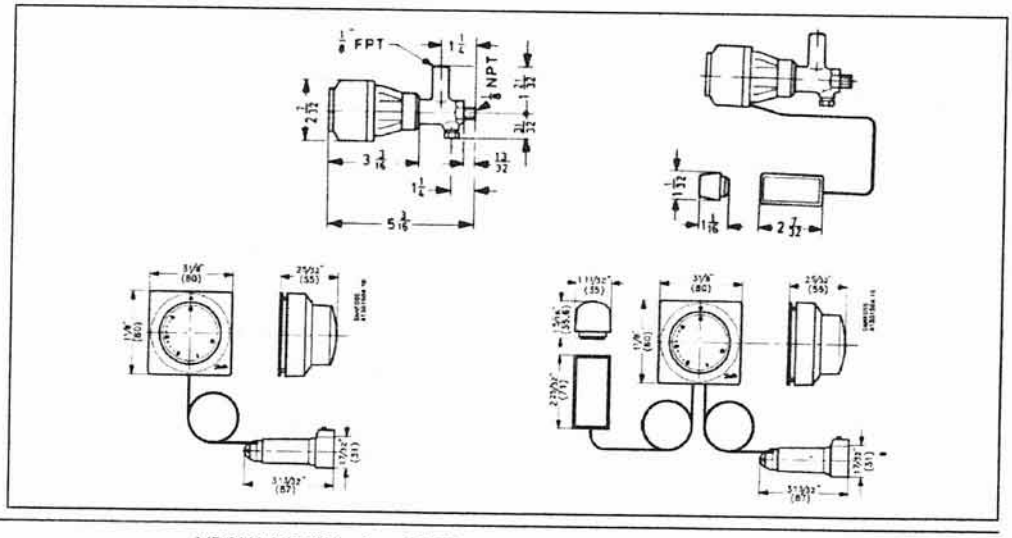
Design & Function



Part	Material
1. Valve	Nickel plated brass
2. Valve Disc	EPDM
3. Spindle guide	Phosphor bronze
4. Spring	Stainless steel
5. Back seat washer	EPDM
6. Valve spindle	Brass
7. Pressure pin	Stainless steel
8. Clamping band	Al. alloy
9. Allenscrew	Steel
10. Socket	Zytel Nylon
11. Bellows	Phosphor bronze
12. Handle	ABS
13. Adjustment spring	Steel
14. Safety spring	Steel
15. Pressure spindle	Polyamide No. 6
16. Air vent	-
17. Retainer	Brass
18. Packing gland	-
Capillary Tube	Steel

- Danfoss' RA 2000 1PS one-pipe steam thermostatic radiator valve provides accurate temperature control and quite operation.
- The movement of air across the thermostatic operator effects the modulation control in regulating the venting of air from the radiator or convector.
- Based on the set temperature on the operator, the 1PS regulates the amount of steam allowed into the emitter by controlling the amount of air allowed to vent out.
- The venting action occurs during each system (boiler) on-cycle only when heat is required. Air will re-enter the system during the boiler off-cycle via a patened "across the seat" vacuum breaker. This eliminates condensate buildup and allows natural system aspiration to take place.
- The RA 2000 1PS assembly is specifically designed for low pressure steam systems. The system pressure should not be constant preventing air to get back into the system.
- Thermostatic radiator valve assembly- valve, thermostatic operator and air vent- can be used for free standing radiators, convectors, and enclosed radiators. 1PS is not recommended for copper fin tube radiators.

Dimensions



Data sheet

RA 2000 1PS
Thermostatic Radiator Valve
For Use on One-Pipe Low-Pressure Steam Systems

Technical Data

Type	Maximum Temperature	Maximum Pressure
RA 2000 1PS	250°F	15psig

RA 2000 Operators

Temp. Range: 45°F-86°F

Max. Sensor Temp.: 140°F

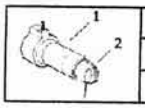
Symbol	Code No.	Description	Sensor	Capillary
	013G8250	Valve mounted dial & sensor	Built-in	-
	013G8252	Valve mounted dial with remote sensor	Remote	6'
	013G8240	Valve mounted dial and sensor, tamper-resistant	Built-in	-
	013G2922	Valve mounted dial with remote sensor, tamper-resistant	Remote	6'
	013G8562	Combined remote mounted dial & sensor	-	6'
	013G8565	Combined remote mounted dial & sensor	-	16'
	013G8568	Combined remote mounted dial & sensor	-	26'
	013G8564	Separate remote mounted dial and sensor	Remote	6' + 6'

Parts & Accessories For RA 2000 Operators:

013G8250
013G8252
013G8240
013G2922

Code No.	Description
013G1236	Screwdriver tool set
013G1215	Limitation pins for RA 8250/52 (30 pcs)
013G1237	Limitation pins for tamper resistant operators RA 8240 / 2922 (30 pcs)
013G5245	Anti-theft protection clips for RA 8250/52 (20 pcs)
013G1232	Locking screw plugs for tamper resistant operators RA 8240 / 2922 (50 pcs).
013G1672	Cover plate for scale window of tamper resistant operators (20 pcs)

013G8562
013G8565
013G8568
013G8564



Position No.	Description	Code No.
1	Socket Body for RA 2000	013G5191
2	Bellows Holder (set of 2 pcs)	013G5503

RA2000 1PS Valve

Design	Code no.	Valve Size	Pattern	Connections Inlet x Outlet
	013G0140	1/8"	1PS	MPT x FTP

Parts & Accessories For RA2000 1PS Valve

Code No.	Description
013L8011	1-pipe steam air vent
013L8300	Brass 45° street elbow for convector
013G0290	Packing gland for valves

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Tunstall Corporation

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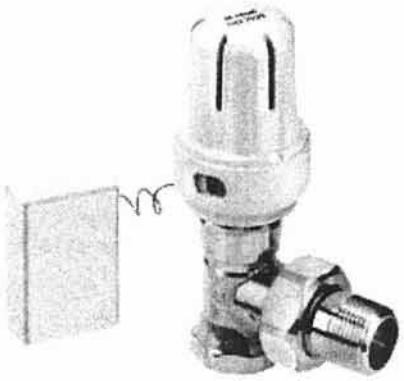
REMOTE SENSOR THERMOSTAT MTWZ

Sample



Operation

The sensor on the MTWZ is wax-filled and the wax volume varies according to ambient temperature. The volume changes are transmitted to the valve stem via a liquid capillary system. The valve body has a return spring which closes the valve when the stem is under low pressure. When the force from the sensor and the return spring are balanced to the room temperature selected, the valve disc stops in that position to allow a certain amount of water or steam to flow through the valve. Ambient temperature changes cause the valve disc to change position and thereby continuously modulate the flow so that the room temperature is maintained at the desired temperature. The unit is secured against damage from over-pressure by a built-in pressure absorbing spring.

Features:

- Valve-mounted setting knob and remote temperature sensor
- Brass sensor, High sensitivity
- Fiberglass valve plug shaft
- Stainless steel capillary tube, 6'6" standard length
- Longer capillary available, consult factory
- Fits all Macon NT series valves
- Replaces the valve-mounted sensors on built-in convectors, etc., and where the valve-mounted sensor is exposed to draft from doors and windows
- Fully automatic - nonelectric, no wiring
- Manufactured to exacting standards using exceptionally high quality materials
- Each sensor is tested and re-checked to achieve exact settings before leaving the factory
- Note that changing the actuator can be accomplished without draining the system
- All Macon thermostats can be locked at or limited to a specific

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CAPACITY TABLES for "NT" SERIES VALVES

STEAM
BTU/hour

P.D.* with 10 PSI Inlet	3.5 C_v 1-1/4" Valves	2.74 C_v 1" Valves	2.5 C_v 3.4" Valves	1.8 C_v 1/2" Valves
1 psi	48,000	39,000	36,000	28,000
3 psi	87,000	70,000	65,000	46,000
5 psi	113,000	91,000	84,000	63,000
7 psi	130,000	104,000	96,000	72,000
10 psi	162,000	130,000	120,000	90,000

***P.D. = Pressure Drop**
Capacity measured with 10 psi inlet preasure.
EDR = Equivalent Direct Radiation (in ft.^{2})
EDR = (BTU/hr) / 240
BTU/hr = 240 x EDR
BTU/hour - lbs. steam/hour x 1000

HOT WATER
BTU/hour**

**Pressure Drop Ft.	P.D. PSI	3.5 C_v 1-1/4" Valves	2.74 C_v 1" Valves	2.5 C_v 3/4" Valves	1.8 C_v 1/2" Valves
1	.43	21,000	17,000	16,500	12,000
2	.87	28,000	23,000	22,000	15,500
4	1.7	44,000	35,000	32,500	23,500
6	2.6	53,000	43,000	40,000	29,000
8	3.5	64,000	51,000	47,000	33,500
10	4.3	70,000	56,000	52,000	37,500
12	5.2	77,000	62,000	57,000	41,000
14	6.1	83,000	67,000	62,000	44,500
16	7.0	88,000	71,000	66,000	47,500

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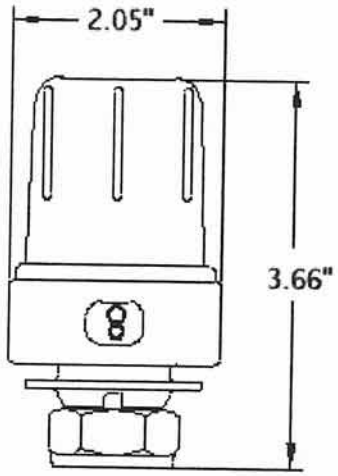
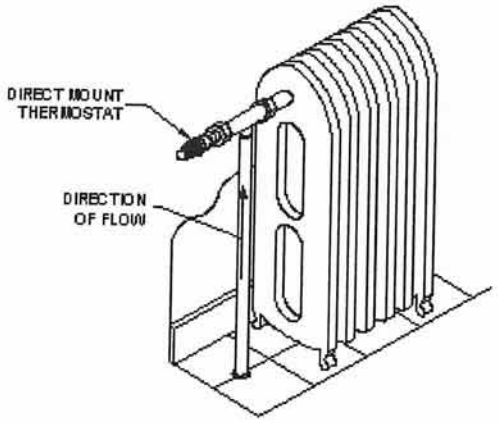
SPECIFICATIONS
MTW



DATA:

Temp. Range: 46° - 82°F
Hystersis: 0.9°F
Heat Transfer: 1.1°F (Valve Housing Sensor)
Dead Time: 0.8 Minutes
Max. Differential Pressure: 20 psi
Suggested Differential Pressure = 0.5 to 2.9 psi
Max. Water Temp.: 250°F
Max. Storage & Ambient Temp.: 122°F
Max. Steam Pressure: 15 psig
Max. Movement: 0.125 inches
Nominal Opening: 0.018 (3.6°F)
Long Term Test: 5000 cycles (1.3°F)



DIAL SETTINGS:

0 = Off
* = 46°F (Frost Protection)

1 = 54°F
3 = 61°F
5 = 68°F
6 = 72°F
7 = 76°F

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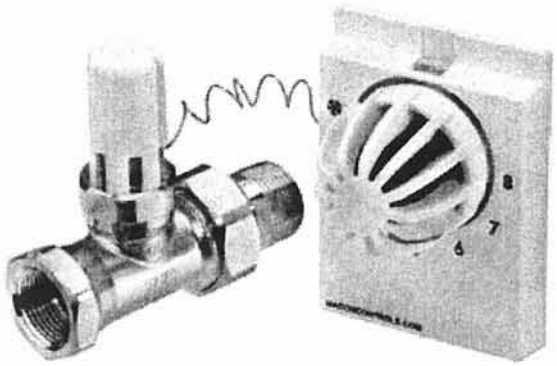
REMOTE SENSOR THERMOSTAT
ENTL B46000



Operation:
The sensor is wax-filled and the wax volume varies according to ambient temperature. The volume changes are transmitted to the valve stem via a liquid capillary system. The valve body has a return spring which closes the valve when the stem is under low pressure. When the force from the sensor and the return spring are balanced to the room temperature selected, the valve disc stops in that position to allow a certain amount of water or steam to flow through the valve. Temperature changes cause the valve disc to change position and thereby continuously modulate the flow so that the room temperature is maintained at the desired temperature. The unit is secured against damage from over pressure by a pressure absorbing spring.

SPECIFICATIONS - ENTL B46000

Features:	
Combined remote dial/sensor	Small dimensions
Brass sensor, High sensitivity	Manufactured to exacting standards using exceptionally high quality materials
Fiberglass valve plug shaft	Each sensor is tested and re-checked to achieve exact settings before leaving the factory
Stainless steel capillary tube, 6'6" standard length	Note that changing of the actuator can be accomplished without draining the system
Longer capillary available, consult factory	All Macon thermostats can be locked at or limited to a specific temperature or temperature range
Fits all Macon NT series valves	Simple one-trade installation
Replaces the valve-mounted	All Macon valves and thermostats conform

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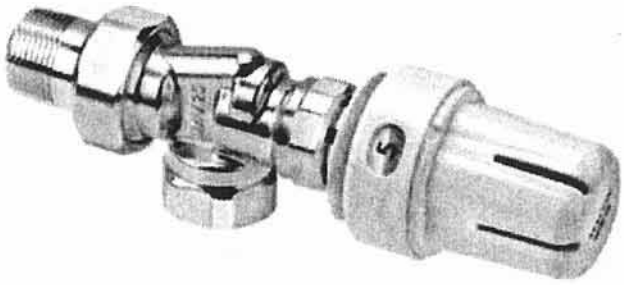
DIRECT MOUNT OPERATOR MTW



The Macon MTW thermostatic valve will help you balance your heating system. The MTW operator has one of the most accurate sensors available for radiator temperature control. The problems of overheating, underheating and wide temperature swings can now be minimized.

The MTW thermostatic valve by Macon Controls conserves energy by regulating temperature. Fuel costs can be reduced up to 30%!

The MTW is a self-acting adjustable non-electric thermostatic operator. It has an anti-freeze position, adjustable max./min. temperature settings, selected temperature locking feature and can be shutoff completely if desired. Each MTW thermostatic operator is individually calibrated and conforms to ASHRAE standardization rules for temperature regulation. The MTW's smooth shape with narrow air gaps is a very functional design and allows for easy cleaning. The MTW can be mounted on all Macon NT series valves. Millions are in use throughout the world.

SPECIFICATIONS - MTW

Max, Min Setting - MTW

Toll Free:1-800-423-5578
Tunstall Corporation - 118 Exchange Street - Chicopee, MA 01013
Phone:(413)594-8695 - Fax:(413)598-8109

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-4 Install Control Valves

Install new 3/4" self contained control valves on the existing 3/4" steam fin tube radiation.
Control valve to have a capillary and wall mounted thermostat for controlling space temperature.

Multipliers*	
Material:	1.00
**Labor:	1.22
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Install 3/4" control valve and thermostat.	432	ea.	$ 100	$ 90		$ 43,200	$ 47,434	$ -	$ 90,634	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 90,634	Subtotal
$ 9,063	10% Contingency
$ 14,955	Contractor 15% O&P
$ -	0% Engineering
$ 114,652	**Total**

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey
**Multiplier for Mechanical Labor specific to Newark, New Jersey area.

APPENDIX K

ECM-5 Install Door Seals

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-5 Install Door Seals

Existing: Doors or Door Seals result in excessive heat loss and infiltration
Proposed: Install new doors and/or weatherstripping to eliminate door infiltration
Bib Data for Newark, New Jersey

Bin Dry Bulb Temp. F	Bin Wet Bulb Temp. F	Enthalpy Btu/ lb.a Ha	Humidity Ratio lb/lb.a	Grains / lb.a	Specific Volume Cu. Ft./ lb.a	Delta T - F	Specific Heat BTU/Hr.-lb.a- F	Conversion Factor	Break Point Enthalpy Hb	Delta Enthalpy Ha-Hb	Mass Flow	Cooling Load BTUH	Heating Load BTUH	Hours of Operation / Yr.	BTU / Year	Therm / Year	Yearly Operating Cost (Heating)	Yearly Operating Cost (Cooling)
90	72.2	37.1	0.0112	90.177	14.2	20	0.24	1.01	21.1	16	337.18	5,395		37	199,612	2		$0.30
85	67.7	32.1	0.0104	73.821	13.9	15	0.24	1.04	21.1	11	344.46	3,789		131	496,367	5		$0.74
80	65.1	30.1	0.0098	68.81	13.7	10	0.24	1.05	21.1	9	349.49	3,145		500	1,572,701	16		$2.36
75	62.6	28.1	0.0092	64.95	13.65	5	0.24	1.05	21.1	7	350.77	2,455		620	1,522,338	15		$2.28
70	60.1	26.6	0.0088	61.68	13.55	0	0.24	1.06	21.1	5.5	353.36	1,943		664	1,290,463	13		$1.94
65	57.6	24.5	0.0084	58.97	13.4	5	0.24	1.07	21.1	3.4			429	854	366,175	4	$4.03	
60	55	23.1	0.0081	56.37	13.3	10	0.24	1.08	21.1	2			864	927	800,928	8	$8.81	
55	52.5	21.5	0.0078	54.665	13.2	15	0.24	1.09	21.1	0.4			1,306	600	783,491	8	$8.62	
50	50	20.3	0.0076	53.4	13	20	0.24	1.11	26.6	-6.3			1,768	610	1,078,405	11	$11.86	
45	45	17.5	0.0063	44.152	12.8	25	0.24	1.13	26.6	-9.1			2,244	611	1,371,313	14	$15.08	
40	40	15.5	0.0052	36.36	12.7	30	0.24	1.13	26.6	-11.1			2,714	656	1,780,684	18	$19.59	
35	35	13	0.0043	29.82	12.6	35	0.24	1.14	26.6	-13.6			3,192	1023	3,265,416	33	$35.92	
30	30	11	0.0035	24.09	12.4	40	0.24	1.16	26.6	-15.6			3,707	734	2,720,820	27	$29.93	
25	25	8.75	0.0028	19.06	12.3	45	0.24	1.17	26.6	-17.85			4,204	334	1,404,169	14	$15.45	
20	20	6.75	0.0022	15.01	12.2	50	0.24	1.18	26.6	-19.85			4,710	252	1,186,796	12	$13.05	
15	15	5.5	0.0017	11.77	12	55	0.24	1.20	26.6	-21.1			5,267	125	658,350	7	$7.24	
10	10	3.5	0.0013	9.174	11.8	60	0.24	1.22	26.6	-23.1			5,843	47	274,620	3	$3.02	
5	5	2	0.001	7.116	11.5	65	0.24	1.25	26.6	-24.6			6,495	22	142,891	1	$1.57	
1	1	1	0.0008	5.49	11.2	69	0.24	1.29	26.6	-25.6			7,079	13	92,032	1	$1.01	
										Total		16,728	47,223	8760		Total	$162.35	$7.62

	Heating Hours	4427	Total Seasonal Heating - BTU / Yr.	15,926,089
	Cooling Hours	4333	Average BTUH	3,597
Old Door Leakage - CFM	133		Therms / Hr.	0.04
New Door Leakage - CFM	53.2		Therms / Year	159
			Cost / Year	$162.35
Leakage Reduction - CFM	79.8		Cost / CFM	$2.03
			Total Seasonal Cooling - BTU / Yr.	5,081,482
			Average BTUH	1,173
Assumptions:			Therms / Hr.	0.01
Average Space Temperature	70		Therms / Year	51
			Cost / Year	$7.62
			Cost / CFM	$0.10
			Therm (Btu) Conversion	100,000
			Cost Per Therm	$1.10
			Cost Per KW/H	$0.1500
			Total Operating Cost Savings	$231.08
			Total Therms per Year	210

Door Dimensions	Width	Height	No. of Doors	Perimeter Dimen.	Leakage / L.F. for Bad Door	Leakage / L.F. for Good Door	Old Door Leakage	New Door Leakage
Single	3	7	10	20	0.5	0.2	100	40
Double	6	7	2	33	0.5	0.2	33	13.2

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-5 Install Door Seals

Multipliers *	
Material:	1.00
**Labor:	1.22
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
									$ -	
Door Seals (3'x7')	10	ea	$ 35	$ 50	$ -	$ 350	$ 610	$ -	$ 960	
Door Seals (double door - 6' x 7')	2	ea	$ 65	$ 100	$ -	$ 130	$ 244	$ -	$ 374	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey
**Multiplier for Carpentry Labor specific to the Newark, New Jersey area.

$	1,334	Subtotal
$	133	10% Contingency
$	220	Contractor 15% O&P
$	-	0% Engineering
$	1,688	**Total**

APPENDIX L

ECM-6 Insulate Steam and Condensate Piping

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-6 Piping Insulation (Bare Pipe)

Description Insulate the low pressure condensate piping which are not currently insulated to reduce heat loss from piping and heat gain to the spaces.

Given

		Pipe #1	Pipe #2	Pipe #3	Pipe #4	
Fuel Energy Cost	=				$ 1.10	$/Therm (Nat'l Gas)
Operation (Hours/Week)	=				168.00	Hours/Week
Operation (Heating Weeks/Year)	=				28.00	Weeks/Year
Operation (Hours/Year)	=				4704	Hours/Year
Heating Media	=				Water	
Piping Material	=				Mild Steel	
Ambient Temperature	=				65	°F
Pipe Diameter	=	3/4	1 1/2	8	2	
Pipe Length	=	1000.00 feet	900.00 feet	36.00 feet	0.00 feet	

Assumption

		Pipe #1	Pipe #2	Pipe #3	Pipe #4	
Min. Pipe Insulation Recommended	=	1.50 inches	1.50 inches	1.50 inches	1.50	inches
Circulating Temperature	=				210	4 °F
Heating Efficiency	=				65%	
Pipe Insulation Conductivity	=				0.29	Btu*in./(h*ft2*F)

Formula

Piping Correction Factor = (Current Transmission Coefficient / Reference Transmission Coefficient)
Temperature Correction Factor = (Circulating Temperature - Ambient Temperature) / (Circulating Temperature - Reference Temperature)
Hourly Heat Loss per pipe size and length = (Heat loss per foot [from chart]) x (Piping Correction Factor) x (Temperature Correction Factor) x (Pipe Length)
Seasonal Heat Loss = (Hourly Heat Loss Total) x (Operating hours) / (Heating Efficiency) / (1,000 btu/Mbtu)

Energy Loss = (Seasonal Heat Loss) / (Conversion Factor [MBtu/Unit])
Energy Loss Cost = (Energy Loss) x (cost/unit)

Calculation

Existing

Piping Correction Factor = (Current Transmission Coefficient 2.00 / Reference Transmission Coefficient 2.00) = **1.00**

Temperature Correction Factor = (Circulating Temp. 210 - Ambient Temp. 65) / (Circulating Temp. 210 - Reference Temp. 80) = **1.12**

	Heat Loss per foot	Piping CF	Temperature CF	Pipe Length		
Heat Loss Pipe #1 (Hourly)	= (104.78) x	1.00) x (	1.12) x (	1000.00) =	116,870	Btuh
Heat Loss Pipe #2 (Hourly)	= (179.28) x	1.00) x (	1.12) x (	900.00) =	179,970	Btuh
Heat Loss Pipe #3 (Hourly)	= (716.02) x	1.00) x (	1.12) x (	36.00) =	28,751	Btuh
Heat Loss Pipe #4 (Hourly)	= (219.69) x	1.00) x (	1.12) x (	0.00) =	-	Btuh
					325,590	**Btuh**

	Hourly Heat Loss	operating Hours	Heating Efficiency	Factor		
Seasonal Heat Loss	= 325,590) x (	4,704) / (	65%) / (	1,000) =	**2,356,273**	**Mbtu**

	Seasonal Heat Loss	Btu/unit		
Existing Energy Loss	2,356,273) / (	100) =	**23,563**	**Therm**

	Unit	Cost per Unit	
Existing Energy Loss Cost	= (23,563) x (	$ 1.10) =	**$ 25,919**

New

	Heat Loss per foot	Piping CF	Temperature CF	Pipe Length		
Heat Loss Pipe #1 (Hourly)	= (16.10) x	1.00) x (	1.12) x (	1000.00) =	17,958	Btuh
Heat Loss Pipe #2 (Hourly)	= (20.19) x	1.00) x (	1.12) x (	900.00) =	20,268	Btuh
Heat Loss Pipe #3 (Hourly)	= (32.60) x	1.00) x (	1.12) x (	36.00) =	1,309	Btuh
Heat Loss Pipe #4 (Hourly)	= (20.00) x	1.00) x (	1.12) x (	0.00) =	-	Btuh
					39,534	**Btuh**

	Hourly Heat Loss	operating Hours	Heating Efficiency	Factor		
Seasonal Heat Loss	= 39,534) x (	4,704) / (	65%) / (	1,000) =	**286,107**	**Mbtu**

	Seasonal Heat Loss	Btu/unit		
New Energy Loss	286,107) / (	100) =	**2,861**	**Therm**

	Unit	Cost per Unit	
New Energy Loss Cost	= 2,861) x (	$ 1.10) =	**$ 3,147**

Result

Existing Heat Loss		**23,563**	**Therm**	**$ 25,919**	
New Heat Loss		**2,861**	**Therm**	**$ 3,147**	
Savings	**100%**	**20,702**	**Therm**	**$ 22,772**	**87.9%**

Comment

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-6 Piping Insulation (Bare Pipe)

Multipliers*	
Material:	1.00
**Labor:	1.22
Equipment:	1.00

Description	QTY	UNIT	INIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Insulate 3/4" BS Pipe w/ 1-1/2"	1140	L.F.	$ 1.68	$ 2.89		$ 1,915	$ 4,019	$ -	$ 5,935	Means Mech. Cost Data 2009.
insulation.						$ -	$ -	$ -	$ -	
Insulate 11/2" BS Pipe w/ 1-1/2"	1020	L.F.	$ 1.80	$ 3.02		$ 1,836	$ 3,758	$ -	$ 5,594	Means Mech. Cost Data 2009.
insulation.						$ -	$ -	$ -	$ -	
Insulate Heatwell Tank	15	L.F.	$ 34	$ 27		$ 510	$ 485	$ -	$ 995	Means Mech. Cost Data 2009.
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey

**Multiplier for Mechanical Labor specific to the Newark, New Jersey area.

$ 12,524	Subtotal
$ 2,505	20% Contingency
$ 2,254	15% Contractor O&P
$ -	0% Engineering
$ 17,283	**Total**

APPENDIX M

ECM-7 Air Conditioner Changeout

YOUR SUMMARY

This report addresses the key recommendations for improving the comfort, safety and efficiency of your home. You should use it as a guide for deciding what work you want to have done. Remember, your Home Performance Contractor is ready to complete these projects promptly, and the work is guaranteed.

Selected Packages

Measure Description	Non-energy benefits	Package1	Package2	Package3
A/C Window Replacement with 12 EER : Install 12 SEER 290,000 Btu/hr cooling system. Reuse existing distribution system.	Increase value of building.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 2,529		
Annual KWh Savings, KWh		16,861		
Total Energy Savings, MMBtu		57.5		
Simple annual payback, years		NA		
Savings to Investment Ratio		NA		

The following fuel prices were used to estimate annual energy cost savings, payback and savings to investment ratio:

- Natural gas: 1.1100 $/Therm
- Electricity: 0.1500 $/kWh

Base Load Report

Customer Information

Customer Name: NBHA

Address: 6121/3131 Grand Avenue
North Bergen, NJ 07047

Billing Period: None

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 8/17/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Ac Unit Window Replacement with 12 EER

Billing Period Name: None

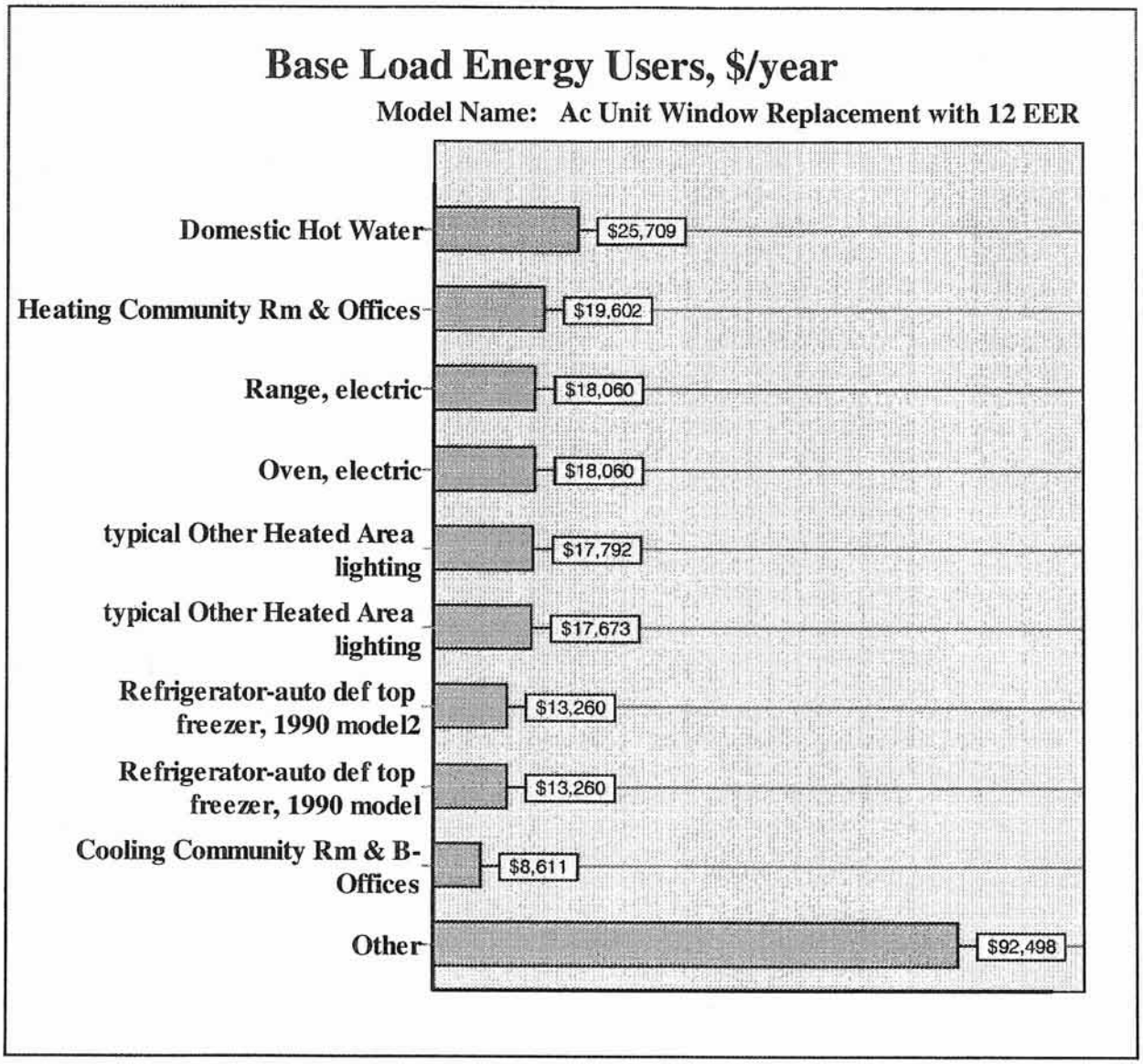
	Electricity		Natural gas			
	kWh	$	Therm	$		
Model	1,484,677	222,702	24,076	26,724		
Billing						
% Difference						

Note: No billing data is available because the model was not compared to a billing period

Annual Use of Domestic Hot Water, Appliances, and Lighting

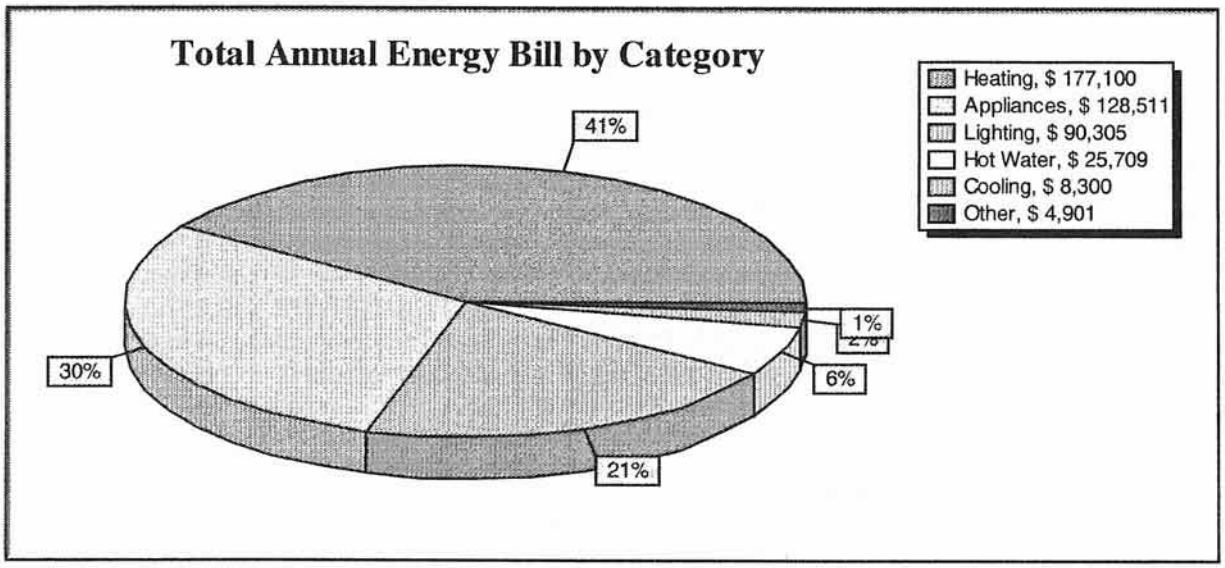
Model Name: Ac Unit Window Replacement with 12 EER

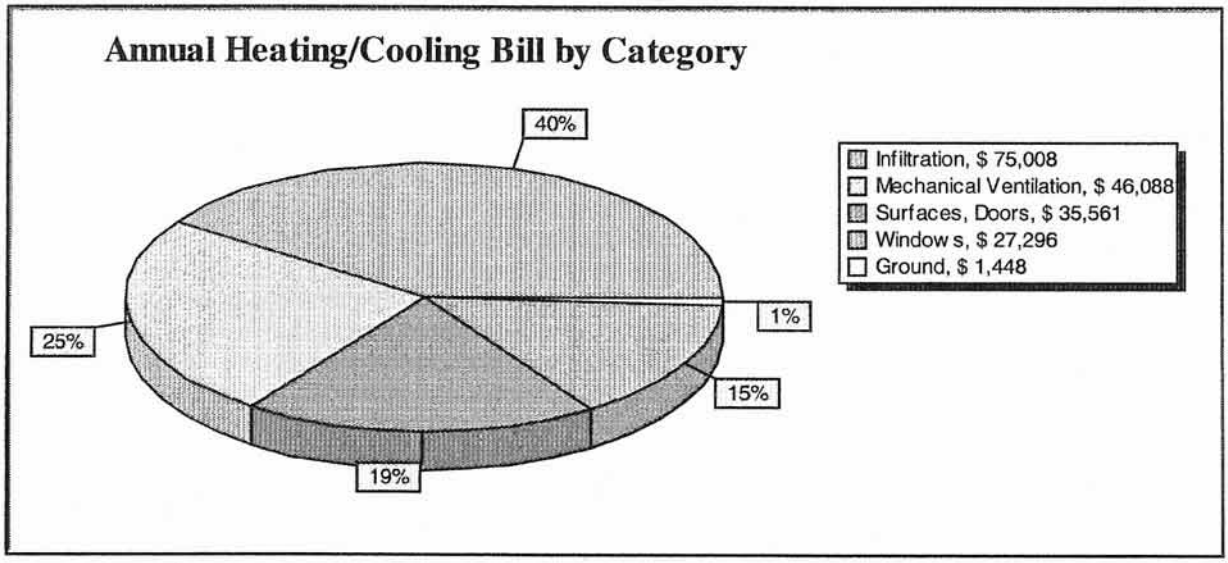
	Electricity $0.15 per kWh		Natural gas $1.11 per Therm				Total
	kWh	$	therms	$			$
1. Domestic Hot Water	0	0	23,161	25,709			25,709
2. Heating Community Rm & Offices	130,680	19,602	0	0			19,602
3. Range, electric	120,400	18,060	0	0			18,060
4. Oven, electric	120,400	18,060	0	0			18,060
5. typical Other Heated Area lighting	118,610	17,792	0	0			17,792
6. typical Other Heated Area lighting	117,822	17,673	0	0			17,673
7. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
8. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
9. Cooling Community Rm & B-Offices	57,408	8,611	0	0			8,611
10. Other	609,883	91,482	915	1,016			92,498
TOTAL	1,452,003	217,800	24,076	26,725			244,525


Base Load Energy Users, $/year
Model Name: Ac Unit Window Replacement with 12 EER
Domestic Hot Water
$25,709
Heating Community Rm & Offices
$19,602
Range, electric
$18,060
Oven, electric
$18,060
typical Other Heated Area lighting
$17,792
typical Other Heated Area lighting
$17,673
Refrigerator-auto def top freezer, 1990 model2
$13,260
Refrigerator-auto def top freezer, 1990 model
$13,260
Cooling Community Rm & B-Offices
$8,611
Other
$92,498

MODEL ENERGY REPORT FOR AC UNIT WINDOW REPLACEMENT WITH 12 EER

NBHA Lawlwer Apts
For: NBHA
By:
Date: 8/17/2009





Note: Due to rounding, the sum of percentages may not be equal to 100.

DESIGN HEATING AND COOLING LOADS FOR AC UNIT WINDOW REPLACEMENT WITH 12 EER

8/17/2009
Project Name: NBHA Lawlwer Apts

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
Gr Fl Common Tower A	166444	27	18.9	319
2nd Fl Apts Tower B	102364	19	11.6	196
3rd Fl Apts Tower B	105945	20	12.0	203
2nd Fl Commom Tower B	0	0	0.0	0
Community Room	205047	65	23.3	393
Mechanical Spaces T-A	396754	64	45.1	760
1st Fl Common Tower A	31227	13	3.5	60
1st- Apts Tower A	93445	26	10.6	179
Gr Fl Office B Tower	403732	52	45.9	773
Basement Tower B	19203	25	2.2	37
1st Fl Common Tower B	0	0	0.0	0
1st Fl Apts Tower B	88223	24	10.0	169
3rd Fl Commom	0	0	0.0	0
4th-13th Apts Tower B	1280775	27	145.6	2451
4th-13th Common Tower B	0	0	0.0	0
2nd Fl Apts Tower A	116662	22	13.3	224
2nd Fl Common Tower A	0	0	0.0	0
3rd Fl Apts Tower A	119730	23	13.6	230
3rd Fl Common Tower A	0	0	0.0	0
4th-13th Apts Tower A	1442561	30	164.0	2760
4th-13th Common Tower A	0	0	0.0	0

Required Heating Equipment Output Capacity: 5424734 Btu/hr
Available Heating Equipment Output Capacity: 6327100 Btu/hr
Total flow: 542.6 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 65 %
Calculated Distribution Efficiency: 93 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
Gr Fl Common Tower A	110762	4030
2nd Fl Apts Tower B	70500	2565
3rd Fl Apts Tower B	66013	2402
2nd Fl Commom Tower B	0	0
Community Room	87420	3180
Mechanical Spaces T-A	0	0
1st Fl Common Tower A	64367	2342
1st- Apts Tower A	57465	2091
Gr Fl Office B Tower	219345	7979
Basement Tower B	6271	229
1st Fl Common Tower B	130099	4733
1st Fl Apts Tower B	57589	2095
3rd Fl Commom	0	0
4th-13th Apts Tower B	822976	29937
4th-13th Common Tower B	0	0
2nd Fl Apts Tower A	51676	1880
2nd Fl Common Tower A	0	0
3rd Fl Apts Tower A	67962	2473
3rd Fl Common Tower A	0	0
4th-13th Apts Tower A	661186	24052
4th-13th Common Tower A	0	0

Required Cooling Equipment Output Capacity: 2562708 Btu/hr
Available Cooling Equipment Output Capacity: 290000 Btu/hr
Total flow: 84746 CFM
Cooling Equipment Efficiency: 12 SEER
Calculated Distribution Efficiency: 99%
Temperature Drop: 28 F
Cooling Safety Factor: 1.10
Distribution Safety Factor: 1.10
COOLING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED COOLING LOAD.

Notes:

1. The room heating/cooling loads do not include the equipment and distribution safety factor and distribution losses
2. The room distribution includes distribution safety factor.
3. The load on the room is the peak load for this room in a year.
4. Available equipment output capacity includes equipment efficiency.
5. Required equipment output capacity includes diversity, distribution losses and equipment safety factor.
6. Overall distribution CFM/GPM for heating/cooling includes equipment safety factor, distribution losses and diversity.

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Ac Unit Window Replacement with 12 EER

NBHA Lawlwer Apts

For: NBHA

By:

Date:8/17/2009

Improvement Information:

1. A/C Window Replacement with 12 EER

Cooling System Improvement

Input Capacity, Btu/Hr	290000
SEER	12

Non-Energy Benefits: Increase value of building.

Work Scope:

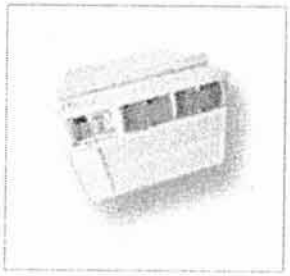
Comply with general conditions. Submit product information to owner for approval in writing prior to ordering. Remove existing air conditioning system safely and completely. Patch and paint where existing equipment was removed to match existing surfaces. Perform complete load sizing of the building prior to selecting replacement equipment, using standard methods such as ACCA manual J, or ASHRAE. Size new equipment according to this load sizing, and not according to the size of removed equipment. Provide a written copy of load sizing and assumptions for approval by the owner prior to ordering equipment. Size distribution system according to standard methods. Install forced air system securely and level. Securely fasten system to duct work with mechanical fasteners and seal. Install locking balancing dampers. Install a clean air filter. Duct sealing and insulation shall comply with standards described in the separate duct sealing and duct insulation work scopes. After installation is complete, measure and record air temperature change. Ensure that these measurements are within the manufacturer's requirements. Balance distribution system by measuring air supply to all grilles and adjusting manual balancing dampers. Set anticipator at thermostat. Charge per manufacturer's instructions. Measure and adjust superheat, subcooling, saturated suction temperature, saturated condensing temperature, compressor amps, outside air temperature, return air temperature, and supply air temperature. Provide training to the owner in the use of the system and thermostat. Deliver to the owner users manual, including measurement reports, warranties, and approved submittals.

Room Air Conditioners for Consumers

(Are you a partner? For Partners)

If every room air conditioner sold in the U.S. were ENERGY STAR qualified, it would prevent 1.3 billion pounds of greenhouse gas emissions - the equivalent emissions from 115,000 cars.

Earning the ENERGY STAR means a product meets strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.



- ENERGY STAR qualified room air conditioners use at least 10% less energy than conventional models.
- ENERGY STAR qualified room air conditioners often include timers for better temperature control, allowing you to use the minimum amount of energy you need to cool your room.

Remember, saving energy prevents pollution. By choosing ENERGY STAR, you are helping prevent global warming and promoting cleaner air without sacrificing the product quality and performance you expect.

You may also be interested to know that many people buy an air conditioner that is too large. ENERGY STAR suggests making sure your unit is properly sized.

FIND A PRODUCT

FIND A STORE

SPECIAL OFFERS

ROOM AIR CONDITIONERS FOR PARTNERS

Resources

Qualified Room Air Conditioners
Excel | Text (CSV) | HTML

Definitions of Product List Column Headers

Purchasing Tips

Manufacturer List

Room AC FAQs

Savings Calculator

Key Product Criteria

APPENDIX N

ECM-8 Night Setback for Offices and Community Room

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-9 Community Room and Office Night Setback

Utility Costs	$ 0.15
kW/Ton	1.2

Community Room Capacity	21.6	16.2
Office Area Capacity	26.4	19.8
Total	48	36
	1,196	3,690
	57,408	**130,680**

NYC Bin Hours above and below balance temp

100,000 Btu/Therm
55 Balance Temp

Inputs

		Current	Proposed
Operating Hours	Hr per Day	24	9
	Day per Wk	7	6
	Wk per Yr	52	52
Annual Operating Hours		8,736	2,808
Occupied Hours	Hr per Day	9	9
	Day per Wk	6	6
	Wk per Yr	52	52
Annual Occupied Hours		2,808	2,808
Occupancy Rate		32%	100%

Fuel Costs		
Winter	$ -	/Therm
Summer	$ -	/Therm
Heating Efficiency	100%	
Cooling Efficiency	1.20	kW/ton
Cooling Efficiency	1.20	kW/ton

Proposed Night Setback Optimization

		Unit	Current Heating	Current Cooling	Proposed Heating	Proposed Cooling
Total Capacity		kWh	130,680	57,408	130,680	57,408
Capacity to be Setback		%	100%	100%	100%	100%
		BTU/hr	130,680	57,408	130,680	57,408
Design Point		F DB	5	90	5	95
Total Load		BTU/hr F	2,614	1,435	2,614	1,435
Dead band		F DB	5	0	5	0
Setpoints	Occ.	F DB	72	75	72	75
	Unocc.	F DB	72	75	60	80
Balance Point		F DB	55	55	55	55

Savings

	Heating Therm	Cooling Therm	Cooling Kwh	Heating kWh
Current	2,445	499		
Proposed	786	160		
Energy Savings	1,659	339	3,387	16,590
Cost Savings	$0	$0	$508	$2,488

Total **$2,997**

Calculation

Occupied

Mean Temperature	Binned Hours	Adjusted Hours Current	Adjusted Hours Proposed
°F db	Hrs	Hrs	Hrs
92.5	1	1.0	0.3
87.5	34	33.9	10.9
82.5	77	76.8	24.7
77.5	366	365.0	117.3
72.5	718	716.0	230.2
67.5	802	799.8	257.1
62.5	759	756.9	243.3
57.5	830	827.7	266.1
52.5	754	751.9	241.7
47.5	789	786.8	252.9
42.5	562	560.5	180.1
37.5	629	627.3	201.6
32.5	909	906.5	291.4
27.5	788	785.8	252.6
22.5	322	321.1	103.2
17.5	223	222.4	71.5
12.5	122	121.7	39.1
7.5	50	49.9	16.0
2.5	20	19.9	6.4
-2.5	5	5.0	1.6
-7.5	0	-	-
Total	8,760	8,736	2,808

Current

Occ. Hours	Status Heating	Status Cooling	Heating Load	Cooling Load	Energy Therm	Energy Therm
Hrs			BTU/hr	BTU/hr	Therm	Therm
0.3	0	1	-	53,820	-	0
10.9	0	1	-	46,644	-	4
24.7	0	1	-	39,468	-	8
117.3	0	1	-	32,292	-	32
230.2	0	1	-	25,116	-	48
257.1	0	1	-	17,940	-	38
243.3	0	1	-	10,764	-	22
266.1	0	1	-	3,588	-	8
241.7	0	0	-	-	-	-
252.9	1	0	19,602	-	50	-
180.1	1	0	32,670	-	59	-
201.6	1	0	45,738	-	92	-
291.4	1	0	58,806	-	171	-
252.6	1	0	71,874	-	182	-
103.2	1	0	84,942	-	88	-
71.5	1	0	98,010	-	70	-
39.1	1	0	111,078	-	43	-
16.0	1	0	124,146	-	20	-
6.4	1	0	137,214	-	9	-
1.6	1	0	150,282	-	2	-
-	1	0	163,350	-	-	-
2,808	12	8	1,097,712	229,632	786	160

Proposed

Occ. Hours	Status Heating	Status Cooling	Heating Load	Cooling Load	Energy Therm	Energy Therm
Hrs			BTU/hr	BTU/hr	Therm	Therm
0.3	0	1	-	53,820	-	0
10.9	0	1	-	46,644	-	4
24.7	0	1	-	39,468	-	8
117.3	0	1	-	32,292	-	32
230.2	0	1	-	25,116	-	48
257.1	0	1	-	17,940	-	38
243.3	0	1	-	10,764	-	22
266.1	0	1	-	3,588	-	8
241.7	0	0	-	-	-	-
252.9	1	0	19,602	-	50	-
180.1	1	0	32,670	-	59	-
201.6	1	0	45,738	-	92	-
291.4	1	0	58,806	-	171	-
252.6	1	0	71,874	-	182	-
103.2	1	0	84,942	-	88	-
71.5	1	0	98,010	-	70	-
39.1	1	0	111,078	-	43	-
16.0	1	0	124,146	-	20	-
6.4	1	0	137,214	-	9	-
1.6	1	0	150,282	-	2	-
-	1	0	163,350	-	-	-
2,808	12	8	1,097,712	229,632	786	160

Unoccupied

Mean Temperature	Binned Hours	Adjusted Hours Current	Adjusted Hours Proposed
°F db	Hrs	Hrs	Hrs
92.5	1	1.0	0.3
87.5	34	33.9	10.9
82.5	77	76.8	24.7
77.5	366	365.0	117.3
72.5	718	716.0	230.2
67.5	802	799.8	257.1
62.5	759	756.9	243.3
57.5	830	827.7	266.1
52.5	754	751.9	241.7
47.5	789	786.8	252.9
42.5	562	560.5	180.1
37.5	629	627.3	201.6
32.5	909	906.5	291.4
27.5	788	785.8	252.6
22.5	322	321.1	103.2
17.5	223	222.4	71.5
12.5	122	121.7	39.1
7.5	50	49.9	16.0
2.5	20	19.9	6.4
-2.5	5	5.0	1.6
-7.5	0	-	-
Total	8,760	8,736	2,808

Unocc. Hours	Status Heating	Status Cooling	Heating Load	Cooling Load	Energy Therm	Energy Therm
Hrs			BTU/hr	BTU/hr	Therm	Therm
0.7	0	1	-	53,820	-	0
23.0	0	1	-	46,644	-	9
52.1	0	1	-	39,468	-	17
247.7	0	1	-	32,292	-	67
485.9	0	1	-	25,116	-	102
542.7	0	1	-	17,940	-	81
513.6	0	1	-	10,764	-	46
561.7	0	1	-	3,588	-	17
510.2	0	0	-	-	-	-
533.9	1	0	19,602	-	105	-
380.3	1	0	32,670	-	124	-
425.7	1	0	45,738	-	195	-
615.1	1	0	58,806	-	362	-
533.2	1	0	71,874	-	383	-
217.9	1	0	84,942	-	185	-
150.9	1	0	98,010	-	148	-
82.6	1	0	111,078	-	92	-
33.8	1	0	124,146	-	42	-
13.5	1	0	137,214	-	19	-
3.4	1	0	150,282	-	5	-
-	1	0	163,350	-	-	-
5,928	12	8	1,097,712	229,632	1,659	339

Unocc. Hours	Status Heating	Status Cooling	Heating Load	Cooling Load	Energy Therm	Energy Therm
Hrs			BTU/hr	BTU/hr	Therm	Therm
-	0	1	-	53,820	-	-
-	0	1	-	46,644	-	-
-	0	1	-	39,468	-	-
-	0	1	-	32,292	-	-
-	0	1	-	25,116	-	-
-	0	1	-	17,940	-	-
-	0	1	-	10,764	-	-
-	0	1	-	3,588	-	-
-	0	0	-	-	-	-
-	1	0	19,602	-	-	-
-	1	0	32,670	-	-	-
-	1	0	45,738	-	-	-
-	1	0	58,806	-	-	-
-	1	0	71,874	-	-	-
-	1	0	84,942	-	-	-
-	1	0	98,010	-	-	-
-	1	0	111,078	-	-	-
-	1	0	124,146	-	-	-
-	1	0	137,214	-	-	-
-	1	0	150,282	-	-	-
-	1	0	163,350	-	-	-
-	12	8	1,097,712	229,632	-	-

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-8 Night Setback Controls

Suggestions

Program the existing programable thermostats in the Community Room and the NBHA Offices for night set back temperatures for heating and cooling.

Clean the air cooled condensers for the Office and Community Room air conditioning equipment.

Multipliers *	
Material:	1.00
**Labor:	1.44
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Program the existing AC unit programmable thermostats for night setback conditions.	10	ea.		$ 20		$ -	$ 288	$ -	$ 288	
						$ -	$ -	$ -	$ -	
Clean the remote air cooled condensers for the Office and Community Rm. AC Units.	10	ea.		$ 40	$ 1.00	$ -	$ 576	$ 10	$ 586	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 874	Subtotal
$ 87	10% Contingency
$ 144	15% Contractor O&P
$ -	0% Engineering
$ 1,106	**Total**

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey
**Multiplier for Electrical and Controls Labor specific to the Newark, New Jersey area.

APPENDIX O

ECM-9 Boiler Replacement

YOUR SUMMARY

This report addresses the key recommendations for improving the comfort, safety and efficiency of your home. You should use it as a guide for deciding what work you want to have done. Remember, your Home Performance Contractor is ready to complete these projects promptly, and the work is guaranteed.

Selected Packages

Measure Description	Non-energy benefits	Package1	Package2	Package3
Boiler Upgrade: Install new natural gas 9,734,000 Btu/hr boiler with efficiency of 72.0 %.	Increased equity.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 18,440		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		1,661.3		
Simple annual payback, years		NA		
Savings to Investment Ratio		NA		

The following fuel prices were used to estimate annual energy cost savings, payback and savings to investment ratio:

- Natural gas: 1.1100 $/Therm
- Electricity: 0.1500 $/kWh

Base Load Report

Customer Information

Customer Name: NBHA

Address: 6121/3131 Grand Avenue
North Bergen, NJ 07047

Billing Period: None

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 8/17/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Boiler Burner Upgrade

Billing Period Name: None

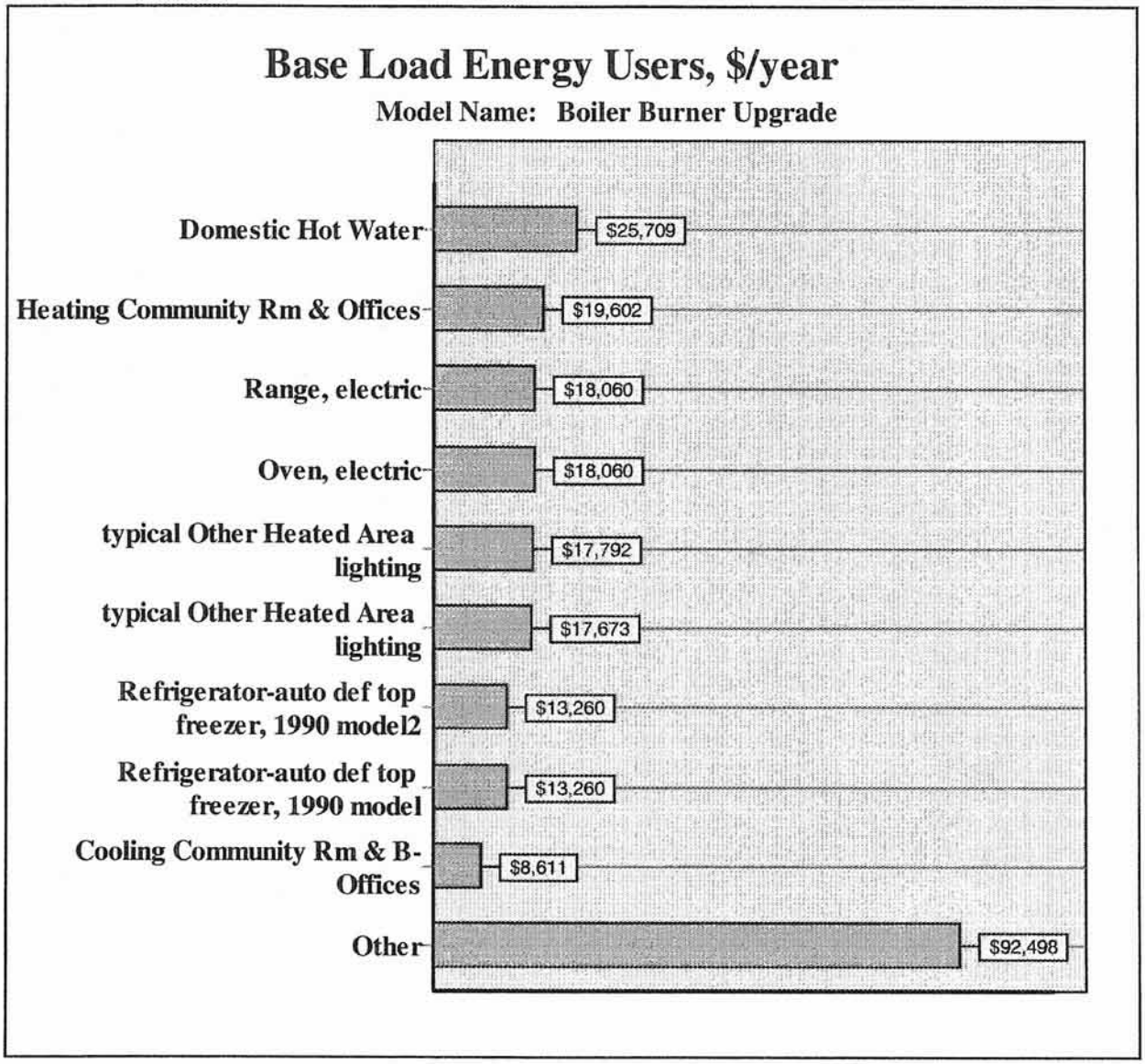
	Electricity		Natural gas			
	kWh	$	Therm	$		
Model	1,484,677	222,702	24,076	26,724		
Billing						
% Difference						

Note: No billing data is available because the model was not compared to a billing period

Annual Use of Domestic Hot Water, Appliances, and Lighting

Model Name: Boiler Burner Upgrade

	Electricity $0.15 per kWh		Natural gas $1.11 per Therm				Total
	kWh	$	therms	$			$
1. Domestic Hot Water	0	0	23,161	25,709			25,709
2. Heating Community Rm & Offices	130,680	19,602	0	0			19,602
3. Range, electric	120,400	18,060	0	0			18,060
4. Oven, electric	120,400	18,060	0	0			18,060
5. typical Other Heated Area lighting	118,610	17,792	0	0			17,792
6. typical Other Heated Area lighting	117,822	17,673	0	0			17,673
7. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
8. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
9. Cooling Community Rm & B-Offices	57,408	8,611	0	0			8,611
10. Other	609,883	91,482	915	1,016			92,498
TOTAL	1,452,003	217,800	24,076	26,725			244,525


Base Load Energy Users, $/year
Model Name: Boiler Burner Upgrade
Domestic Hot Water
$25,709
Heating Community Rm & Offices
$19,602
Range, electric
$18,060
Oven, electric
$18,060
typical Other Heated Area lighting
$17,792
typical Other Heated Area lighting
$17,673
Refrigerator-auto def top freezer, 1990 model2
$13,260
Refrigerator-auto def top freezer, 1990 model
$13,260
Cooling Community Rm & B-Offices
$8,611
Other
$92,498

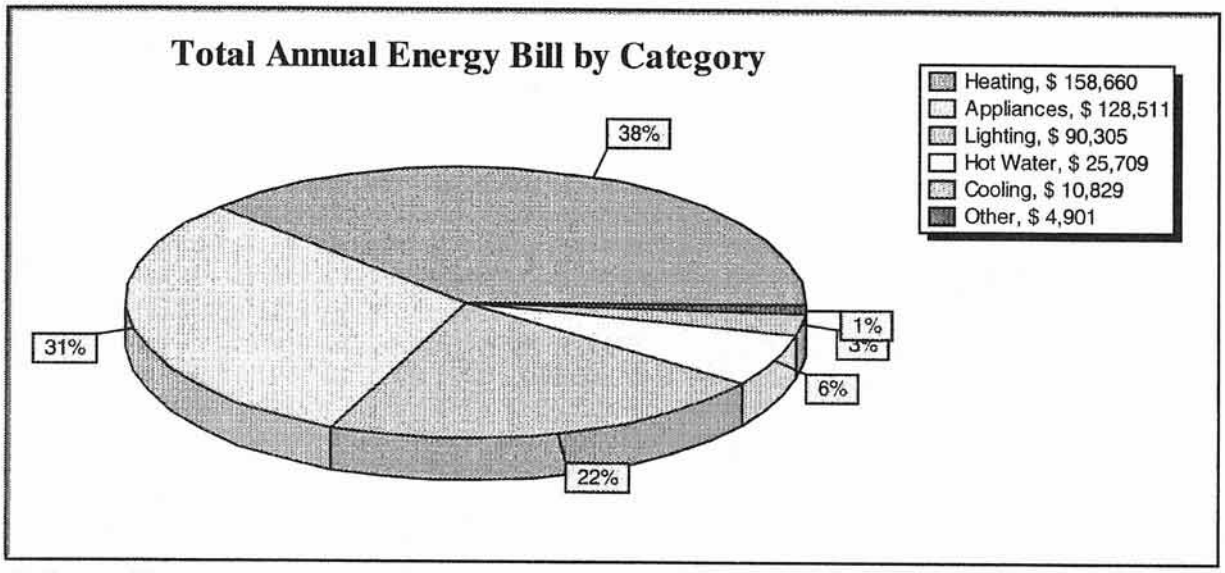
MODEL ENERGY REPORT FOR BOILER BURNER UPGRADE

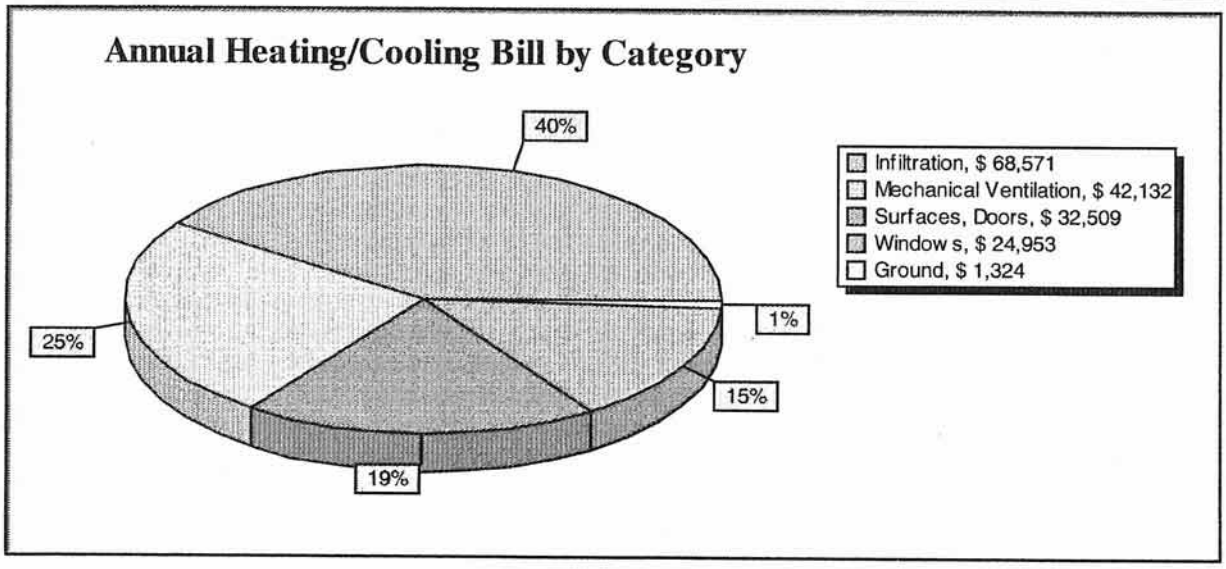
NBHA Lawlwer Apts

For: NBHA

By:

Date: 8/17/2009





Note: Due to rounding, the sum of percentages may not be equal to 100.

DESIGN HEATING AND COOLING LOADS FOR BOILER BURNER UPGRADE

8/17/2009
Project Name: NBHA Lawlwer Apts

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
Gr Fl Common Tower A	166444	27	18.9	319
2nd Fl Apts Tower B	102364	19	11.6	196
3rd Fl Apts Tower B	105945	20	12.0	203
2nd Fl Commom Tower B	0	0	0.0	0
Community Room	205047	65	23.3	393
Mechanical Spaces T-A	396754	64	45.1	760
1st Fl Common Tower A	31227	13	3.5	60
1st- Apts Tower A	93445	26	10.6	179
Gr Fl Office B Tower	403732	52	45.9	773
Basement Tower B	19203	25	2.2	37
1st Fl Common Tower B	0	0	0.0	0
1st Fl Apts Tower B	88223	24	10.0	169
3rd Fl Commom	0	0	0.0	0
4th-13th Apts Tower B	1280775	27	145.6	2451
4th-13th Common Tower B	0	0	0.0	0
2nd Fl Apts Tower A	116662	22	13.3	224
2nd Fl Common Tower A	0	0	0.0	0
3rd Fl Apts Tower A	119730	23	13.6	230
3rd Fl Common Tower A	0	0	0.0	0
4th-13th Apts Tower A	1442561	30	164.0	2760
4th-13th Common Tower A	0	0	0.0	0

Required Heating Equipment Output Capacity: 5383271 Btu/hr
Available Heating Equipment Output Capacity: 7008480 Btu/hr
Total flow: 538.5 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 72 %
Calculated Distribution Efficiency: 93 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
Gr Fl Common Tower A	110762	4030
2nd Fl Apts Tower B	70500	2565
3rd Fl Apts Tower B	66013	2402
2nd Fl Commom Tower B	0	0
Community Room	87420	3180
Mechanical Spaces T-A	0	0
1st Fl Common Tower A	64367	2342
1st- Apts Tower A	57465	2091
Gr Fl Office B Tower	219345	7979
Basement Tower B	6271	229
1st Fl Common Tower B	130099	4733
1st Fl Apts Tower B	57589	2095
3rd Fl Commom	0	0
4th-13th Apts Tower B	822976	29937
4th-13th Common Tower B	0	0
2nd Fl Apts Tower A	51676	1880
2nd Fl Common Tower A	0	0
3rd Fl Apts Tower A	67962	2473
3rd Fl Common Tower A	0	0
4th-13th Apts Tower A	661186	24052
4th-13th Common Tower A	0	0

Required Cooling Equipment Output Capacity: 2672598 Btu/hr
Available Cooling Equipment Output Capacity: 290000 Btu/hr
Total flow: 88380 CFM
Cooling Equipment Efficiency: 9 SEER
Calculated Distribution Efficiency: 95%
Temperature Drop: 28 F
Cooling Safety Factor: 1.10
Distribution Safety Factor: 1.10
COOLING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED COOLING LOAD.

Notes:

1. The room heating/cooling loads do not include the equipment and distribution safety factor and distribution losses
2. The room distribution includes distribution safety factor.
3. The load on the room is the peak load for this room in a year.
4. Available equipment output capacity includes equipment efficiency.
5. Required equipment output capacity includes diversity, distribution losses and equipment safety factor.
6. Overall distribution CFM/GPM for heating/cooling includes equipment safety factor, distribution losses and diversity.

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Boiler Burner Upgrade

NBHA Lawlwer Apts

For: NBHA

By:

Date:8/17/2009

Improvement Information:

1. Boiler Upgrade

New Heating Plant Installation

Heat Plant Type	Boiler, Steam
Fuel	Natural gas
Input Capacity, Btu/Hr	9734000
Efficiency%	72

Non-Energy Benefits: Increased equity.

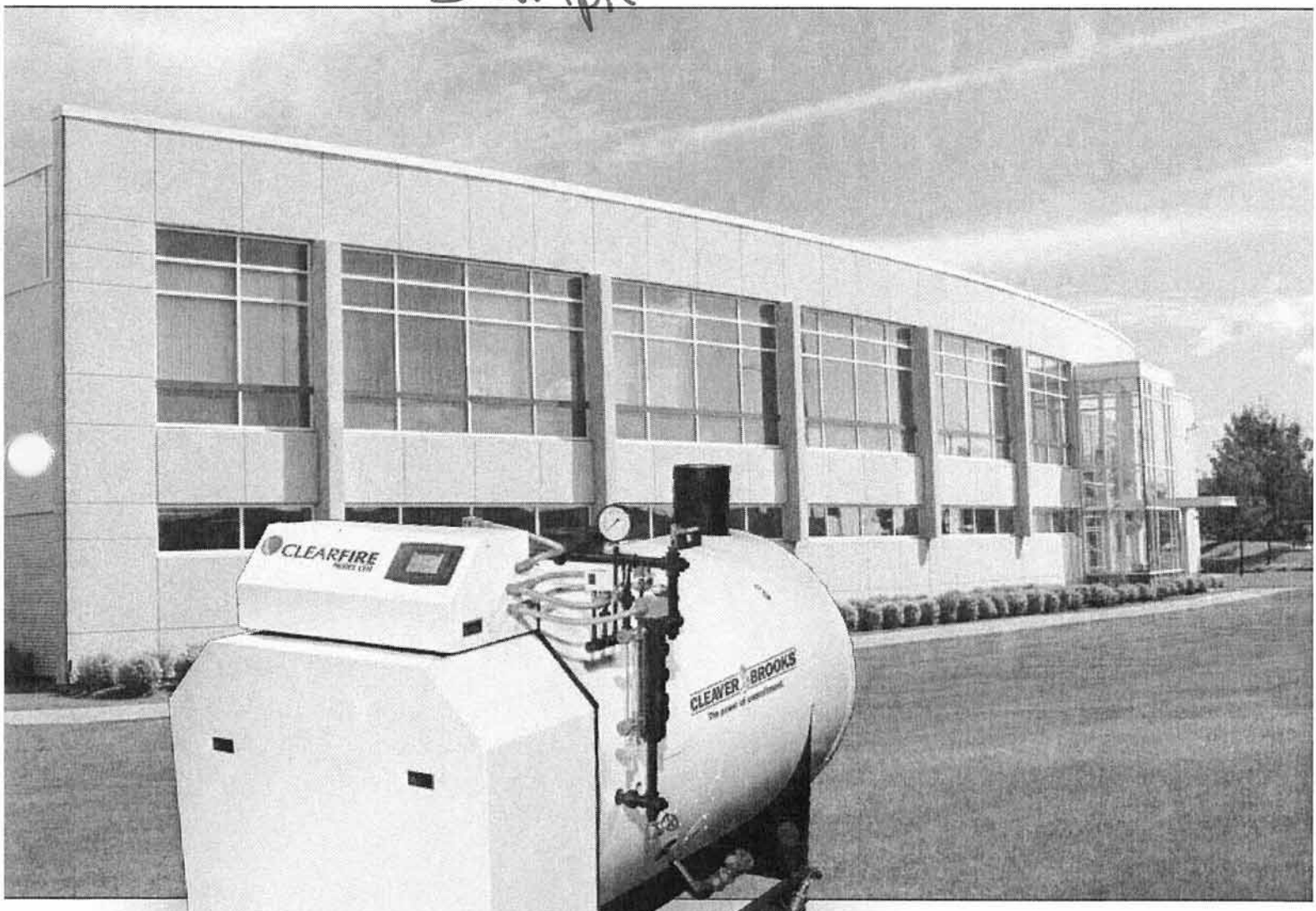
Work Scope:

Comply with general conditions. Submit product information to owner for approval in writing prior to ordering. Remove existing heating system safely and completely. Patch and paint where existing equipment was removed to match existing surfaces. If existing heat was baseboard electric and included receptacles mounted on the heaters, install new receptacles to replace the ones removed. Perform complete load sizing of the building prior to selecting replacement equipment, using standard methods such as ACCA manual J, or ASHRAE. Size new equipment according to this load sizing, and not according to the size of removed equipment. Provide a written copy of load sizing and assumptions for approval by the owner prior to ordering equipment. Size distribution system according to standard methods. Install forced air system securely and level. Install locking balancing dampers. For combustion systems, install combustion air in compliance with NFPA 54. All gas piping shall be tested with a sniffer. All buried gas piping shall be pressure tested for 24 hours. Securely fasten heating system to duct work with mechanical fasteners and seal. Install a clean air filter. Make sure that there are no duct openings, filter openings, or furnace openings in the return air in the furnace room, as this will pose a risk of carbon monoxide poisoning. Duct sealing and insulation shall comply with standards described in the separate duct sealing and duct insulation work scopes. After installation is complete, measure and record air temperature rise, gas input at the gas meter, and gas pressure at the gas valve. Ensure that all of these measurements are within the manufacturer's requirements. Balance distribution system by measuring air supply to all grilles and adjusting manual balancing dampers. Measure and record combustion efficiency. Set anticipator at thermostat. Provide training to the owner in the use of the forced air system and thermostat. Deliver to the owner users manual, including measurement reports, warranties, and approved submittals.

CB PACKAGE BOILER®

PREMIER COMMERCIAL BOILERS

Sample



MODEL CFH

CLEARFIRE

HORIZONTAL STEAM BOILER 10-60 HP

Full Modulation · High efficiency · Low Emissions · Touch Screen Control

ClearFire-H The New Standard in Commercial High-Efficiency Firetube Boilers

ClearFire-H
Features and Benefits

The Cleaver-Brooks compact gas-fired ClearFire-H horizontal boiler is designed specifically for the requirements of the commercial market and is available in sizes ranging 10-60 horsepower for 15# or 150# psig steam pressure.

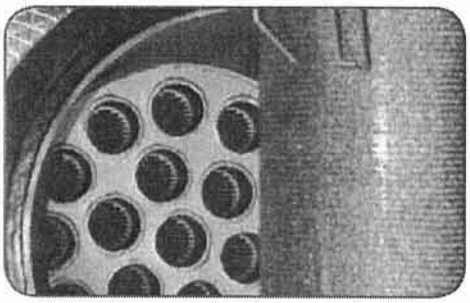
- *Fully-modulating with high turndown via variable speed blower maximizing fuel savings*
- *High efficiencies up to 85%, reduces greenhouse gas emissions*
- *Easily-tuned, zero-governor, premix Burner*
- *More reliable operation with no dampers or linkages*
- *Advanced combustion design eliminates need for flue gas recirculation while providing low emissions (< 20 ppm NOx and < 10 ppm CO)*
- *Direct spark Ignition*
- *Low gas supply pressure < 14" W.C.*
- *Quiet operation < 70 DBA*
- *Single Phase Power -115V for minimal electrical energy consumption*
- *UL Listed (Natural Gas)*
- *Controls are CSD-1 Compliant*
- *15# & 150# designs deliver superior steam quality*
- *ModBus (RS 485) Communications*

ClearFire-H Options

- *Sealed combustion for reduced make-up air requirement thus reducing energy costs*
- *Surface Blow-Off Controls*
- *Chemical Feed Tank*
- *Integral Feedwater System*
- *High Pressure Regulator*
- *Blowdown & Feedwater Valve Assemblies*
- *Reuseable Air Filter*
- *Feedwater Economizer*

Advanced Burner Technology

The ClearFire-H's high efficiency is achieved by employing an advanced Fecralloy burner designed to premix air and fuel for optimal combustion and low emissions. A variable speed blower motor provides extended burner turndown capability.



Durable Fecralloy Burner

Patented Heat Transfer Technology®

The internationally patented AluFer® firetube is the latest Cleaver-Brooks innovation in advanced heat transfer technology.

Patented AluFer Tubes®

The ClearFire-H utilizes AluFer® firetubes to achieve unmatched heat transfer rates and superior fuel-to-steam efficiency of up to 85% depending upon operating pressure, all in a compact design.

The tube is constructed from an inner aluminum alloy finned surface, die fitted within an outer carbon steel tube providing exceptional heat exchange characteristics that are attributed to the following factors:

- *Thermal conductivity of the AluFer® insert is significantly greater than that of carbon steel.*
- *Internal finned surface of the AluFer® tube enlarges the heat exchange surface area threefold.*
- *Inner surface of the tube is divided into ten flow channels to create maximum turbulence and heat transfer.*

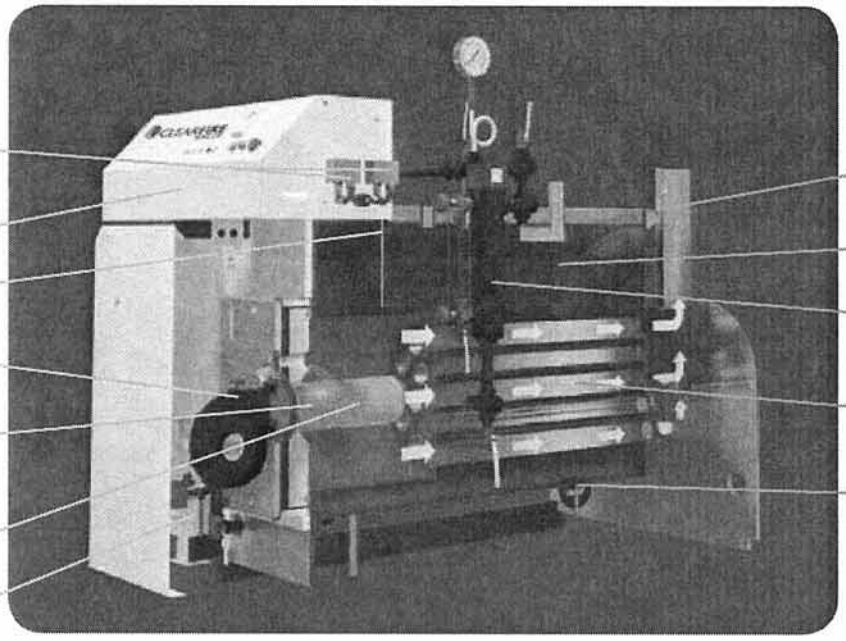
C-B Falcon Control

The C-B Falcon is a total boiler control that provides our customers with the integrated functionality needed to efficiently and economically operate their boiler system, while providing necessary safety and reliability.

- *A single source solution for total Boiler control*
- *Touch screen graphics with trending*
- *Integrated Burner sequencing, alarming and lockout*
- *Date/time stamping of lockouts and alerts*
- *First out expanded annunciation, firing rate limiting, time of day (setback) and PID loops.*
- *ModBus (RS485) Communications*
- *UL Recognized*

User-friendly Touch Screen Graphics

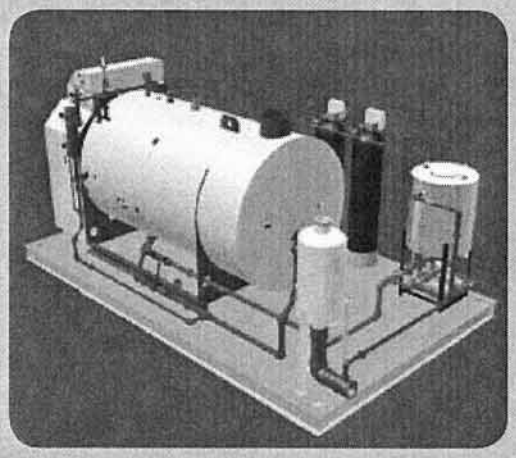
The ClearFire- H Advantage



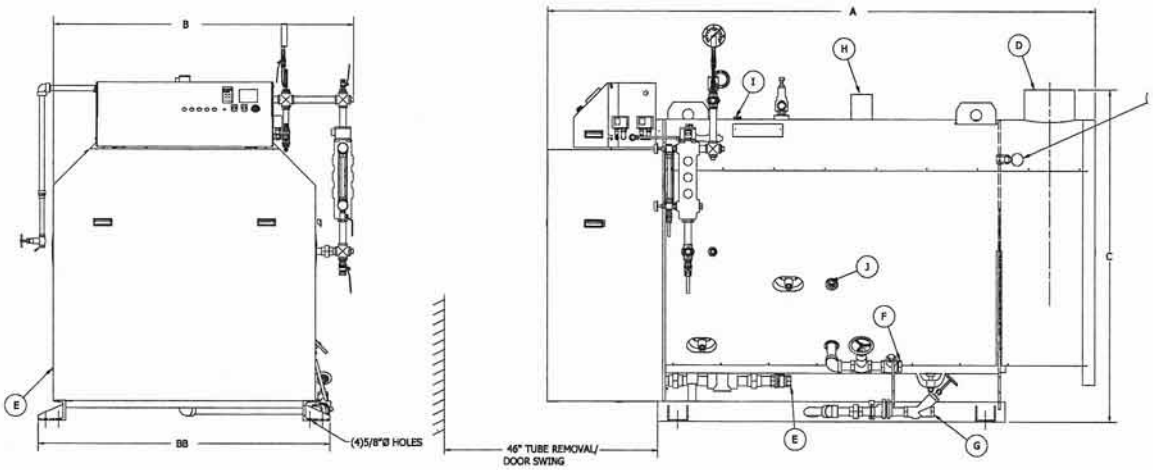
Single Source Skid Package Solutions

Looking for a turn-key steam solution? Cleaver-Brooks offers standard and complete steam boiler system skid mounted packages in gas and propane fuels. The package includes the steam boiler, feed system and blowdown separator with optional chemical feed system and water softener. This complete package saves you time installing the system as all is required is power, gas, steam and water connections.

- *Single Source Responsibility*
- *Plug and Play, minimizes installation*
- *Standard Skid Solutions to meet your needs*



MODEL CFH
CLEARFIRE



ClearFire-H Boiler Dimensions and Ratings

Boiler Horsepower	10	15	20	25	30	40	50	60
Dimensions – inches								
Overall Length (A)	86	86	87	87	92	104	110	110
Overall Width (B)	44	44	47	47	55.5	55.5	60.5	60.5
Width (BB) minus water column and blowdown	38	38	41.5	41.5	49	49	55	55
Overall Height (C)	54	54	57	57	66	66	68	68
Connections - inches								
Stack Nominal OD (D)	6	6	6	6	8	8	10	10
Gas Connection (E)	1	1	1	1	1 1/4	1 1/4	1 1/2	1 1/2
Feed Water (F)	1	1	1	1	1	1	1 1/4	1 1/4
Bottom Blowdown (G)	1	1	1	1	1	1	1 1/4	1 1/4
Steam Outlet (H) 15# ST.	4	4	4	4	4	6	6	6
Steam Outlet (H) 150# ST.	1 1/2	1 1/2	1 1/2	1 1/2	2	2	3	3
Surface Blowoff (I)	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Chemical Feed (J)	1	1	1	1	1	1	1	1
Overflow (K)	1	1	1	1	1	1	1	1
Steam Boiler Weights in lbs								
Normal Water Weight - 15#	920	920	1,150	1,150	1,710	1,980	2,510	2,510
Normal Water Weight - 150#	1,010	1,010	1,250	1,250	1,850	2,150	2,700	2,700
Approx. Shipping Weight	2,450	2,450	2,750	2,750	3,400	3,700	5,200	5,200
Power Requirements (115VAC, 60 Hz, single phase)								
Blower Motor Size (Watts)*	335	335	335	335	335	750	1,200	1,200
Ratings								
Rated Capacity–Steam (lbs-steam/hr from 212°F)	345	518	690	863	1,035	1,380	1,725	2,070
Efficiency %	86.2	85.2	85.6	85.1	85.9	85.8	86.2	85.8
Output (1,000 Btu/hr)	339	503	674	838	1,015	1,351	1,697	2,027
Input (1,000 Btu/hr)	394	591	788	984	1,181	1,575	1,969	2,363
Fireside Heating Surface (sq.ft.)	122	122	191	191	310	381	573	573
Turndown/Modulating Firing Range	4:1	4:1	4:1	4:1	5:1	5:1	5:1	5:1

Notes:

* For altitudes above 1500 ft., contact local Cleaver-Brooks authorized representative for verification of boiler and blower motor size.

** All Ratings from 0 psig and at 212°

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The power of commitment.
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CB-8084
06/09

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM - 9 Replacement of Kewanee Boilers with High Efficiency Steam Boilers

Suggestions

Install four (4) new high efficiency steam boilers to replace the existing two Kewanee low pressure steam boilers.

Multipliers *	
Material:	1.00
**Labor:	1.22
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
New High Efficiency Steam Boilers	4	ea	$ 32,000			$ 128,000	$ -	$ -	$ 128,000	Vendor quote.
Boiler Control System	1	ea.	$ 6,000			$ 6,000	$ -	$ -	$ 6,000	Vendor quote.
System Startup	1	Lot		$ 4,000		$ -	$ 4,880	$ -	$ 4,880	Vendor quote.
Boiler removal includes disconnecting all piping, electrical and boiler flues and removal from the building.	2			$ 5,000		$ -	$ 12,200	$ -	$ 12,200	Means Mechanical Cost Data - 2009
Boiler installation includes all piping labor; flue stack material and installation; gas regulators; insulation labor and materials; setting of the boilers.	2	Lot		$ 25,500		$ -	$ 62,220	$ -	$ 62,220	Means Mechanical Cost Data - 2009
Piping materials includes all pipe, valves, hangers, flanges and hardware.	1	Lot	$ 17,000			$ 17,000	$ -	$ -	$ 17,000	Means Mechanical Cost Data - 2009
Electrical labor and materials.	1	Lot	$ 5,000	$ 5,000		$ 5,000	$ 6,100	$ -	$ 11,100	Means Mechanical Cost Data - 2009

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey

**Multiplier for Mechanical Labor specific to the Newark, New Jersey area.

$ 241,400	Subtotal
$ 24,140	10% Contingency
$ 39,831	15% Contractor O&P
$ 30,537	10% Engineering
$ 335,908	**Total**

APPENDIX P

ECM-10 Window Replacements

YOUR SUMMARY

This report addresses the key recommendations for improving the comfort, safety and efficiency of your home. You should use it as a guide for deciding what work you want to have done. Remember, your Home Performance Contractor is ready to complete these projects promptly, and the work is guaranteed.

Selected Packages

Measure Description	Non-energy benefits	Package1	Package2	Package3
Window Replacement : Install 1823 triple pane clear windows with aluminum with 3/8" thermal break frame.	Improve comfort (reduce drafts), increase value of building.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 5,008		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		451.1		
Simple annual payback, years		NA		
Savings to Investment Ratio		NA		

The following fuel prices were used to estimate annual energy cost savings, payback and savings to investment ratio:

- Natural gas: 1.1100 $/Therm
- Electricity: 0.1500 $/kWh

DESIGN HEATING AND COOLING LOADS FOR WINDOW REPLACEMENT

9/2/2009
Project Name: NBHA Lawlwer Apts

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
Gr Fl Common Tower A	163806	27	18.6	314
2nd Fl Apts Tower B	99020	19	11.3	190
3rd Fl Apts Tower B	102601	20	11.7	197
2nd Fl Commom Tower B	0	0	0.0	0
Community Room	202888	64	23.1	389
Mechanical Spaces T-A	396603	64	45.1	759
1st Fl Common Tower A	31227	13	3.5	60
1st- Apts Tower A	90101	25	10.2	173
Gr Fl Office B Tower	401269	52	45.6	768
Basement Tower B	19203	25	2.2	37
1st Fl Common Tower B	0	0	0.0	0
1st Fl Apts Tower B	84878	23	9.6	163
3rd Fl Commom	0	0	0.0	0
4th-13th Apts Tower B	1240711	26	141.0	2374
4th-13th Common Tower B	0	0	0.0	0
2nd Fl Apts Tower A	113319	21	12.9	217
2nd Fl Common Tower A	0	0	0.0	0
3rd Fl Apts Tower A	116386	22	13.2	223
3rd Fl Common Tower A	0	0	0.0	0
4th-13th Apts Tower A	1402501	29	159.4	2684
4th-13th Common Tower A	0	0	0.0	0

Required Heating Equipment Output Capacity: 5296346 Btu/hr
Available Heating Equipment Output Capacity: 6327100 Btu/hr
Total flow: 529.8 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 65 %
Calculated Distribution Efficiency: 93 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
Gr Fl Common Tower A	109696	3991
2nd Fl Apts Tower B	69525	2529
3rd Fl Apts Tower B	65492	2383
2nd Fl Commom Tower B	0	0
Community Room	87363	3178
Mechanical Spaces T-A	0	0
1st Fl Common Tower A	64367	2342
1st- Apts Tower A	56674	2062
Gr Fl Office B Tower	218961	7965
Basement Tower B	6271	229
1st Fl Common Tower B	130099	4733
1st Fl Apts Tower B	56796	2066
3rd Fl Commom	0	0
4th-13th Apts Tower B	813704	29600
4th-13th Common Tower B	0	0
2nd Fl Apts Tower A	50983	1855
2nd Fl Common Tower A	0	0
3rd Fl Apts Tower A	67169	2444
3rd Fl Common Tower A	0	0
4th-13th Apts Tower A	651914	23714
4th-13th Common Tower A	0	0

Required Cooling Equipment Output Capacity: 2643704 Btu/hr
Available Cooling Equipment Output Capacity: 290000 Btu/hr
Total flow: 87424 CFM
Cooling Equipment Efficiency: 9 SEER
Calculated Distribution Efficiency: 95%
Temperature Drop: 28 F
Cooling Safety Factor: 1.10
Distribution Safety Factor: 1.10
COOLING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED COOLING LOAD.

Notes:

1. The room heating/cooling loads do not include the equipment and distribution safety factor and distribution losses
2. The room distribution includes distribution safety factor.
3. The load on the room is the peak load for this room in a year.
4. Available equipment output capacity includes equipment efficiency.
5. Required equipment output capacity includes diversity, distribution losses and equipment safety factor.
6. Overall distribution CFM/GPM for heating/cooling includes equipment safety factor, distribution losses and diversity.

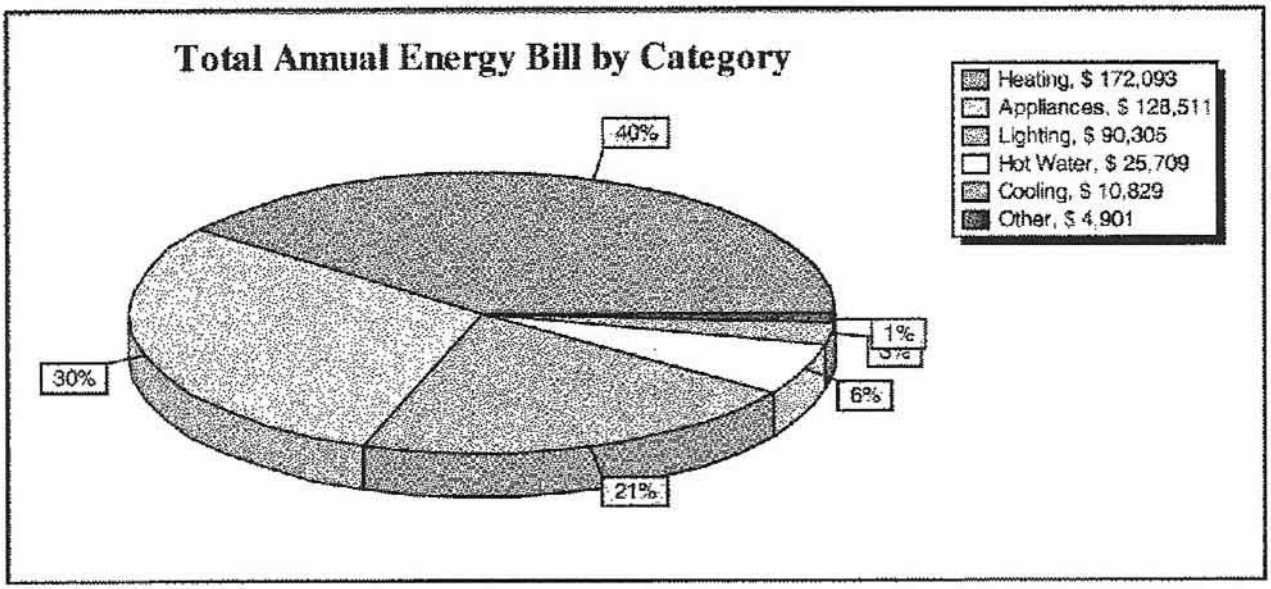
MODEL ENERGY REPORT FOR WINDOW REPLACEMENT

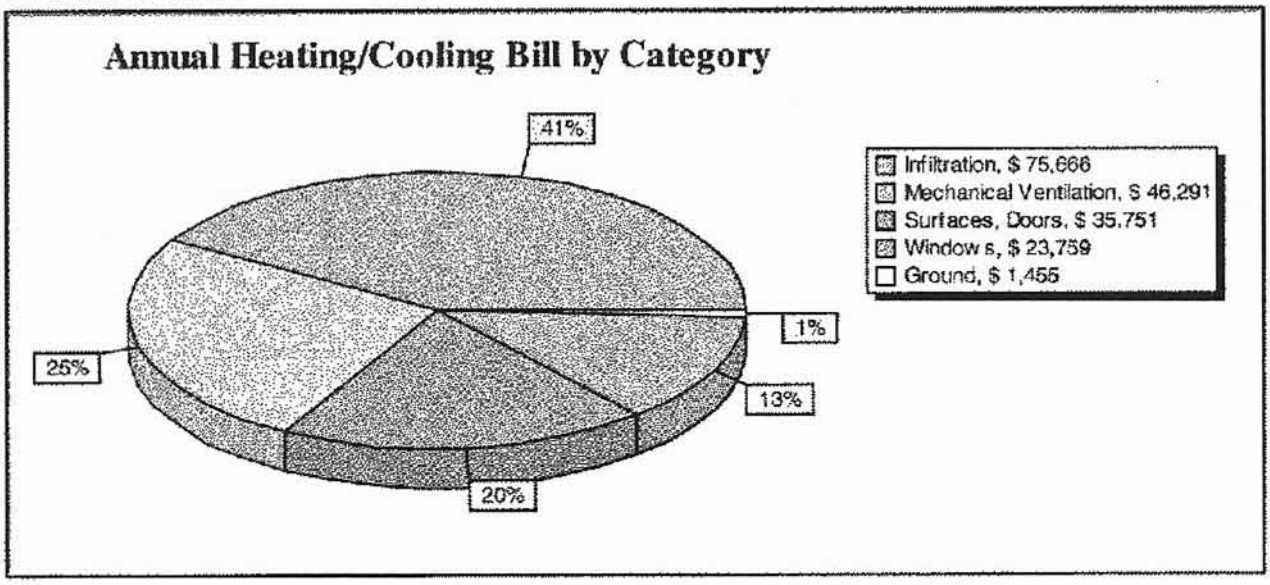
NBHA Lawlwer Apts

For: NBHA

By:

Date: 9/2/2009





Note: Due to rounding, the sum of percentages may not be equal to 100.

Base Load Report

Customer Information

Customer Name: NBHA

Address: 6121/3131 Grand Avenue
North Bergen, NJ 07047

Billing Period: None

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 9/2/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Window Replacement

Billing Period Name: None

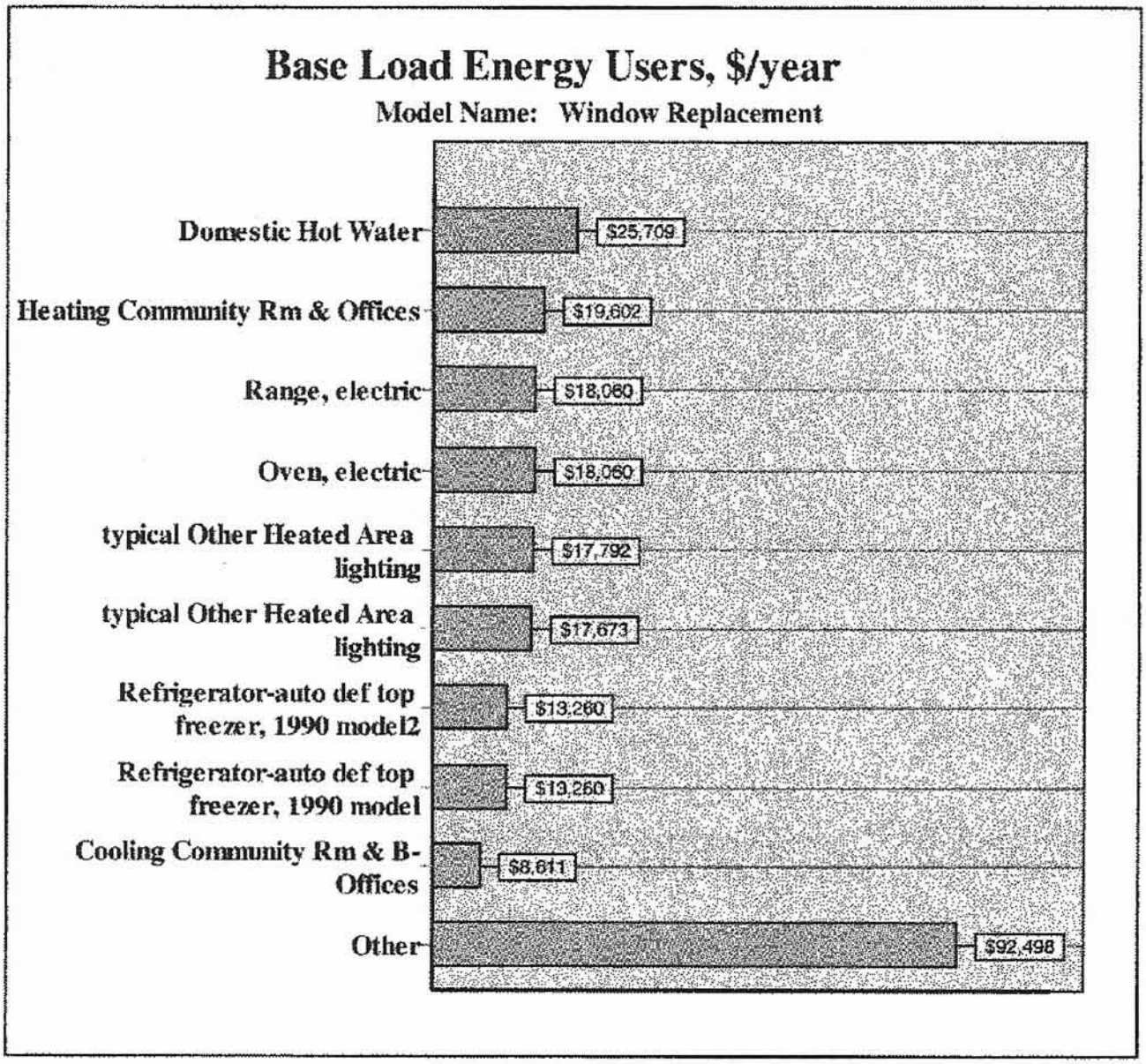
	Electricity		Natural gas			
	kWh	$	Therm	$		
Model	1,484,677	222,702	24,076	26,724		
Billing						
% Difference						

Note: No billing data is available because the model was not compared to a billing period

Annual Use of Domestic Hot Water, Appliances, and Lighting

Model Name: Window Replacement

	Electricity $0.15 per kWh		Natural gas $1.11 per Therm				Total
	kWh	$	therms	$			$
1. Domestic Hot Water	0	0	23,161	25,709			25,709
2. Heating Community Rm & Offices	130,680	19,602	0	0			19,602
3. Range, electric	120,400	18,060	0	0			18,060
4. Oven, electric	120,400	18,060	0	0			18,060
5. typical Other Heated Area lighting	118,610	17,792	0	0			17,792
6. typical Other Heated Area lighting	117,822	17,673	0	0			17,673
7. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
8. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
9. Cooling Community Rm & B-Offices	57,408	8,611	0	0			8,611
10. Other	609,883	91,482	915	1,016			92,498
TOTAL	1,452,003	217,800	24,076	26,725			244,525


Base Load Energy Users, $/year
Model Name: Window Replacement
Domestic Hot Water
$25,709
Heating Community Rm & Offices
$19,602
Range, electric
$18,060
Oven, electric
$18,060
typical Other Heated Area lighting
$17,792
typical Other Heated Area lighting
$17,673
Refrigerator-auto def top freezer, 1990 model2
$13,260
Refrigerator-auto def top freezer, 1990 model
$13,260
Cooling Community Rm & B-Offices
$8,611
Other
$92,498

IMPROVEMENT PACKAGES

NBHA Lawlwer Apts

For: NBHA

By:

Date: 9/2/2009

Evaluated Packages:

Package Name	Cost $	Annual Savings, MMBtu	Annual Savings, $	Payback years	Cashflow $/year	SIR
Window Replacement	0	451.14	5,008	0	5,008	N/C

Package Description:

1. **Window Replacement**

Improvement Name	Cost ($)	Annual Savings MMBtu	Annual Savings ($)	Payback (years)	Cashflow ($/year)	Improve-ment Life (Years)	SIR in Package
Window Replacement	0	451.14	5,008	N/A	5,008	20	N/C
Total for Package	0	451.14	5,008	0	5,008	N/A	N/C

Non-Energy Benefits:

1. Window Replacement : Improve comfort (reduce drafts), increase value of building.

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Window Replacement

NBHA Lawlwer Apts

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Window Replacement

Window Replacement

Upgrade 1823 existing windows to the following:
Frame: Aluminum with 3/8" thermal break, Operable
Glazing: 7/8" triple glass, 0.25" argon spaces, e = 0.2 on surface 2, 3, 4 or 5, clear

Non-Energy Benefits: Improve comfort (reduce drafts), increase value of building.

Work Scope:

Perform infrared scan if indoor/outdoor temperature difference is a minimum 15 F, prior to replacement. Perform blower door test prior to replacement. Record results and date of test. Notify owner if asbestos-containing materials are found. Comply with general conditions. Submit product information to owner for approval in writing prior to ordering. Inspect for the presence of lead paint. If lead paint is suspected, notify owner and proceed with owner's approval in compliance with state and local solid waste regulations, to remove windows and doors. Dispose of removed windows off site, or as instructed by owner. Provide temporary covering over window openings to protect the building from the outdoor weather before new windows are installed. Install windows in a workmanlike manner. Windows shall be installed per manufacturer's instructions and to meet the requirements of generally accepted standards. Install windows plumb and level. Test windows for smooth operation after installation, in the presence of owner. Install full weather-stripping. Weather-stripping shall not prevent smooth operation of windows. Caulk both interior and exterior frames of windows. After work is complete, if indoor/outdoor temperature difference is minimum 15 F, perform infrared scan. Provide written reports to the owner, including: approved submittals, written record of which windows were replaced, pre and post blower door tests results, pre and post infrared scan results, warranty.

RECOMMENDED IMPROVEMENTS

Customer: NBHA

This report addresses the key recommendations for improving the comfort, safety and efficiency of your home.

Annual Cost Savings by Improvement in Recommended Packages

Improvement Description	Non-energy benefits	Improve-ment Cost	Window Replacement	NA	NA
Window Replacement : Install 1823 triple pane clear windows with aluminum with 3/8" thermal break frame.	Improve comfort (reduce drafts), increase value of building.	$ 0	$ 5,008/yr		
Total Annual Energy Cost Savings			$ 5,008 /yr		
Total Installed Cost			$ 0		
Monthly Loan Payment at 8.00%, 30-year Term			$ 0		
Estimated Monthly Cash Flow After Energy Savings			$ 417.30		
Simple Annual Payback, Years			NA		
Savings to Investment Ratio			NA		

The following fuel prices were used to estimate annual energy cost savings, payback and savings to investment ratio:

- Natural gas: 1.1100 $/Therm
- Electricity: 0.1500 $/kWh

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM - 10 Replace Windows

Suggestions

Replace exiting 4.5' x 4.5' aluminum slider windows with new High "E" triple pane windows.

Multipliers *	
Material:	1.00
**Labor:	1.22
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
4.5' x 4.5' aluminum slider window, installed.	1,823	ea.			$ 450	$ -	$ -	$ 820,350	$ 820,350	Means Building Cost Data - 2009
Remove old windows.	1,823	ea.		$ 50		$ -	$ 111,203	$ -	$ 111,203	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 931,553	Subtotal
$ 93,155	10% Contingency
$ 153,706	15% Contractor O&P
$ -	0% Engineering
$ 1,178,415	**Total**

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey
**Multiplier for Carpentry Labor specific to the Newark, New Jersey area.

APPENDIX Q

ECM-11a Insulate NBHA Office Walls

YOUR SUMMARY

This report addresses the key recommendations for improving the comfort, safety and efficiency of your home. You should use it as a guide for deciding what work you want to have done. Remember, your Home Performance Contractor is ready to complete these projects promptly, and the work is guaranteed.

Selected Packages

Measure Description	Non-energy benefits	Package1	Package2	Package3
Wall Insulation Office Addition Tower B : Upgrade 1,940 square feet of existing wall to Gyp Bd, 2x4 16" OC, 2" Fiberglass, 1.5" Air, 1" Wood, R-9	Improve comfort, increase value of building.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 2,396		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		215.8		
Simple annual payback, years		NA		
Savings to Investment Ratio		NA		

The following fuel prices were used to estimate annual energy cost savings, payback and savings to investment ratio:

- Natural gas: 1.1100 $/Therm
- Electricity: 0.1500 $/kWh

Base Load Report

Customer Information

Customer Name: NBHA

Address: 6121/3131 Grand Avenue
North Bergen, NJ 07047

Billing Period: None

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 8/17/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Insulation Office Addition Walls

Billing Period Name: None

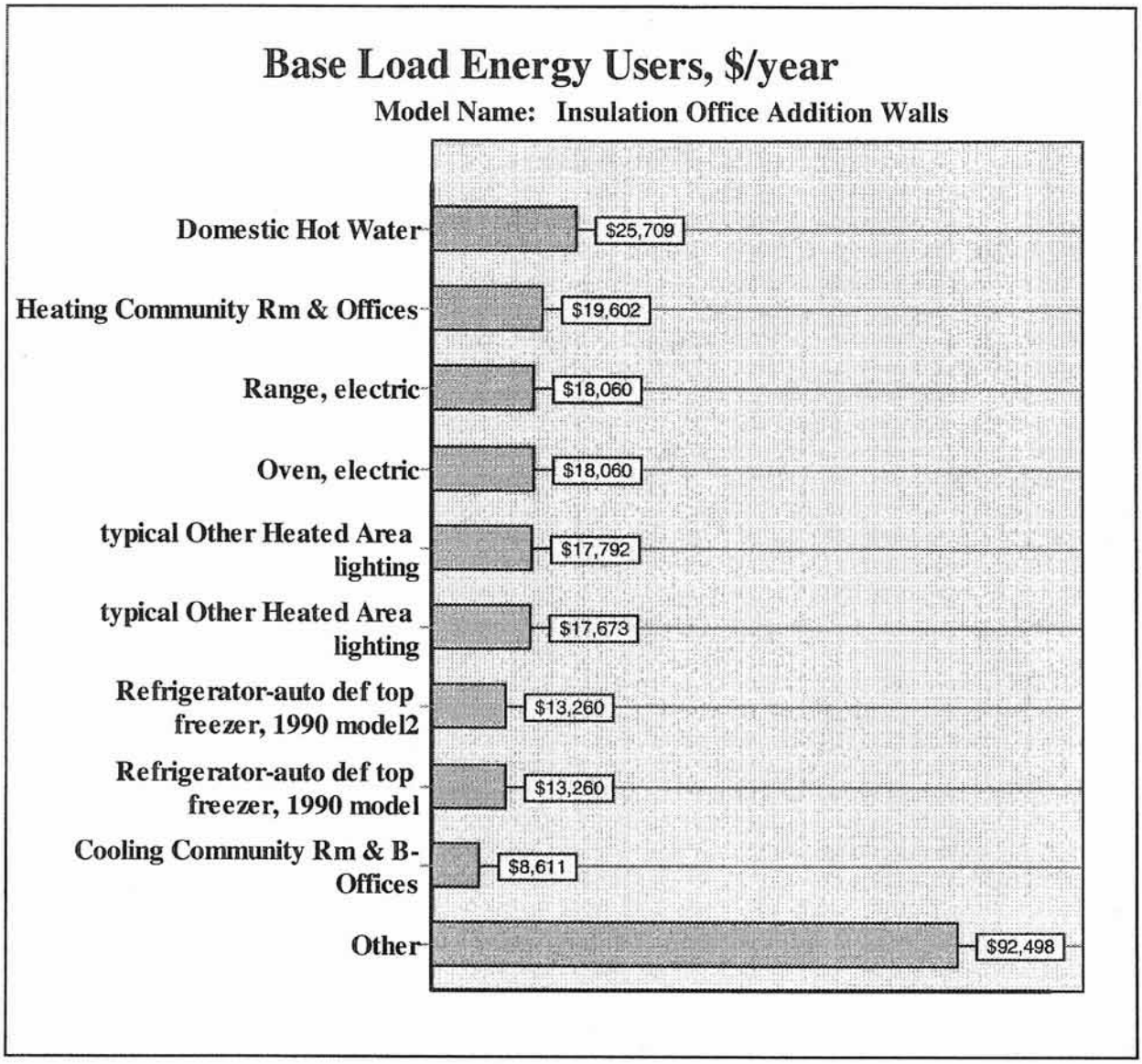
	Electricity		Natural gas			
	kWh	$	Therm	$		
Model	1,484,677	222,702	24,076	26,724		
Billing						
% Difference						

Note: No billing data is available because the model was not compared to a billing period

Annual Use of Domestic Hot Water, Appliances, and Lighting

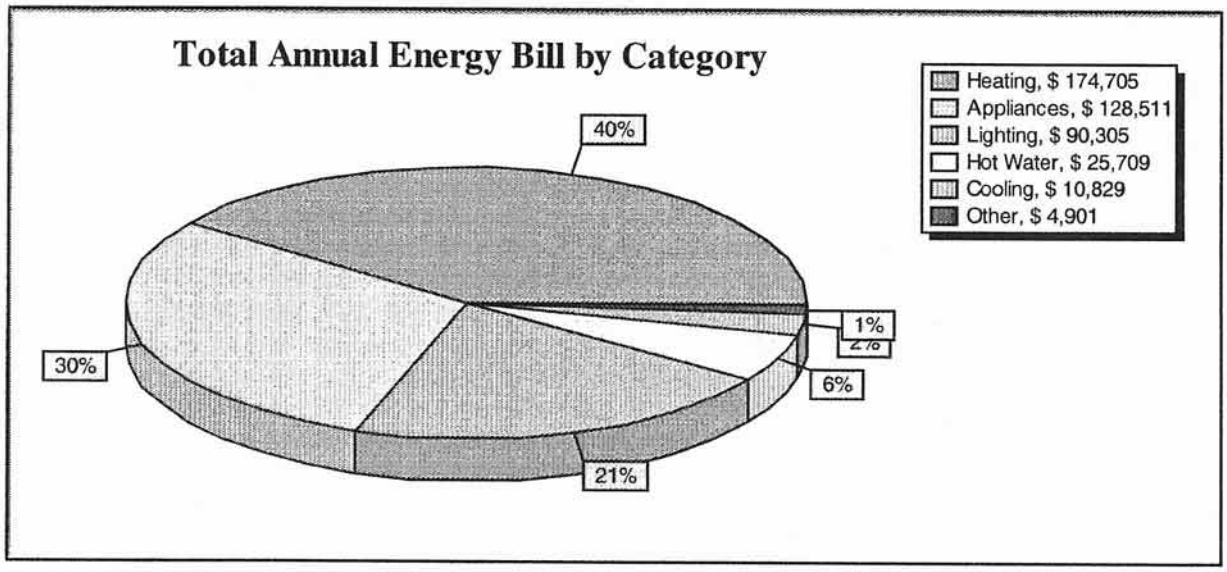
Model Name: Insulation Office Addition Walls

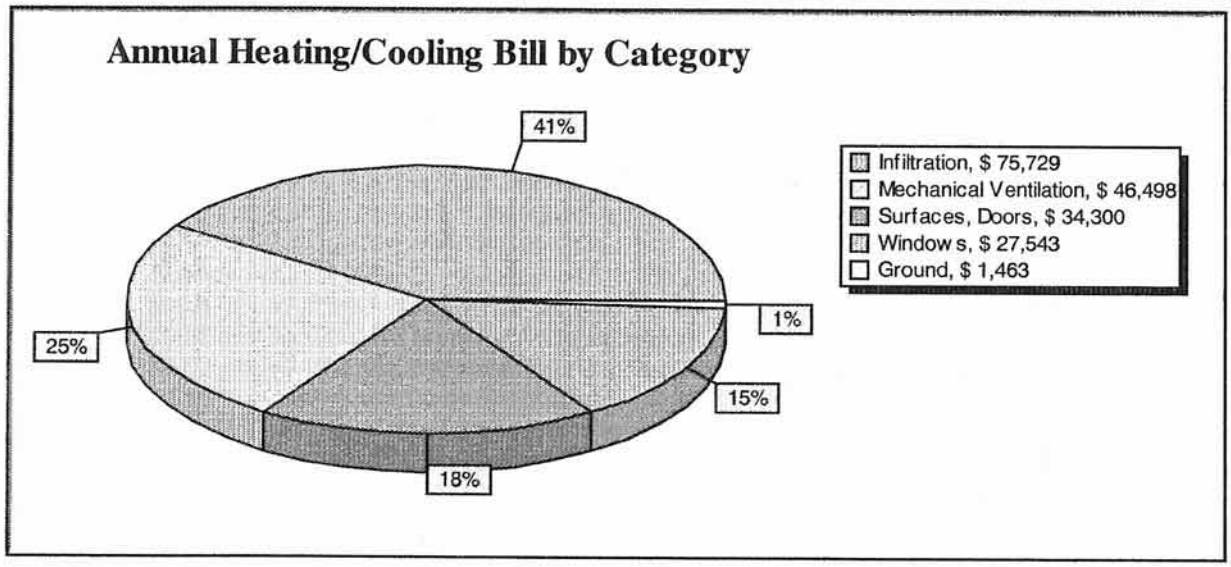
	Electricity $0.15 per kWh		Natural gas $1.11 per Therm				Total
	kWh	$	therms	$			$
1. Domestic Hot Water	0	0	23,161	25,709			25,709
2. Heating Community Rm & Offices	130,680	19,602	0	0			19,602
3. Range, electric	120,400	18,060	0	0			18,060
4. Oven, electric	120,400	18,060	0	0			18,060
5. typical Other Heated Area lighting	118,610	17,792	0	0			17,792
6. typical Other Heated Area lighting	117,822	17,673	0	0			17,673
7. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
8. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
9. Cooling Community Rm & B-Offices	57,408	8,611	0	0			8,611
10. Other	609,883	91,482	915	1,016			92,498
TOTAL	1,452,003	217,800	24,076	26,725			244,525


Base Load Energy Users, $/year
Model Name: Insulation Office Addition Walls
Domestic Hot Water
$25,709
Heating Community Rm & Offices
$19,602
Range, electric
$18,060
Oven, electric
$18,060
typical Other Heated Area lighting
$17,792
typical Other Heated Area lighting
$17,673
Refrigerator-auto def top freezer, 1990 model2
$13,260
Refrigerator-auto def top freezer, 1990 model
$13,260
Cooling Community Rm & B-Offices
$8,611
Other
$92,498

MODEL ENERGY REPORT FOR INSULATION OFFICE ADDITION WALLS

NBHA Lawlwer Apts
For: NBHA
By:
Date: 8/17/2009





Note: Due to rounding, the sum of percentages may not be equal to 100.

DESIGN HEATING AND COOLING LOADS FOR INSULATION OFFICE ADDITION WALLS

8/17/2009
Project Name: NBHA Lawlwer Apts

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
Gr Fl Common Tower A	166444	27	18.9	319
2nd Fl Apts Tower B	102364	19	11.6	196
3rd Fl Apts Tower B	105945	20	12.0	203
2nd Fl Commom Tower B	0	0	0.0	0
Community Room	205047	65	23.3	393
Mechanical Spaces T-A	396754	64	45.1	760
1st Fl Common Tower A	31227	13	3.5	60
1st- Apts Tower A	93445	26	10.6	179
Gr Fl Office B Tower	348484	45	39.6	667
Basement Tower B	19203	25	2.2	37
1st Fl Common Tower B	0	0	0.0	0
1st Fl Apts Tower B	88223	24	10.0	169
3rd Fl Commom	0	0	0.0	0
4th-13th Apts Tower B	1280775	27	145.6	2451
4th-13th Common Tower B	0	0	0.0	0
2nd Fl Apts Tower A	116662	22	13.3	224
2nd Fl Common Tower A	0	0	0.0	0
3rd Fl Apts Tower A	119730	23	13.6	230
3rd Fl Common Tower A	0	0	0.0	0
4th-13th Apts Tower A	1442561	30	164.0	2760
4th-13th Common Tower A	0	0	0.0	0

Required Heating Equipment Output Capacity: 5359113 Btu/hr
Available Heating Equipment Output Capacity: 6327100 Btu/hr
Total flow: 536.1 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 65 %
Calculated Distribution Efficiency: 93 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
Gr Fl Common Tower A	110762	4030
2nd Fl Apts Tower B	70500	2565
3rd Fl Apts Tower B	66013	2402
2nd Fl Commom Tower B	0	0
Community Room	87417	3180
Mechanical Spaces T-A	0	0
1st Fl Common Tower A	64367	2342
1st- Apts Tower A	57465	2091
Gr Fl Office B Tower	200598	7297
Basement Tower B	6271	229
1st Fl Common Tower B	130099	4733
1st Fl Apts Tower B	57589	2095
3rd Fl Commom	0	0
4th-13th Apts Tower B	822976	29937
4th-13th Common Tower B	0	0
2nd Fl Apts Tower A	51676	1880
2nd Fl Common Tower A	0	0
3rd Fl Apts Tower A	67962	2473
3rd Fl Common Tower A	0	0
4th-13th Apts Tower A	661186	24052
4th-13th Common Tower A	0	0

Required Cooling Equipment Output Capacity: 2652641 Btu/hr
Available Cooling Equipment Output Capacity: 290000 Btu/hr
Total flow: 87720 CFM
Cooling Equipment Efficiency: 9 SEER
Calculated Distribution Efficiency: 95%
Temperature Drop: 28 F
Cooling Safety Factor: 1.10
Distribution Safety Factor: 1.10
COOLING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED COOLING LOAD.

Notes:

1. The room heating/cooling loads do not include the equipment and distribution safety factor and distribution losses
2. The room distribution includes distribution safety factor.
3. The load on the room is the peak load for this room in a year.
4. Available equipment output capacity includes equipment efficiency.
5. Required equipment output capacity includes diversity, distribution losses and equipment safety factor.
6. Overall distribution CFM/GPM for heating/cooling includes equipment safety factor, distribution losses and diversity.

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Insulation Office Addition Walls

NBHA Lawlwer Apts

For: NBHA

By:

Date:8/17/2009

Improvement Information:

1. Wall Insulation Office Addition Tower B

Surface Insulation

Upgrade 1940 Sq.Ft of existing surfaces to Gyp Bd, 2x4 16" OC, 2" Fiberglass, 1.5" Air, 1" Wood, R-9

Non-Energy Benefits: Improve comfort, increase value of building.

Work Scope:

Comply with general conditions. Perform blower door test prior to insulating. Record results and date. Perform infrared scan if indoor/outdoor temperature difference is a minimum 15 F, prior to insulating. Inspect walls for damage, including moisture, prior to insulating. If damage or moisture is found, notify owner before proceeding. Inspect walls for live wiring. If found, notify owner before proceeding. Notify owner if asbestos-containing materials are found. Submit product information to owner for approval in writing prior to ordering. Insulation shall be installed according to manufacturer's instructions. Remove siding to drill holes in sheathing, to blow insulation into wall cavities. If siding cannot be removed, notify owner before drilling holes in finished interior or exterior surfaces. If holes have to be drilled in finished interior or exterior surfaces, holes should be patched and painted to match the surface. Drill a minimum two-inch diameter hole. Probe the wall cavity thoroughly to identify obstructions before insulating. Drill additional holes to insulate on all sides of obstruction as necessary. Dense-pack blow cellulose insulation at sufficient density to avoid settling, and to fill all voids. Insulate to a minimum 3.5 lb. per cubic foot density. Allow owner to inspect the insulation prior to plugging holes. All holes shall be plugged with wood plugs, and air-sealed prior to finishing. After insulating is complete, perform blower door tests. If indoor/outdoor temperature difference is minimum 15 F, perform infrared scan. Clean-up shall be thorough, and shall include inspection and cleaning of any forced air systems. Provide written reports to the owner, including: approved submittals, written record of which walls were insulated and where insulation was not installed, pre and post blower door tests results, pre and post infrared scan results, and warranty.

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-11a Office Wall Insulation Cost

Suggestions

Insulate the walls of the Housing Authority Offices using blown in insulation (R-19).

Multipliers *	
Material:	1.00
**	1.22
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Insulate walls of office - 3-1/2"	1,000	S.F.	$ 1.90	$ 1.50	$ 0.07	$ 1,900	$ 1,830	$ 70	$ 3,800	Means Building Cost Data - 2009
Wall Patching and insulating	1,000	S.F.	$ 0.06	$ 1.16	$ 0.50	$ 60	$ 1,415	$ 500	$ 1,975	Means Building Cost Data - 2009
Seal external panels	800	L.F.	$ 0.06	$ 0.15	$ 0.07	$ 48	$ 146	$ 56	$ 250	Means Building Cost Data - 2009
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey

**Multiplier for Carpentry Labor specific to the Newark, New Jersey area.

$ 6,026	Subtotal
$ 1,205	20% Contingency
$ 1,085	15% Contractor O&P
$ -	0% Engineering
$ 8,315	**Total**

APPENDIX R

ECM-11b Insulate Area Below the NBHA Offices and Community Room

YOUR SUMMARY

This report addresses the key recommendations for improving the comfort, safety and efficiency of your home. You should use it as a guide for deciding what work you want to have done. Remember, your Home Performance Contractor is ready to complete these projects promptly, and the work is guaranteed.

Selected Packages

Measure Description	Non-energy benefits	Package1	Package2	Package3
Insulation Crawl Space Office & Comm Rm: Upgrade 10,880 square feet of existing floor above grade to 6" Concrete, 2" XPS, R-10	Improve comfort, increase value of building.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 2,747		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		247.5		
Simple annual payback, years		NA		
Savings to Investment Ratio		NA		

The following fuel prices were used to estimate annual energy cost savings, payback and savings to investment ratio:

- Natural gas: 1.1100 $/Therm
- Electricity: 0.1500 $/kWh

Base Load Report

Customer Information

Customer Name: NBHA

Address: 6121/3131 Grand Avenue
North Bergen, NJ 07047

Billing Period: None

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 8/17/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Insulation Crawl Space Cieling B-Office & Comm Rm

Billing Period Name: None

	Electricity		Natural gas			
	kWh	$	Therm	$		
Model	1,484,677	222,702	24,076	26,724		
Billing						
% Difference						

Note: No billing data is available because the model was not compared to a billing period

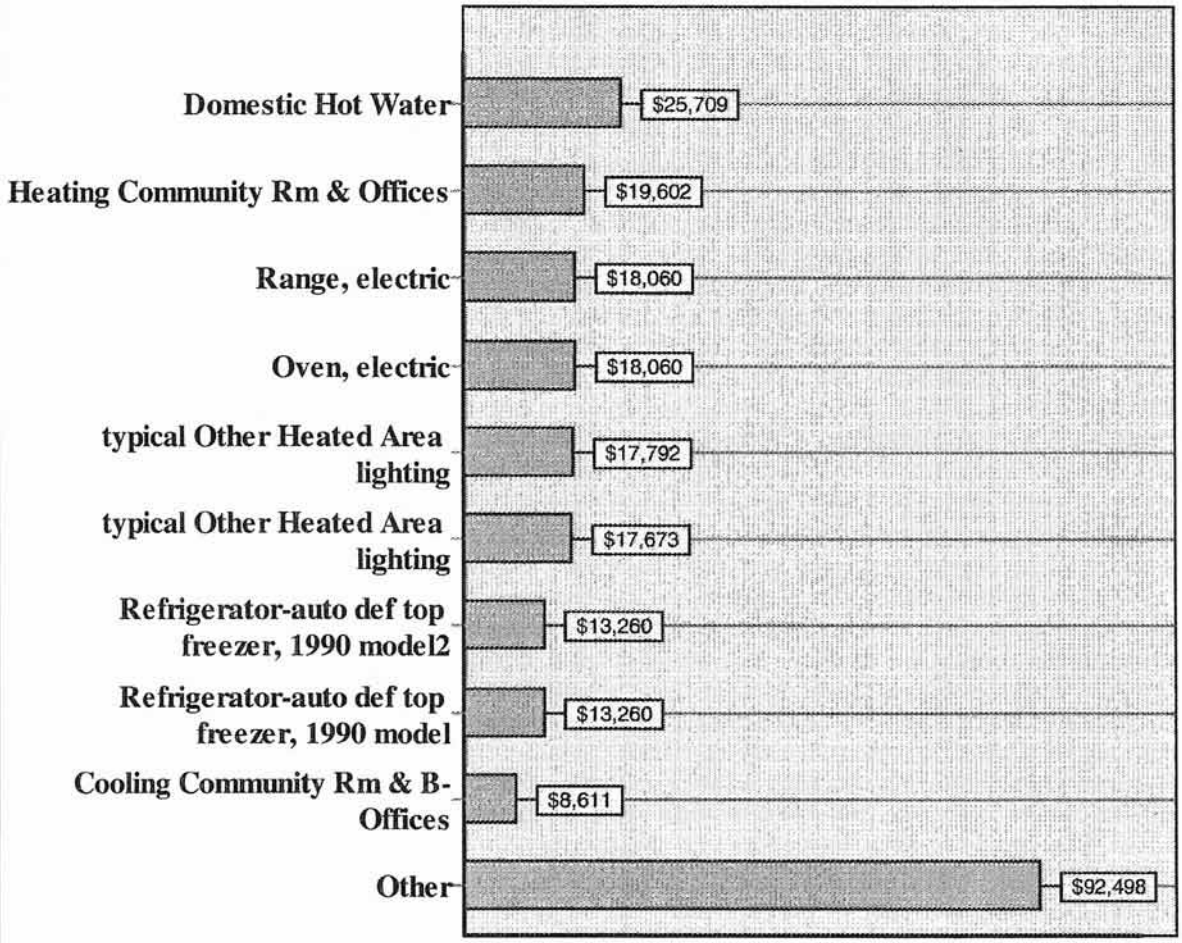
Annual Use of Domestic Hot Water, Appliances, and Lighting

Model Name: Insulation Crawl Space Cieling B-Office & Comm Rm

	Electricity $0.15 per kWh		Natural gas $1.11 per Therm				Total
	kWh	$	therms	$			$
1. Domestic Hot Water	0	0	23,161	25,709			25,709
2. Heating Community Rm & Offices	130,680	19,602	0	0			19,602
3. Range, electric	120,400	18,060	0	0			18,060
4. Oven, electric	120,400	18,060	0	0			18,060
5. typical Other Heated Area lighting	118,610	17,792	0	0			17,792
6. typical Other Heated Area lighting	117,822	17,673	0	0			17,673
7. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
8. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
9. Cooling Community Rm & B-Offices	57,408	8,611	0	0			8,611
10. Other	609,883	91,482	915	1,016			92,498
TOTAL	1,452,003	217,800	24,076	26,725			244,525

Base Load Energy Users, $/year

Model Name: Insulation Crawl Space Cieling B-Office & Comm Rm



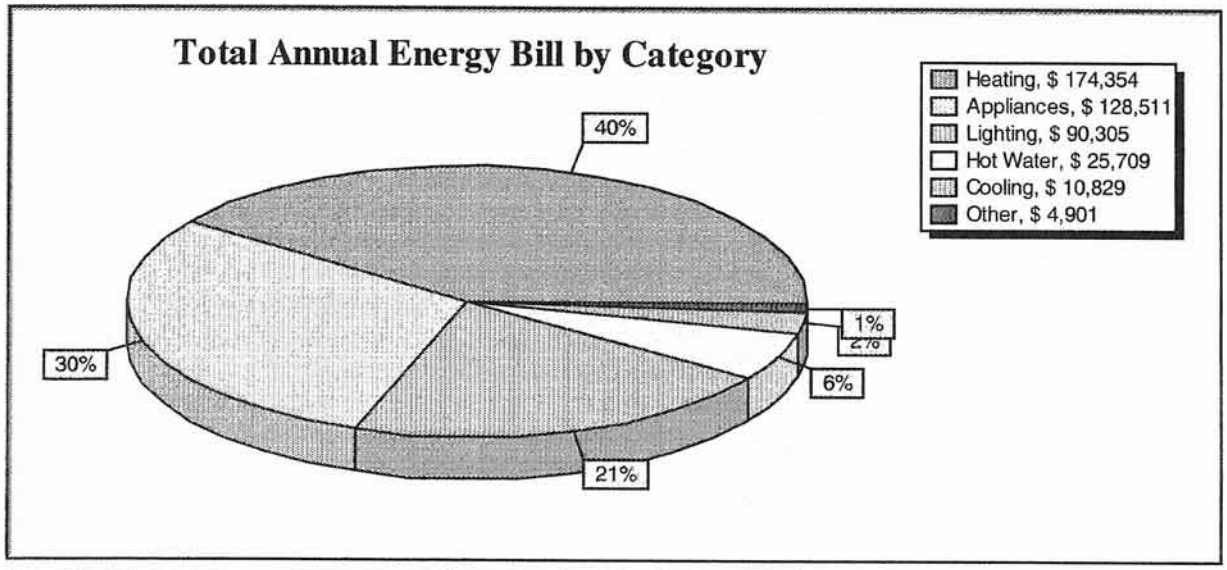
MODEL ENERGY REPORT FOR INSULATION CRAWL SPACE CIELING B-OFFICE & COMM RM

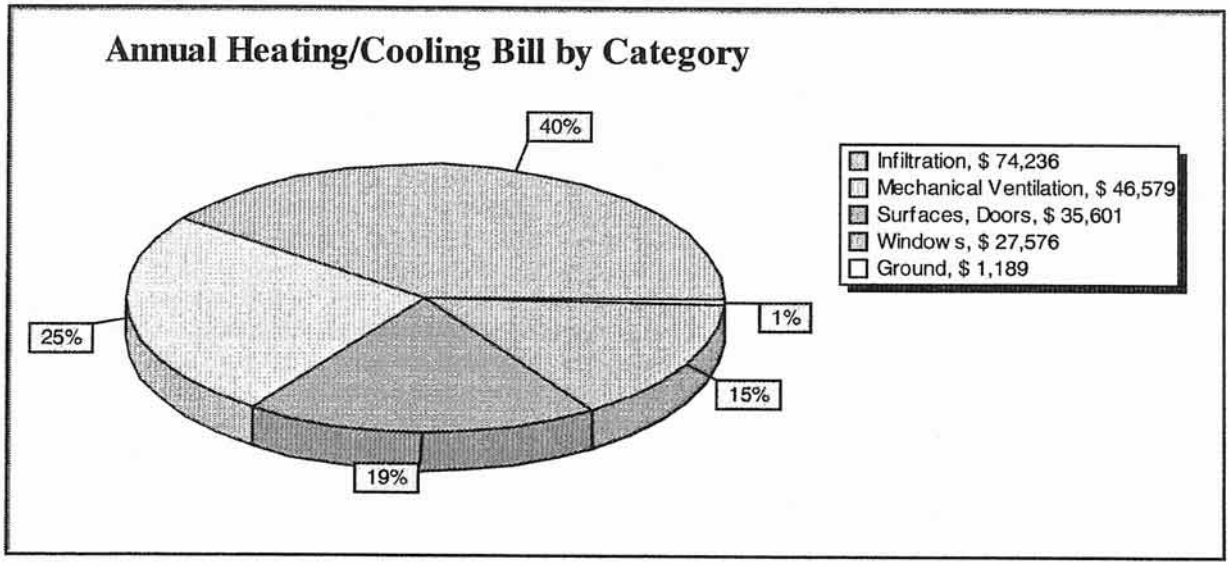
NBHA Lawlwer Apts

For: NBHA

By:

Date: 8/17/2009





Note: Due to rounding, the sum of percentages may not be equal to 100.

DESIGN HEATING AND COOLING LOADS FOR INSULATION CRAWL SPACE CIELING B-OFFICE & COMM RM

8/17/2009
Project Name: NBHA Lawlwer Apts

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
Gr Fl Common Tower A	166444	27	18.9	319
2nd Fl Apts Tower B	102364	19	11.6	196
3rd Fl Apts Tower B	105945	20	12.0	203
2nd Fl Commom Tower B	0	0	0.0	0
Community Room	188216	59	21.4	361
Mechanical Spaces T-A	396754	64	45.1	760
1st Fl Common Tower A	31227	13	3.5	60
1st- Apts Tower A	93445	26	10.6	179
Gr Fl Office B Tower	362066	47	41.2	693
Basement Tower B	19203	25	2.2	37
1st Fl Common Tower B	0	0	0.0	0
1st Fl Apts Tower B	88223	24	10.0	169
3rd Fl Commom	0	0	0.0	0
4th-13th Apts Tower B	1280775	27	145.6	2451
4th-13th Common Tower B	0	0	0.0	0
2nd Fl Apts Tower A	116662	22	13.3	224
2nd Fl Common Tower A	0	0	0.0	0
3rd Fl Apts Tower A	119730	23	13.6	230
3rd Fl Common Tower A	0	0	0.0	0
4th-13th Apts Tower A	1442561	30	164.0	2760
4th-13th Common Tower A	0	0	0.0	0

Required Heating Equipment Output Capacity: 5369312 Btu/hr
Available Heating Equipment Output Capacity: 6327100 Btu/hr
Total flow: 537.1 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 65 %
Calculated Distribution Efficiency: 92 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
Gr Fl Common Tower A	110762	4030
2nd Fl Apts Tower B	70500	2565
3rd Fl Apts Tower B	66013	2402
2nd Fl Commom Tower B	0	0
Community Room	86414	3144
Mechanical Spaces T-A	0	0
1st Fl Common Tower A	64367	2342
1st- Apts Tower A	57465	2091
Gr Fl Office B Tower	216225	7866
Basement Tower B	6271	229
1st Fl Common Tower B	130099	4733
1st Fl Apts Tower B	57589	2095
3rd Fl Commom	0	0
4th-13th Apts Tower B	822976	29937
4th-13th Common Tower B	0	0
2nd Fl Apts Tower A	51676	1880
2nd Fl Common Tower A	0	0
3rd Fl Apts Tower A	67962	2473
3rd Fl Common Tower A	0	0
4th-13th Apts Tower A	661186	24052
4th-13th Common Tower A	0	0

Required Cooling Equipment Output Capacity: 2665498 Btu/hr
Available Cooling Equipment Output Capacity: 290000 Btu/hr
Total flow: 88145 CFM
Cooling Equipment Efficiency: 9 SEER
Calculated Distribution Efficiency: 95%
Temperature Drop: 28 F
Cooling Safety Factor: 1.10
Distribution Safety Factor: 1.10
COOLING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED COOLING LOAD.

Notes:

1. The room heating/cooling loads do not include the equipment and distribution safety factor and distribution losses
2. The room distribution includes distribution safety factor.
3. The load on the room is the peak load for this room in a year.
4. Available equipment output capacity includes equipment efficiency.
5. Required equipment output capacity includes diversity, distribution losses and equipment safety factor.
6. Overall distribution CFM/GPM for heating/cooling includes equipment safety factor, distribution losses and diversity.

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Insulation Crawl Space Cieling B-Office & Comm Rm

NBHA Lawlwer Apts

For: NBHA

By:

Date:8/17/2009

Improvement Information:

1. Insulation Crawl Space Office & Comm Rm

Surface Insulation

Upgrade 10880 Sq.Ft of existing surfaces to 6" Concrete, 2" XPS, R-10

Non-Energy Benefits: Improve comfort, increase value of building.

Work Scope:

Comply with general conditions. Perform blower door test prior to insulating. Record results and date. Perform infrared scan if indoor/outdoor temperature difference is a minimum 15 F, prior to insulating. Inspect walls for damage, including moisture, prior to insulating. If damage or moisture is found, notify owner before proceeding. Inspect walls for live wiring. If found, notify owner before proceeding. Notify owner if asbestos-containing materials are found. Submit product information to owner for approval in writing prior to ordering. Insulation shall be installed according to manufacturer's instructions. Remove siding to drill holes in sheathing, to blow insulation into wall cavities. If siding cannot be removed, notify owner before drilling holes in finished interior or exterior surfaces. If holes have to be drilled in finished interior or exterior surfaces, holes should be patched and painted to match the surface. Drill a minimum two-inch diameter hole. Probe the wall cavity thoroughly to identify obstructions before insulating. Drill additional holes to insulate on all sides of obstruction as necessary. Dense-pack blow cellulose insulation at sufficient density to avoid settling, and to fill all voids. Insulate to a minimum 3.5 lb. per cubic foot density. Allow owner to inspect the insulation prior to plugging holes. All holes shall be plugged with wood plugs, and air-sealed prior to finishing. After insulating is complete, perform blower door tests. If indoor/outdoor temperature difference is minimum 15 F, perform infrared scan. Clean-up shall be thorough, and shall include inspection and cleaning of any forced air systems. Provide written reports to the owner, including: approved submittals, written record of which walls were insulated and where insulation was not installed, pre and post blower door tests results, pre and post infrared scan results, and warranty.

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM-11b Office and Community Room Floor Insulation Cost

Suggestions

Insulate the floor of the Community Room and the floor of the Housing Authority Offices.
Use a 3" Isocyanurate board insulation (R-21.6). 4' x 8' sheets.

Multipliers *	
Material:	1.00
**Labor:	1.22
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
3" Isocyanurate Ins. board.	8,000	S.F.	$ 1.90	$ 0.44	$ -	$ 15,200	$ 4,294	$ -	$ 19,494	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey

**Multiplier for Carpentry Labor specific to the Newark, New Jersey area.

$ 19,494	Subtotal
$ 3,899	20% Contingency
$ 3,509	15% Contractor O&P
$ -	0% Engineering
$ 26,902	**Total**

APPENDIX S

ECM-12a Install On/Off Controls for Apartment Exhaust Fans

YOUR SUMMARY

This report addresses the key recommendations for improving the comfort, safety and efficiency of your home. You should use it as a guide for deciding what work you want to have done. Remember, your Home Performance Contractor is ready to complete these projects promptly, and the work is guaranteed.

Selected Packages

Measure Description	Non-energy benefits	Package1	Package2	Package3
Fan Apartments Off 8hr/day Thermal: Replace existing fan with new 12,000 CFM fan.	Improve indoor air quality, increase value of building.	$ 0		
Fan Off 8hr/day Apartments kWh Savings: Removed Appliances: 3 Rooftop fan, 1 hp Apartments; Added Appliances: 3 Fan Apartments Off 8hr Kwh Savings	Increase value of building, reduce environmental risk due to old ozone-depleting refrigerants.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 16,491		
Annual KWh Savings, KWh		6,537		
Total Energy Savings, MMBtu		1,419.6		
Simple annual payback, years		NA		
Savings to Investment Ratio		NA		

The following fuel prices were used to estimate annual energy cost savings, payback and savings to investment ratio:

- Natural gas: 1.1100 $/Therm
- Electricity: 0.1500 $/kWh

Base Load Report

Customer Information

Customer Name: NBHA

Address: 6121/3131 Grand Avenue
North Bergen, NJ 07047

Billing Period: None

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 8/17/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Fan Off 8hrday Apartments Thermal & kWh

Billing Period Name: None

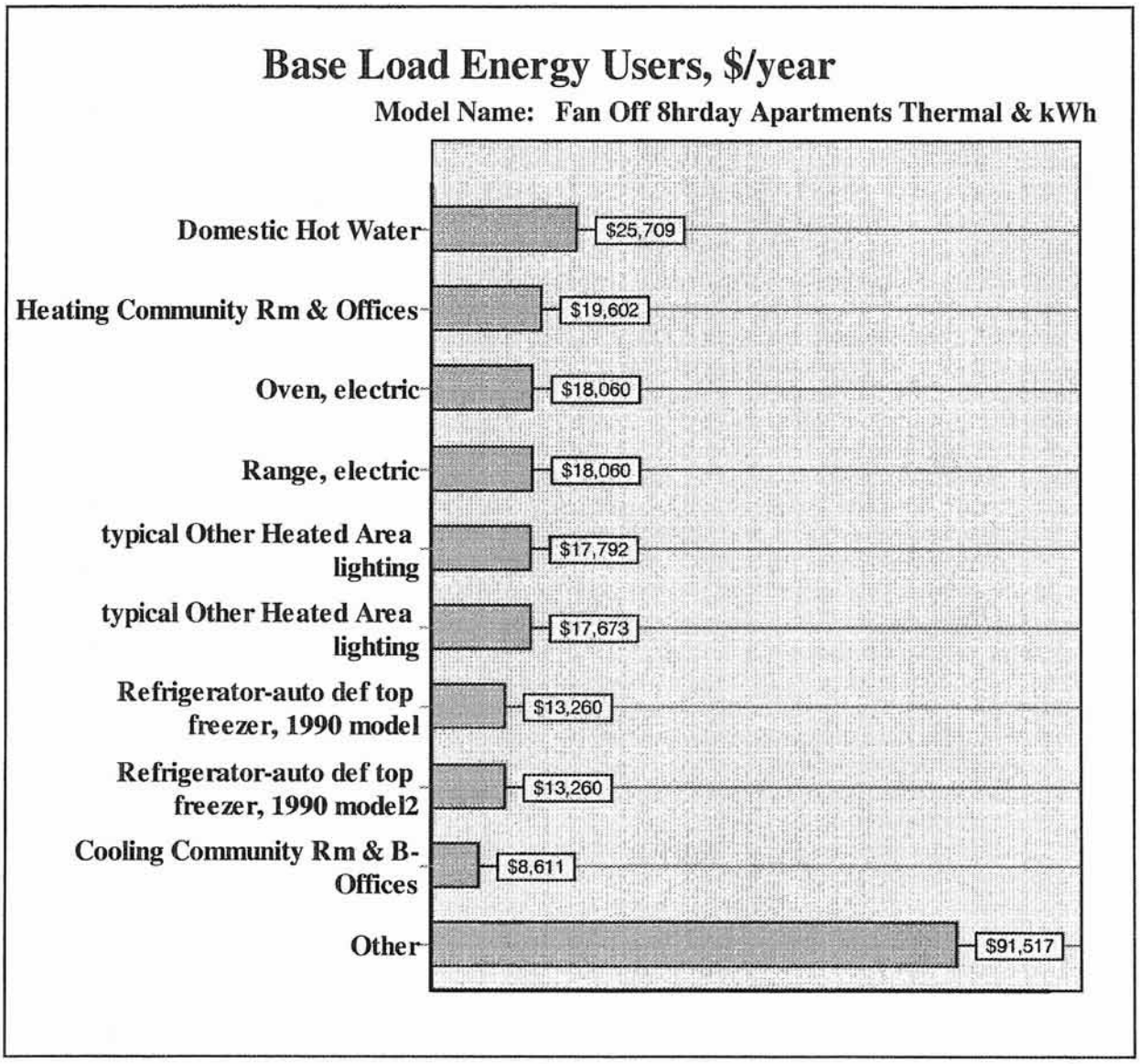
	Electricity		Natural gas			
	kWh	$	Therm	$		
Model	1,478,140	221,721	24,076	26,724		
Billing						
% Difference						

Note: No billing data is available because the model was not compared to a billing period

Annual Use of Domestic Hot Water, Appliances, and Lighting

Model Name: Fan Off 8hrday Apartments Thermal & kWh

	Electricity $0.15 per kWh		Natural gas $1.11 per Therm				Total
	kWh	$	therms	$			$
1. Domestic Hot Water	0	0	23,161	25,709			25,709
2. Heating Community Rm & Offices	130,680	19,602	0	0			19,602
3. Oven, electric	120,400	18,060	0	0			18,060
4. Range, electric	120,400	18,060	0	0			18,060
5. typical Other Heated Area lighting	118,610	17,792	0	0			17,792
6. typical Other Heated Area lighting	117,822	17,673	0	0			17,673
7. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
8. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
9. Cooling Community Rm & B-Offices	57,408	8,611	0	0			8,611
10. Other	603,346	90,501	915	1,016			91,517
TOTAL	1,445,466	216,819	24,076	26,725			243,544


Base Load Energy Users, $/year
Model Name: Fan Off 8hrday Apartments Thermal & kWh
Domestic Hot Water
$25,709
Heating Community Rm & Offices
$19,602
Oven, electric
$18,060
Range, electric
$18,060
typical Other Heated Area lighting
$17,792
typical Other Heated Area lighting
$17,673
Refrigerator-auto def top freezer, 1990 model
$13,260
Refrigerator-auto def top freezer, 1990 model2
$13,260
Cooling Community Rm & B-Offices
$8,611
Other
$91,517

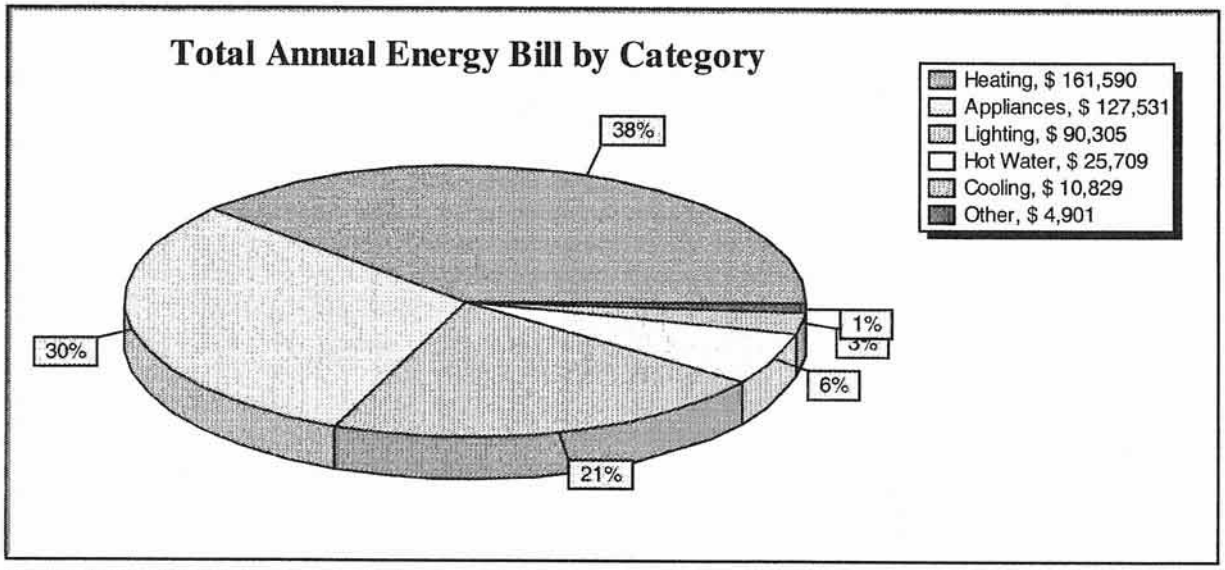
MODEL ENERGY REPORT FOR FAN OFF 8HRDAY APARTMENTS THERMAL & KWH

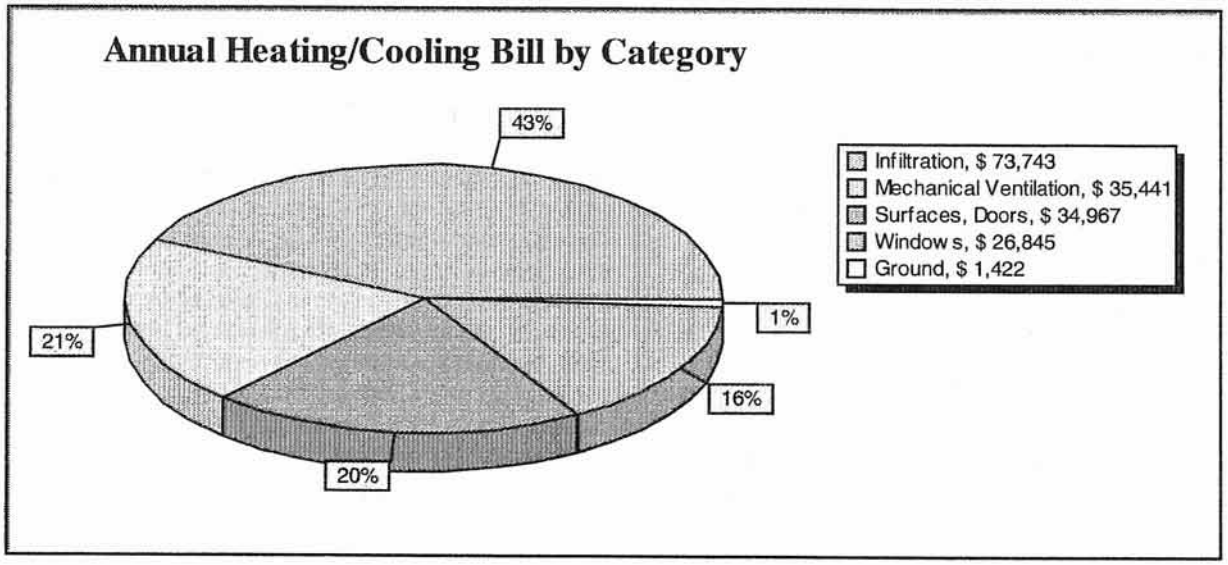
NBHA Lawlwer Apts

For: NBHA

By:

Date: 8/17/2009





Note: Due to rounding, the sum of percentages may not be equal to 100.

DESIGN HEATING AND COOLING LOADS FOR FAN OFF 8HRDAY
APARTMENTS THERMAL & KWH

8/17/2009
Project Name: NBHA Lawlwer Apts

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
Gr Fl Common Tower A	166444	27	18.9	319
2nd Fl Apts Tower B	95776	18	10.9	184
3rd Fl Apts Tower B	99357	19	11.3	191
2nd Fl Commom Tower B	0	0	0.0	0
Community Room	205047	65	23.3	393
Mechanical Spaces T-A	396754	64	45.1	760
1st Fl Common Tower A	31227	13	3.5	60
1st- Apts Tower A	86857	24	9.9	167
Gr Fl Office B Tower	403732	52	45.9	773
Basement Tower B	19203	25	2.2	37
1st Fl Common Tower B	0	0	0.0	0
1st Fl Apts Tower B	81635	23	9.3	157
3rd Fl Commom	0	0	0.0	0
4th-13th Apts Tower B	1165885	24	132.5	2231
4th-13th Common Tower B	0	0	0.0	0
2nd Fl Apts Tower A	110074	21	12.5	211
2nd Fl Common Tower A	0	0	0.0	0
3rd Fl Apts Tower A	108750	21	12.4	209
3rd Fl Common Tower A	0	0	0.0	0
4th-13th Apts Tower A	1332761	28	151.5	2550
4th-13th Common Tower A	0	0	0.0	0

Required Heating Equipment Output Capacity: 5104244 Btu/hr
Available Heating Equipment Output Capacity: 6327100 Btu/hr
Total flow: 510.6 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 65 %
Calculated Distribution Efficiency: 93 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
Gr Fl Common Tower A	110762	4030
2nd Fl Apts Tower B	67898	2470
3rd Fl Apts Tower B	63411	2307
2nd Fl Commom Tower B	0	0
Community Room	87420	3180
Mechanical Spaces T-A	0	0
1st Fl Common Tower A	64367	2342
1st- Apts Tower A	54863	1996
Gr Fl Office B Tower	219345	7979
Basement Tower B	6271	229
1st Fl Common Tower B	130099	4733
1st Fl Apts Tower B	54987	2001
3rd Fl Commom	0	0
4th-13th Apts Tower B	784706	28545
4th-13th Common Tower B	0	0
2nd Fl Apts Tower A	49075	1786
2nd Fl Common Tower A	0	0
3rd Fl Apts Tower A	63626	2315
3rd Fl Common Tower A	0	0
4th-13th Apts Tower A	617826	22474
4th-13th Common Tower A	0	0

Required Cooling Equipment Output Capacity: 2558162 Btu/hr
Available Cooling Equipment Output Capacity: 290000 Btu/hr
Total flow: 84595 CFM
Cooling Equipment Efficiency: 9 SEER
Calculated Distribution Efficiency: 95%
Temperature Drop: 28 F
Cooling Safety Factor: 1.10
Distribution Safety Factor: 1.10
COOLING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED COOLING LOAD.

Notes:

1. The room heating/cooling loads do not include the equipment and distribution safety factor and distribution losses
2. The room distribution includes distribution safety factor.
3. The load on the room is the peak load for this room in a year.
4. Available equipment output capacity includes equipment efficiency.
5. Required equipment output capacity includes diversity, distribution losses and equipment safety factor.
6. Overall distribution CFM/GPM for heating/cooling includes equipment safety factor, distribution losses and diversity.

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Fan Off 8hrday Apartments Thermal & kWh

NBHA Lawlwer Apts

For: NBHA

By:

Date:8/17/2009

Improvement Information:

1. Fan Apartments Off 8hr/day Thermal

Mechanical Ventilation Improvement

Ventilation Rate, CFM	Heat Recovery Efficiency	Ventilated Spaces	Type of Installation
300	0	2nd Fl Apts Tower A	Replace existing fan
300	0	1st Fl Apts Tower B	Replace existing fan
300	0	2nd Fl Apts Tower B	Replace existing fan
300	0	1st- Apts Tower A	Replace existing fan
300	0	3rd Fl Apts Tower B	Replace existing fan
500	0	3rd Fl Apts Tower A	Replace existing fan
5000	0	4th-13th Apts Tower A	Replace existing fan
5000	0	4th-13th Apts Tower B	Replace existing fan

Non-Energy Benefits: Improve indoor air quality, increase value of building.

Work Scope:

Comply with general conditions. Submit product information to owner for approval in writing prior to ordering. Patch and paint where existing equipment was removed to match existing surfaces. Perform complete ventilation sizing of the building prior to selecting equipment, using standard methods such as ASHRAE Standard 62. Size new equipment according to this sizing, and not according to the size of removed equipment. Provide a written copy of sizing and assumptions for approval by the owner prior to ordering equipment. Size distribution system according to standard methods. Install system securely and level. Securely fasten system to duct work with mechanical fasteners and seal. Install clean air filters. Duct sealing and insulation shall comply with standards described in the separate duct sealing and duct

insulation work scopes. Balance distribution system by measuring air supply to all grilles and adjusting manual balancing dampers. Balancing dampers shall be of the locking type. Install defrost drainage per manufacturer's instructions. Provide air gap for drain pipe per building or local codes. Insulate all ductwork per energy code requirements. Insulation shall be mechanically fastened. Tape is unacceptable as a fastener. Install supply grilles in locations where cold entering air will not present a comfort problem. After installation is complete, measure and record entering and leaving air temperatures. Ensure that these measurements are within the manufacturer's requirements. Provide training to the owner in the use of the system and controls. Deliver to the owner users manual, including measurement reports, warranties, and approved submittals.

2. Fan Off 8hr/day Apartments kWh Savings

Removed Appliances:

Appliance Name	Location	Quantity
Rooftop fan, 1 hp Apartments	4th-13th Apts Tower B	3

Added Appliances:

Appliance Name	Location	Quantity
Fan Apartments Off 8hr Kwh Savings	4th-13th Apts Tower B	3

Non-Energy Benefits: Increase value of building, reduce environmental risk due to old ozone-depleting refrigerants.

Work Scope:

Comply with general conditions. Submit product information and obtain Owner approval prior to ordering. Dispose of original refrigerator in compliance with state and local regulations. Remove refrigerant in compliance with EPA regulations. Set thermostat in refrigerator to its warmest position. After equilibrium, measure and record temperature in refrigerator. Deliver all owner's manuals, test results, and warranties to the Owner.

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM - 12a Apartment Exhaust Fans On/Off 8 Hrs. / Day

Suggestions

Install a small programmable controller and relays to turn roof mounted exhaust fans on and off based on a time schedule.

Multipliers *	
Material:	1.00
**Labor:	1.44
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
16 Point Programable Controller. Cost includes, installation, programming and startup	1	ea.		$ 1,000	$ 2,000	$ -	$ 1,440	$ 2,000	$ 3,440	Means Mechanical Cost Data - 2009
						$ -	$ -	$ -	$ -	
Install On/Off Relays in NEMA cabinet. Install conduit and wire from controller to MCC.	10	ea.			$ 510	$ -	$ -	$ 5,100	$ 5,100	Means Mechanical Cost Data - 2009
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey

**Multiplier for Electrical and Controls Labor specific to the Newark, New Jersey area.

$ 8,540	Subtotal
$ 1,708	20% Contingency
$ 1,537	15% Contractor O&P
$ -	0% Engineering
$ 11,785	**Total**

APPENDIX T

ECM-12b Install On/Off Controls for Common Area Exhaust Fans

YOUR SUMMARY

This report addresses the key recommendations for improving the comfort, safety and efficiency of your home. You should use it as a guide for deciding what work you want to have done. Remember, your Home Performance Contractor is ready to complete these projects promptly, and the work is guaranteed.

Selected Packages

Measure Description	Non-energy benefits	Package1	Package2	Package3
Fan Off Common Area 8hr/day Thermal: Replace existing fan with new 11,070 CFM fan.	Improve indoor air quality, increase value of building.	$ 0		
Fan Common Off 8hr/day kWh: Removed Appliances: 1 Rooftop fan, Common Area 1 hp; Added Appliances: 1 Fan Common Off 8hr kWh Savings	Increase value of building, reduce environmental risk due to old ozone-depleting refrigerants.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 1,993		
Annual KWh Savings, KWh		2,179		
Total Energy Savings, MMBtu		157.5		
Simple annual payback, years		NA		
Savings to Investment Ratio		NA		

The following fuel prices were used to estimate annual energy cost savings, payback and savings to investment ratio:

- Natural gas: 1.1100 $/Therm
- Electricity: 0.1500 $/kWh

Base Load Report

Customer Information

Customer Name: NBHA

Address: 6121/3131 Grand Avenue
North Bergen, NJ 07047

Billing Period: None

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 8/17/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Fan Off 8hrday Common Areas Thermal & kWh

Billing Period Name: None

	Electricity		Natural gas			
	kWh	$	Therm	$		
Model	1,482,498	222,375	24,076	26,724		
Billing						
% Difference						

Note: No billing data is available because the model was not compared to a billing period

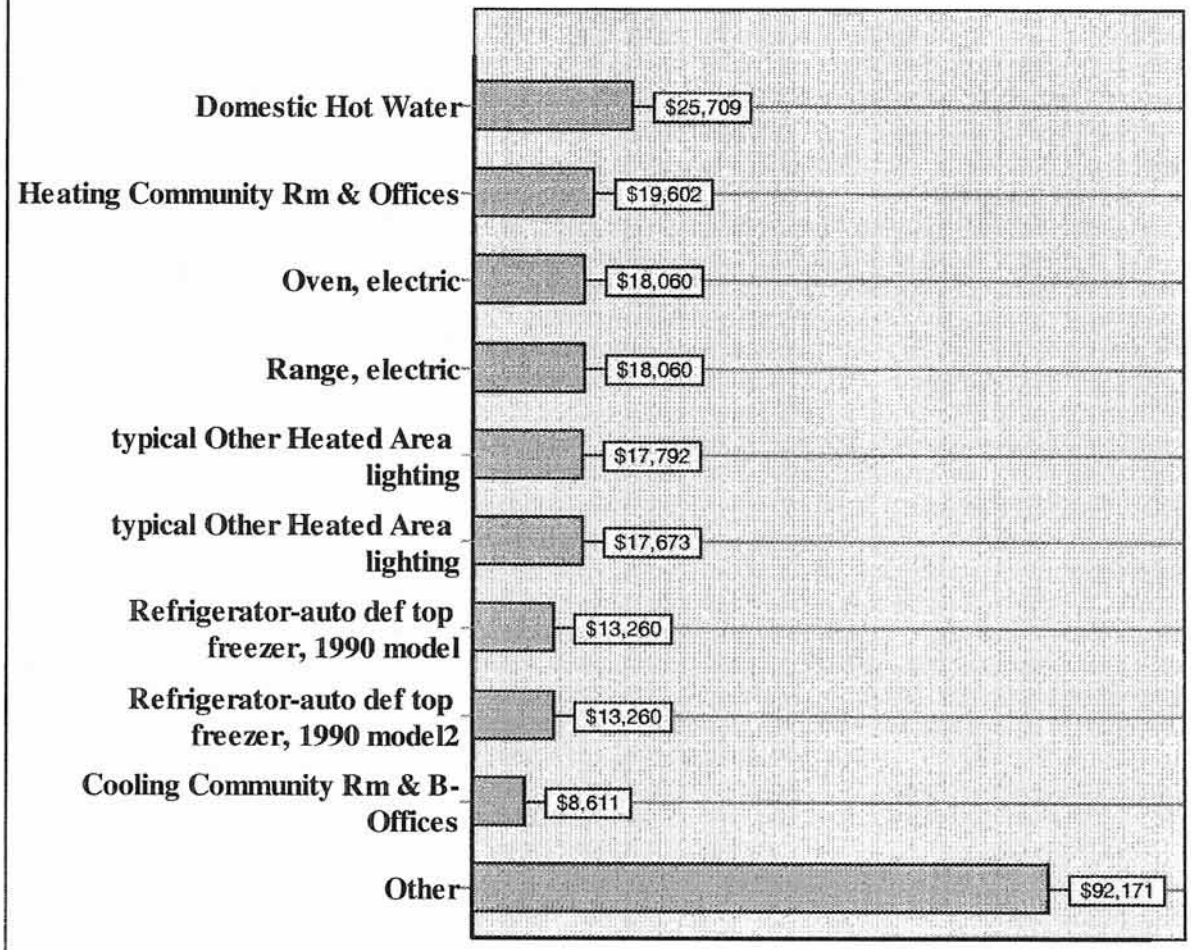
Annual Use of Domestic Hot Water, Appliances, and Lighting

Model Name: Fan Off 8hrday Common Areas Thermal & kWh

	Electricity $0.15 per kWh		Natural gas $1.11 per Therm				Total
	kWh	$	therms	$			$
1. Domestic Hot Water	0	0	23,161	25,709			25,709
2. Heating Community Rm & Offices	130,680	19,602	0	0			19,602
3. Oven, electric	120,400	18,060	0	0			18,060
4. Range, electric	120,400	18,060	0	0			18,060
5. typical Other Heated Area lighting	118,610	17,792	0	0			17,792
6. typical Other Heated Area lighting	117,822	17,673	0	0			17,673
7. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
8. Refrigerator-auto def top freezer, 1990	88,400	13,260	0	0			13,260
9. Cooling Community Rm & B-Offices	57,408	8,611	0	0			8,611
10. Other	607,704	91,155	915	1,016			92,171
TOTAL	1,449,824	217,473	24,076	26,725			244,198

Base Load Energy Users, $/year

Model Name: Fan Off 8hrday Common Areas Thermal & kWh



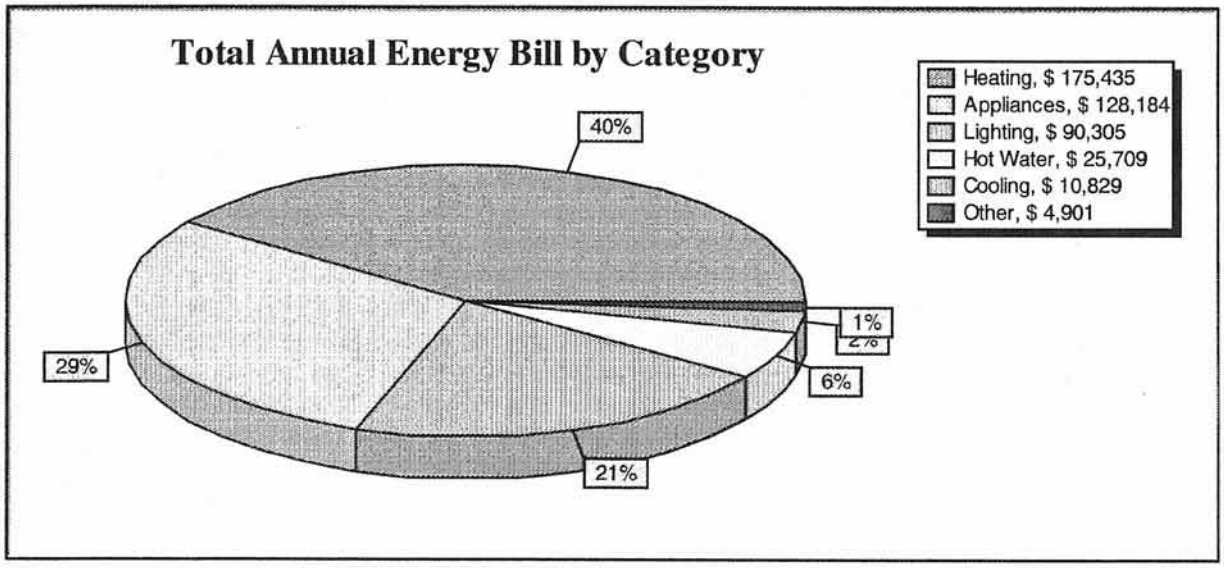
MODEL ENERGY REPORT FOR FAN OFF 8HRDAY COMMON AREAS THERMAL & KWH

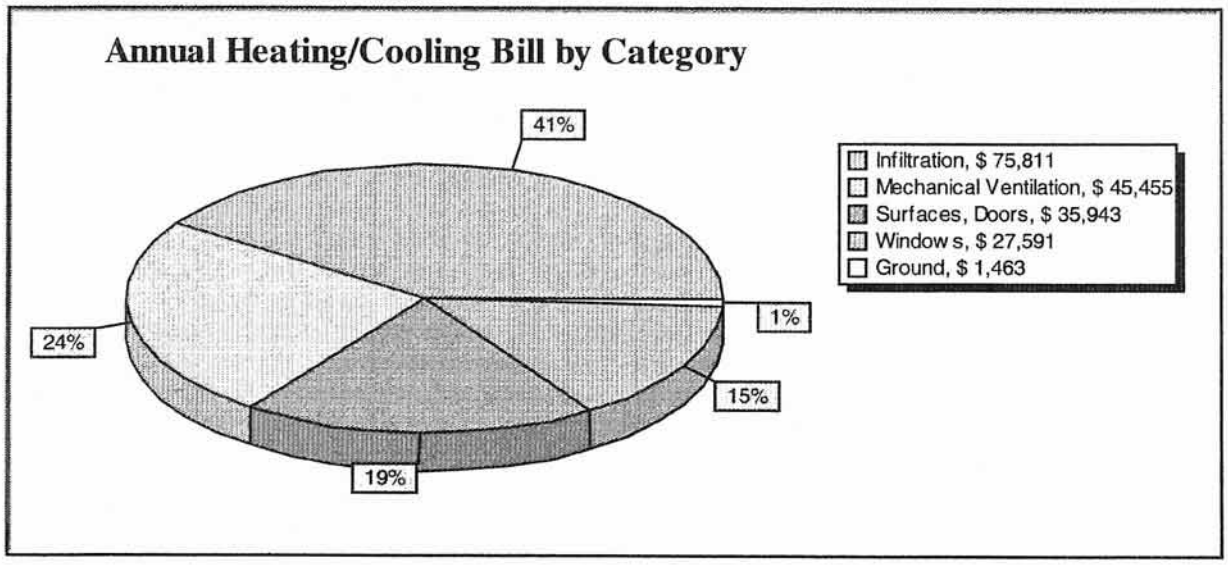
NBHA Lawlwer Apts

For: NBHA

By:

Date: 8/17/2009





Note: Due to rounding, the sum of percentages may not be equal to 100.

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Fan Off 8hrday Common Areas Thermal & kWh

NBHA Lawlwer Apts

For: NBHA

By:

Date:8/17/2009

Improvement Information:

1. Fan Off Common Area 8hr/day Thermal

Mechanical Ventilation Improvement

Ventilation Rate, CFM	Heat Recovery Efficiency	Ventilated Spaces	Type of Installation
350	0	2nd Fl Common Tower A	Replace existing fan
350	0	3rd Fl Commom	Replace existing fan
350	0	2nd Fl Commom Tower B	Replace existing fan
350	0	1st Fl Common Tower B	Replace existing fan
350	0	1st Fl Common Tower A	Replace existing fan
1000	0	Gr Fl Common Tower A	Replace existing fan
4160	0	4th-13th Common Tower B	Replace existing fan
4160	0	4th-13th Common Tower A	Replace existing fan

Non-Energy Benefits: Improve indoor air quality, increase value of building.

Work Scope:

Comply with general conditions. Submit product information to owner for approval in writing prior to ordering. Patch and paint where existing equipment was removed to match existing surfaces. Perform complete ventilation sizing of the building prior to selecting equipment, using standard methods such as ASHRAE Standard 62. Size new equipment according to this sizing, and not according to the size of removed equipment. Provide a written copy of sizing and assumptions for approval by the owner prior to ordering equipment. Size distribution system according to standard methods. Install system securely and level. Securely fasten system to duct work with mechanical fasteners and seal. Install clean air filters. Duct sealing and insulation shall comply with standards described in the separate duct sealing and duct

2. Fan Common Off 8hr/day kWh

Removed Appliances:

Appliance Name	Location	Quantity
Rooftop fan, Common Area 1 hp	4th-13th Common Tower B	1

Added Appliances:

Appliance Name	Location	Quantity
Fan Common Off 8hr kWh Savings	4th-13th Apts Tower B	1

Non-Energy Benefits: Increase value of building, reduce environmental risk due to old ozone-depleting refrigerants.

Work Scope:

Comply with general conditions. Submit product information and obtain Owner approval prior to ordering. Dispose of original refrigerator in compliance with state and local regulations. Remove refrigerant in compliance with EPA regulations. Set thermostat in refrigerator to its warmest position. After equilibrium, measure and record temperature in refrigerator. Deliver all owner's manuals, test results, and warranties to the Owner.

insulation work scopes. Balance distribution system by measuring air supply to all grilles and adjusting manual balancing dampers. Balancing dampers shall be of the locking type. Install defrost drainage per manufacturer's instructions. Provide air gap for drain pipe per building or local codes. Insulate all ductwork per energy code requirements. Insulation shall be mechanically fastened. Tape is unacceptable as a fastener. Install supply grilles in locations where cold entering air will not present a comfort problem. After installation is complete, measure and record entering and leaving air temperatures. Ensure that these measurements are within the manufacturer's requirements. Provide training to the owner in the use of the system and controls. Deliver to the owner users manual, including measurement reports, warranties, and approved submittals.

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM - 12b Common Area Exhaust Fans On/Off 8 Hrs. / Day

Suggestions

Install a small programmable controller and relays to turn roof mounted exhaust fans on and off based on a time schedule.

Multipliers *	
Material:	1.00
**Labor:	1.44
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
16 Point Programable Controller. Cost includes, installation, programming and startup	1	ea.		$ 1,000	$ 2,000	$ -	$ 1,440	$ 2,000	$ 3,440	Means Mechanical Cost Data - 2009
						$ -	$ -	$ -	$ -	
Install On/Off Relays in NEMA cabinet. Install conduit and wire from controller to MCC.	4	ea.			$ 510	$ -	$ -	$ 2,040	$ 2,040	Means Mechanical Cost Data - 2009
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey

**Multiplier for Electrical and Controls Labor specific to the Newark, New Jersey area.

$ 5,480	Subtotal
$ 1,096	20% Contingency
$ 986	15% Contractor O&P
$ -	0% Engineering
$ 7,562	**Total**

APPENDIX U

ECM-13 Energy Star Appliances

YOUR SUMMARY

This report addresses the key recommendations for improving the comfort, safety and efficiency of your home. You should use it as a guide for deciding what work you want to have done. Remember, your Home Performance Contractor is ready to complete these projects promptly, and the work is guaranteed.

Selected Packages

Measure Description	Non-energy benefits	Package1	Package2	Package3
Energy Star Refrigerators: Removed Appliances: 1 Refrigerator - auto def side freezer, 20 CF, high eff 2000, 7 Kitchen Refrigerators, 7 Refrigeratort 1st, 10 Refigerators, 10 Refrigerator - auto def top freezer, 1990 model, 10 Refrigerator 2, 10 Refrigertor, 100 Refrigerator-auto def top freezer, 1990 model, 100 Refrigerator-auto def top freezer, 1990 model2; Added Appliances: 1 Refrigerator - auto def, 20 CF, high efficiency, 7 Refrigerator - auto def, 15 CF, high efficiency, 7 Refrigerator - auto def, 15 CF, high efficiency 7, 10 Refrigerator - auto def, 15 CF, high efficiency 11, 10 Refrigerator - auto def, 15 CF, high efficiency 2, 10 Refrigerator - auto def, 15 CF, high efficiency 3, 10 Refrigerator - auto def, 15 CF, high efficiency 4, 10 Refrigerator - auto def, 15 CF, high efficiency 6, 100 Refrigerator - auto def, 15 CF, high efficiency 10, 100 Refrigerator - auto def, 15 CF, high efficiency 8	Increase value of building, reduce environmental risk due to old ozone-depleting refrigerants.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 13,063		
Annual KWh Savings, KWh		106,584		
Total Energy Savings, MMBtu		100.2		
Simple annual payback, years		NA		
Savings to Investment Ratio		NA		

The following fuel prices were used to estimate annual energy cost savings, payback and savings to investment ratio:

- Natural gas: 1.1100 $/Therm
- Electricity: 0.1500 $/kWh

Base Load Report

Customer Information

Customer Name: NBHA

Address: 6121/3131 Grand Avenue
North Bergen, NJ 07047

Billing Period: None

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 8/17/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Energy Star Refrigerators

Billing Period Name: None

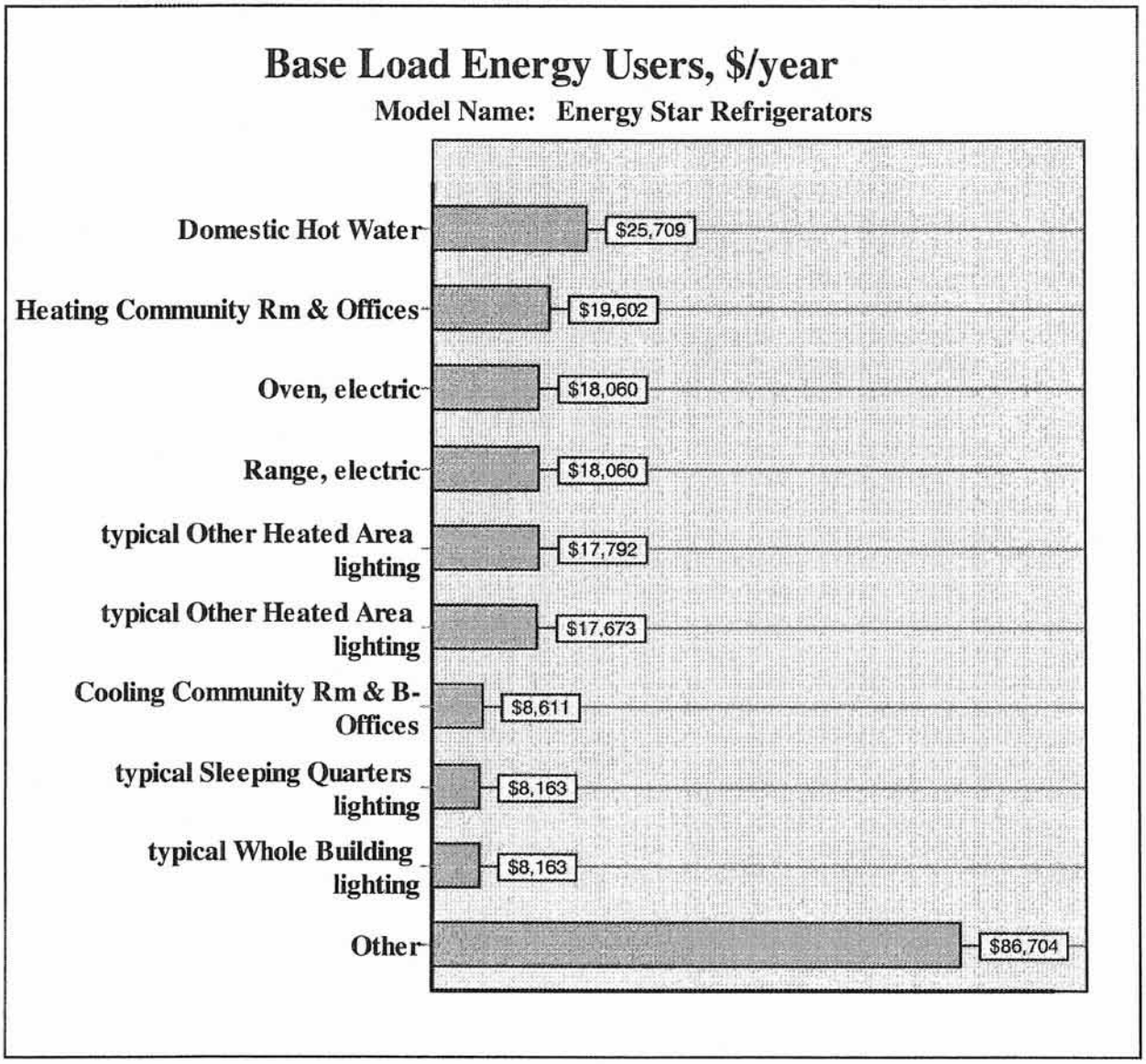
	Electricity		Natural gas			
	kWh	$	Therm	$		
Model	1,378,093	206,714	24,076	26,724		
Billing						
% Difference						

Note: No billing data is available because the model was not compared to a billing period

Annual Use of Domestic Hot Water, Appliances, and Lighting

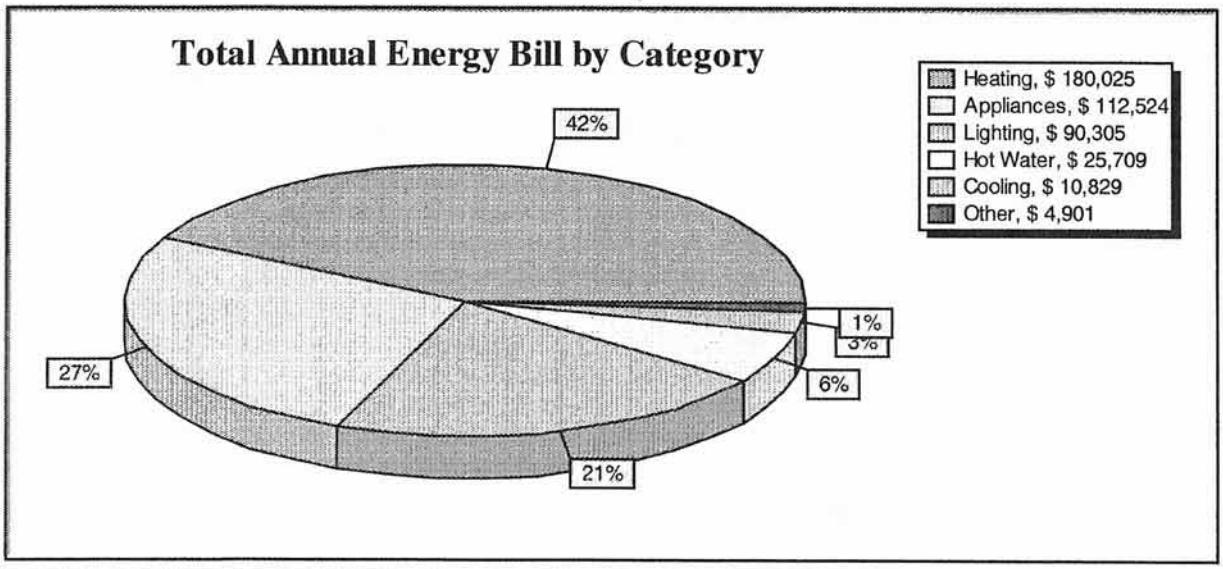
Model Name: Energy Star Refrigerators

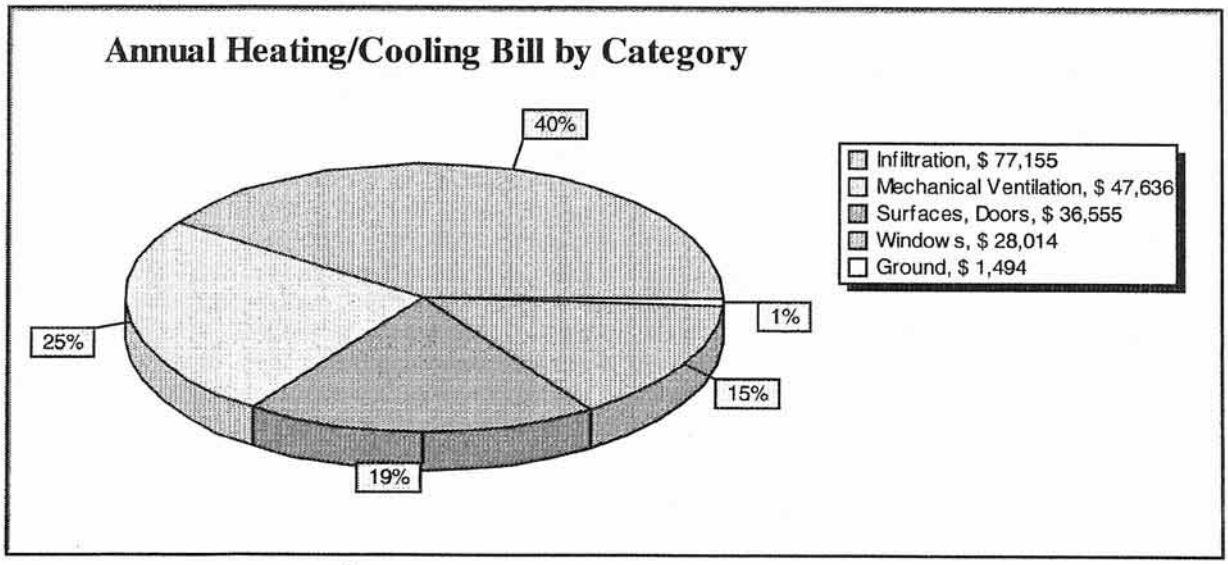
	Electricity $0.15 per kWh		Natural gas $1.11 per Therm				Total
	kWh	$	therms	$			$
1. Domestic Hot Water	0	0	23,161	25,709			25,709
2. Heating Community Rm & Offices	130,680	19,602	0	0			19,602
3. Oven, electric	120,400	18,060	0	0			18,060
4. Range, electric	120,400	18,060	0	0			18,060
5. typical Other Heated Area lighting	118,610	17,792	0	0			17,792
6. typical Other Heated Area lighting	117,822	17,673	0	0			17,673
7. Cooling Community Rm & B-Offices	57,408	8,611	0	0			8,611
8. typical Sleeping Quarters lighting	54,417	8,163	0	0			8,163
9. typical Whole Building lighting	54,417	8,163	0	0			8,163
10. Other	571,265	85,688	915	1,016			86,704
TOTAL	1,345,419	201,812	24,076	26,725			228,537


Base Load Energy Users, $/year
Model Name: Energy Star Refrigerators
Domestic Hot Water
$25,709
Heating Community Rm & Offices
$19,602
Oven, electric
$18,060
Range, electric
$18,060
typical Other Heated Area lighting
$17,792
typical Other Heated Area lighting
$17,673
Cooling Community Rm & B-Offices
$8,611
typical Sleeping Quarters lighting
$8,163
typical Whole Building lighting
$8,163
Other
$86,704

MODEL ENERGY REPORT FOR ENERGY STAR REFRIGERATORS

NBHA Lawlwer Apts
For: NBHA
By:
Date: 8/17/2009





Note: Due to rounding, the sum of percentages may not be equal to 100.

DESIGN HEATING AND COOLING LOADS FOR ENERGY STAR REFRIGERATORS

8/17/2009
Project Name: NBHA Lawlwer Apts

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
Gr Fl Common Tower A	166444	27	18.9	319
2nd Fl Apts Tower B	104064	20	11.8	200
3rd Fl Apts Tower B	107645	20	12.2	206
2nd Fl Commom Tower B	0	0	0.0	0
Community Room	205047	65	23.3	393
Mechanical Spaces T-A	396754	64	45.1	760
1st Fl Common Tower A	31227	13	3.5	60
1st- Apts Tower A	94635	26	10.8	182
Gr Fl Office B Tower	403732	52	45.9	773
Basement Tower B	19203	25	2.2	37
1st Fl Common Tower B	0	0	0.0	0
1st Fl Apts Tower B	89413	25	10.2	172
3rd Fl Commom	0	0	0.0	0
4th-13th Apts Tower B	1297755	27	147.5	2483
4th-13th Common Tower B	0	0	0.0	0
2nd Fl Apts Tower A	116662	22	13.3	224
2nd Fl Common Tower A	0	0	0.0	0
3rd Fl Apts Tower A	121430	23	13.8	233
3rd Fl Common Tower A	0	0	0.0	0
4th-13th Apts Tower A	1442561	30	164.0	2760
4th-13th Common Tower A	0	0	0.0	0

Required Heating Equipment Output Capacity: 5454019 Btu/hr
Available Heating Equipment Output Capacity: 6327100 Btu/hr
Total flow: 545.6 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 65 %
Calculated Distribution Efficiency: 93 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
Gr Fl Common Tower A	110762	4030
2nd Fl Apts Tower B	68800	2503
3rd Fl Apts Tower B	63842	2323
2nd Fl Commom Tower B	0	0
Community Room	87290	3176
Mechanical Spaces T-A	0	0
1st Fl Common Tower A	64367	2342
1st- Apts Tower A	56275	2048
Gr Fl Office B Tower	219345	7979
Basement Tower B	6271	229
1st Fl Common Tower B	130099	4733
1st Fl Apts Tower B	56399	2052
3rd Fl Commom	0	0
4th-13th Apts Tower B	805996	29319
4th-13th Common Tower B	0	0
2nd Fl Apts Tower A	51676	1880
2nd Fl Common Tower A	0	0
3rd Fl Apts Tower A	66262	2411
3rd Fl Common Tower A	0	0
4th-13th Apts Tower A	661186	24052
4th-13th Common Tower A	0	0

Required Cooling Equipment Output Capacity: 2644317 Btu/hr
Available Cooling Equipment Output Capacity: 290000 Btu/hr
Total flow: 87444 CFM
Cooling Equipment Efficiency: 9 SEER
Calculated Distribution Efficiency: 95%
Temperature Drop: 28 F
Cooling Safety Factor: 1.10
Distribution Safety Factor: 1.10
COOLING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED COOLING LOAD.

Notes:

1. The room heating/cooling loads do not include the equipment and distribution safety factor and distribution losses
2. The room distribution includes distribution safety factor.
3. The load on the room is the peak load for this room in a year.
4. Available equipment output capacity includes equipment efficiency.
5. Required equipment output capacity includes diversity, distribution losses and equipment safety factor.
6. Overall distribution CFM/GPM for heating/cooling includes equipment safety factor, distribution losses and diversity.

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Energy Star Refrigerators

NBHA Lawlwer Apts

For: NBHA

By:

Date:8/17/2009

Improvement Information:

1. Energy Star Refrigerators

Removed Appliances:

Appliance Name	Location	Quantity
Kitchen Refrigerators	1st- Apts Tower A	7
Refigerators	2nd Fl Apts Tower A	10
Refrigerator - auto def side freezer, 20 CF, high eff 2000	Community Room	1
Refrigerator - auto def top freezer, 1990 model	3rd Fl Apts Tower B	10
Refrigerator 2	3rd Fl Apts Tower A	10
Refrigerator-auto def top freezer, 1990 model	4th-13th Apts Tower A	100
Refrigerator-auto def top freezer, 1990 model2	4th-13th Apts Tower B	100
Refrigeratort 1st	1st Fl Apts Tower B	7
Refrigertor	2nd Fl Apts Tower B	10

Added Appliances:

Appliance Name	Location	Quantity
Refrigerator - auto def, 15 CF, high efficiency	1st- Apts Tower A	7
Refrigerator - auto def, 15 CF, high efficiency 10	4th-13th Apts Tower A	100
Refrigerator - auto def, 15 CF, high efficiency 11	2nd Fl Common Tower A	10
Refrigerator - auto def, 15 CF, high efficiency 2	2nd Fl Apts Tower B	10
Refrigerator - auto def, 15 CF, high efficiency 3	3rd Fl Apts Tower B	10

Refrigerator - auto def, 15 CF, high efficiency 4	3rd Fl Apts Tower A	10
Refrigerator - auto def, 15 CF, high efficiency 6	2nd Fl Apts Tower A	10
Refrigerator - auto def, 15 CF, high efficiency 7	1st Fl Apts Tower B	7
Refrigerator - auto def, 15 CF, high efficiency 8	4th-13th Apts Tower B	100
Refrigerator - auto def, 20 CF, high efficiency	Community Room	1

Non-Energy Benefits: Increase value of building, reduce environmental risk due to old ozone-depleting refrigerants.

Work Scope:

Comply with general conditions. Submit product information and obtain Owner approval prior to ordering. Dispose of original refrigerator in compliance with state and local regulations. Remove refrigerant in compliance with EPA regulations. Set thermostat in refrigerator to its warmest position. After equilibrium, measure and record temperature in refrigerator. Deliver all owner's manuals, test results, and warranties to the Owner.

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM - 13 Replace Refrigerators with Energy Star Rated Units

Suggestions

Replace existing 15 C.F. refrigerators with new 15 C.F. Energy Star rated refrigerators.

Multipliers *	
Material:	1.00
**Labor:	1.22
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Replace all 15 C.F. refrigerators in Lawler Towers with Energy Star rated units.	253	ea.	$ 600	$ 20		$ 151,800	$ 6,173	$ -	$ 157,973	Quotes from Home Depot and Lowes.
Disposal cost for each unit.	253	ea.		$ 35		$ -	$ 10,803	$ -	$ 10,803	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

*Multipliers per RS Means Mechanical Cost Data for Newark, New Jersey

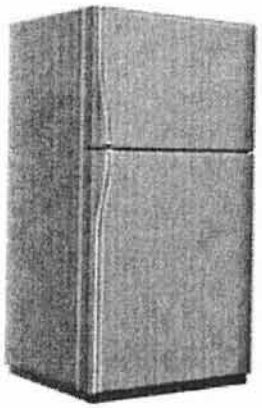
**Multiplier for Millwright Labor specific to the Newark, New Jersey area.

$ 168,776	Subtotal
$ 8,439	5% Contingency
$ -	0% Contractor O&P
$ -	0% Engineering
$ 177,215	**Total**

Energy Savings Are Just the Beginning

Thanks to recent improvements in insulation and compressors, today's refrigerators use much less energy than older models. With an ENERGY STAR qualified refrigerator, you can maximize your energy and dollar savings without sacrificing the features you want.

- **Slash your energy bills.**
  ENERGY STAR qualified refrigerators are required by the U.S. Department of Energy to use 20% less energy than models not labeled with the ENERGY STAR logo. Choose a new qualified model rather than a non-qualified model and cut your energy bills by $165 over the lifetime of your fridge.
- **Replace your old fridge for bigger savings.**
  If you still have a fridge from the 1980s, replace it with an ENERGY STAR qualified model and save over $100 each year on your utility bills. Replace a fridge from the 1970s and save nearly $200 each year! Use the ENERGY STAR Savings Calculator to find out exactly how much money you'll save by replacing your existing refrigerator.
- **Get the latest features.**
  You can find the ENERGY STAR label on the most advanced refrigerators in a variety of designs, including French-door, side-by-side, bottom-mount freezer, and top-mount freezer. Many ENERGY STAR qualified refrigerators use innovative drawer designs and improved temperature controls to keep your food fresher, longer.
- **Protect the environment.**
  Nearly 70% of U.S. electricity is generated with coal and natural gas, which release greenhouse gasses into the atmosphere and contribute to global warming. ENERGY STAR qualified refrigerators use less energy and help us reduce our impact on the environment.



A fridge from the 1970s uses 4 times more energy than a new ENERGY STAR qualified model.

How old is YOUR fridge?

Email This Page

APPENDIX V

ECM-14 Photovoltaic Power Generation

North Bergen Housing Authority
CHA #20241
Building: Lawler Towers Apartments

ECM - 14 Photovoltaic Panels

Cost of Electricity $0.15 $/kWh

ECM-14 Photovoltaic (PV) Rooftop Solar Power Generation-20kW System

Budgetary	Annual Utility Savings				Estimated	Total	New Jersey Renewable	New Jersey Renewable	Payback	Payback
Cost					Maintenance Savings	Savings	* Energy Incentive	** SREC	(without incentive)	(with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$200,000	**0.0**	**23,660**	**0**	**$3,549**	**0**	**$3,549**	**$20,000**	**$11,515**	**>30**	**11.9**

*Incentive based on New Jersey renewable energy program for non-residential applications(PV)= $1.00/W of installed PV system

** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $487/1000kwh

Estimated Solar Renewable Energy Certificate Program (SREC) payments for 15 Years from RR Renewable Energy Consultants

Year	SREC
1	600
2	600
3	600
4	500
5	500
6	500
7	500
8	500
9	500
10	500
11	400
12	400
13	400
14	400
15	400
AVG	**487**


W Granton Ave
Granton Ave
Grand Ave
Meadowview Ave
6131 Grand Ave, NJ 07047
Newkirk
© 2009 Tele Atlas
Image © 2009 Sanborn
Google
Imagery Date: 2004
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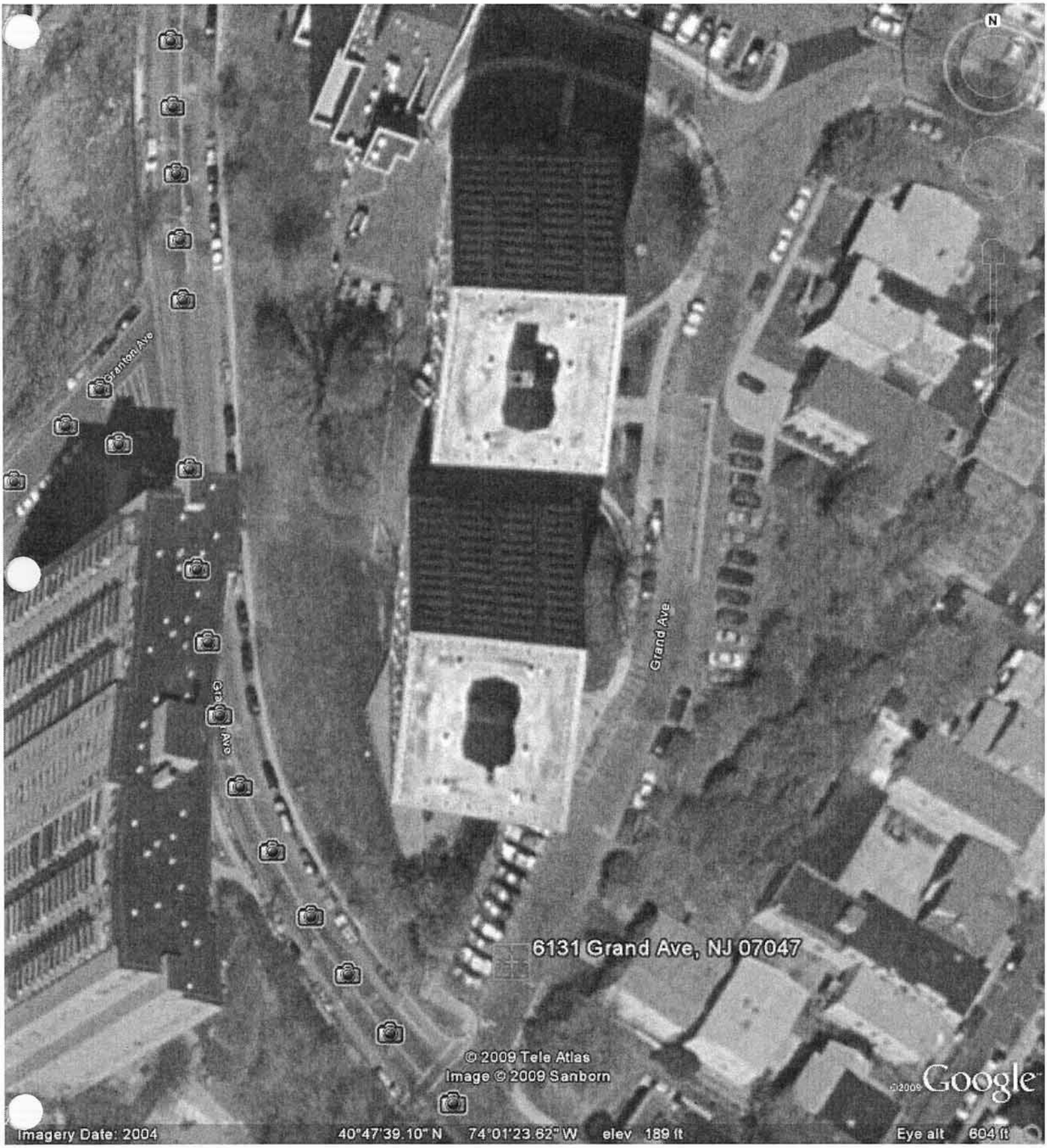
Eye alt 1145 ft


N
Scranton Ave
Grand Ave
Grand Ave
6131 Grand Ave, NJ 07047
© 2009 Tele Atlas
Image © 2009 Sanborn
©2009 Google
Imagery Date: 2004
40°47'39.10" N 74°01'23.62" W elev 189 ft
Eye alt 604 ft

APPENDIX W

EPA Energy Star Portfolio Manager Report

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Lawler

Building ID: 1789113
For 12-month Period Ending: May 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: August 25, 2009

Facility
Lawler
6121 Grand Ave
North Bergen, NJ 07047

Facility Owner
North Bergen Housing Authority
6121 Grand Ave.
North Bergen, NJ 07047

Primary Contact for this Facility
Ryan Leggio
6121 Grand Ave.
North Bergen, NJ 07047

Year Built: 1968
Gross Floor Area (ft²): 191,100

Energy Performance Rating[2] (1-100) N/A

Site Energy Use Summary[3]	
Natural Gas (kBtu)[4]	17,149,310
Electricity (kBtu)	5,671,878
Total Energy (kBtu)	22,821,188

Energy Intensity[5]	
Site (kBtu/ft²/yr)	119
Source (kBtu/ft²/yr)	193

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	1,845

Electric Distribution Utility
PSE&G - Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	
National Average Source EUI	
% Difference from National Average Source EUI	
Building Type	Multifamily Housing

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Certifying Professional
Ryan Leggio
6121 Grand Ave.
North Bergen, NJ 07047

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Lawler	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Multifamily Housing	Is this an accurate description of the space in question?		☐
Location	6121 Grand Ave, North Bergen, NJ 07047	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Edward A. Lawler Towers (Multifamily Housing)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	191,100 Sq. Ft.	Does the square footage include all supporting functions such as residential units, common areas, elevators, storage areas, vent shafts, lobbies, boiler room and basement, etc? Interstitial (plenum) space between floors should be excluded from the total.		☐
Number of units	N/A(Optional)	Is this the total number of occupied or unoccupied apartment units in the Multifamily Housing building? This should include apartments on every line of the building and of every floor plan type and the basement apartments. This should exclude storage or maintenance closets, boiler rooms, garbage compactor or receptacle rooms, management offices or laundry facilities.		☐
Total Number of Bedrooms	N/A(Optional)	Is this the total number of bedrooms located in each individual apartment unit? This should include any additions to the original floor plan performed by the owner. This should exclude in-unit common areas being used as bedrooms by tenants.		☐
Number of Floors	N/A(Optional)	Is this the total number of floors located within a Multifamily Housing Building? This number should include the total number of floors above the existing grade plane. This number should exclude interstitial space between floors or the roof.		☐
Percent of square footage devoted to individual units	N/A(Optional)	Is this the percentage of square footage that is devoted to occupied and unoccupied apartment units?		☐
Laundry in each unit	N/A(Optional)	Is this the total number of laundry hookups located in each individual apartment unit? The laundry facility should be accounted for if the machine is inoperable, operable or if there is a laundry hookup available.		☐
Laundry in common area	N/A(Optional)	Is this the number of laundry hookups located in a common area that are either coin-operated or subsidized by the building owner? The laundry facility should be accounted for if the machine is inoperable, operable or if there is a laundry hookup available.		☐

Dishwashers in each unit	N/A(Optional)	Is this the total number of dishwashers located in individual apartment units? The dishwasher should be accounted for if the machine is inoperable, operable or if there is a dishwasher hookup available.		☐
Percent Heated	N/A(Optional)	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment? This includes the individual apartment units that are individually mechanically heated. The percent heated cannot be greater than 100%. The percent heated attribute is similar to the percent heated attribute for dormitories. The user should select from a drop-down-menu with options presented in bins of 10 (i.e. 0, 10, 20, 30?).		☐
Percent Cooled	N/A(Optional)	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment? This includes the individual apartment units that are individually mechanically cooled. The percent cooled cannot be greater than 100%. The percent cooled attribute is similar to the percent cooled attribute for dormitories. The user should select from a drop-down-menu with options presented in bins of 10 (i.e. 0, 10, 20, 30?).		☐
Market Rate or Affordable Housing	N/A(Optional)	Select Affordable Housing when a Multifamily Housing building is regulated by a national, state or local housing agency and offers subsidized housing to lower and moderate income range households. Select Market Rate when a Multifamily Housing building has either no subsidized units or minimal units with allocated subsidies.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity

Meter: Electricity (kWh (thousand Watt-hours))
Space(s): Entire Facility

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
03/31/2009	04/29/2009	123,854.00
02/24/2009	03/30/2009	140,558.00
01/28/2009	02/23/2009	109,558.00
12/31/2008	01/27/2009	119,739.00
12/04/2008	12/30/2008	115,143.00
11/01/2008	12/03/2008	147,737.00
10/03/2008	10/31/2008	119,970.00
09/04/2008	10/02/2008	132,462.00
08/05/2008	09/03/2008	158,087.00
07/04/2008	08/04/2008	198,280.00
06/05/2008	07/03/2008	161,676.00
Electricity Consumption (kWh (thousand Watt-hours))		**1,527,064.00**
Electricity Consumption (kBtu)		**5,210,342.37**
Total Electricity Consumption (kBtu)		**5,210,342.37**
Is this the total Electricity consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Natural Gas 2415033 (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
03/31/2009	04/29/2009	2,869.00
02/24/2009	03/30/2009	3,684.00
01/28/2009	02/23/2009	2,965.00
12/31/2008	01/27/2009	2,847.00
12/04/2008	12/30/2008	2,705.00
11/04/2008	12/03/2008	2,602.00
10/03/2008	11/03/2008	2,414.00
09/04/2008	10/02/2008	1,812.00
08/05/2008	09/03/2008	1,646.00
07/04/2008	08/04/2008	1,674.00

06/05/2008	07/03/2008	1,813.00
Natural Gas 2415033 Consumption (therms)		**27,031.00**
Natural Gas 2415033 Consumption (kBtu)		**2,703,100.00**
Meter: Natural Gas - 2600157 (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
03/31/2009	04/29/2009	12,291.00
02/24/2009	03/30/2009	26,570.00
01/28/2009	02/23/2009	21,928.00
12/31/2008	01/27/2009	25,071.00
12/04/2008	12/30/2008	22,379.00
11/04/2008	12/03/2008	22,647.00
10/03/2008	11/03/2008	10,761.00
09/04/2008	10/02/2008	0.00
08/05/2008	09/03/2008	0.00
07/04/2008	08/04/2008	0.00
06/05/2008	07/03/2008	0.00
Natural Gas - 2600157 Consumption (therms)		**141,647.00**
Natural Gas - 2600157 Consumption (kBtu)		**14,164,700.00**
Total Natural Gas Consumption (kBtu)		**16,867,800.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

Certifying Professional

(When applying for the ENERGY STAR, this must be the same PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Lawler
6121 Grand Ave
North Bergen, NJ 07047

Facility Owner
North Bergen Housing Authority
6121 Grand Ave.
North Bergen, NJ 07047

Primary Contact for this Facility
Ryan Leggio
6121 Grand Ave.
North Bergen, NJ 07047

General Information

Lawler	
Gross Floor Area Excluding Parking: (ft²)	191,100
Year Built	1968
For 12-month Evaluation Period Ending Date:	May 31, 2009

Facility Space Use Summary

Edward A. Lawler Towers	
Space Type	Multifamily Housing
Gross Floor Area(ft2)	191,100
Number of units[o]	N/A
Total Number of Bedrooms[o]	N/A
Number of Floors[o]	N/A
Percent of square footage devoted to individual units[o]	N/A
Laundry in each unit[o]	N/A
Laundry in common area[o]	N/A
Dishwashers in each unit[o]	N/A
Percent Heated[o]	N/A
Percent Cooled[o]	N/A
Market Rate or Affordable Housing[o]	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 05/31/2009)	**Baseline** (Ending Date 04/30/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft2)	119	120	0	N/A	N/A
Source (kBtu/ft2)	193	194	0	N/A	N/A
Energy Cost					
$/year	$ 439,731.78	$ 442,228.80	N/A	N/A	N/A
$/ft²/year	$ 2.30	$ 2.31	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	1,845	1,853	0	N/A	N/A
$kgCO_2e$/ft²/year	10	10	0	N/A	N/A

Because more than 50% of your building is Multifamily Housing, your building is designated as Multifamily Housing within Portfolio Manager. This type of building is not eligible for an energy performance rating and does not have a reference national average.

Notes:
o - This attribute is optional.
d - A default value has been supplied by Portfolio Manager.

APPENDIX X

New Jersey Pay for Performance Incentives

Incentive Structure for NJ Pay For Performance Program

Incentive #1: Energy Reduction Plan

Incentive Amount:	$0.10	per sq ft
Minimum Incentive:	$5,000	
Maximum Incentive:	$50,000	or 50% of facility annual energy cost

This incentive will be developed to offset the cost of services associated with the development of the Energy Reduction Plan. Projects must identify efficiency improvements that meet the minimum performance level in order to become eligible for Incentive #1. Incentive amount will be based on the square footage of the building.

Incentive #2: Installation of Recommended Measures

	Minimum Performance Target:	**15%**	
Electric Incentives	Base Incentive based on 15% savings:	$0.11	per projected kWh saved
	For each % over 15% add:	$0.005	
	Maximum Incentive:	$0.13	
Gas Incentives	Base Incentive based on 15 % savings:	$1.10	per projected Therm saved
	For each % over 15% add:	$0.05	
	Maximum Incentive:	$1.45	
	Incentive Cap:	**30%**	**of total project cost**

This incentive will be based on projected energy savings and designed to pay approximately 60% of the total performance-based incentive. Savings projections will be calculated using calibrated energy simulation and rounded to the nearest percent. Incentive #2 may not exceed 30% of the total project cost.

Incentive #3: Post-Construction Benchmarking Report

	Minimum Performance Target:	**15%**	
Electric Incentives	Base Incentive based on 15% savings:	$0.07	per projected kWh saved
	For each % over 15% add:	$0.005	
	Maximum Incentive:	$0.09	
Gas Incentives	Base Incentive based on 15% savings:	$0.70	per projected Therm saved
	For each % over 15% add:	$0.05	
	Maximum Incentive:	$1.05	
	Incentive Cap:	**20%**	**of total project cost**

This incentive will be released upon submittal of a Post-Construction Benchmarking Report that verifies that the level of savings actually achieved by the installed measures meets or exceeds the minimum performance threshold. To validate the savings and achievement of the Energy Target, the EPA Portfolio Manager shall be used. Savings should be rounded to the nearest percent. Total value of Incentive #2 and Incentive #3 may not exceed 50% of the total project cost. This incentive will "true up" proposed savings and the related payment for Incentive #2 so that the total incentive is based on actual savings. For buildings not covered by EPA, the process used by LEED EB shall be followed.

Advanced Measure Incentive: Combined Heat and Power

Eligible Technology	Incentive (per Watt) Max: $1 Million	Maximum % of Project Cost
Level 1:	$4.00	60%
Fuel cells not fueled by Class I renewable fuel		
Level 2:	$1.00	30% [1]
Microturbines		
Internal Combustion Engines		
Combustion Turbines		
Level 3:	$0.50	30%
Heat Recovery or Other Mechanical Recovery from Existing		

[1] The maximum % of project cost will go to 40% where a cooling application is used or included with the CHP system.

Note: Incentives for renewable fueled projects (Class1) are currently being developed. This document will be updated when the incentive levels are finalized.

Effective through December 31st 2009

Pay for Performance projects for the FIVE(5) customer classes listed below will be eligible for increased incentive levels:

- Hospitals
- Non-profits
- Public colleges/universities
- Governmental entities not receiving Energy Efficiency and Conservation Block Grants (EECBG)
- Affordable multifamily housing ("affordable" is defined as low income, subsidized, HUD, etc.)

Increased incentive levels are as follows:

- Incentive #2: If a reduction in energy consumption of 20% or more is projected, above listed customers will be eligible for an additional $0.11/kWh and $1.10/therm.
- Incentive #3: If a reduction in energy consumption of 20% or more is achieved, above listed customers will be eligible for an additional $0.07/kWh and $0.70/therm.
- Incentive #2 and #3 combined may not exceed 80% of the total project cost.
- Incentive cap is $2million per gas account and $2million per electric account.
- 200kW threshold is not required

In order to take advantage of this opportunity Partners must submit the following by December 31st 2009:

- A signed P4P Initial Application, including
  - W9
  - 12 months utility bills
- Copy of Partner-Participant Contract
- EPA Portfolio Benchmarking results (may be print out)
- Cover letter indicating
  - The modeling software to be used in developing ERP
  - Type of customer class

Partners that have already submitted Initial Applications for eligible customer classes will be allowed to take advantage of the increased incentive levels.

Thank You,

Pay for Performance Program Update (TMC)

Original Program:
Structure Needs to be over 200 kW average monthly load
Structure saves more than 15% MMBTU (EPA Portfolio Manager)

	15%	Over 20%		15%	Over 20%	
Incentive #1	$0.10					
	kWh			Therm		
Min $5000 Max $50,000						
Incentive #2	$0.11	0.005	Per % over 15%	$1.10	0.05	Per % over 15%
30% of Project Cost Cap						
Incentive #3	$0.07	0.005	Per % over 15%	$0.70	0.05	Per % over 15%
20% of Project Cost Cap						
Incentive #2 & #3	$0.18	0.01	Per % over 15%	$1.80	$0.10	Per % over 15%
50% of Project Cost Cap						

Updated program till Dec 31st 2009
200 avg kW Requirement dropped
Structure saves more than 20% MMBTU (EPA Portfolio Manager)
Incentive Cap $2 million per gas account and $2 million per electric account

	15%	Over 20%		15%	Over 20%		
Incentive #1	$0.10						
	kWh			Therm			
Min $5000 Max $50,000							
Incentive #2	$0.22	0	Per % over 15%	$2.20	0	Per % over 15%	
Incentive #3	$0.14	0	Per % over 15%	$1.40	0	Per % over 15%	
Incentive #2 & #3	$0.36	0	Per % over 15%	$3.60	0	Per % over 15%	
Insentive #2 & #3 not to exceed 80% of Project Cost							

APPENDIX Y

Equipment Inventory

North Bergen Housing Authority
CHA Project No. 20241
Lawler Tower Apartments
Equipment Inventory

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Date Installed	Useable Life Expectancy	Other Info.
HW Boiler #1	PVI	Nickelshield Model 1400N-250A-PV	Condensing Hot Water Boiler	1 MMBtu/hr (input) Natural Gas	Lawler Tower A - Boiler Room	1990		
HW Boiler #2	PVI	Nickelshield Model 1400N-250A-PV	Condensing Hot Water Boiler	1 MMBtu/hr (input) Natural Gas	Lawler Tower A - Boiler Room	1990		
HW Boiler #3	PVI	Nickelshield Model 1400N-250A-PV	Condensing Hot Water Boiler	1 MMBtu/hr (input) Natural Gas	Lawler Tower A - Boiler Room	1990		
LPS Boiler #1	Kewanee	LS3-125-G04	Low Pressure Steam Boiler	Output - 4184 MBH Natural Gas	Lawler Tower A - Boiler Room	1990		
LPS Boiler #2	Kewanee	LS3-125-G04	Low Pressure Steam Boiler	Output - 4184 MBH Natural Gas	Lawler Tower A - Boiler Room	1990		
Heat Pump #1	Daiken	RZQ42MVJU	Heat Pump - Heating / Cooling Unit	Cooling Input - 4.8 KW, Cooling Output - 40,500 BTUH, Heating Input - 4.15 KW, Heating Output - 41,500 BTUH	Community Room	Aug-08		
Heat Pump #2	Daiken	RZQ42MVJU	Heat Pump - Heating / Cooling Unit	Cooling Input - 4.8 KW, Cooling Output - 40,500 BTUH, Heating Input - 4.15 KW, Heating Output - 41,500 BTUH	Community Room	Aug-08		
Heat Pump #3	Daiken	RZQ42MVJU	Heat Pump - Heating / Cooling Unit	Cooling Input - 4.8 KW, Cooling Output - 40,500 BTUH, Heating Input - 4.15 KW, Heating Output - 41,500 BTUH	Community Room	Aug-08		
Heat Pump #4	Daiken	RZQ42MVJU	Heat Pump - Heating / Cooling Unit	Cooling Input - 4.8 KW, Cooling Output - 40,500 BTUH, Heating Input - 4.15 KW, Heating Output - 41,500 BTUH	Community Room	Aug-08		
Air Conditioning Unit #1	Mitsubishi	PL24AK / EK	Split Air Conditioning Unit	24,000 BTUH Cooling Capacity	Basement - Document Storage Room			
Air Conditioning Unit #2	Mitsubishi	PL24AK / EK	Split Air Conditioning Unit	24,000 BTUH Cooling Capacity	Basement - Document Storage Room			
Emergency Generator	Cummins	DGAB-5632283 (S/N J 030552367)	Emergency Generator	230 kW - Diesel Fuel	West Side - Community Room			automatically exercised once per week for 1-hr
R.T.U. #1	Trane	YCC024F1L0BJ	Package Rooftop Unit	24,000 BTUH Cooling Capacity	Directors Office Roof	Oct-05		
Air Conditioning Unit w/ Remote Air Cooled Condenser #1	York	H5DB048S06A	Split Air Conditioning Unit with remote air cooled condenser. Electric Reheat.	48,000 BTUH Cooling Capacity R22 - 6 lb, 0 oz	NBHA Offices			Condenser on the west side of Tower A.
Air Conditioning Unit w/ Remote Air Cooled Condenser #2	York	H4DB060S06A	Split Air Conditioning Unit with remote air cooled condenser. Electric Reheat.	60,000 BTUH Cooling Capacity R22 - 8 lb, 0 oz	NBHA Offices			Condenser on the west side of Tower A.
Air Conditioning Unit w/ Remote Air Cooled Condenser #3	York	H5DB048S06A	Split Air Conditioning Unit with remote air cooled condenser. Electric Reheat.	48,000 BTUH Cooling Capacity R22 - 6 lb, 0 oz	NBHA Offices			Condenser on the west side of Tower A.

North Bergen Housing Authority
CHA Project No. 20241
Lawler Tower Apartments
Equipment Inventory

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Date Installed	Useable Life Expectancy	Other Info.
Air Conditioning Unit w/ Remote Air Cooled Condenser #4	York	H5DB048S06A	Split Air Conditioning Unit with remote air cooled condenser. Electric Reheat.	48,000 BTUH Cooling Capacity R22 - 5 lb, 11 oz	NBHA Offices			Condenser on the west side of Tower A.
Air Conditioning Unit w/ Remote Air Cooled Condenser #5	York	H4DB036S06A	Split Air Conditioning Unit with remote air cooled condenser. Electric Reheat.	36,000 BTUH Cooling Capacity	NBHA Offices (Air Handler #5)			Condenser on the west side of Tower A.
Air Conditioning Unit w/ Remote Air Cooled Condenser #5	Sanyo	KSO9051	Split Air Conditioning Unit with remote air cooled condenser. Wall mounted evaporator.	9,000 BTUH Cooling Capacity	NBHA Offices - Server Room	Apr-05		
Bathroom Exhaust Fan	Loren Cook	100 ACEH 100C10DH	Ceiling Mounted	0.04 Hp	NBHA Offices - Conference Room Bathroom			
Bathroom Exhaust Fan	Fan Tech Turbo Flo	TBD 11	Ceiling Mounted	0.25 Hp	NBHA Offices - Directors Bathroom	Sep-05		
Clothes Washers (10)	Speed Queen	SWFF61WN	Front Loading Clothes Washer		Tower A - First Floor			Typical of ten (10) units.
Clothes Dryers (10)	Speed Queen	STT30NNRB2G1W01	Front Loading Clothes Dryer	N.G. input - 146,00 Btu/hr	Tower A - First Floor			Typical of ten (10) units.
Unit Heater	Reznor	V3TCOR52	Gas Fired Unit Heater	Used to heat intake air to Speed Queen Dryers. Natural Gas.	Plenum behind dryers.			1/20 fan H.P.
Roof Exhaust Fan	Greenheck	GB-100-4	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	1/4 H.P.; .25" W.C.; 1,100 CFM	Roof of Tower A	1968		OFF
Roof Exhaust Fan	Greenheck	GB-240-7	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	3/4 H.P.; .25" W.C.; 5,500 CFM	Roof of Tower A	1968		ON
Roof Exhaust Fan	Greenheck	GB-121-4x-QD	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	1/4 H.P.; .25" W.C.; 1,200 CFM	Roof of Tower A	1968		ON
Roof Exhaust Fans (2)	Greenheck	GB-120-4x-QD	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	1/4 H.P.; .25" W.C.; 1,200 CFM	Roof of Tower A	1968		ON
Roof Exhaust Fan	Greenheck	GB-101-4x-QD-R3	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	1/4 H.P.; .25" W.C.; 1,100 CFM	Roof of Tower A	1968		ON
Roof Exhaust Fan	Greenheck	GB-180-4	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	1/4 H.P.; .25" W.C.; 4,000 CFM	Roof of Tower A	1968		ON
Roof Exhaust Fan	Greenheck	GB-100-4	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	1/4 H.P.; .25" W.C.; 1,100 CFM	Roof of Tower B	1968		ON, but not blowing (belt issue?)
Roof Exhaust Fan	Greenheck	GB-240-7	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	3/4 H.P.; .25" W.C.; 5,500 CFM	Roof of Tower B	1968		OFF
Roof Exhaust Fan	Greenheck	GB-121-4x-QD	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	1/4 H.P.; .25" W.C.; 1,200 CFM	Roof of Tower B	1968		ON, but not blowing (belt issue?)
Roof Exhaust Fans (2)	Greenheck	GB-120-4x-QD	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	1/4 H.P.; .25" W.C.; 1,200 CFM	Roof of Tower B	1968		ON
Roof Exhaust Fan	Greenheck	GB-90-4x-QD	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	1/4 H.P.; .25" W.C.; 1,100 CFM	Roof of Tower B	1968		OFF
Roof Exhaust Fan	Greenheck	GB-130-4x-QD	Roof Mounted; Belt Driven Centrifugal Exhaust Fan.	1/4 H.P.; .25" W.C.; 4,000 CFM	Roof of Tower B	1968		ON

North Bergen Housing Authority
CHA Project No. 20241
Lawler Tower Apartments
Equipment Inventory

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Date Installed	Useable Life Expectancy	Other Info.
Tower A East Elevator Drive Motor	MAG - Magol Corp.		Open Drip Proof Motor; VFD Driven.	20 H.P.; 1180 RPM; 230/460V; 3 PH.; 60 Hz.; 91% Efficiency	Roof Mechanical Room	2008		New motor
Tower A West Elevator Drive Motor	MAG - Magol Corp.		Open Drip Proof Motor; VFD Driven.	20 H.P.; 1180 RPM; 230/460V; 3 PH.; 60 Hz.; 91% Efficiency	Roof Mechanical Room	2008		New motor
Tower B East Elevator Drive Motor	MAG - Magol Corp.		Open Drip Proof Motor; VFD Driven.	20 H.P.; 1180 RPM; 230/460V; 3 PH.; 60 Hz.; 91% Efficiency	Roof Mechanical Room	2008		New motor
Tower B West Elevator Drive Motor	MAG - Magol Corp.		Open Drip Proof Motor; VFD Driven.	20 H.P.; 1180 RPM; 230/460V; 3 PH.; 60 Hz.; 91% Efficiency	Roof Mechanical Room	2008		New motor
Vending			Snacks		Community Room			
Vending			Pepsi		Community Room			
Vending			Pepsi		Community Room			
Vending			Snapple		Community Room			
Refrigerator	Hotpoint	ZF732500	Vertical Type	15 C.F.	Office Kitchen			
Refrigerator	Hotpoint	ZF732500	Vertical Type	15 C.F.	Community Room Kitchen			
Refrigerator	Hotpoint	CTF14CG	Vertical Type	14.2 C.F.	Community Room Kitchen			
Window Air Conditioning Units	Various	Various	Window Mounted Air Conditioning Units.	Various - 5,000 BTUH to 10,000 BTUH	Tower Apartments	Various	Various	

Lawler Towers - Building 6131

Apartment #	# Bedrooms	Heating Type	Appliances	Washer/Dryer	Kitchen Equipment	Windows/Doors	Air Conditioning	Thermostats	Exhaust Fans	Lighting
1A	1	Steam Fin Tube	Desktop Computer, (2)Cable Boxes, (2)Med.TVs, Alarm Clock, Box Fan	Common Laundry	GE Spacemaker Stove Mod.# JAS030H1WH 10.4 kW, GE Fridge Mod.# GTS16BBSARWW 6.5A, Sm. Microwave, Toaster, Coffee Pot	3/4" Commercial Grade Double Glazed in Good Condition	(2) 7500BTU 10.0EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, W17WF1-E (T8) Plug-In, 2I60 Plug-In
1B	3	Steam Fin Tube	Fish Tank, (2)Desktop Computers, Printer, Lg. TV, Sm. TV, Med. TV, (3)Cable Boxes, (2)DVD, XBOX 360, Window Fan	Common Laundry	New GE 4-Burner Digital Control Stove, New GE Mod.# GTH22SBNARBS 11.6A Fridge, G.Foreman Grill, Coffee Pot, Toaster, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	(1) Amana: 7500BTU (1)Sunbeam: 5000BTU, 9.7EER (1)LG: 10000BTU 9.8EER	None	Central Exhaust System	2CF23WallMt-Dual SW, W34CF2-Mag(T12)SW, 5CF23: 4 on Med. Cabinet, 1 Clg. Mt. on one SW, (3) I40 Plug-In, 1CF13 & (2)2CF23 Plug-In
1F	1	Steam Fin Tube	Recip. Fan, Ans. Mach., Med. TV, (2) DTV Cable Converter, DVD, Lg Stereo, Sm. TV	Common Laundry	Premier Stove Mod.#EAK220WP01 8,800W, Sears Fridge Mod.#2538692310 3.75A, Med. Microwave, Toaster, Coffee Maker, Coffee Grinder	3/4" Commercial Grade Double Glazed in Good Condition	(2) Fedders: 6000BTU 9.7EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, W17WF1-E (T8) Plug-In, 2I60 Plug-In
1G *Moisture Problems due to Poor Ventilation	1	Steam Fin Tube	Med. TV, Cable Box, Sm. Radio, Alarm Clk.	Common Laundry	GE Spacemaker Stove Mod.# J243705WH 9.5kW, 220V, Old GE Energy Star Fridge, Sm. Microwave, Toaster	3/4" Commercial Grade Double Glazed in Good Condition	Old Emerson Quiet Cool Window Low EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, I60 on Bedrm SW, (4) I60 Plug-Ins
2A	0	Steam Fin Tube	(2)Med. TV, SM. TV, Sm. Radio, Cable Box, DVD/VCR, VCR	Common Laundry	GE Fridge Mod.# GTS16BBSARWW 6.5A, Kenmore 4-Burner Stove, Sm. Microwave, Coffee Pot, Toaster	3/4" Commercial Grade Double Glazed in Good Condition	Old GE Window 8000BTU 10.0EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, I60 on Bedrm SW, (2) I60 Plug-Ins
2B	0	Steam Fin Tube	Recip. Fan (2)Med. TV, SM. TV, Sm. Radio, (2)Cable Box, DVD/VCR, VCR	Common Laundry	GE Fridge Mod.# GTS16BBSARWW 6.5A, Kenmore 4-Burner Stove, Med. Microwave, Coffee Pot, Toaster, Croc Pot	3/4" Commercial Grade Double Glazed in Good Condition	6000BTU 9.7EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (3) I60 Plug-Ins

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Apartment #	# Bedrooms	Heating Type	Appliances	Washer/Dryer	Kitchen Equipment	Windows/Doors	Air Conditioning	Thermostats	Exhaust Fans	Lighting
2D	0	Steam Fin Tube	Sm. RCA TV, Breathing Machine Cable Box	Common Laundry	Kanmore Fridge Mod.# 2539333010 3.75A, Smaller Kenmore Stove, Toaster, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	Frigidaire 6000BTU Low EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA,
2F	0	Steam Fin Tube	(2)Med. TV, SM. TV, Sm. Radio, Cable Box, DVD/VCR, VCR	Common Laundry	GE Fridge Mod.# GTS16BBSARWW 6.5A, Kenmore 4-Burner Stove, Sm. Microwave, Coffee Pot, Toaster	3/4" Commercial Grade Double Glazed in Good Condition	Old GE Window 8000BTU 10.0EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, I60 on Bedrm SW, (2) I60 Plug-Ins
2J	0	Steam Fin Tube	(2) SM. TV, Cable Box, Recip Fan	Common Laundry	Kenmore Fridge Mod.# 2539333010 3.75A, Smaller Kenmore Stove, Toaster, Sm. Microwave, Coffee Pot, Toaster Oven	3/4" Commercial Grade Double Glazed in Good Condition	7500BTU Low EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (2)I75 Plug-Ins
2K	2	Steam Fin Tube	Water Cooler, Air Cleaner, Med. TV, Sm. TV, (2) Cable Boxes, (2)Sm. Radios, Recip. Pedistal Fan	Common Laundry	LG Magic Chef 4-Burner Stove, Hotpoint Fridge Mod.# HTR16ABSERWW 6.5A, Blender, (2)Coffee Pots, Toaster, Med. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	(1)GE Window: 10500BTU 9.8EER (1)Frigidaire: 7500BTU 10EER	None	Central Exhaust System, Range Hood: GE Mod.# JN3220V1WH	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, I150 Plug-In, (2)I40 Plug-In
3A	1	Steam Fin Tube	Med. TV, Cable Box, VCR, Answering Machine, Recip. Fan, Alarm Clk.	Common Laundry	Magic Chef 4-Burner Stove, Old GE Fridge, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	Whirlpool Window 7500BTU Low EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (5)I60 Plug-Ins
3B	1	Steam Fin Tube	Sm. TV, Cable Box, (2) Answering Machines	Common Laundry	GE Spacemaker Stove Mod.# JAS030H1WH 10.4 kW, GE Fridge Mod.# GTS16BBSARWW 6.5A, Sm. Microwave, Toaster Oven, Toaster, Coffee Pot	3/4" Commercial Grade Double Glazed in Good Condition	Whirlpool Window 10000BTU Low EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (3)I60 Plug-Ins, 3I60 Plug-In

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Apartment #	# Bedrooms	Heating Type	Appliances	Washer/Dryer	Kitchen Equipment	Windows/Doors	Air Conditioning	Thermostats	Exhaust Fans	Lighting
3C	1	Steam Fin Tube	Med. TV, (2)Cable Boxes, DVD, Sm. TV, Alarm Clock	Common Laundry	Hotpoint Fridge Mod.# HTR16ABSERWW 6.5A, Premier Stove Mod.#EAK220WP01 8,800W, Toaster Oven	3/4" Commercial Grade Double Glazed in Good Condition	Whirlpool Window 7500BTU Low EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (3)I75 Plug-Ins
3D	0	Steam Fin Tube	Lg. TV, Cable Box, DVD/VCR, Alarm Clock	Common Laundry	Hotpoint Fridge Mod.# HTR16ABSERWW 6.5A, Premier Stove Mod.#EAK220WP01 8,800W, Toaster Oven	3/4" Commercial Grade Double Glazed in Good Condition	7500BTU Low EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (2)I75 Plug-Ins
3E	1	Steam Fin Tube	(2) Sm. TV, Cable Box	Common Laundry	GE Spacemaker Stove Mod.# JAS030H1WH 10.4 kW, GE Fridge Mod.# GTS16BBSARWW 6.5A, Sm. Microwave, Toaster, Coffee Pot	3/4" Commercial Grade Double Glazed in Good Condition	Daewoo Mod#DWC121C 12100BTU 10.1EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW (2 Lamps Out), W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (3)I60 Plug-Ins
3F	1	Steam Fin Tube	Med. TV, DVD/VCR, (2)Cable Boxes, Sm. Radio, Pencil Sharpener, Sm. TV	Common Laundry	Hotpoint Fridge Mod.# HTR16ABSERWW 6.5A, New Hotpoint 4-Burner Stove	3/4" Commercial Grade Double Glazed in Good Condition	Old Airtemp Window 10000BTU Low EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (4)I150 Plug-Ins
3G	1	Steam Fin Tube	(2)Desktop Computers, Net Modem, (2)Sm. Radios, Lg. TV, Cable Box, DVD, Ans. Machine, (2)Recip Fans, Lg. Stereo, Sm TV	Common Laundry	Hotpoint Fridge Mod.# HTH15ABSERWWW 4A, GE Stove Mod.# JAS030H1WH 10.4 kW, Med. Microwave, Toaster Oven, Croc Pot, Espresso Maker, Coffee Pot	3/4" Commercial Grade Double Glazed in Good Condition	Samsung Window 5200BTU 9.8EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (2)2CF23 1SW EA, W17WF1-E(T8) SW, (2)I60 Plug-Ins, (2)CF23 Plug-Ins
3H	1	Steam Fin Tube	Lg. TV, Cable Box, SM. TV, DVD, Record Player, Alarm Clock	Common Laundry	Premier Stove Mod.#EAK220WP01 8,800W, Old GE Energy Saver Fridge, Sm. Microwave, Coffee Pot, Toaster Oven, Croc Pot	3/4" Commercial Grade Double Glazed in Good Condition	LG Window 8000BTU	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (2)I60 Plug-Ins

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Apartment #	# Bedrooms	Heating Type	Appliances	Washer/Dryer	Kitchen Equipment	Windows/Doors	Air Conditioning	Thermostats	Exhaust Fans	Lighting
3J	0	Steam Fin Tube	Med. TV, Cable Box, Recip. Fan, Alarm Clock, DVD	Common Laundry	GE Spacemaker Stove Mod.# JAS030H1WH 10.4 kW, GE Fridge Mod.# GTS16BBSARWW 6.5A, Sm. Microwave, Toaster, Coffee Pot	3/4" Commercial Grade Double Glazed in Good Condition	None	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (2)I60 Plug-Ins, Clg Fan-3I60 SW
3K	1	Steam Fin Tube	Med. TV, Desktop Computer, Printer, Cable Box	Common Laundry	Premier Stove Mod.#EAK220WP01 8,800W, GE Fridge Mod.# GTS16BBSARWW 6.5A, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	Frigidaire 8000BTU 9.8EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (2)2CF23 SW, (4)I100 Plug-Ins, Clg Fan-5I60 SW
4A	1	Steam Fin Tube	Desktop Computer, (2)Sm. TVs, (2)Cable Boxes, (2)VCRs, Pedistal Fan, Sm. Radio, Med. TV, DVD, (2) Alarm Clocks	Common Laundry	Tappan 4-Burner Stove, Frigidaire Fridge Mod.#FRT13CRHWO 3.75A, Med. Microwave, Coffee Pot, Toaster Oven	3/4" Commercial Grade Double Glazed in Good Condition	Panasonic Window 10000BTU 10.5EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (2)2CF23 SW, (3)I75 Plug-Ins, Chandelier-6I75 SW
4B	1	Steam Fin Tube	Fish Tank, (2)Recip. Fans, (3)Med. TVs, (2)Cable Boxes, DVD/VCR, Paper Shredder, Window Fan	Common Laundry	New Hotpoint 4-Burner Stove, Old GE Energy Saver Fridge, Med. Microwave, Toaster	3/4" Commercial Grade Double Glazed in Good Condition	Kenmore Window 5600BTU 11.0EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 SW,(2) I60 Plug-Ins (1 on SW), W17CF1-E(T8) Plug-In
4C	1	Steam Fin Tube	Pedistal Fan, Air Cleaner, (2) Cable Boxes, (2)Med. TVs, DVD, Laptop Computer	Common Laundry	Premier Stove Mod.#EAK220WP01 8,800W, Old GE Energy Saver Fridge, Sm. Microwave, Coffee Pot, Toaster, Blender	3/4" Commercial Grade Double Glazed in Good Condition	Old Window 7500BTU Low EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (2)I60 Plug-Ins
4D	0	Steam Fin Tube	(2)Desktop Computers, Record Player, Lg. Stereo, Net Modem, Fax, Lg. TV, Cable Box, Answering Machine	Common Laundry	New Hotpoint 4-Burner Stove, Old GE Energy Saver Fridge, Med. Microwave, Toaster Oven, G. Foreman Grill, Coffee Pot	3/4" Commercial Grade Double Glazed in Good Condition	Whirlpool 10000BTU	None	Central Exhaust System	W32CF4-E(T8)SW, (2)2CF23WallMt. SW

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Apartment #	# Bedrooms	Heating Type	Appliances	Washer/Dryer	Kitchen Equipment	Windows/Doors	Air Conditioning	Thermostats	Exhaust Fans	Lighting
4E	1	Steam Fin Tube	Answering Machine, Sm. TV, Lg. Stereo, (2) Cable Boxes, DVD, (2) Sm. Radios, Med. TV, (2)Alarm Clocks	Common Laundry	New Larger GE Stove, Hotpoint Fridge Mod.#CTX14CYXKRWH 6.5A, Sm. Microwave, Toaster	3/4" Commercial Grade Double Glazed in Good Condition	Sharp Window 8000BTU	None	Central Exhaust System, Range Hood: GE Mod.# JN3220V1WH	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (2)I75 Plug-Ins
4F	1	Steam Fin Tube	Laptop Computer, Printer, Net Modem, (2)Med. TVs, Elec. Piano, Lg. Stereo, Cable Box, DVD, (2)CD Players, Guitar Amp, Alarm Clock	Common Laundry	GE Stove Mod.# JAS030HIWH 10.4kW, Frigidaire Fridge Mod.# FRT13CRHW1 3.75A, Croc Pot, 700W Microwave	3/4" Commercial Grade Double Glazed in Good Condition	(1)Daewoo: 9000BTU 9.6EER (1)Kenmore: 5300BTU 10.0EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (4)2CF23 1SW EA, 2CF15 Plug-In, (2)Small Plug-Ins
4G	1	Steam Fin Tube	Lg. Stereo, (2)Med. TVs, (2)Cable Boxes, Answering Machine, (2)Recip. Fans, Sm. Stereo, (2)Alarm Clocks	Common Laundry	GE Stove Mod.# JAS030HIWH 10.4kW, GE Fridge Mod.# GTS16BBSPRWW 6.5A, Croc Pot, G. Foreman Grill, Blender, Toaster Oven, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	(1)Whirlpool: 7500BTU (1)Fedders: 7500BTU	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, I60 Plug-In, I25 Plug-In, "Fish Tank" Plug-In
4K	1	Steam Fin Tube	Med. TV, Cable Box	Common Laundry	Premier Stove Mod.#EAK220WP01 8,800W, GE Fridge Mod.# GTS16BBSARWW 6.5A, Croc Pot	3/4" Commercial Grade Double Glazed in Good Condition	GE Window 8200BTU 10.8EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, (2)CF23 Plug-Ins

Building Averages

Apartment #	# Bedrooms	Heating Type	Appliances	Washer/Dryer	Kitchen Equipment	Windows/Doors	Air Conditioning	Thermostats	Exhaust Fans	Lighting
Average	0	Steam Fin Tube	(2)Med TVs, Cable Box, DVD/VCR, Sm. Radio, Alarm Clock	Community Laundry	GE Fridge Mod.# GTS16BBSARWW 6.5A, Kenmore 4-Burner Stove, Sm. Microwave, Coffee Pot, Toaster	3/4" Commercial Grade Double Glazed in Good Condition	7500BTU Low EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, I60 on Bedrm SW, (2) I60 Plug-Ins
Average	1	Steam Fin Tube	Desktop Computer, (2)Cable Boxes, Lg. TV, Med. TV, Alarm Clock, Fan, Med. Stereo	Community Laundry	GE Spacemaker Stove Mod.# JAS030H1WH 10.4 kW, GE Fridge Mod.# GTS16BBSARWW 6.5A, Sm. Microwave, Toaster Oven, Toaster, Coffee Pot	3/4" Commercial Grade Double Glazed in Good Condition	Frigidaire 8000BTU 9.8EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, I60 on Bedrm SW, (4) I60 Plug-Ins
Average	2	Steam Fin Tube	Water Cooler, Air Cleaner, Med. TV, Sm. TV, (2) Cable Boxes, (2)Sm. Radios, Recip. Pedistal Fan	Community Laundry	LG Magic Chef 4-Burner Stove, Hotpoint Fridge Mod.# HTR16ABSERWW 6.5A, Blender, (2)Coffee Pots, Toaster, Med. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	(1)GE Window: 10500BTU 9.8EER (1)Frigidaire: 7500BTU 10EER	None	Central Exhaust System	W32CF4-E(T8) Dual SW, W20CF1-Mag(T12)SW, (3)2CF23 1SW EA, I150 Plug-In, (2)I40 Plug-In
Average	3	Steam Fin Tube	Fish Tank, (2)Desktop Computers, Printer, Lg. TV, Sm. TV, Med. TV, (3)Cable Boxes, (2)DVD, XBOX 360, Window Fan	Community Laundry	New GE 4-Burner Digital Control Stove, New GE Mod.# GTH22SBNARBS 11.6A Fridge, G.Foreman Grill, Coffee Pot, Toaster, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	(1) Amana: 7500BTU (1)Sunbeam: 5000BTU, 9.7EER (1)LG: 10000BTU 9.8EER	None	Central Exhaust System	2CF23WallMt-Dual SW, W34CF2-Mag(T12)SW, 5CF23: 4 on Med. Cabinet, 1 Clg. Mt. on one SW, (3) I40 Plug-In, 1CF13 & (2)2CF23 Plug-In

Apartment Averages

	Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
0-Bed	1	Cable Box	1	GE Fridge	1	7500 BTU, Low EER	1	W32CF4-E Dual SW (T8, Occ)	3	I60
	2	Med. TVs	1	Kenmore Stove			1	W20CF1-Mag SW (T12, Occ)		
	1	Alarm Clock	1	Toaster			3	2CF23 1 SW EA (Occ)		
	1	Sm. Stereo	1	Sm. Microwave						
	1	DVD/VCR	1	Coffee Pot						
	Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
1-Bed	1	Desktop Computer	1	GE Stove	1	8000 BTU, 9.8 EER	1	W32CF4-E SW (T8, Occ)	5	I60
	1	Lg. TV	1	GE Fridge			1	W20CF1-Mag SW (T12, Occ)		
	2	Cable Boxes	1	Coffee Pot			3	2CF23 1 SW EA (Occ)		
	1	Med. TV	1	Toaster						
	1	Alarm Clock	1	Sm. Microwave						
	1	Med. Stereo	1	Toaster Oven						
	1	Fan								
	Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
2-Bed	1	Med. TV	1	Hotpoint Fridge	1	7500 BTU, 10.0 EER	1	W32CF4-E SW (T8, Occ)	2	I40
	1	Sm. TV	1	LG Stove	1	10500 BTU, 9.8 EER	1	W20CF1-Mag SW (T12, Occ)	1	I150
	2	Cable Boxes	2	Coffee Pots			3	2CF23 1 SW EA (Occ)		
	2	Sm. Radios	1	Med. Microwave						
	1	Water Cooler	1	Toaster						
	1	Air Cleaner	1	Blender						
	1	Recip. Pedistal Fan								
	Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
3-Bed	1	Fish Tank	1	GE Digital Stove	1	7500 BTU, 9.8 EER	1	2CF23 Wall Mt Dual SW (Occ)	3	I40
	2	Desktop Computers	1	New GE Fridge	1	10000 BTU, 9.8 EER	1	W34CF2-Mag SW (T12 Occ)	2	C2CF23
	1	Printer	1	G. Foreman Grill	1	5000 BTU, 9.7 EER	1	4CF23 SW (No Occ)	1	CF13
	1	Lg. TV	1	Coffee Pot			1	CF23 SW (Occ)		
	1	Sm. TV	1	Toaster						
	1	Med. TV	1	Sm. Microwave						
	3	Cable Boxes								
	2	DVD								
	1	XBOX 360								
	1	Window Fan								

Entire Complex Totals: 1 3-Bed APT 17 2-Bed APTs 173 1-Bed APTs 62 0-Bed APTs

	Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
0-Bed	62	Cable Box	62	GE Fridge	62	7500 BTU, Low EER	62	W32CF4-E Dual SW (T8, Occ)	186	I60
	124	Med. TVs	62	Kenmore Stove			62	W20CF1-Mag SW (T12, Occ)		
	62	Alarm Clock	62	Toaster			186	2CF23 1 SW EA (Occ)		
	62	Sm. Stereo	62	Sm. Microwave						

	62	DVD/VCR	62	Coffee Pot							
		Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
	173	Desktop Computer	173	GE Stove	173	8000 BTU, 9.8 EER	173	W32CF4-E SW (T8, Occ)	865	I60	
	173	Lg. TV	173	GE Fridge			173	W20CF1-Mag SW (T12, Occ)			
	346	Cable Boxes	173	Coffee Pot			519	2CF23 1 SW EA (Occ)			
1-Bed	173	Med. TV	173	Toaster							
	173	Alarm Clock	173	Sm. Microwave							
	173	Med. Stereo	173	Toaster Oven							
	173	Fan									
		Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
	17	Med. TV	17	Hotpoint Fridge	17	7500 BTU, 10.0 EER	17	W32CF4-E SW (T8, Occ)	34	I40	
	17	Sm. TV	17	LG Stove	17	10500 BTU, 9.8 EER	17	W20CF1-Mag SW (T12, Occ)	17	I150	
	34	Cable Boxes	34	Coffee Pots			51	2CF23 1 SW EA (Occ)			
2-Bed	34	Sm. Radios	17	Med. Microwave							
	17	Water Cooler	17	Toaster							
	17	Air Cleaner	17	Blender							
	17	Recip. Pedistal Fan									
		Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
	1	Fish Tank	1	GE Digital Stove	1	7500 BTU, 9.8 EER	1	2CF23 Wall Mt Dual SW (Occ)	3	I40	
	2	Desktop Computers	1	New GE Fridge	1	10000 BTU, 9.8 EER	1	W34CF2-Mag SW (T12 Occ)	2	C2CF23	
	1	Printer	1	G. Foreman Grill	1	5000 BTU, 9.7 EER	1	4CF23 SW (No Occ)	1	CF13	
	1	Lg. TV	1	Coffee Pot			1	CF23 SW (Occ)			
3-Bed	1	Sm. TV	1	Toaster							
	1	Med. TV	1	Sm. Microwave							
	3	Cable Boxes									
	2	DVD									
	1	XBOX 360									
	1	Window Fan									

Totals

Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
174	Lg. TV	1	GE Digital Stove	17	10500 BTU, 9.8 EER	252	W32CF4-E SW (T8, Occ)	37	I40
315	Med. TV	17	LG Stove	1	10000 BTU, 9.8 EER	1	W34CF2-Mag SW (T12 Occ)	1051	I60
18	Sm. TV	173	GE Stove	173	8000 BTU, 9.8 EER	252	W20CF1-Mag SW (T12, Occ)	17	I150
445	Cable Boxes	62	Kenmore Stove	1	7500 BTU, 9.8 EER	756	2CF23 1 SW EA (Occ)	2	C2CF23
175	Desktop Computers	1	New GE Fridge	17	7500 BTU, 10.0 EER	1	2CF23 Wall Mt Dual SW (Occ)	1	CF13
1	Printers	17	Hotpoint Fridge	1	5000 BTU, 9.7 EER	1	4CF23 SW (No Occ)		
1	Fish Tanks	235	GE Fridge			1	CF23 SW (Occ)		
2	DVD	173	Toaster Oven						
34	Sm. Radios	1	G. Foreman Grill						
17	Water Cooler	270	Coffee Pot						
17	Air Cleaner	253	Toaster						
17	Recip. Pedistal Fan	17	Med. Microwave						
62	Sm. Stereo	236	Sm. Microwave						
173	Med. Stereo	17	Blender						
62	DVD/VCR								
1	Window Fan								

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
Existing Lighting

Cost of Electricity: $0.119 $/kWh
$15.03 $/kW

EXISTING CONDITIONS

Field Code	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Retrofit Control	Annual kWh	Notes
	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrofit control device	(kW/space) * (Annual Hours)	
Tower A											
4	Lobby/Halls	19	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.4	Breaker	8760	None	11,984	No OCC for safety
4	Security Room	2	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2600	OCC	374	
39	Vestibule	4	2' 17 W F 2 (ELE)	F22ILL	33	0.1	Breaker	8760	None	1,156	No OCC for safety
33	Vestibule	7	13 W CF 1	CFQ13/1-L	15	0.1	Breaker	8760	None	920	No OCC for safety
6	Kitchen	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2912	OCC	1,677	
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	C-OCC	2,009	4 fixtures per switch
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	C-OCC	2,009	4 fixtures per switch
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	C-OCC	2,009	4 fixtures per switch
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	C-OCC	2,009	4 fixtures per switch
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	C-OCC	2,009	4 fixtures per switch
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	C-OCC	2,009	4 fixtures per switch
61	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	C-OCC	2,009	4 fixtures per switch
2	Maintenance Office	2	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.2	SW	2600	OCC	416	
2	Men's Room 1	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	2080	OCC	166	
2	Women's Room 1	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	2080	OCC	166	
18	Laundry Room	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	OCC	1500	None	672	OCC already installed
2	Storage Room	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	1000	None	80	No OCC for safety
33	Storage Room	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	1000	None	45	No OCC for safety
2	Janitor Closet	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	1000	None	80	No OCC for safety
2	Mech/Elect Room	10	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.8	Breaker	2000	None	1,600	No OCC for safety
2	Firepump Room	10	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.8	Breaker	2000	None	1,600	No OCC for safety
2	Garage	4	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.3	SW	2000	None	640	No OCC for safety
73	Garage	2	I 120	I120/1	120	0.2	SW	2000	None	480	No OCC for safety
Tower B											
4	Lobby/Halls	17	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.2	Breaker	8760	None	10,722	No OCC for safety
3	Stairways	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	8760	None	377	No OCC for safety
4	Office hall	9	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.6	SW	2600	None	1,685	No OCC for safety
33	Office hall	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	2600	None	117	No OCC for safety
5	Fileroom	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	OCC	312	
5	Windowless office (northside)	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	OCC	312	
5	Windowless office (by fileroom)	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	OCC	312	
5	Small conf. room	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	OCC	468	
5	Small corner office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	OCC	312	
5	Server room	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	OCC	312	
5	Office w/ window	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	OCC	468	
5	Office w/ window	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	Dual SW	2600	OCC	468	
5	Large Conference room	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	OCC	780	
20	Large Conference room	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2600	OCC	998	
71	Large Conference room bath	3	I 60	I60/1	60	0.2	OCC	1000	None	180	OCC already installed
5	Large Corner Office	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	OCC	780	
20	Large Corner Office	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2600	OCC	998	
235	Large Corner Office	7	R 75 C Q 1	h75/1	75	0.5	SW	2600	OCC	1,365	
71	Large Corner Office bath	2	I 60	I60/1	60	0.1	OCC	1000	None	120	OCC already installed

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
Existing Lighting

Cost of Electricity: **$0.119 $/kWh**
$15.03 $/kW

			EXISTING CONDITIONS									
		Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Retrofit Control	Annual kWh	
	Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrofit control device	(kW/space) * (Annual Hours)	Notes
First Floor	5	Center Office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	OCC	312	
	106	Center Office	3	SP 65 I	I65/1	65	0.2	SW	2600	OCC	507	
	5	Center Office fileroom	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	OCC	312	
	5	Cubical Area (north side)	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	2600	None	1,248	
	182	Cubical Area (north side)	34	W 25 C F 2 (ELE) 3' T8	F32EE	66	2.2	SW	2600	None	5,834	
	106	Cubical Area (north side)	8	SP 65 I	I65/1	65	0.5	SW	2600	None	1,352	
	5	Cubical Area (south side)	12	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.7	SW	2600	None	1,872	
	182	Cubical Area (south side)	16	W 25 C F 2 (ELE) 3' T8	F32EE	66	1.1	SW	2600	None	2,746	
	106	Cubical Area (south side)	18	SP 65 I	I65/1	65	1.2	SW	2600	None	3,042	
	182	Cubical nook	12	W 25 C F 2 (ELE) 3' T8	F32EE	66	0.8	SW	2600	None	2,059	
	106	Cubical nook	3	SP 65 I	I65/1	65	0.2	SW	2600	None	507	
	5	Office Kitchen	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	OCC	780	
	117	Office Men's Room	3	CF 23	CFS23/1	23	0.1	SW	2600	None	179	
	117	Office Women's Room	3	CF 23	CFS23/1	23	0.1	SW	2600	None	179	
	15	Elevator Motor Room	4	S 32 C F 2 (ELE)	F42LL	60	0.2	SW	2600	None	624	
	4	File Storage Room (Twr. B)	3	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	2600	None	562	
	18	File Storage Room (Twr. B)	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	SW	2600	None	1,456	
	18	File Storage Room (Twr. B)	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	2600	None	2,330	
	18	File Storage Room (Twr. B) bath	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2080	OCC	233	
	11	Trash Compactor Room	3	S 34 P F 2 (MAG)	F42EE	72	0.2	SW	2000	None	432	No OCC for safety
	117	Chiller Room	3	CF 23	CFS23/1	23	0.1	SW	2000	None	138	No OCC for safety
	Both Towers A and B											
2nd Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	No OCC for safety
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	No OCC for safety
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	No OCC for safety
3rd Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
4th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
5th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
6th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
7th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
8th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
9th	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	

Energy Audit of North Bergen Housing Authority

CHA Project No. 20241 Lawler Towers

Existing Lighting

Cost of Electricity: **$0.119 $/kWh**

$15.03 $/kW

			EXISTING CONDITIONS									
		Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Retrofit Control	Annual kWh	
	Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrofit control device	(kW/space) * (Annual Hours)	Notes
9th Flr	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
10th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
11th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
12th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
13th Floor	2	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42ES	80	1.4	Breaker	8760	None	12,614	
	3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	None	753	
	73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	None	4,205	
Apartments (both towers)	217	W32CF4-E SW (T8, Occ)	252	W 32 C F 4 (ELE)	F44ILL/2	118	29.7	SW	2912	OCC	86,591	T8 (4ft-4bulbs per fixture)
	126	2CF23 Wall Mt 1 SW EA (Occ)	756	DC 23 C CF 2	CFQ22/2	48	36.3	SW	2912	OCC	105,671	2 bulbs per fixture (500 fixtures)
	222	W20CF1-Mag SW (T12)	252	W 20 CF1 (MAG)	F21SS	28	7.1	SW	2912	None	20,547	2-ft lighting under cabinet
	2	W34CF2-Mag SW (T12 Occ)	1	T 34 W F 2 (MAG) RL/RB	F42ES	80	0.1	SW	2912	OCC	233	
	126	2CF23 Wall Mt Dual SW (Occ)	1	DC 23 C CF 2	CFQ22/2	48	0.0	SW	2912	OCC	140	
	126	4CF23 SW (No Occ)	2	DC 23 C CF 2	CFQ22/2	48	0.1	SW	2912	OCC	280	
	117	CF23 SW (Occ)	1	CF 23	CFS23/1	23	0.0	SW	2912	OCC	67	
Exterior	225	Outside	4	70 High Pressure Sodium	HPS70/1	95	0.4	Timer	4368	None	1,660	
	229	Outside	6	WP200 I 1	i200/1	200	1.2	Timer	4368	None	5,242	
	237	Pole	18	WP 400 Po HPS	hps400/1	465	8.4	Timer	4368	None	36,560	
	93	Storage Rooms (tenant floors)	26	I 75	I75/1	75	2.0	Timer	4368	None	8,518	
	3	Trash Rooms (tenant floors)	26	W 34 W F 1 (MAG)	F41EE	43	1.1	Timer	4368	None	4,883	
	189	Exit Signs (both towers)	124	X 7.0 W 1	ECF7/1	10	1.2	Breaker	8760	None	10,862	
		Total	**2,111**				**136.0**				**576,037**	

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Lawler Towers
ECM-1a Lighting Replacements

Cost of Electricity: $0.119 $/kWh
$15.82 $/kW

Field Code	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS					
	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fxt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fxt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
Tower A																							
4	Lobby/Halls	19	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.4	Breaker	8760	11,984	19	2T 17 R F 2 (ELE)	F22LL	33	0.6	Breaker	8,760	5,491	6,491	$ 774.62	$ 1,923.75	$190	2.5	2.2
4	Security Room	2	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2600	374	2	2T 17 R F 2 (ELE)	F22LL	33	0.1	SW	2,600	172	203	$ 24.21	$ 202.50	$20	8.4	7.5
29	Vestibule	4	2T 17 W F 2 (ELE)	F22LL	33	0.1	Breaker	8760	1,156	4	2T 17 W F 2 (ELE)	F22LL	33	0.1	Breaker	8,760	1,156	-	$ -	$ -	$0		
23	Vestibule	7	13 W CF 1	CFQ13/1-L	15	0.1	Breaker	8760	920	7	13 W CF 1	CFQ13/1-L	15	0.1	Breaker	8,760	920	-	$ -	$ -	$0		
8	Kitchen	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2912	1,677	4	T 28 R F 4	F44SSILL	96	0.4	SW	2,912	1,118	559	$ 66.75	$ 525.00	$80	7.9	6.7
81	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 89.59	$ 513.00	$80	5.7	4.8
81	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 89.59	$ 513.00	$80	5.7	4.8
81	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 89.59	$ 513.00	$80	5.7	4.8
81	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 89.59	$ 513.00	$80	5.7	4.8
81	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 89.59	$ 513.00	$80	5.7	4.8
81	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 89.59	$ 513.00	$80	5.7	4.8
81	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 89.59	$ 513.00	$80	5.7	4.8
81	Community Room	4	T 34 R F 3 (MAG)	F43EE	115	0.5	SW	4368	2,009	4	T 28 R F 3	F43SSILL	72	0.3	SW	4,368	1,258	751	$ 89.59	$ 513.00	$80	5.7	4.8
2	Maintenance Office	2	T 34 W F 2 (MAG) RL/RB	F42EE	80	0.2	SW	2600	416	2	W 28 W F 2	F42SSILL	48	0.1	SW	2,600	250	166	$ 19.86	$ 212.50	$20	10.7	9.7
2	Men's Room 1	1	T 34 W F 2 (MAG) RL/RB	F42EE	80	0.1	SW	2080	166	1	W 28 W F 2	F42SSILL	48	0.0	SW	2,080	100	67	$ 7.94	$ 106.25	$10	13.4	12.1
2	Women's Room 1	1	T 34 W F 2 (MAG) RL/RB	F42EE	80	0.1	SW	2080	166	1	W 28 W F 2	F42SSILL	48	0.0	SW	2,080	100	67	$ 7.94	$ 106.25	$10	13.4	12.1
18	Laundry Room	4	T 32 R F 4 (ELE)	F44LL	112	0.4	OCC	1500	672	4	T 32 R F 4 (ELE)	F44LL	112	0.4	OCC	1,500	672	-	$ -	$ -	$0		
2	Storage Room	1	T 34 W F 2 (MAG) RL/RB	F42EE	80	0.1	SW	1000	80	1	W 28 W F 2	F42SSILL	48	0.0	SW	1,000	48	32	$ 3.82	$ 106.25	$10	27.8	25.2
23	Storage Room	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	1000	45	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	1,000	45	-	$ -	$ -	$0		
2	Janitor Closet	1	T 34 W F 2 (MAG) RL/RB	F42EE	80	0.1	SW	1000	80	1	W 28 W F 2	F42SSILL	48	0.0	SW	1,000	48	32	$ 3.82	$ 106.25	$10	27.8	25.2
2	Mech/Elect Room	10	T 34 W F 2 (MAG) RL/RB	F42EE	80	0.8	Breaker	2000	1,600	10	W 28 W F 2	F42SSILL	48	0.5	Breaker	2,000	960	640	$ 76.40	$ 1,062.50	$100	13.9	12.6
2	Firepump Room	10	T 34 W F 2 (MAG) RL/RB	F42EE	80	0.8	Breaker	2000	1,600	10	W 28 W F 2	F42SSILL	48	0.5	Breaker	2,000	960	640	$ 76.40	$ 1,062.50	$100	13.9	12.6
2	Garage	4	T 34 W F 2 (MAG) RL/RB	F42EE	80	0.3	SW	2000	640	4	W 28 W F 2	F42SSILL	48	0.2	SW	2,000	384	256	$ 30.56	$ 425.00	$40	13.9	12.6
73	Garage	2	I 120	I120/1	120	0.2	SW	2000	480	2	CF 26	CFQ26/1-L	27	0.1	SW	2,000	108	372	$ 44.41	$ 13.50	$0	0.3	0.3
Tower B																							
4	Lobby/Halls	17	2B 34 R F 2 (u) (MAG)	FU2EE	72	1.2	Breaker	8760	10,722	17	2T 17 R F 2 (ELE)	F22LL	33	0.6	Breaker	8,760	4,914	5,808	$ 693.35	$ 1,721.25	$170	2.5	2.2
3	Stairways	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	8760	377	1	W 28 W F 1	F41SSILL	26	0.0	SW	8,760	228	149	$ 17.78	$ 114.75	$20	6.5	5.3
4	Office hall	9	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.6	SW	2600	1,685	9	2T 17 R F 2 (ELE)	F22LL	33	0.3	SW	2,600	772	913	$ 108.95	$ 911.25	$90	8.4	7.5
23	Office hall	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	2600	117	3	13 W CF 1	CFQ13/1-L	15	0.0	SW	2,600	117	-	$ -	$ -	$0		
8	Transom	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
8	Windowless office (northside)	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
8	Windowless office (by Transom)	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
8	Small conf. room	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2,600	468	-	$ -	$ -	$0		
8	Small corner office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
8	Server room	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
8	Office w/ window	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2600	468	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	2,600	468	-	$ -	$ -	$0		
8	Office w/ window	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	Dual SW	2600	468	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	Dual SW	2,600	468	-	$ -	$ -	$0		
8	Large Conference room	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2,600	780	-	$ -	$ -	$0		
28	Large Conference room	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2600	998	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2,600	998	-	$ -	$ -	$0		
71	Large Conference room bath	3	I 60	I60/1	60	0.2	OCC	1000	180	3	CF 26	CFQ26/1-L	27	0.1	OCC	1,000	81	99	$ 11.92	$ 20.25	$0	1.7	1.7
8	Large Corner Office	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2,600	780	-	$ -	$ -	$0		
28	Large Corner Office	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2600	998	12	S 32 C F 1 (ELE)	F41LL	32	0.4	SW	2,600	998	-	$ -	$ -	$0		
229	Large Corner Office	7	H 75 C G 1	H75/1	75	0.5	SW	2600	1,365	7	CF 26	CFQ26/1-L	27	0.2	SW	2,600	491	874	$ 104.29	$ 47.25	$0	0.5	0.5
71	Large Corner Office bath	2	I 60	I60/1	60	0.1	OCC	1000	120	2	CF 26	CFQ26/1-L	27	0.1	OCC	1,000	54	66	$ 7.88	$ 13.50	$0	1.7	1.7
8	Center Office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
106	Center Office	3	SP 65 I	I65/1	65	0.2	SW	2600	507	3	CF 26	CFQ26/1-L	27	0.1	SW	2,600	211	296	$ 35.38	$ 20.25	$0	0.6	0.6
8	Center Office transom	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	312	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2,600	312	-	$ -	$ -	$0		
8	Cubical Area (north side)	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	2600	1,248	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	2,600	1,248	-	$ -	$ -	$0		
162	Cubical Area (north side)	34	W 25 C F 3 (ELE) 3' T8	F32EE	66	2.2	SW	2600	5,834	34	W 25 C F 3 (ELE) 3' T8	F32EE	66	2.2	SW	2,600	5,834	-	$ -	$ -	$0		
108	Cubical Area (north side)	8	SP 65 I	I65/1	65	0.5	SW	2600	1,352	8	CF 26	CFQ26/1-L	27	0.2	SW	2,600	562	790	$ 94.26	$ 54.00	$0	0.6	0.6
8	Cubical Area (south side)	12	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.7	SW	2600	1,872	12	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.7	SW	2,600	1,872	-	$ -	$ -	$0		
162	Cubical Area (south side)	16	W 25 C F 3 (ELE) 3' T8	F32EE	66	1.1	SW	2600	2,746	16	W 25 C F 3 (ELE) 3' T8	F32EE	66	1.1	SW	2,600	2,746	-	$ -	$ -	$0		
108	Cubical Area (south side)	18	SP 65 I	I65/1	65	1.2	SW	2600	3,042	18	CF 26	CFQ26/1-L	27	0.5	SW	2,600	1,264	1,779	$ 212.21	$ 121.50	$0	0.6	0.6
162	Cubical nook	12	W 25 C F 3 (ELE) 3' T8	F32EE	66	0.8	SW	2600	2,059	12	W 25 C F 3 (ELE) 3' T8	F32EE	66	0.8	SW	2,600	2,059	-	$ -	$ -	$0		
106	Cubical nook	3	SP 65 I	I65/1	65	0.2	SW	2600	507	3	CF 26	CFQ26/1-L	27	0.1	SW	2,600	211	296	$ 35.38	$ 20.25	$0	0.6	0.6
8	Office Kitchen	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2600	780	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	2,600	780	-	$ -	$ -	$0		
117	Office Men's Room	3	CF 23	CFS23/1	23	0.1	SW	2600	179	3	CF 23	CFS23/1	23	0.1	SW	2,600	179	-	$ -	$ -	$0		
117	Office Women's Room	3	CF 23	CFS23/1	23	0.1	SW	2600	179	3	CF 23	CFS23/1	23	0.1	SW	2,600	179	-	$ -	$ -	$0		
15	Elevator Motor Room	4	S 32 C F 2 (ELE)	F42LL	60	0.2	SW	2600	624	4	S 32 C F 2 (ELE)	F42LL	60	0.2	SW	2,600	624	-	$ -	$ -	$0		
4	File Storage Room (Twr. B)	3	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	2600	562	3	2T 17 R F 2 (ELE)	F22LL	33	0.1	SW	2,600	257	304	$ 36.32	$ 303.75	$30	8.4	7.5
18	File Storage Room (Twr. B)	5	T 32 R F 4 (ELE)	F44LL	112	0.6	SW	2600	1,456	5	T 32 R F 4 (ELE)	F44LL	112	0.6	SW	2,600	1,456	-	$ -	$ -	$0		
18	File Storage Room (Twr. B)	8	T 32 R F 4 (ELE)	F44LL	112	0.9	SW	2600	2,330	8	T 32 R F 4 (ELE)	F44LL	112	0.9	SW	2,600	2,330	-	$ -	$ -	$0		
18	File Storage Room (Twr. B) bath	1	T 32 R F 4 (ELE)	F44LL	112	0.1	SW	2080	233	1	T 32 R F 4 (ELE)	F44LL	112	0.1	SW	2,080	233	-	$ -	$ -	$0		
11	Trash Compactor Room	3	T 34 R F 2 (MAG)	F42EE	72	0.2	SW	2000	432	3	C 28 R F 2	F42SSILL	48	0.1	SW	2,000	288	144	$ 17.18	$ 318.75	$30	18.6	16.8
117	Chiller Room	3	CF 23	CFS23/1	23	0.1	SW	2000	138	3	CF 23	CFS23/1	23	0.1	SW	2,000	138	-	$ -	$ -	$0		
Both Towers A and B																							
3	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42EE	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 602.36	$ 1,912.50	$180	3.2	2.9
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	455	298	$ 35.56	$ 226.50	$60	6.4	4.7
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 388.03	$ 27.00	$0	0.1	0.1
3	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42EE	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 602.36	$ 1,912.50	$180	3.2	2.9
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	455	298	$ 35.56	$ 226.50	$60	6.4	4.7
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 388.03	$ 27.00	$0	0.1	0.1
3	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42EE	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 602.36	$ 1,912.50	$180	3.2	2.9
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	455	298	$ 35.56	$ 226.50	$60	6.4	4.7
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 388.03	$ 27.00	$0	0.1	0.1
3	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42EE	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 602.36	$ 1,912.50	$180	3.2	2.9
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	455	298	$ 35.56	$ 226.50	$60	6.4	4.7
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 388.03	$ 27.00	$0	0.1	0.1
3	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42EE	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 602.36	$ 1,912.50	$180	3.2	2.9
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	455	298	$ 35.56	$ 226.50	$60	6.4	4.7
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 388.03	$ 27.00	$0	0.1	0.1
3	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42EE	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 602.36	$ 1,912.50	$180	3.2	2.9
3	Stairways	2	W 34 W F 1 (MAG)	F41EE	43	0.1	Breaker	8760	753	2	W 28 W F 1	F41SSILL	26	0.1	Breaker	8,760	455	298	$ 35.56	$ 226.50	$60	6.4	4.7
73	Hallway Doors	4	I 120	I120/1	120	0.5	Breaker	8760	4,205	4	CF 26	CFQ26/1-L	27	0.1	Breaker	8,760	946	3,259	$ 388.03	$ 27.00	$0	0.1	0.1
3	Hallways (tenant floors)	18	T 34 W F 2 (MAG) RL/RB	F42EE	80	1.4	Breaker	8760	12,614	18	W 28 W F 2	F42SSILL	48	0.9	Breaker	8,760	7,569	5,046	$ 602.36	$ 1,912.50	$180	3.2	2.9