NORTH BERGEN HOUSING AUTHORITY
MEADOWVIEW APARTMENTS
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

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CHA PROJECT NO. 20241

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APPENDICES

1.0 INTRODUCTION & BACKGROUND

The North Bergen Housing Authority (NBHA) Meadowview Apartments (Meadowview), constructed in 1939, is an eight building low income housing facility located on 5828 Meadowview Ave. in North Bergen, New Jersey. The complex is comprised of three town houses and five garden apartment buildings. Each varies in the number of floors and apartments per unit. Meadowview originally utilized a central steam heating plant that supplied all eight buildings with underground steam and condensate feeds. The central plant was abandoned, and each facility was retrofitted with Smith cast iron sectional boilers with heat exchangers for the domestic water heating. Approximately 20 apartments, equaling slightly over 10%, were surveyed as part of the energy audit.

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, Meadowview Apartment complex.

2.0 EXECUTIVE SUMMARY

This report details the results of the North Bergen Housing Authority Meadowview Apartment complex, a 42,100 square foot, eight building complex in North Bergen, New Jersey. The following areas were evaluated for energy conservation measures:

- Lighting upgrades
- Light bulb exchange
- Water conservation
- Control valves for steam radiators
- Insulation upgrades
- Air conditioner changeout
- Boiler replacement
- 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 $149,500 for the recommended ECMs may be realized with a payback of 3.4 years.

The ECMs identified in this report will allow for the building to reduce its energy usage and if pursued has the opportunity to qualify for the New Jersey Smart Start Buildings 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		#2 Oil	Total				
$	kW	kWh	gallons	$		$	Years	Years
162,100	28	186,800	0	29,200	0.8	17,000	5.5	5.0

* 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
5,000	43	21,700	0	10,100	9.1	NA	0.5	NA

* No incentive available.

ECM -3b Install Low Flow Showerheads – Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
4,800	230	2,100	5.6	NA	2.2	NA

* No incentive available.

ECM -3b Install low flow Showerheads – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
1,000	50	400	5.6	NA	2.5	NA

* No incentive available.

ECM – 4 Thermostats and Control Valves for Steam Radiators – Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
163,200	0	0	18,200	20,600	0.9	65,500	7.9	4.7

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

ECM – 4 Thermostats and Control Valves for Steam Radiators – Townhome Apartments 6 - 8

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
35,300	0	0	2,390	2,700	0.2	8,600	13.1	9.9

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

ECM – 5 Air Conditioner Changeout - Garden Apartments 1 - 5

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	14,900	0	2,400	NA	NA	NA	NA

* No incentive available.

ECM – 5 Air Conditioner Changeout - Townhome Apartments 6 - 8

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	2,200	0	400	NA	NA	NA	NA

* No incentive available.

ECM-7a Insulate Crawlspace - Garden Apartments

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
83,500	0.0	0.0	6,700	7,600	1.7	24,100	11.0	7.9

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

ECM – 7b Insulate Condensate Piping – Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
$=6,700	0	0	3,200	3,600	9.8	5,400	1.9	0.4

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

ECM – 7b Insulate Condensate Piping – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
2,400	0	0	1,500	1,700	13.2	1,900	1.4	0.3

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

ECM – 8 Energy Star Appliances - Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings				ROI	New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
99,500	0.0	13,100	0	11,000	0.7	4,700	9.0	8.6

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

ECM – 8 Energy Star Appliances – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings				ROI	New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
21,000	0.0	2,500	0	2,100	0.5	4,800	9.9	7.6

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

3.0 EXISTING CONDITIONS

3.1 Building – General

The North Bergen Housing Authority (NBHA) Meadowview Apartment complex is comprised of eight buildings, totaling 116,875 square feet, for low income housing. Buildings 1 thru 5 are the Garden Apartments and are multi-story buildings with multiple apartments. Buildings 6 thru 8 are Row Houses with two floors and multiple apartments.

Each building has a dedicated domestic hot water heating system and low pressure steam boiler for space heating. The entire complex was originally heated from a central boiler plant, which was abandoned for separate steam boilers for each building. The Smith sectional steam boilers for each building were installed in the late 1960s and early 70s.

Building #1 – Garden Apartment

Building #1 has three floors and 30 apartments. The building area is 6,300 square feet.

The building is heated with a natural gas fired 1 MMBH Smith cast iron sectional steam boiler. The boiler produces low pressure steam (<15 psig) to vertical heating radiators and fintube baseboard radiation. A typical apartment has a section of baseboard fintube radiation in the living room and the bedroom(s), and a vertical radiator in the kitchen.

The boiler has a condensate receiver and boiler feed system as well as a makeup water valve. Boiler chemicals are added through the boiler feed system. Some condensate piping was insulated from the radiators back to the condensate receivers. There is no temperature control of the space heating in any of the apartments.

The building has two PVI platinum nickel coated condensing domestic hot water boilers rated at 299,000 BTUH. The boilers are high efficiency systems (>93%). Cooling in the apartments is provided by window air conditioners.

Building #2 – Garden Apartment

Building #2, 7,225 square feet, has three floors and 34 apartments. The building is heated with two 1 MMBH Smith cast iron sectional steam boilers, which produce low pressure steam (< 15 psig) to vertical heating radiators and fintube baseboard radiation. A typical apartment has a section of baseboard fintube radiation in the living room and bedroom(s) and a vertical radiator in the kitchen.

Each boiler has a condensate receiver and boiler feed system, makeup water valve, and boiler chemicals are added through the boiler feed system. Some of the condensate piping was insulated from the radiators back to the condensate receivers.

The building has two PVI 299,000 BTUH, high efficiency systems (>93%). Cooling is provided by window air conditioners; the apartments have no temperature control of the space heating.

This building also houses the Community Room and Data Center, which are cooled with two split AC systems with remote condensers.

Building #3 – Garden Apartment

Building #3, 5,275 square feet in area, consists of three floors housing 24 apartments.

Heat is provided by a natural gas fired 1 MMBH Smith cast iron sectional steam boiler producing low pressure steam (<15 psig) to vertical heating radiators and fintube baseboard radiation. Typically, the apartment has a section of baseboard fintube radiation in the living room and the bedroom(s) and a vertical radiator in the kitchen. The boiler has a condensate receiver, boiler feed system, and makeup water valve. Boiler chemicals are added through the boiler feed system. Some condensate piping was insulated from the radiators to the condensate receivers.

The building has one PVI platinum nickel coated condensing domestic hot water boiler rated at 299,000 BTUH. This boiler constitutes a high efficiency system (>93%).

The apartments have no temperature control of the space heating. Window air conditioners provide cooling.

Building #4 – Garden Apartment

The 6,550 square foot Building #4 has three floors containing 30 apartments.

The building is heated with a natural gas fired 1 MMBH Smith cast iron sectional steam boiler. The boiler produces low pressure steam (<15 psig) to vertical heating radiators and fintube baseboard radiation. In general, the apartments have a section of baseboard fintube radiation in the living room and bedroom(s) and a vertical radiator in the kitchen.

Each boiler has a condensate receiver, boiler feed system, as well as a makeup water valve. Boiler chemicals are added through the boiler feed system.

Some condensate piping was insulated from the radiators back to the receivers.

The building has two PVI platinum nickel coated condensing domestic hot water boilers. Each boiler was rated at 299,000 BTUH and are high efficiency systems (>93%).

Temperature control of the space heating is not provided. Cooling is provided by window air conditioners.

Building #5 – Garden Apartment

Building #5, which is 5,275 square feet in area, has three stories housing 24 apartments.

The building is heated with a natural gas fired 1 MMBH Smith cast iron sectional steam boiler. The boiler produces low pressure steam (<15 psig) to vertical heating radiators and fintube baseboard radiation. A standard apartment's living room and bedroom(s) contain a section of baseboard fintube radiation, and the kitchen has a vertical radiator.

The boiler consists of a condensate receiver, boiler feed system, and makeup water valve; boiler chemicals are provided through the boiler feed system.

Sections of condensate piping was insulated from the radiators to condensate receivers.

The building has one 299,000 BTUH PVI platinum nickel coated condensing domestic hot water boiler, with an efficiency of >93%.

The apartments do not provide temperature control of the space heating; cooling is performed with window air conditioners.

Building #6 – Town House Apartment

Building #6 Town House has two floors and 12 apartment units. The building area is approximately 5,100 square feet.

Heating is performed by a natural gas fired 1 MMBH Smith cast iron sectional steam boiler producing low pressure steam (<15 psig) to vertical heating radiators and fintube baseboard radiation. A typical apartment has a vertical steam radiator in the living room, two bedrooms, and kitchen.

The boiler has a condensate receiver, makeup water valve, and boiler feed system through which chemicals are added.

Portions of condensate piping was insulated from the radiators to condensate receivers.

The building has one PVI platinum nickel coated condensing domestic hot water boiler rated at 299,000 BTUH. This boiler is a high efficiency system (>93%).

There is no temperature control of the space heating; window air conditioners provide cooling.

Building #7 – Town House Apartment

Building #7 Town House has two floors consisting of 10 apartment units within a 4,150 square foot area.

A natural gas fired 1 MMBH Smith cast iron sectional steam boiler, producing low pressure steam (<15 psig) to vertical heating radiators and fintube baseboard radiation, provides building heat. In general, apartments have a vertical steam radiator in the living room, two bedrooms, and the kitchen.

The boiler includes a condensate receiver, makeup water valve, and boiler feed system through which the chemicals are added. Select sections of the condensate piping were insulated from the radiators to the condensate receivers.

The building has one PVI platinum nickel coated condensing domestic hot water boiler. The boiler is rated at 299,000 BTUH, and is a high efficiency system (>93%).

Temperature control for space heating is not utilized in the apartments. Apartment cooling is provided by window air conditioners.

Building #8 – Town House Apartment

Building #8 Town House has two floors with eight apartment units; the building is 3,300 square feet.

Building heat is provided by a 1 MMBH Smith natural gas fired cast iron sectional steam boiler. The boiler produces low pressure steam (<15 psig) to vertical heating radiators and fintube baseboard

radiation. Typically, an apartment contains a vertical steam radiator in the living room, two bedrooms, and kitchen.

The boiler has a condensate receiver, boiler feed system, as well as a makeup water valve. Chemicals for the boiler are added through the boiler feed system. Sections of condensate piping were insulated from the radiators to the condensate receivers.

The building has one PVI platinum nickel coated condensing domestic hot water boiler rated at 299,000 BTUH. This boiler system is high efficiency (>93%).

Apartments do not utilize temperature control for space heating. Cooling is provided by window air conditioners.

3.2 Utility Usage

The eight buildings use electricity and natural gas. 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 is supplied and delivered by PSE&G, and each building has separate meters. From July 2008 through June 2009, the buildings had a total annual electric consumption of 1,243,400 kWh, with a combined demand peak of approximately 374 kW (August 2008), and an annual electric cost of $202,800. This resulted in a blended electric unit cost of $0.1631 per kWh. Natural gas consumption during the same period was 158,400 therms, for an annual cost of $179,000, which resulted in a natural gas unit cost of $1.13 per therm.

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 General Lighting and Power Tariff and natural gas is likely billed under the Large Volume Service (copies of bills have not been provided).

3.3 HVAC Systems

3.3.1 Heating System

Heating for the Garden and Town House Apartments is provided with low pressure steam fintube baseboard or vertical radiators. There are no thermostats for controlling space temperature.

3.3.2 Domestic Hot Water Heating System

Domestic hot water heating is supplied through PVI Power VT gas fired condensing water heaters. Each system is designed for 299,000 MBH capacity. The system contains a mixing valve and small recirculation pump. The heaters are located in the basements of the individual buildings.

3.3.3 Direct Expansion Air Conditioning Units

Meadowview has 191 window air conditioning units ranging in capacity between 5,000 and 10,000 BTUH. The majority of observed units had an EER below 10. These units are placed in the windows.

The Community Room and Data Center have two split air conditioning units. The two linear evaporators are mounted on the wall, and the condensers are outside the building. They are controlled with wall mounted thermostats.

3.4 Lighting/Electrical

Most of the lighting for Meadowview was specified for efficiency in the early 1960s. By today's standards, the buildings' 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 observed apartments had enclosed T-8 ceiling mounted fixtures, and incandescent bulbs in tenants' lamps. The majority the original incandescent lighting fixtures in apartments owned by NBHA have been replaced with efficient compact fluorescent light bulbs. Occupancy sensors were not observed in the apartments. In addition, 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 connected to timers turn on and off at certain times each day. All observed outdoor lighting fixtures were off during the site visit. The basketball courts were at one time illuminated by five 1000 metal halide pole fixtures. These courts are no longer used at night.

3.5 Control Systems

There is no centralized building management system (BMS) in the facility. The domestic hot water system is managed from controls on the PVI boilers. The steam boilers operate off their respective pressure controls.

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 the common areas and approximately 10% of the apartments. Each switch and circuit was identified, and the number of fixtures, locations, and existing wattage established. 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 1, 2 & 4 fixtures with T-8 28-watt lamps and electronic ballasts
- Replace incandescent exit signs with LED technology

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.

Lighting has an expected lifetime of 20 years, according to IEEE, and the estimated annual energy savings is 95,900 kWh for a total energy savings of 1,917,360 kWh ($342,000) 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		#2 Oil	Total				
$	kW	kWh	gallons	$		$	Years	Years
60,000	28	95,900	0	17,100	4.7	6,200	3.5	3.1

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

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

4.1.2 ECM-1b Install Lighting Occupancy Sensors

In many areas of Meadowview, 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 the lights when the area is unoccupied. 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 101,000 kWh for a total energy savings of 1,009,500 kWh ($131,000) 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		#2 Oil	Total				
$	kW	kWh	gallons	$		$	Years	Years
102,100	0.0	101,000	0	13,100	0.3	10,800	7.8	7.0

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

This measure is not 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 electronic 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. In combination with the above measures, the facility should consider stocking low wattage 28 watt T-8s 4-foot lamps to replace the existing 34 watt lamps when they fail. These lamps can be installed in the existing efficient T-8 electronic ballasted fixtures and will increase the energy efficiency of the system.

This type of system has an expected lifetime of 10 years and the estimated annual energy savings was 186,800 kWh for a total energy savings of 1,867,900 kWh ($292,000) 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		#2 Oil	Total				
$	kW	kWh	gallons	$		$	Years	Years
162,100	28	186,800	0	29,200	0.8	17,000	5.5	5.0

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

This measure is recommended.

4.2 ECM-2 Light Bulb Exchange

Approximately 20 apartments (i.e., 10% of all the apartments) were surveyed as part of this energy audit. Based on this survey, it is estimated that approximately 680 incandescent light bulbs are presently used in various tenant-owned lamps and plug-in lighting fixtures. For this ECM, potential energy savings were calculated if NBHA initiated a bulb exchange program to replace tenant owned incandescent bulbs with higher efficient compact fluorescent light bulbs. This measure is expected to have a less than one year 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 was 21,700 kWh for a total energy savings of 108,700 kWh ($50,500) over the life of the project.

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

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
5,000	43	21,700	0	10,100	9.1	NA	0.5	NA

* No incentive available.

This measure is recommended.

4.3 ECM-3 Water Conservation

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

There are 172 toilets in Meadowview. Approximately 86 have been replaced over the years with low flow fixtures. This measure would replace the remaining toilets.

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

ECM -3a Replace Toilets and Flush Valves with Low Flow Types – Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
32,200	300	2,700	NA	NA	12.1	NA

* No incentive available.

ECM -3a Toilets and Flush Valves with Low Flow Types – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
6,800	60	600	NA	NA	12.1	NA

* No incentive available.

These measures are not recommended.

4.3.2 ECM-3b Install Low Flow Showerheads

There are 172 showers in Meadowview apartments. The showers have a standard showerhead nominally rated at 2.5 gallons per minute. LEED information indicates that an average shower lasts approximately five minutes.

This measure would install 142 new 1.6 GPM showerheads to replace the existing 2.5 GPM showerheads in the five buildings of the Garden Apartments.

Showerheads have an expected lifetime of about 15 years and the estimated annual water and sewer savings were 230 Kgal for a total savings of 3,500 Kgal ($31,500) over the life of the project.

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

ECM -3b Install Low Flow Showerheads – Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
4,800	230	2,100	5.6	NA	2.2	NA

* No incentive available.

This measure would install 30 new 1.6 GPM showerheads to replace the existing 2.5 GPM showerheads in the three buildings of the Town House Apartments.

Showerheads have an expected lifetime of about 15 years and the estimated annual water and sewer savings were 50 Kgal./Yr. for a total savings of 700 Kgal./Yr. ($6,600) over the life of the project.

ECM -3b Install Low Flow Showerheads – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
1,000	50	400	5.6	NA	2.5	NA

* No incentive available.

These measures are recommended.

4.4 ECM-4 Thermostats and Control Valves for Steam Radiators

The Town House and Garden Apartments are heated with low pressure steam supplied by a Smith Series 19 sectional low pressure steam boiler, with a nominal 1 MMBH capacity. The steam heating system is comprised of the steam supply main, vertical steam radiators that transfer heat to the apartment, and condensate return headers. Each building has a steam header that runs from the boiler under the first floor of the basement with ¾" branch lines that go up to feed the vertical radiators. The steam and condensate headers run up the north/south or east/west walls of each building.

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

A self contained, temperature control valve would be installed on radiators in each apartment room. This control valve would have a capillary tube that would extend from the control valve to a wall mounted thermostat. This would allow the tenant to set and control to a temperature maximum of 72°F. On an individual basis, the maintenance staff could increase the maximum temperature, if approved by NBHA. A cutsheet of a proposed control valve and thermostat is presented in Appendix I.

The five Garden Apartment buildings have 615 vertical radiators.

Thermostats and control valves have an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings was 18,200 therms for a total energy savings of 273,000 ($309,000) therms over the life of the project.

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

ECM – 4 Thermostats and Control Valves for Steam Radiators – Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings				ROI	New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
163,200	0	0	18,200	20,600	0.9	65,500	7.9	4.7

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

The three Town House Apartment buildings have 133 vertical radiators.

Thermostats and control valves have an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings was 2,385 therms for a total energy savings of 35,775 ($40,500) therms over the life of the project.

ECM – 4 Thermostats and Control Valves for Steam Radiators – Townhome Apartments 6 - 8

Budgetary Cost	Annual Utility Savings				ROI	New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
$35,300	0	0	2,390	$2,700	0.2	$8,600	13.1	9.9

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

These measures are recommended.

4.5 ECM- 5 Air Conditioner Changeout

The eight buildings of Meadowview Apartments have 191 window air conditioners ranging in capacity from 5,000 to 10,000 BTUH. The units are owned by the tenants who pay a monthly fee for the operational cost. The EER is estimated at between 8 and 9; EER on newer units is typically 10 to 12. Some of the newer air conditioning models were observed to be higher efficiency units.

The available cooling capacity of the existing units is around 1,432,500 BTUH. The TREAT Model indicated that about 25% of this capacity is used during a particular cooling hour. This measure proposes that new tenants at any North Bergen Housing Authority building be required to use only Energy Star rated air conditioners with an EER above 10. Most EPA Energy Star rated window air conditioners fall into 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 L. The savings for an eventual changeout over time are as follows:

ECM – 5 Air Conditioner Changeout - Garden Apartments 1 - 5

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	14,900	0	2,400	NA	NA	NA	NA

* No incentive available.

ECM – 5 Air Conditioner Changeout - Townhome Apartments 6 - 8

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	2,200	0	400	NA	NA	NA	NA

* No incentive available.

This ECM is recommended.

4.6 ECM- 6 Boiler Replacement

4.6.1 ECM-6a Boiler Replacement with High Efficiency Hot Water Boilers

The Town House and Garden Apartments are heated with low pressure steam supplied from a Smith Series 19 sectional low pressure steam boiler, which has a nominal 1 MMBH capacity at a seasonal efficiency of 70%.

This measure proposes replacing the existing Smith boiler with a high efficiency hot water condensing boiler with an efficiency of greater than 90%. The system would be converted from a steam system to a hydronic heating system with pump and expansion tank. The existing steam and condensate piping would be used in the hot water recirculation system.

In this application, a high efficiency condensing hot water boiler, similar to the Aerco Benchmark Model used in Cullum Apartments, would replace the Smith boilers. This would enable heating system efficiencies close to 95% in the spring and fall months, based on outside air temperature. As the outside air temperature got warmer, the hot water system supply temperature would be lowered since less heat is required by the apartments. As the outside air temperature got colder, the hot water supply temperature would get warmer to control space conditions. Energy savings are further realized through the high turndown capability of the boiler system. A cutsheet of a proposed high efficiency hot water boiler is presented in Appendix K.

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

ECM- 6a Boiler Replacement with High Efficiency Hot Water Boilers - Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
493,300	0	0	20,800	23,500	NA	74,800	21.0	17.8

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

ECM- 6a Boiler Replacement with High Efficiency Hot Water Boilers -Townhome Apts. 6 - 8

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
274,600	0	0	5,400	6,100	NA	19,300	> 30	> 30

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

These measures are not recommended.

4.6.2 ECM-6b Boiler Replacement with High Efficiency Steam Boilers

Due to the high cost of boiler conversion from a steam heating system to a hot water hydronic system, it was determined to assess replacement of the Smith boilers with higher efficiency low pressure steam boilers.

This measure evaluates replacing the Smith sectional boilers with new high efficiency (>84%) boilers. The boiler system efficiency of older boilers can historically vary from 80% at full capacity to 60% at low loads in spring and fall. The newer high efficiency designs allow for consistently maintained boiler efficiencies above 84%. Newer boiler burner technology provides low NOx performance is a smaller packaged boiler system. A more detailed boiler plant study should be performed before entering into a full capital project. A cutsheet of a proposed high efficiency low pressure steam boiler is presented in Appendix L.

This measure is not recommended due to the unfavorable payback; however, due to the age of the existing boilers, when replacement is necessary, a higher efficiency boiler with improved turndown and NOx control should be considered.

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

ECM- 6b Boiler Replacement with High Efficiency Steam Boilers - Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
247,600	0	0	13,400	15,100	NA	48,200	16.4	13.2

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

ECM- 6b Boiler Replacement with High Efficiency Steam Boilers – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
137,300	0	0	3,600	4,100	NA	13,000	> 30	>30

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

These measures are not recommended.

4.7 ECM-7 Insulation

4.7.1 ECM-7a Insulate Crawlspace

The area below the first floors of Meadowview consists of a crawlspace for utilities, steam condensate piping, and boiler room. The floor of the apartments is a built-up wood laminate and that is not insulated. The total affected area is approximately 31,000 square feet for the Garden Apartments and 12,600 square feet for the Town House Apartments.

This measure would insulate the bottom of the floors' slabs with 2" board insulation (R-10).

As with the attic insulation measure, crawlspace insulation would save energy and could reduce the capital cost of any proposed boiler replacement due to reduced capacity requirements. This measure along with the attic insulation could also reduce boiler runtime.

The insulation for the Garden Apartments would have an expected lifetime of over 30 years, according to ASHRAE, and the estimated annual energy savings is 6,700 therms for a total energy savings of 201,000 therms ($228,000) over the life of the project.

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

ECM-7a Insulate Crawlspace – Garden Apartments

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
83,500	0.0	0.0	6,700	7,600	1.7	24,100	11.0	7.9

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

This measure is recommended.

ECM-7a Insulate Crawlspace – Town House Apartments

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
34,000	0.0	0.0	1,000	1,100	NA	3,600	29.8	26.6

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

This measure is not recommended.

4.7.2 Insulate Condensate Piping

Town House Apartments 6 - 8 and Garden Apartments 1, 3, 4, and 5 have a single 1 MMBH Smith sectional low pressure steam boiler. Garden Apartment #2 has two 1 MMBH Smith sectional low pressure steam boilers. Each vertical radiator has a ¾" condensate return line that goes back to a common condensate return main. All condensate return lines feed back to a condensate return pump, which feeds back to the Smith boilers.

The heat released by the uninsulated lines in the unconditioned crawlspace has to be made up in the boiler. The hotter the condensate coming back to the boiler is proportional to lower energy levels being required to boil the water to produce steam.

For the Garden Apartments, the expected lifetime of piping insulation is about 20 years and the estimated annual energy savings was 3,200 therms for a total energy savings of 64,000 therms ($72,000) over the life of the project.

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

ECM – 7b Insulate Condensate Piping – Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
6,700	0	0	3,200	3,600	9.8	5,400	1.9	0.4

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

For the Town House Apartments, the expected lifetime of piping insulation is about 20 years and the estimated annual energy savings was 1,500 therms for a total energy savings of 30,000 therms ($34,000) over the life of the project.

ECM – 7b Insulate Condensate Piping – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
2,400	0	0	1,500	1,700	13.2	1,900	1.4	0.3

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

These measures are recommended.

4.8 ECM-8 Energy Star Appliances

The 172 apartments in Meadowview have standard refrigerators ranging between 15.5 and 17 cubic feet.

This measure recommends replacement of the exiting 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 with "ENERGY STAR".

The refrigerators in Garden Apartments would have an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings is 13,100 kWh for a total energy savings of 196,500 kWh ($165,000) over the life of the project.

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

ECM – 8 Energy Star Appliances - Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
99,500	0.0	13,100	0	11,000	0.7	4,700	9.0	8.6

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

The refrigerators in the Town House Apartments have an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings is 2,500 kWh for a total energy savings of 37,500 kWh ($31,500) over the life of the project.

ECM – 8 Energy Star Appliances – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
21,000	0.0	2,500	0	2,100	0.5	4,800	9.9	7.6

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

These measures are recommended.

4.9 North Bergen Housing Authority Building Incentives

The North Bergen Housing Authority energy conservation project will be afforded numerous 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 producing a total of $0.36/kWh and a $3.60/ therm for those 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 31, 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 delivers incentives of various monetary values dependent upon the existing fixture type and proposed lighting retrofit measure. Prescriptive lighting incentives were utilized for this report to show savings and incentives that would be received if only lighting was selected to implement to construction.

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 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. This stable temperature provides a source for heat in the winter and a means to reject excess heat in the summer. With geothermal heat pump systems, water is circulated between the building and the "ground-loop" piping buried in the ground. In the summer, the water picks up heat from the building and moves it to the ground. In the winter the 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 are no central chiller systems or heat pump systems in the Meadowview Apartment complex to reject heat from. Any cooling in the apartments is done with window air conditioning units. The heating system is low pressure steam baseboard and vertical radiators. The NBHA property is in a city environment and consists mainly of buildings and parking area. Due to the limited green space in the complex and a limited parking area, 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 the lack of green space to install a buried ground loop system.

5.2 Solar

5.2.1 Photovoltaic (PV) Rooftop Solar Power Generation

The south facing roofs of Buildings #4, #5 and #7 of the Meadowview Apartments complex 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 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. The roofs of the southeast and southwest wings of the building have ample area between the south edge of the roof and the exhaust fans in the center of the roof system, to install solar panels.

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 New Jersey Clean Energy Program is presently going through updates; therefore, it was recommended using the PVWAT solar grid analyzer version 1. The closest city available in the model is Newark, New Jersey. A fixed tilt array type was utilized to calculate energy production. The PVWATTS solar power generation model may be found in Appendix P.

The incentives given by 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 cost. The 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 New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly 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 1000 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 ACP penalty for 2009 is $689; this is the amount that must be paid per SERC by the high emission producers. The expected 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. R R Renewable Energy Consultants is a third party SREC broker that has been approved by the New Jersey Clean Energy Program. 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 estimated an average of $487/ SERC per year and this number was utilized in the cash flow for this report.

Meadowview Apartment #4 has a maximum kW demand of 49.6 kW and a minimum kW of 23.2 kW. The monthly average over the year observed was 37.8 kW. Meadowview Apartment #5 has a maximum kW demand of 47.2 kW and a minimum kW of 20.8 kW. The monthly average over the year observed was 30.6 kW. Meadowview Apartment #7 has a maximum kW demand of 46.8 kW and a minimum kW of 18.0 kW. The monthly average over the year observed was 28.4 kW. Meadowview Apartments existing load should justify the use of multiple PV solar arrays. A 4 kW system was selected for Apartments #4, #5 and #7, for the calculations based on available roof area on all three buildings. 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 were to increase above $0.27/kWh and if PV installation costs were to decline below $10 per Watt.

The equipment has an expected lifetime of 15 years, according to ASHRAE, and the estimated annual energy savings was 4,732 kWh for a total energy savings of 70,980 kWh ($10,650) over the life of the project.

An aerial satellite depiction of the Meadowview Apartments location and their orientation to a southern exposure may be found in Appendix Q.

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

ECM-9 Photovoltaic (PV) 4 kW Rooftop Solar Power Generation – Bldg. #4

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
40,000	0	4,730	0	710	(0.7)	4,000	2,300	>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

ECM-9 Photovoltaic (PV) 4 kW Rooftop Solar Power Generation – Bldg. #5

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
40,000	0	4,730	0	710	(0.7)	4,000	2,300	> 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

ECM-9 Photovoltaic (PV) 4 kW Rooftop Solar Power Generation – Bldg. #7

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
40,000	0	4,730	0	710	(0.7)	4,000	2,300	> 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

These measures are not recommended.

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 some of the buildings in Meadowview Apartments 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 because 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, 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. 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.

This is not recommended due to the complexity of the installation and the liabilities of operation. 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. Meadowview Apartments 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 baseboard heat so the heat generated 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 a central absorption chiller plant and cooling tower or multiple plants to convert hot water to chilled water. The majority of building cooling is performed by window air conditioners and split systems; therefore, it would not be practical to install this type of cooling system with the existing HVAC equipment. 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 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:

- 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

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

* From NJOCE Website

This is not recommended due to the building complex 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, the North Bergen Housing Authority 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 100kW 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, buildings in the Meadowview Apartment complex do not have back up emergency electrical generation. The bulk of the electricity usage is controlled by the complex tenants and will not be able to be curtailed by the NBHA staff; therefore, there is no ability to drop electrical load.

This is not recommended because there is no application for Demand Response Curtailment in this building complex.

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, NBHA Meadowview Apartments is unable to acquire an Energy Rating. The "other" allocation is indicative of the Portfolio Manager not having a floor characteristic for a low income 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. Meadowview Apartments Current Source Energy Intensity is 265 kBTU/ft^2/year.

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

7.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the NBHA's Meadowview Apartments in North Bergen, New Jersey identified potential ECMs for lighting upgrades, light bulb exchange, water conservation, control valves for steam radiators, insulation upgrades, air conditioner changeout, and energy star appliances. Potential annual savings of $149,500 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		#2 Oil	Total				
$	kW	kWh	gallons	$		$	Years	Years
162,100	28	186,800	0	29,200	0.8	17,000	5.5	5.0

* 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
5,000	43	21,700	0	10,100	9.1	NA	0.5	NA

* No incentive available.

ECM -3b Install Low Flow Showerheads – Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
4,800	230	2,100	5.6	NA	2.2	NA

* No incentive available.

ECM -3b Install low flow Showerheads – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings		ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Water / Sewer	Total				
$	Kgal	$		$	Years	Years
1,000	50	400	5.6	NA	2.5	NA

* No incentive available.

ECM – 4 Thermostats and Control Valves for Steam Radiators – Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
163,200	0	0	18,200	20,600	0.9	65,500	7.9	4.7

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

ECM – 4 Thermostats and Control Valves for Steam Radiators – Townhome Apartments 6 - 8

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
35,300	0	0	2,390	2,700	0.2	8,600	13.1	9.9

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

ECM – 5 Air Conditioner Changeout - Garden Apartments 1 - 5

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	14,900	0	2,400	NA	NA	NA	NA

* No incentive available.

ECM – 5 Air Conditioner Changeout - Townhome Apartments 6 - 8

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	2,200	0	400	NA	NA	NA	NA

* No incentive available.

ECM-7a Insulate Crawlspace - Garden Apartments

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
83,500	0.0	0.0	6,700	7,600	1.7	24,100	11.0	7.9

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

ECM – 7b Insulate Condensate Piping – Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
$=6,700	0	0	3,200	3,600	9.8	5,400	1.9	0.4

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

ECM – 7b Insulate Condensate Piping – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
2,400	0	0	1,500	1,700	13.2	1,900	1.4	0.3

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

ECM – 8 Energy Star Appliances - Garden Apartments 1 - 5

Budgetary Cost	Annual Utility Savings				ROI	New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
99,500	0.0	13,100	0	11,000	0.7	4,700	9.0	8.6

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

ECM – 8 Energy Star Appliances – Town House Apartments 6 - 8

Budgetary Cost	Annual Utility Savings				ROI	New Jersey Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Nat. Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
21,000	0.0	2,500	0	2,100	0.5	4,800	9.9	7.6

* 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
Meadowview Village

Total Electricity (All 8 Buildings)

Notes:
Buildings 1 - 5: Low Rise Garden Apartments
Buildings 6 - 8: Row Houses
All buildings metered seperately.

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/3/2008	143,307	351	26,109.37	6,133.08	19,976.29	0.182	0.139	17.468
8/4/2008	182,957	**374**	32,250.59	5,826.36	26,424.23	0.176	0.144	15.591
9/3/2008	145,092	326	26,966.44	5,291.43	21,675.01	0.186	0.149	16.251
10/2/2008	115,025	340	18,595.02	2,995.53	15,599.49	0.162	0.136	8.813
11/3/2008	97,608	211	14,229.70	2,828.65	11,401.05	0.146	0.117	13.438
12/3/2008	82,612	193	11,732.16	2,433.13	9,299.03	0.142	0.113	12.633
12/30/2008	76,303	181	10,922.48	2,389.12	8,533.36	0.143	0.112	13.178
1/27/2009	72,255	174	10,754.01	2,393.66	8,360.35	0.149	0.116	13.741
2/27/2009	67,942	166	10,653.08	2,361.29	8,291.79	0.157	0.122	14.259
3/30/2009	86,232	181	12,679.78	2,422.02	10,257.76	0.147	0.119	13.367
4/29/2009	80,269	247	12,094.74	2,679.82	9,414.92	0.151	0.117	10.832
6/1/2009	93,756	230	15,816.63	4,303.00	11,513.63	0.169	0.123	18.692
Total	1,243,358	374	202,804.00	42,057.09	160,746.91	0.163	0.129	14.022

New Jersey BPU Energy Audit Program
CHA #20241
North Bergen Housing Authority
Meadowview Village

Account Number: 2101209306
5802 Newirk Ave (Building No. 1 - 5802, 5806, 5816, 5812)
Meter #: 728003752

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/3/2008	21,280	50.4	3,773.75	761.48	3,012.27	0.177	0.142	15.109
8/4/2008	26,400	55.2	4,627.11	814.86	3,812.25	0.175	0.144	14.762
9/3/2008	20,320	44.0	3,725.35	690.31	3,035.04	0.183	0.149	15.689
10/2/2008	15,600	44.0	2,487.79	372.42	2,115.37	0.159	0.136	8.464
11/3/2008	12,400	22.4	1,715.65	289.73	1,425.92	0.138	0.115	12.934
12/3/2008	11,360	24.0	1,574.25	295.96	1,278.29	0.139	0.113	12.332
12/30/2008	10,320	21.6	1,440.40	286.61	1,153.79	0.140	0.112	13.269
1/27/2009	9,680	20.8	1,417.30	297.56	1,119.74	0.146	0.116	14.306
2/27/2009	9,040	22.4	1,407.29	304.31	1,102.98	0.156	0.122	13.585
3/30/2009	11,520	25.6	1,686.75	316.77	1,369.98	0.146	0.119	12.374
4/29/2009	10,240	31.2	1,539.56	338.58	1,200.98	0.150	0.117	10.852
6/1/2009	12,160	28.0	2,026.08	532.77	1,493.31	0.167	0.123	19.028
Total	170,320	55	27,421.28	5,301.36	22,119.92	0.161	0.130	13.559

Account Number: 2101209209
5824 Newirk Ave (Building No. 2 - 5824, 5826, 5828, 5902, 5906)
Meter #728003751

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/3/2008	25,200	60.8	4,542.38	976.01	3,566.37	0.180	0.142	16.053
8/4/2008	34,480	60.8	5,953.73	976.01	4,977.72	0.173	0.144	16.053
9/3/2008	28,160	55.2	5,118.13	913.73	4,204.40	0.182	0.149	16.553
10/2/2008	22,000	60.0	3,515.11	533.66	2,981.45	0.160	0.136	8.894
11/3/2008	19,040	41.6	2,651.31	464.11	2,187.20	0.139	0.115	11.156
12/3/2008	18,000	40.0	2,480.87	457.88	2,022.99	0.138	0.112	11.447
12/30/2008	15,680	33.6	2,183.82	432.96	1,750.86	0.139	0.112	12.886
1/27/2009	15,680	35.2	2,251.67	440.50	1,811.17	0.144	0.116	12.514
2/27/2009	14,240	32.8	2,166.21	431.20	1,735.01	0.152	0.122	13.146
3/30/2009	18,400	35.2	2,626.25	440.54	2,185.71	0.143	0.119	12.515
4/29/2009	15,840	41.6	2,320.91	465.46	1,855.45	0.147	0.117	11.189
6/1/2009	18,240	44.0	3,034.35	797.28	2,237.07	0.166	0.123	18.120
Total	244,960	61	38,844.74	7,329.34	31,515.40	0.159	0.129	13.377

Account Number: 2101208709
5912 Newirk Ave (Building No. 3 - 5912, 5916, 6002)
Meter #: 728003750

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/3/2008	19,840	47.2	3,557.29	748.58	2,808.71	0.179	0.142	15.860
8/4/2008	26,080	49.6	4,541.35	775.28	3,766.07	0.174	0.144	15.631
9/3/2008	20,720	44.0	3,807.72	713.00	3,094.72	0.184	0.149	16.205
10/2/2008	16,400	48.0	2,634.34	410.71	2,223.63	0.161	0.136	8.556
11/3/2008	11,520	24.8	1,646.96	321.93	1,325.03	0.143	0.115	12.981
12/3/2008	10,880	26.4	1,552.61	328.16	1,224.45	0.143	0.113	12.430
12/30/2008	9,840	24.0	1,419.14	318.82	1,100.32	0.144	0.112	13.284
1/27/2009	9,280	21.6	1,384.41	310.77	1,073.64	0.149	0.116	14.388
2/27/2009	8,800	22.4	1,387.74	313.93	1,073.81	0.158	0.122	14.015
3/30/2009	11,440	23.2	1,677.62	317.04	1,360.58	0.147	0.119	13.666
4/29/2009	10,720	36.0	1,623.95	366.89	1,257.06	0.151	0.117	10.191
6/1/2009	12,400	28.8	2,072.62	550.08	1,522.54	0.167	0.123	19.100
Total	167,920	50	27,305.75	5,475.19	21,830.56	0.163	0.130	13.859

New Jersey BPU Energy Audit Program
CHA #20241
North Bergen Housing Authority
Meadowview Village

Account Number: 2100602802
Newirk Ave (Building No. 4 - 6004, 6006, 6008, 6012)
Meter #: 778000334

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/3/2008	20,880	57.6	3,855.44	899.72	2,955.72	0.185	0.142	15.620
8/4/2008	30,720	57.6	5,335.11	899.72	4,435.39	0.174	0.144	15.620
9/3/2008	23,280	49.6	4,287.28	810.75	3,476.53	0.184	0.149	16.346
10/2/2008	17,440	47.2	2,807.43	443.07	2,364.36	0.161	0.136	9.387
11/3/2008	13,520	28.8	1,927.56	373.25	1,554.31	0.143	0.115	12.960
12/3/2008	12,560	31.2	1,795.47	382.60	1,412.87	0.143	0.112	12.263
12/30/2008	10,960	26.4	1,588.98	363.90	1,225.08	0.145	0.112	13.784
1/27/2009	10,480	24.8	1,576.92	365.00	1,211.92	0.150	0.116	14.718
2/27/2009	10,080	23.2	1,588.42	359.04	1,229.38	0.158	0.122	15.476
3/30/2009	13,920	28.8	2,035.34	380.85	1,654.49	0.146	0.119	13.224
4/29/2009	12,320	36.8	1,856.09	412.00	1,444.09	0.151	0.117	11.196
6/1/2009	14,480	36.8	2,459.90	682.39	1,777.51	0.170	0.123	18.543
Total	190,640	58	31,113.94	6,372.29	24,741.65	0.163	0.130	14.095

Account Number: 2100602608
61st Street (Building No. 5 - 6020, 6022, 6024)
Meter #: 728000293

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/3/2008	26,640	40.8	4,694.66	1,239.58	3,455.08	0.176	0.130	30.382
8/4/2008	21,680	44.0	3,848.54	717.12	3,131.42	0.178	0.144	16.298
9/3/2008	16,960	35.2	3,153.14	619.25	2,533.89	0.186	0.149	17.592
10/2/2008	13,600	39.2	2,225.27	380.57	1,844.70	0.164	0.136	9.708
11/3/2008	9,920	24.0	1,464.56	322.97	1,141.59	0.148	0.115	13.457
12/3/2008	9,760	20.8	1,409.36	310.51	1,098.85	0.144	0.113	14.928
12/30/2008	9,360	22.4	1,363.61	316.74	1,046.87	0.146	0.112	14.140
1/27/2009	9,280	20.8	1,381.48	307.84	1,073.64	0.149	0.116	14.800
2/27/2009	8,880	20.8	1,391.27	307.73	1,083.54	0.157	0.122	14.795
3/30/2009	11,280	20.8	1,649.44	307.73	1,341.71	0.146	0.119	14.795
4/29/2009	10,880	32.8	1,630.22	354.46	1,275.76	0.150	0.117	10.807
6/1/2009	11,520	30.4	1,982.96	567.59	1,415.37	0.172	0.123	18.671
Total	159,760	44	26,194.51	5,752.09	20,442.42	0.164	0.128	15.864

Account Number: 2101207907
5801 Meadowview Ave (Building No. 6 - Rowhouses 5801-5824)
Meter #: 726007849

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/3/2008	11,374	38.8	2,208.60	596.59	1,612.01	0.194	0.142	15.376
8/4/2008	16,880	33.5	2,976.71	537.64	2,439.07	0.176	0.144	16.049
9/3/2008	13,780	30.1	2,559.40	499.83	2,059.57	0.186	0.149	16.606
10/2/2008	10,990	32.7	1,784.00	293.05	1,490.95	0.162	0.136	8.962
11/3/2008	8,930	17.6	1,262.96	234.87	1,028.09	0.141	0.115	13.345
12/3/2008	8,206	18.9	1,164.49	239.93	924.56	0.142	0.113	12.695
12/30/2008	7,592	17.6	1,084.76	234.87	849.89	0.143	0.112	13.345
1/27/2009	6,745	16.3	1,014.54	233.03	781.51	0.150	0.116	14.296
2/27/2009	6,377	15.0	1,007.41	228.08	779.33	0.158	0.122	15.205
3/30/2009	8,901	17.9	1,299.05	239.37	1,059.68	0.146	0.119	13.373
4/29/2009	8,491	25.9	1,267.13	270.53	996.60	0.149	0.117	10.445
6/1/2009	9,707	23.2	1,622.84	430.34	1,192.50	0.167	0.123	18.549
Total	117,973	39	19,251.89	4,038.13	15,213.76	0.163	0.129	14.020

New Jersey BPU Energy Audit Program
CHA #20241
North Bergen Housing Authority
Meadowview Village

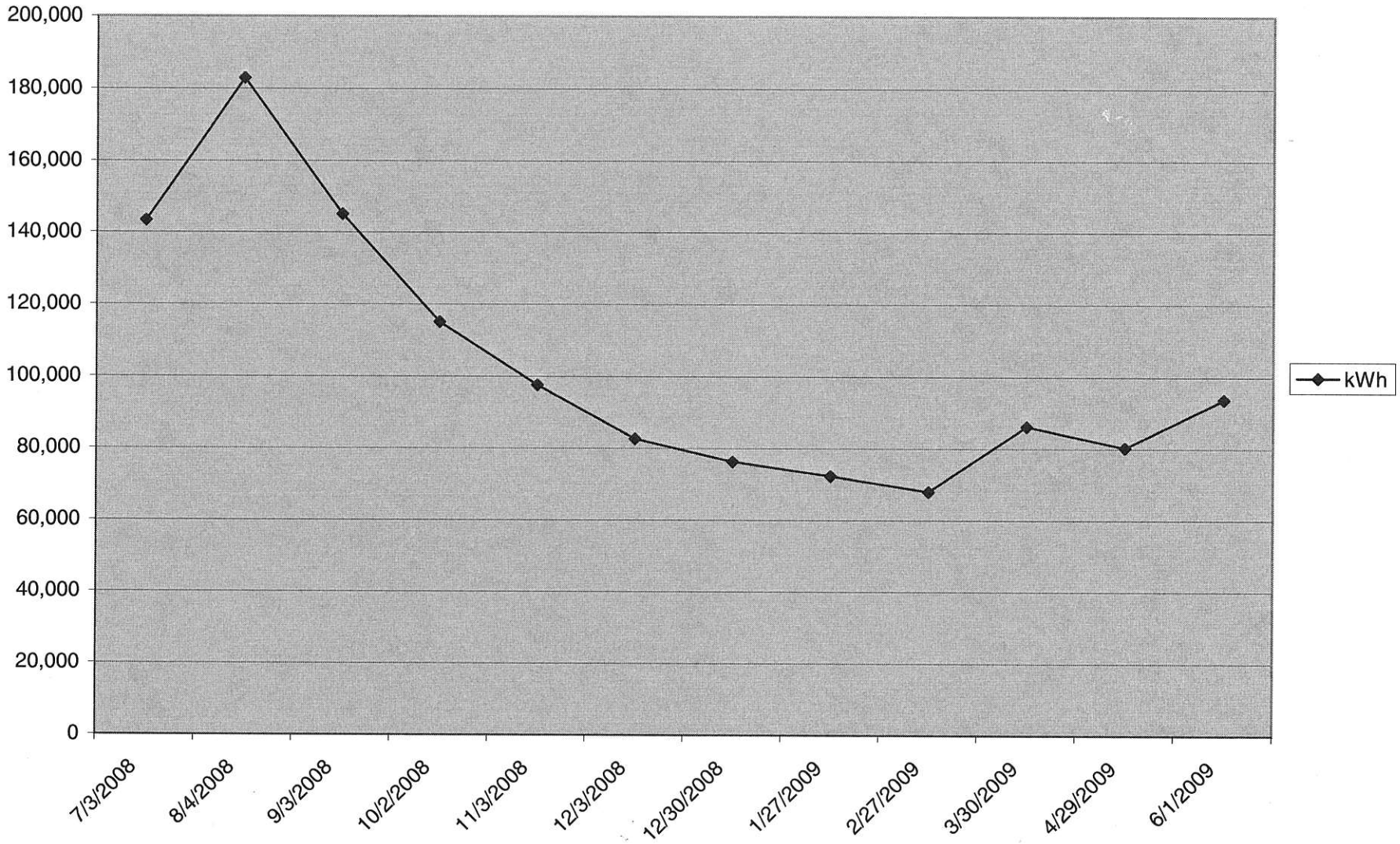
Account Number: 2101208504
5825 Meadowview Ave (Building No. 7 - Rowhouses 5825-5843)
Meter #: 256005773

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/3/2008	9,756	31.3	1,905.99	522.58	1,383.41	0.195	0.142	16.696
8/4/2008	13,992	46.8	2,717.53	694.94	2,022.59	0.194	0.145	14.849
9/3/2008	12,000	46.0	2,480.22	686.05	1,794.17	0.207	0.150	14.914
10/2/2008	11,388	46.8	1,902.27	356.91	1,545.36	0.167	0.136	7.626
11/3/2008	17,496	38.8	2,839.20	652.80	2,186.40	0.162	0.125	16.825
12/3/2008	7,092	20.4	1,054.96	255.33	799.63	0.149	0.113	12.516
12/30/2008	6,432	19.9	974.10	253.38	720.72	0.151	0.112	12.733
1/27/2009	6,132	18.8	966.74	255.90	710.84	0.158	0.116	13.612
2/27/2009	6,240	18.4	1,017.23	254.55	762.68	0.163	0.122	13.834
3/30/2009	5,196	18.4	874.86	254.55	620.31	0.168	0.119	13.834
4/29/2009	6,612	25.1	1,057.62	280.64	776.98	0.160	0.118	11.181
6/1/2009	8,784	23.4	1,525.90	446.21	1,079.69	0.174	0.123	19.069
Total	111,120	47	19,316.62	4,913.84	14,402.78	0.174	0.130	13.974

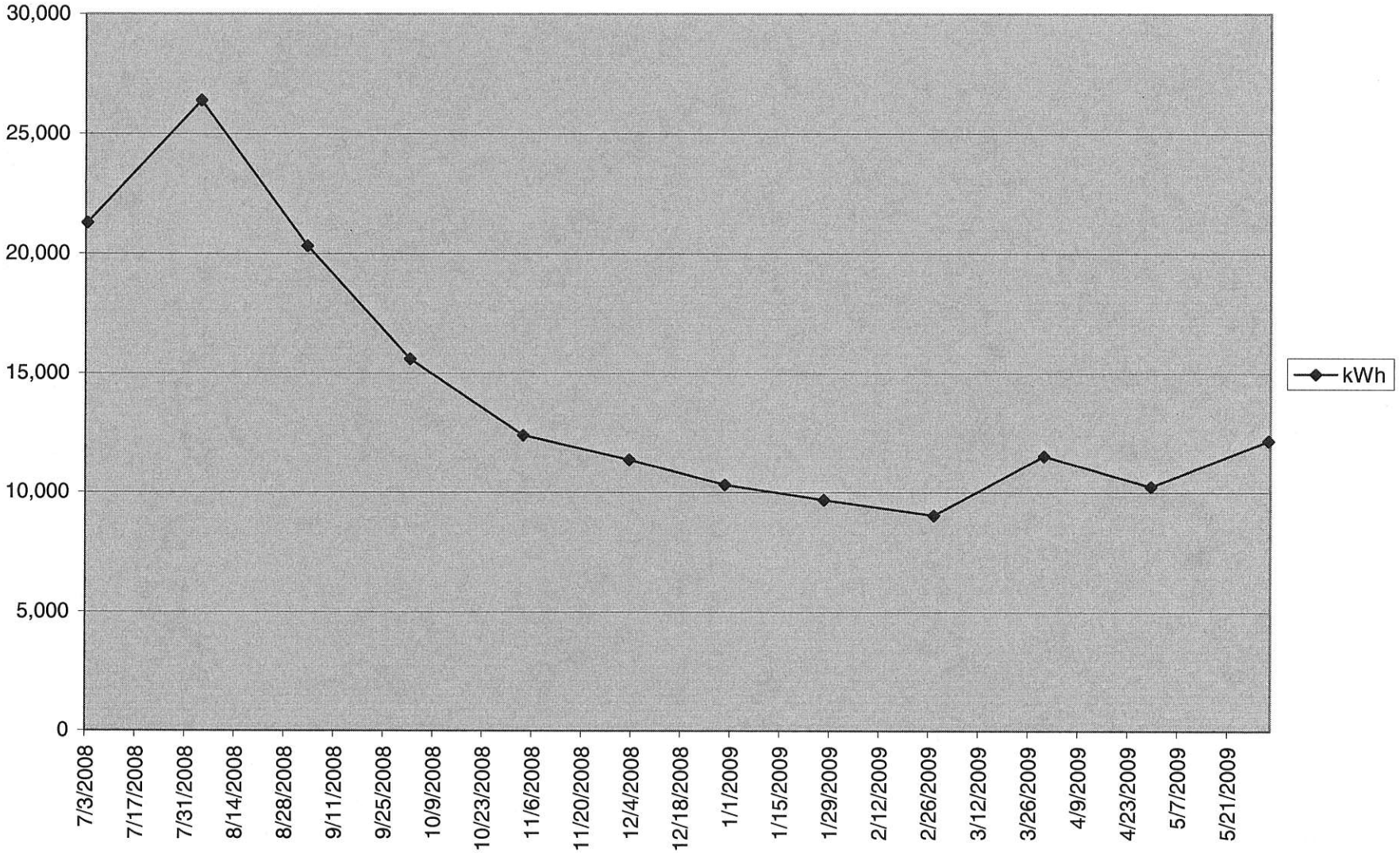
Account Number: 2100603108
Meadowview Ave (Building No. 8 - Rowhouses 6013 - 6027)
Meter #: 726001420

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/3/2008	8,337	24.2	1,571.26	388.54	1,182.72	0.188	0.142	16.055
8/4/2008	12,725	26.2	2,250.51	410.79	1,839.72	0.177	0.145	15.679
9/3/2008	9,872	21.5	1,835.20	358.51	1,476.69	0.186	0.150	16.675
10/2/2008	7,607	22.0	1,238.81	205.14	1,033.67	0.163	0.136	9.325
11/3/2008	4,782	12.5	721.50	168.99	552.51	0.151	0.116	13.519
12/3/2008	4,754	10.9	700.15	162.76	537.39	0.147	0.113	14.932
12/30/2008	6,119	15.8	867.67	181.84	685.83	0.142	0.112	11.509
1/27/2009	4,978	15.9	760.95	183.06	577.89	0.153	0.116	11.513
2/27/2009	4,285	10.6	687.51	162.45	525.06	0.160	0.123	15.325
3/30/2009	5,575	11.3	830.47	165.17	665.30	0.149	0.119	14.617
4/29/2009	5,166	18.0	799.26	191.26	608.00	0.155	0.118	10.626
6/1/2009	6,465	15.6	1,091.98	296.34	795.64	0.169	0.123	18.996
Total	80,665	26	13,355.27	2,874.85	10,480.42	0.166	0.130	14.064

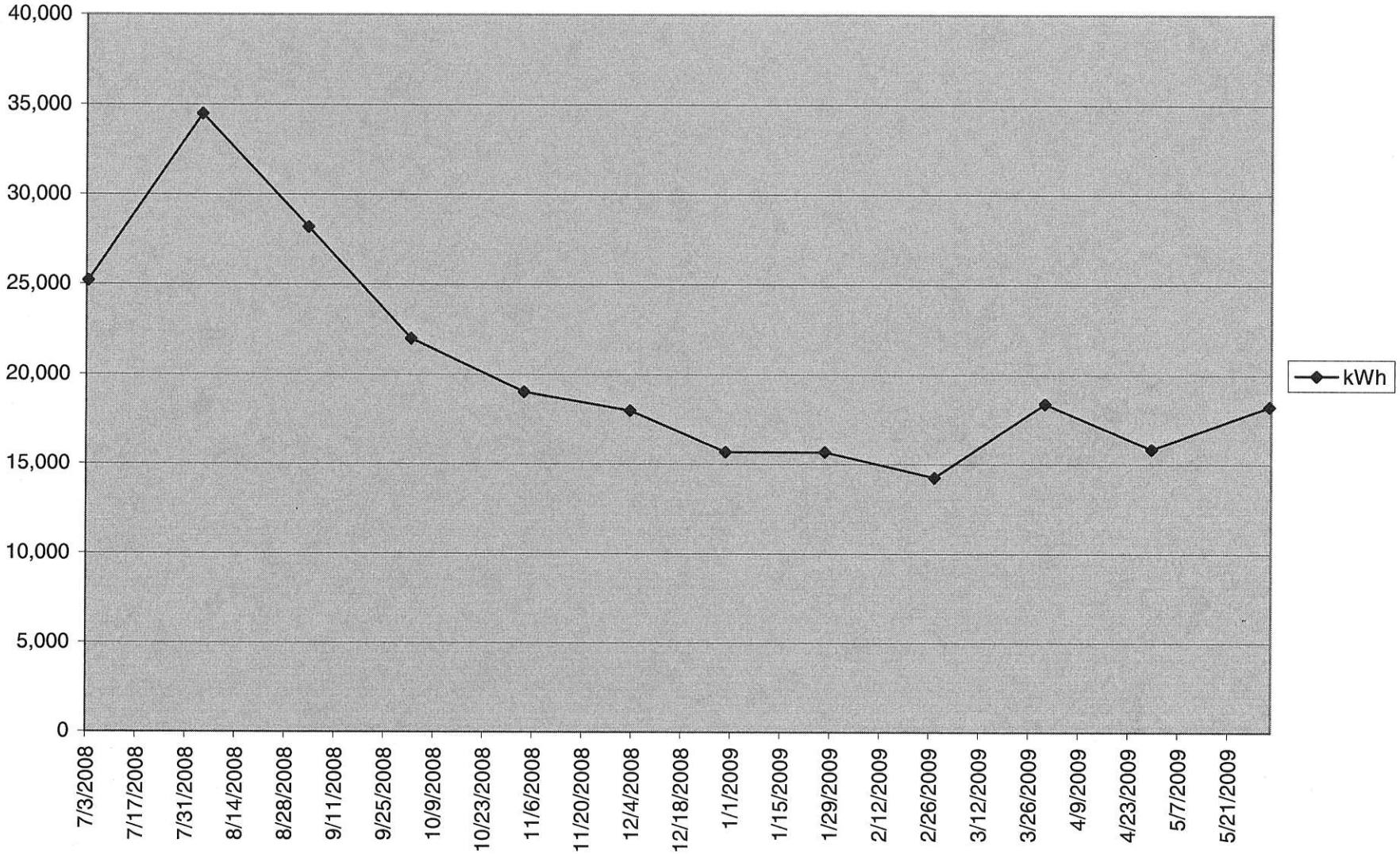
Meadowview Total Electric Usage



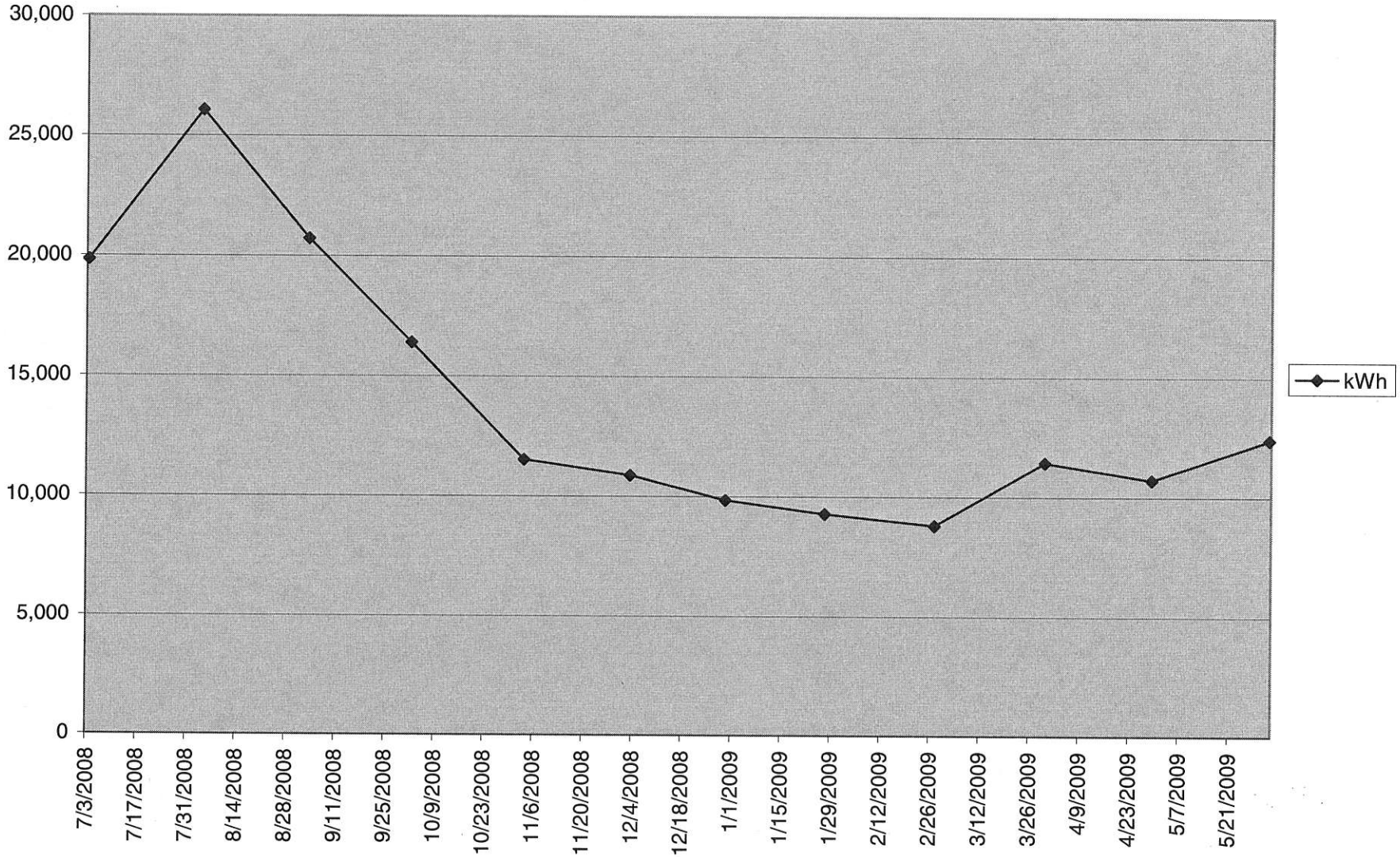
Bldg. #1 Electric Usage



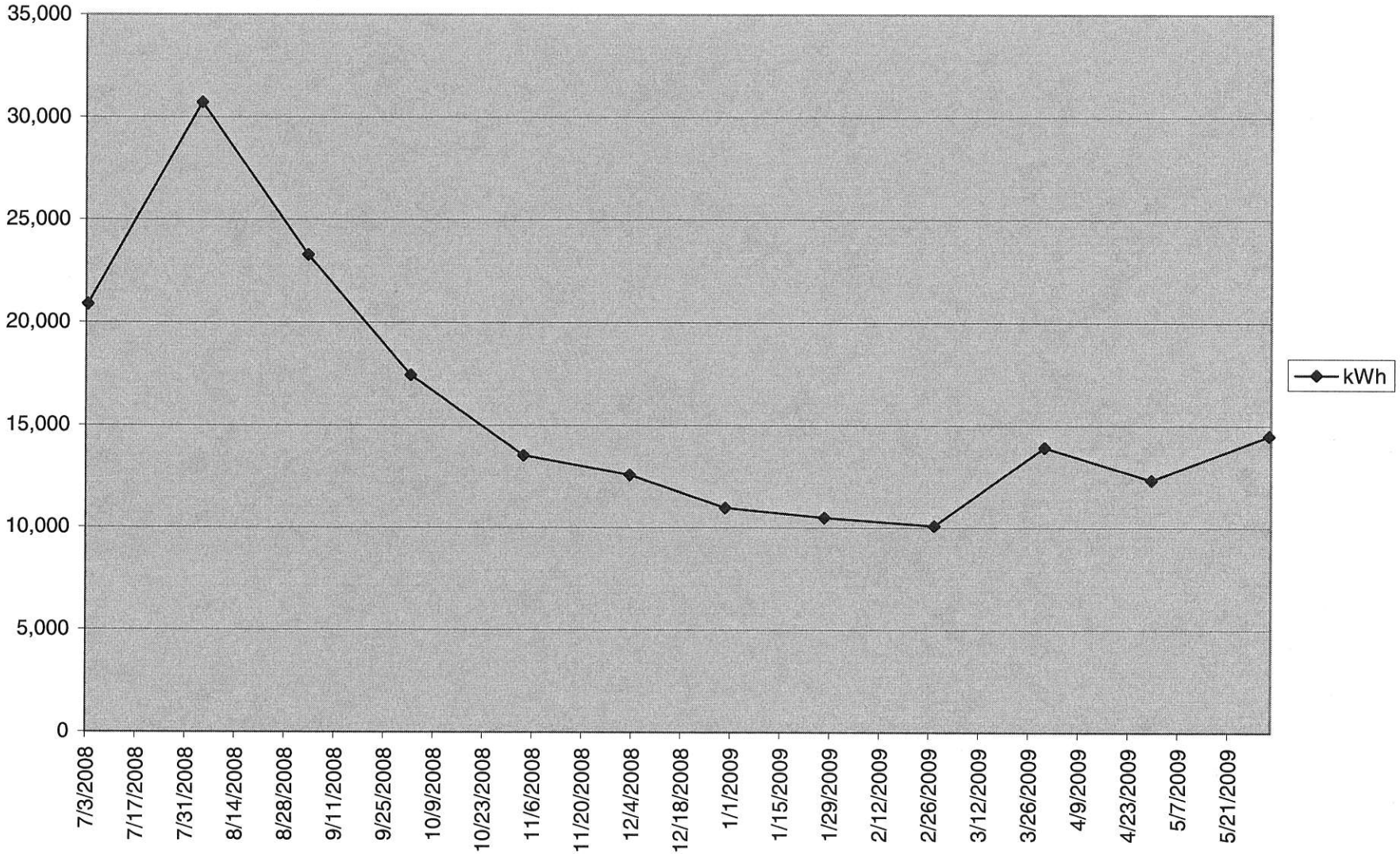
Bldg. 2 Electric Usage



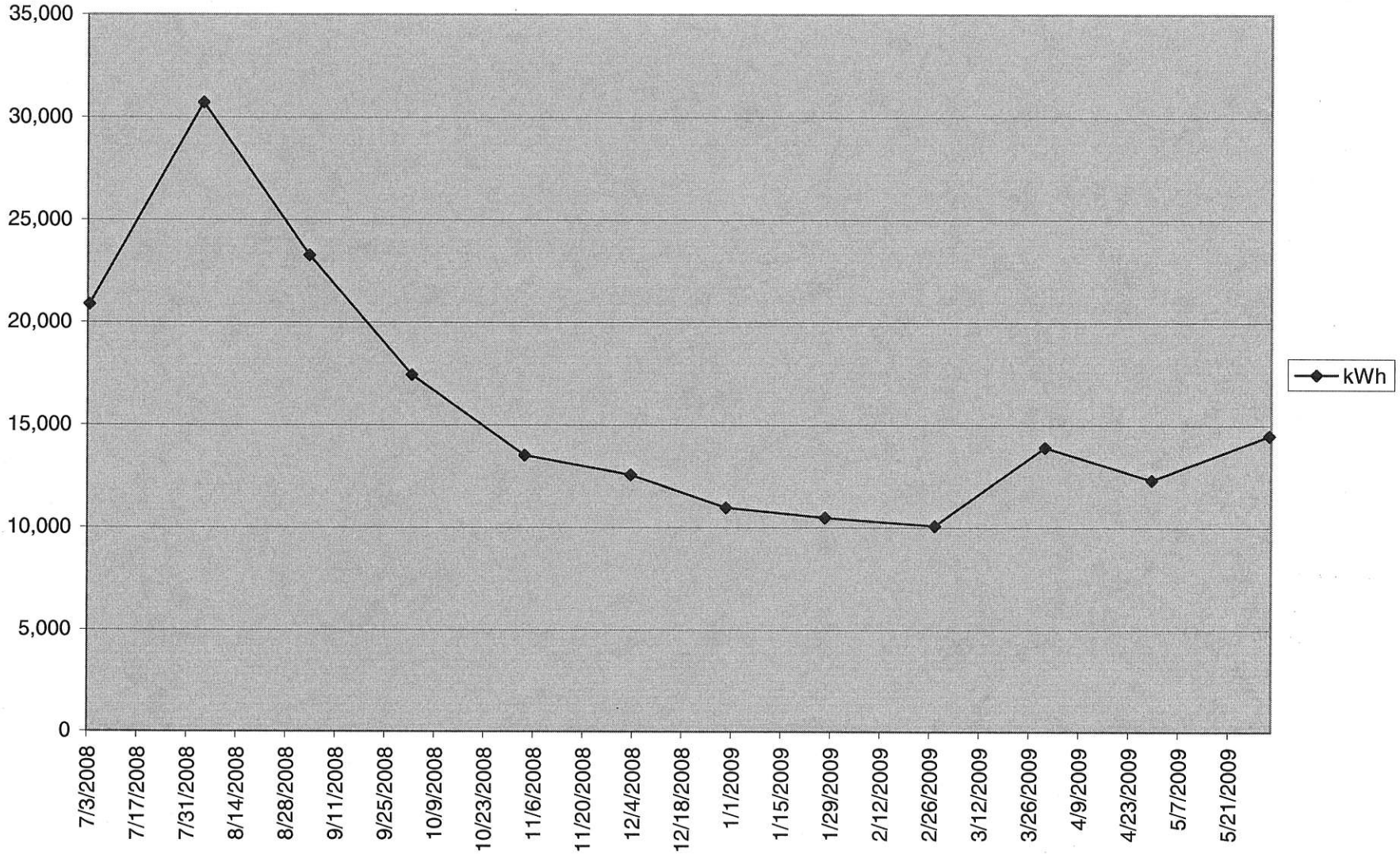
Bldg. 3 Electric Usage



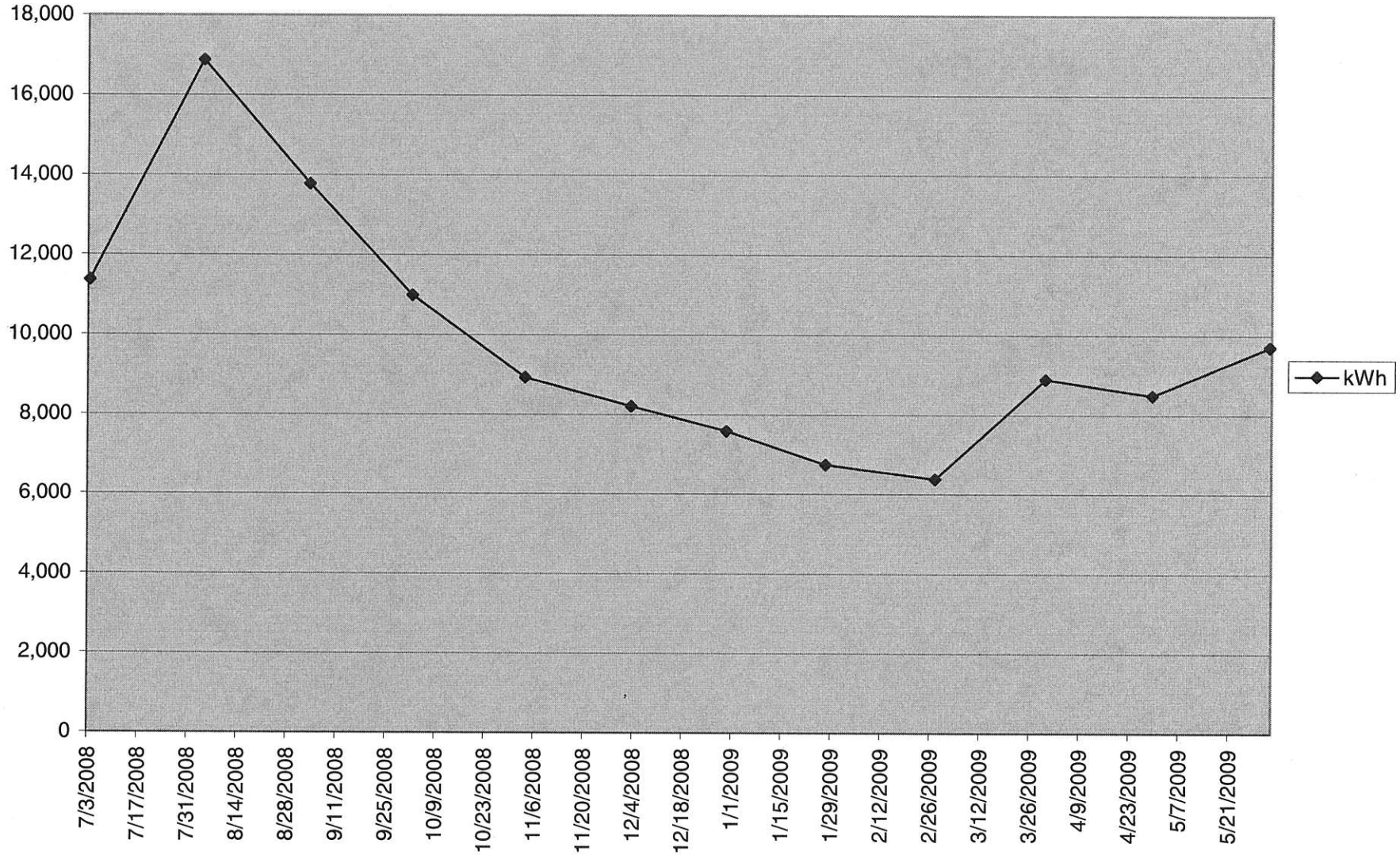
Bldg. 4 Electric Usage



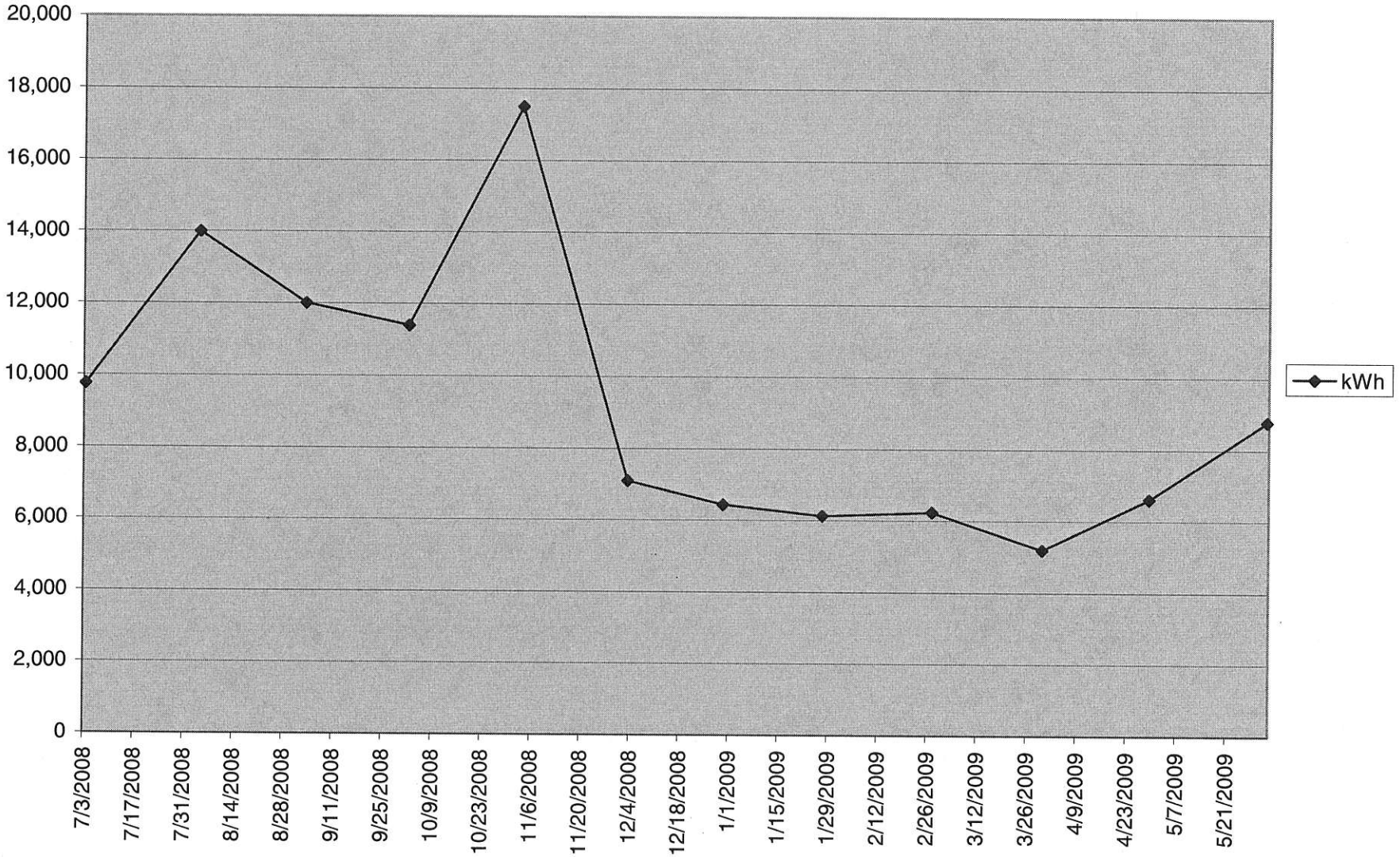
Bldg. 5 Electric Usage



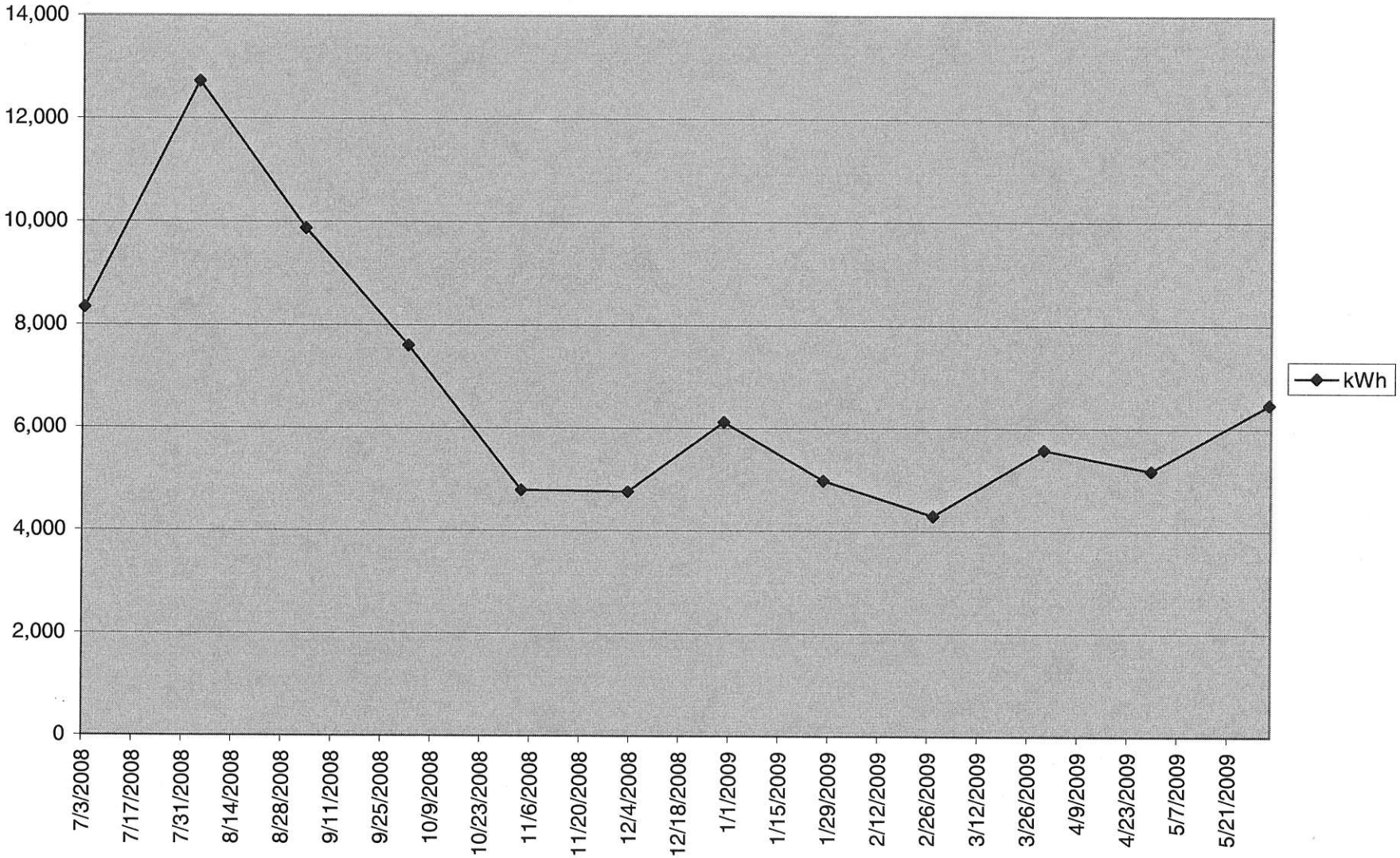
Bldg. 6 Electric Usage



Bldg. 7 Electric Usage



Bldg. 8 Electric Usage



New Jersey BPU Energy Audit Program
CHA #20241
North Bergen Housing Authority
Meadowview Village

Account Number: 2100695738
PSE&G - Natural Gas Service

Total Gas

Date	Therms	Cost	($/Therm)
7/3/2008	8,191	$12,641.45	1.543
8/4/2008	2,942	$4,856.91	1.651
9/3/2008	2,941	$3,873.53	1.317
10/2/2008	2,929	$3,619.46	1.236
11/3/2008	9,458	$14,395.17	1.522
12/3/2008	19,889	$25,188.16	1.266
12/30/2008	22,619	$29,246.78	1.293
1/27/2009	25,231	$30,394.83	1.205
2/23/2009	22,560	$24,047.68	1.066
3/30/2009	24,151	$18,585.25	0.770
4/29/2009	13,253	$9,282.15	0.700
6/1/2009	4,236	$2,894.69	0.683
Most Recent Yr	158,400	$179,026	1.130

Building Areas:

Complex Total	114,738	**Sq-Ft**	100.00%

Apartment Building	**Sq-Ft**	**% of Tot Sq-Ft**
Building #1	17,123	14.92%
Building #2	21,675	18.89%
Building #3	15,825	13.79%
Building #4	19,650	17.13%
Building #5	15,825	13.79%
Apartment Total	90,098	78.52%

Town Homes	**Sq-Ft**	**% of Tot Sq-Ft**
Building #6	9,950	8.67%
Building #7	8,090	7.05%
Building #8	6,600	5.75%
Town Homes Total	24,640	21.48%

Total natural gas consumption and charges from PSE&G invoices are allocated to each building by square footage.

New Jersey BPU Energy Audit Program
CHA #20241
North Bergen Housing Authority
Meadowview Village

Therms by Building:

Date	Building 1	Building 2	Building 3	Building 4	Building 5	Building 6	Building 7	Building 8
7/3/2008	1222	1547	1130	1403	1130	710	578	471
8/4/2008	439	556	406	504	406	255	207	169
9/3/2008	439	556	406	504	406	255	207	169
10/2/2008	437	553	404	502	404	254	207	168
11/3/2008	1411	1787	1304	1620	1304	820	667	544
12/3/2008	2968	3757	2743	3406	2743	1725	1402	1144
12/30/2008	3376	4273	3120	3874	3120	1962	1595	1301
1/27/2009	3765	4766	3480	4321	3480	2188	1779	1451
2/23/2009	3367	4262	3112	3864	3112	1956	1591	1298
3/30/2009	3604	4562	3331	4136	3331	2094	1703	1389
4/29/2009	1978	2504	1828	2270	1828	1149	934	762
6/1/2009	632	800	584	725	584	367	299	244
Most Recent Yr	23,639	29,923	21,847	27,128	21,847	13,736	11,169	9,112

Charges ($) by Building:

Date	Building 1	Building 2	Building 3	Building 4	Building 5	Building 6	Building 7	Building 8
7/3/2008	1887	2388	1744	2165	1744	1096	891	727
8/4/2008	725	918	670	832	670	421	342	279
9/3/2008	578	732	534	663	534	336	273	223
10/2/2008	540	684	499	620	499	314	255	208
11/3/2008	2148	2719	1985	2465	1985	1248	1015	828
12/3/2008	3759	4758	3474	4314	3474	2184	1776	1449
12/30/2008	4365	5525	4034	5009	4034	2536	2062	1682
1/27/2009	4536	5742	4192	5205	4192	2636	2143	1748
2/23/2009	3589	4543	3317	4118	3317	2085	1696	1383
3/30/2009	2774	3511	2563	3183	2563	1612	1310	1069
4/29/2009	1385	1753	1280	1590	1280	805	654	534
6/1/2009	432	547	399	496	399	251	204	167
Most Recent Yr	26,717	33,820	24,692	30,660	24,692	15,525	12,623	10,298

New Jersey BPU Energy Audit Program
CHA #20241
North Bergen Housing Authority
Meadowview Village

Account Number: 10000997823137
United Water - Domestic Water Service

Date	Gallons	Cost	($/Gal)
8/13/2008	1,970,980	$7,615.62	0.00386
9/13/2008	1,743,588	$6,765.05	0.00388
10/11/2008	1,116,016	$4,417.62	0.00396
11/10/2008	1,185,580	$4,677.82	0.00395
12/8/2008	1,071,136	$4,254.30	0.00397
1/12/2009	1,344,904	$5,273.77	0.00392
2/11/2009	1,127,984	$4,462.38	0.00396
3/13/2009	1,296,568	$4,344.83	0.00335
4/16/2009	1,450,372	$6,077.72	0.00419
5/12/2009	997,084	$4,669.63	0.00468
6/11/2009	1,157,904	$5,376.71	0.00464
7/17/2009	1,380,808	$6,356.73	0.00460

Most Recent Yr	15,842,924	$64,292	0.004

United Water - Sewage Service

Date	Gallons	Cost	($/Gal)
9/30/2008	4,042,192	$21,181.09	0.00524
12/31/2008	6,054,312	$31,724.59	0.00524
3/31/2009	3,372,732	$18,566.39	0.00550
6/30/2009	3,569,456	$19,631.86	0.00550

Most Recent Yr	17,038,692	$91,104	0.005

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

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

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

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

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

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

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

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

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

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

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

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

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

RPL Holdings, Inc
601 Carlson Pkwy
Minnetonka, MN 55305

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

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

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

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

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

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

DESIGN HEATING AND COOLING LOADS FOR BASE BUILDING

GARDEN APARTMENTS 1-5

9/2/2009
Project Name: Meadowview Apartment Bld #1

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
1st Floor	180179	30	20.5	345
3rd Floor	341203	56	38.8	653
Boiler Room	3825	12	0.4	8
2nd Floor	100713	17	11.4	193

Required Heating Equipment Output Capacity: 734526 Btu/hr
Available Heating Equipment Output Capacity: 700000 Btu/hr
Total flow: 73.5 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 70 %
Calculated Distribution Efficiency: 94 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10
HEATING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED HEATING LOAD.

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
1st Floor	137415	4999
3rd Floor	351443	12784
Boiler Room	0	0
2nd Floor	118986	4329

Required Cooling Equipment Output Capacity: 651020 Btu/hr

Available Cooling Equipment Output Capacity: 70000 Btu/hr

Total flow: 21528 CFM

Cooling Equipment Efficiency: 10 SEER

Calculated Distribution Efficiency: 100%

Temperature Drop: 28 F

Cooling Safety Factor: 1.10

Distribution Safety Factor: 1.10

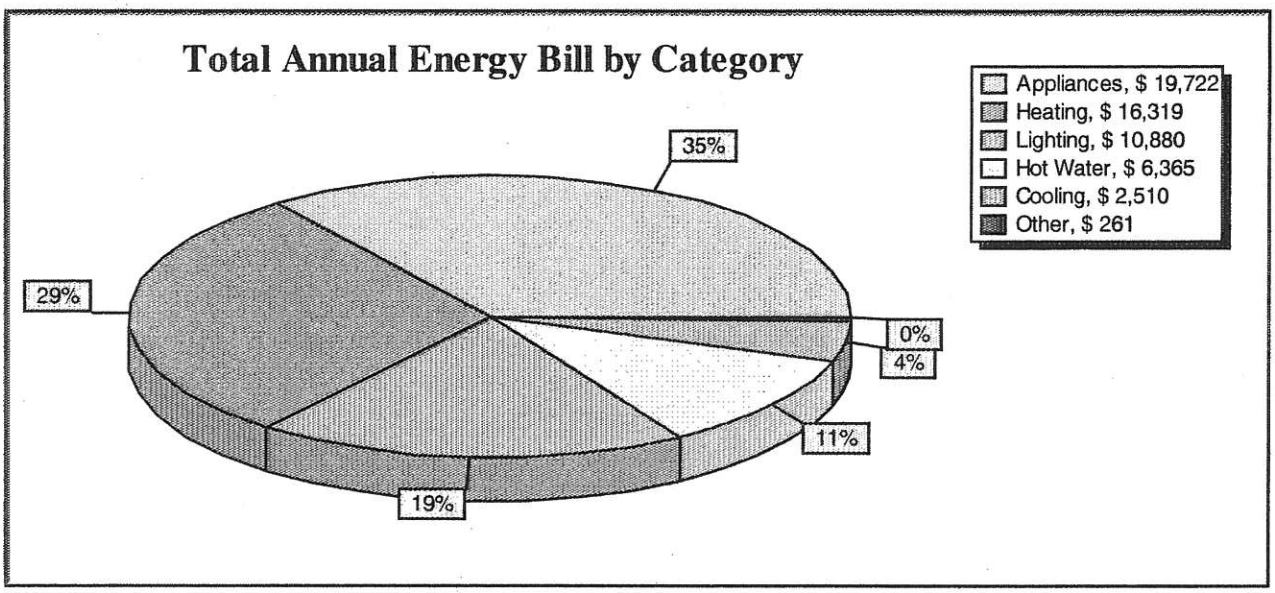
COOLING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED COOLING LOAD.

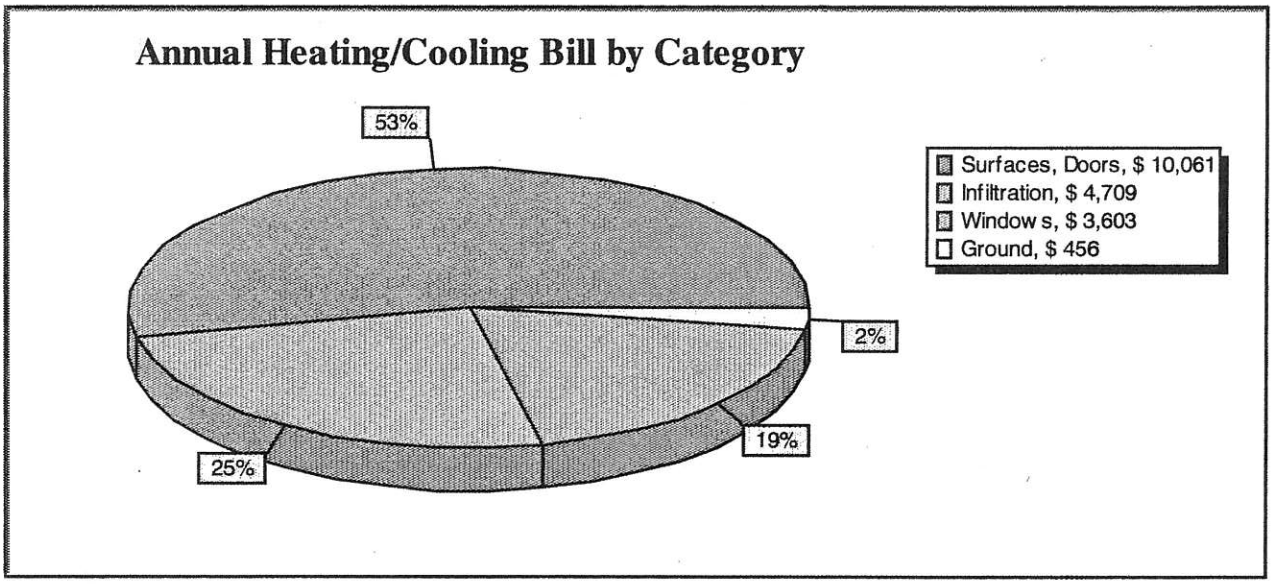
Notes:

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 BASE BUILDING

Meadowview Apartment Bld #1
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: Building # 1 5828 Meadowview A
North Bergen , NJ 07047

Billing Period: 7/2008 - 6/2009

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 9/2/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Base Building

Billing Period Name: BillingPeriod1

	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	12,757	14,415	142,575	22,812		
Billing	12,257	15,123	147,372	23,178		
% Difference	-4	5	3	2		

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

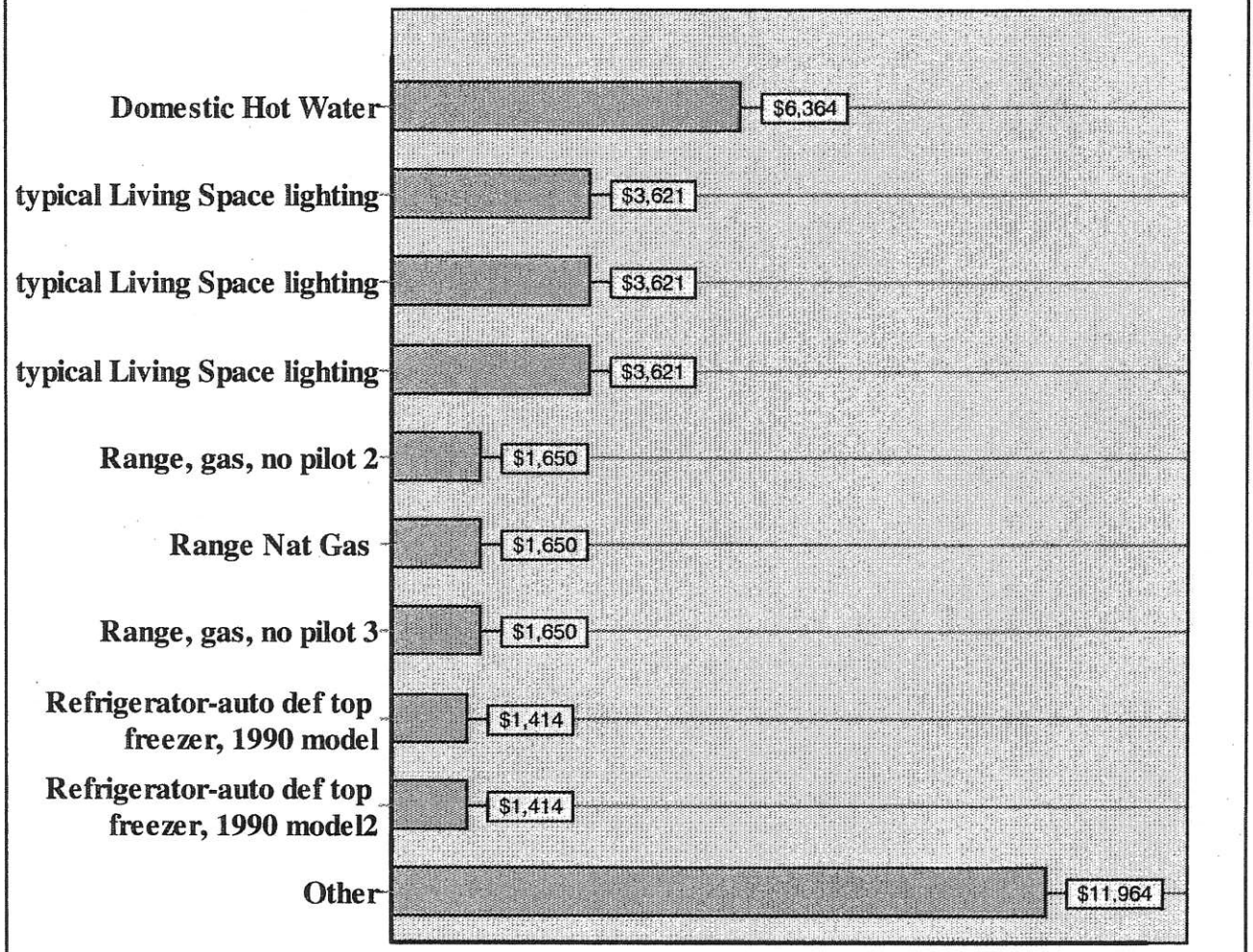
Annual Use of Domestic Hot Water, Appliances, and Lighting

Model Name: Base Building

	Natural gas $1.13 per Therm		Electricity $0.16 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	5,632	6,364	0	0			6,364
2. typical Living Space lighting	0	0	22,630	3,621			3,621
3. typical Living Space lighting	0	0	22,630	3,621			3,621
4. typical Living Space lighting	0	0	22,630	3,621			3,621
5. Range, gas, no pilot 2	1,460	1,650	0	0			1,650
6. Range Nat Gas	1,460	1,650	0	0			1,650
7. Range, gas, no pilot 3	1,460	1,650	0	0			1,650
8. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
9. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
10. Other	2,745	3,102	55,372	8,862			11,964
TOTAL	12,757	14,416	140,942	22,553			36,969

Base Load Energy Users, $/year

Model Name: Base Building



HEATING ENERGY SCORECARD

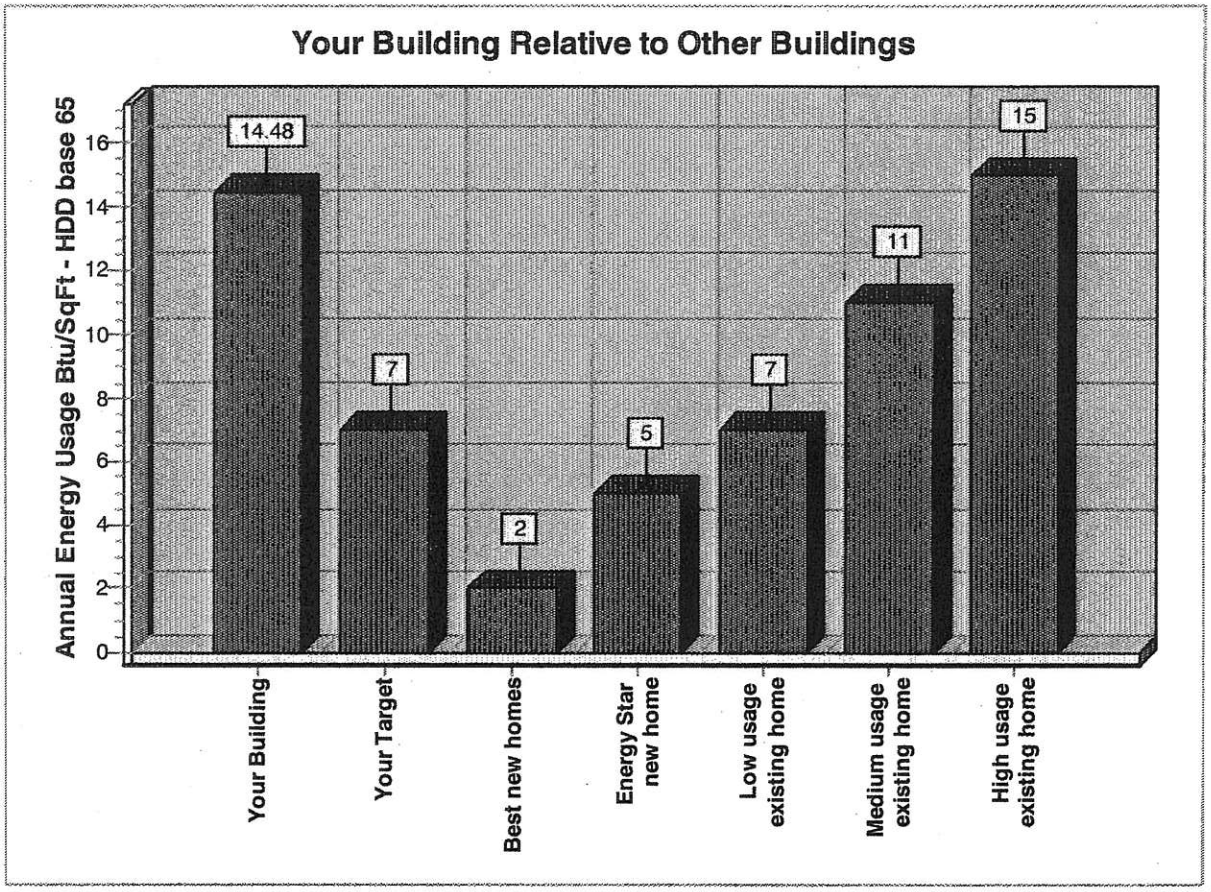
Project name: Meadowview Apartment Bld #1

For : NBHA

By :

Date: 9/2/2009

Billing Period Name: BillingPeriod1



Heating Slope: 17.69

Reference temperature: 61

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.

NORMALIZED MODEL TO BILLING COMPARISON

Project name: Meadowview Apartment Bld #1
For : NBHA
By :
Date: 9/2/2009

Billing Period Name: BillingPeriod1
Model Package Name: Base Building

Natural gas

	Model		Billing Data	
	Consumption Therm	Cost $	Consumption Therm	Cost $
January	4840.42	5482	4372.61	4953
February	3706.19	4200	3525.19	3995
March	3075.94	3488	3076.81	3489
April	1952.47	2218	2125.79	2414
May	1083.50	1236	1041.03	1188
June	1048.55	1197	1007.45	1150
July	1083.50	1236	1041.03	1188
August	1083.50	1236	1041.03	1188
September	1094.91	1249	1007.45	1150
October	1595.16	1815	1573.41	1790
November	2688.24	3050	2490.75	2827
December	3946.99	4472	3545.57	4018
Total	27199.39	30879	25848.11	29352
Daily Base Load	34.95	39	33.58	38

Electricity

	Model		Billing Data	
	Consumption kWh	Cost $	Consumption kWh	Cost $
January	12109.13	1947	12516.52	2013

February	10937.28	1760	11305.25	1819
March	12109.13	1947	12516.52	2013
April	11718.51	1885	12112.76	1948
May	12109.13	1947	12516.52	2013
June	16834.39	2704	15204.15	2443
July	17395.54	2793	16920.29	2717
August	17395.54	2793	16191.19	2601
September	11718.51	1885	12112.76	1948
October	12109.13	1947	12516.52	2013
November	11718.51	1885	12112.76	1948
December	12109.13	1947	12516.52	2013
Total	158263.93	25442	158541.78	25487
Daily Base Load	390.62	62	403.76	65

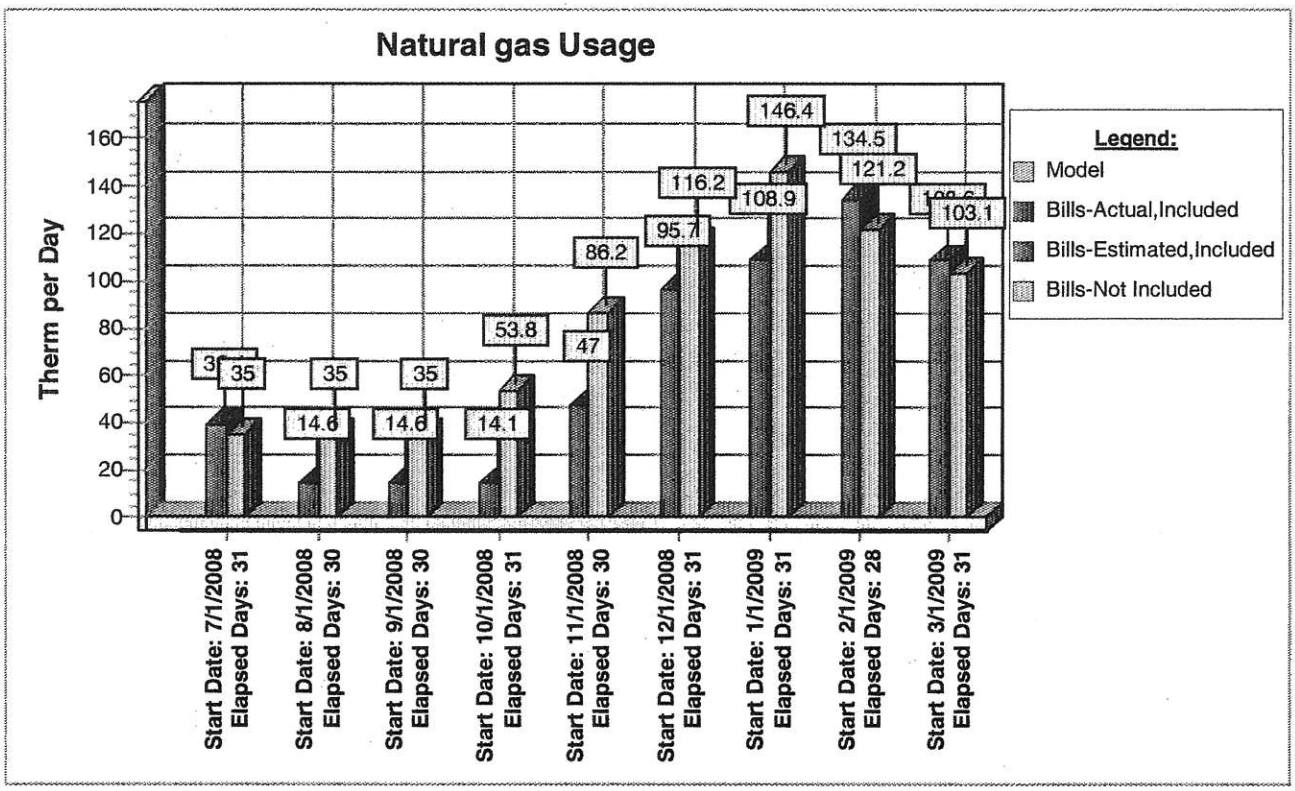
Notes:

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.

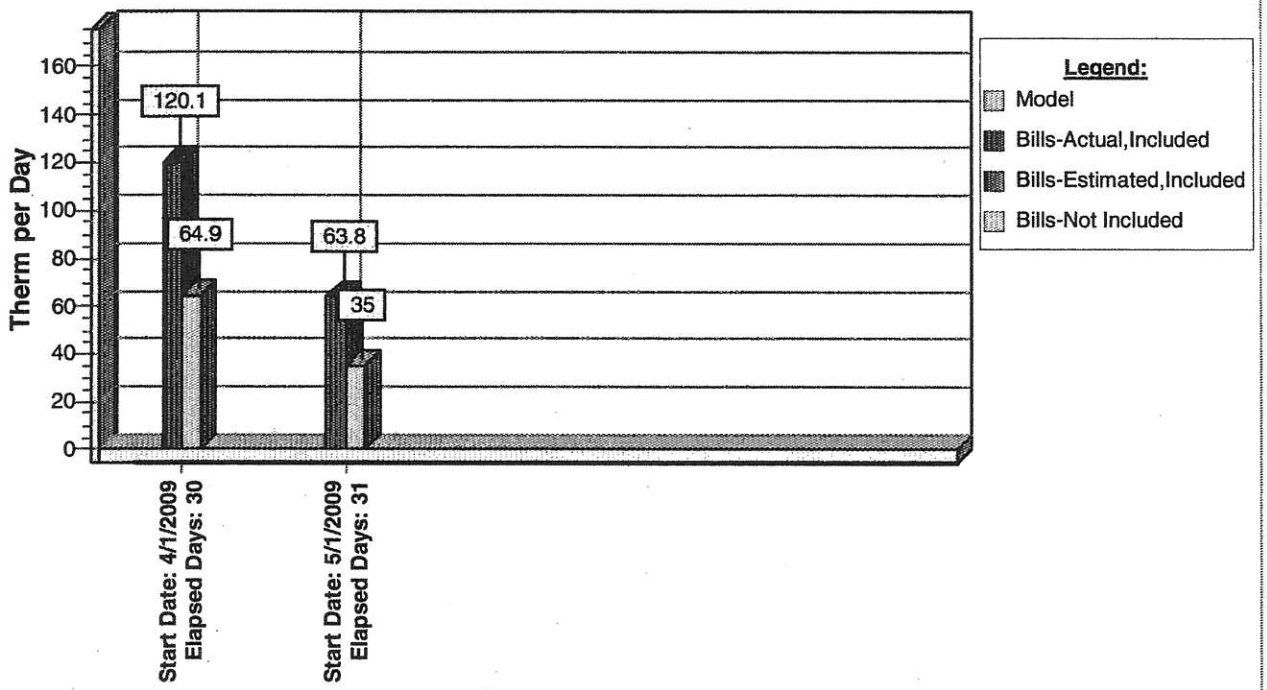
ACTUAL BILLING TO MODEL COMPARISON REPORT

Project name: Meadowview Apartment Bld #1
For : NBHA
By :
Date: 9/2/2009

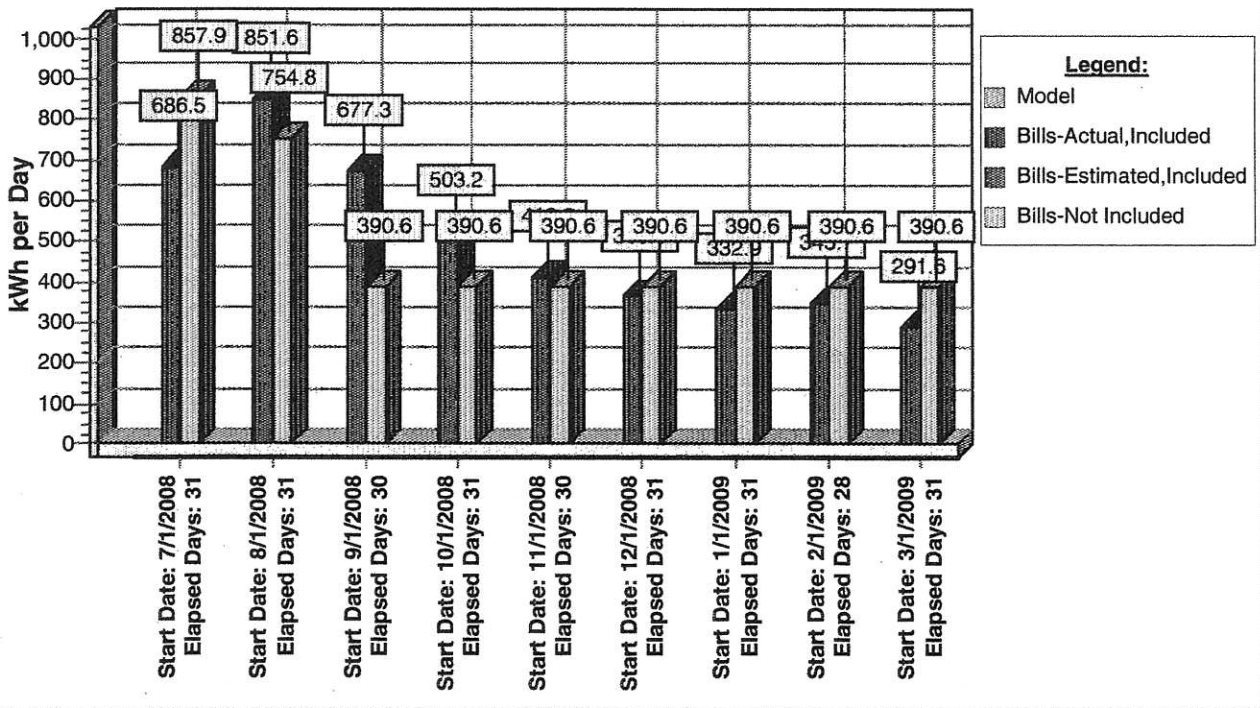
Billing Period Name: BillingPeriod1
Model Package Name: Base Building

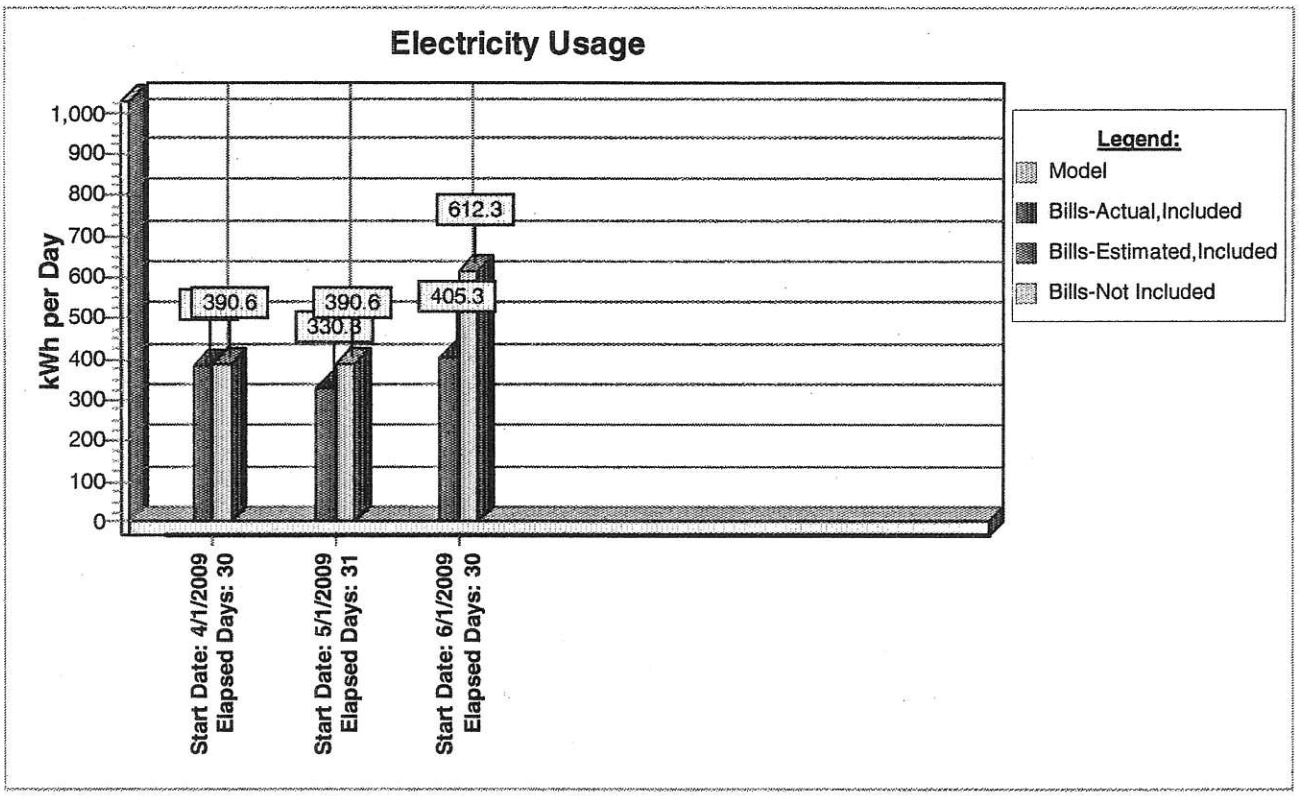


Natural gas Usage



Electricity Usage





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 TOWNHOME APARTMENTS 6-8

Customer Name: NBHA

Address: Building # 7 5828 Meadowview
North Bergen , NJ 07047

Billing Period: 7/2008 - 6/2009

Auditor Information

Technician Name:

Company:

Phone Number:

Date: 9/2/2009

Model to Actual Comparison of Base Usage Per Year

Model Name: Base Building

Billing Period Name: BillingPeriod1

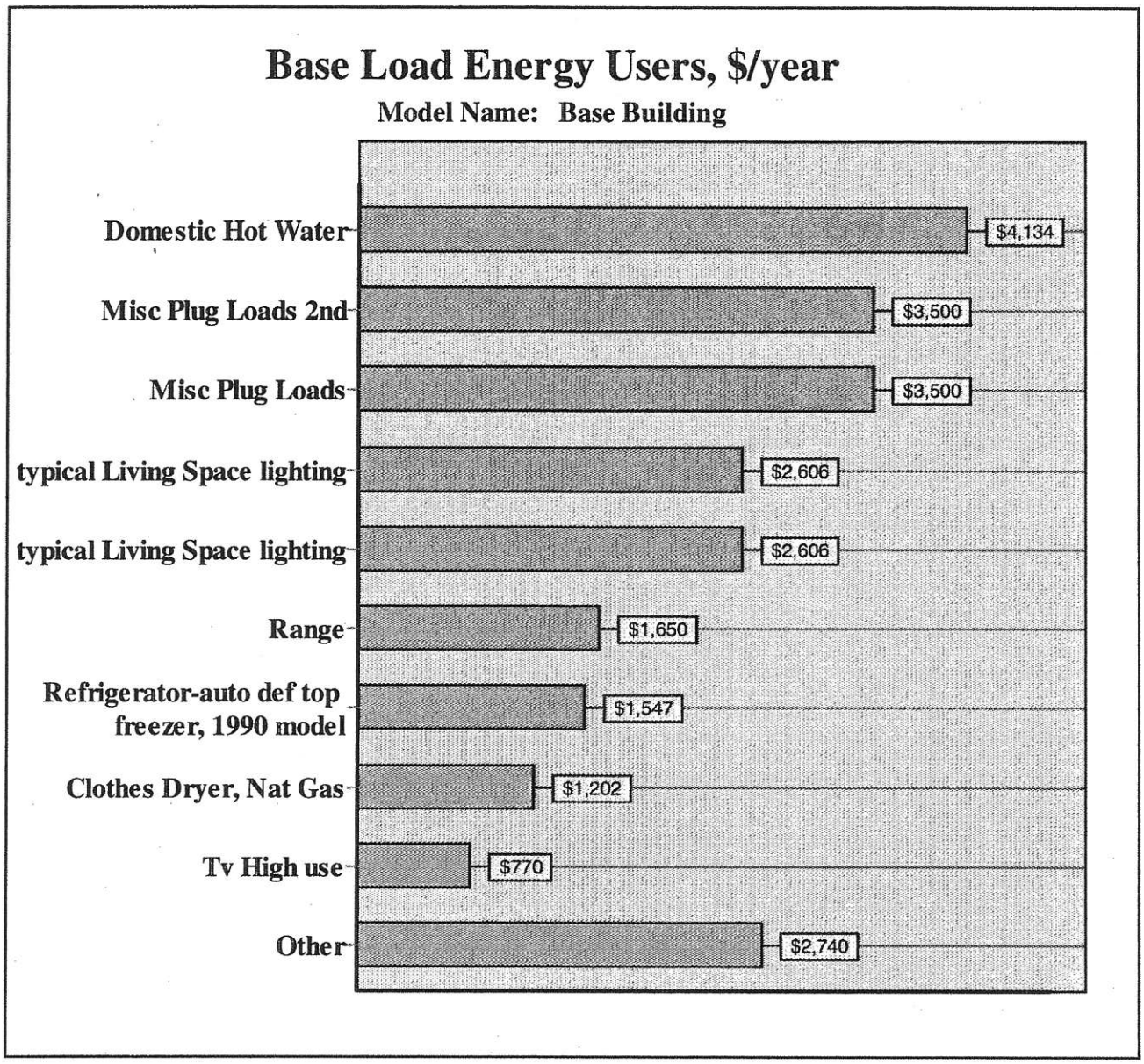
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	6,033	6,817	101,272	17,723		
Billing	5,789	7,142	105,254	17,968		
% Difference	-4	5	4	1		

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

	Natural gas $1.13 per Therm		Electricity $0.18 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	3,658	4,134	0	0			4,134
2. Misc Plug Loads 2nd	0	0	20,000	3,500			3,500
3. Misc Plug Loads	0	0	20,000	3,500			3,500
4. typical Living Space lighting	0	0	14,892	2,606			2,606
5. typical Living Space lighting	0	0	14,892	2,606			2,606
6. Range	1,460	1,650	0	0			1,650
7. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,547			1,547
8. Clothes Dryer, Nat Gas	915	1,034	960	168			1,202
9. Tv High use	0	0	4,400	770			770
10. Other	0	0	15,654	2,740			2,740
TOTAL	6,033	6,818	99,638	17,437			24,255


Base Load Energy Users, $/year
Model Name: Base Building
Domestic Hot Water
$4,134
Misc Plug Loads 2nd
$3,500
Misc Plug Loads
$3,500
typical Living Space lighting
$2,606
typical Living Space lighting
$2,606
Range
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,547
Clothes Dryer, Nat Gas
$1,202
Tv High use
$770
Other
$2,740

INVESTMENT GUIDELINES FOR HEATING

Project name: Meadowview Town Home #7

For : NBHA

By :

Date: 9/2/2009

Billing Period Name: BillingPeriod1

		Heating
Your building heating energy usage	Btu/SqFt-HDD	15.65
Target heating energy usage	Btu/SqFt-HDD	7.00
Your cost of energy	$/MMBtu	12.34
	$/Therm	1.23
Target cost of energy	$/MMBtu	12.34
	$/Therm	1.23
Annual Degree Days base 65	HDD	5,050
Heated Area	SqFt	8,275
Savings from reducing to the target comsumption	Btu/HDD	71,614
	$/Year	4,462
Savings term (target payback)	Years	10.0
Cost effective investment	$	44,617

Notes:
1. Your building heating energy usage 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 the reference temperature below 65F.
2. Target heating energy usage and Savings term are entered on Analysis Periods screen.
3. Your cost of energy is equal to the calculated average heating fuel cost. In the buildings with dual heating fuels the consumption-weighted average of main and back up heating fuel cost is calculated.
4. Target cost of energy allows evaluating feasibility of changing heating fuel, for example switching from electric to gas heating. This feature will be available in the subsequent versions of Treat. Currently target cost is always the same as the actual cost.
5. Savings from reducing to target consumption is the annual savings realized after the current energy usage and energy cost are reduce to target energy usage and target energy cost.
6. Cost effective investment is the product of the Savings from reducing to target consumption and the Savings term. It shows how much may be invested in the home improvements in order for the improvements to pay for itself completely during the specified savings term.

HEATING ENERGY SCORECARD

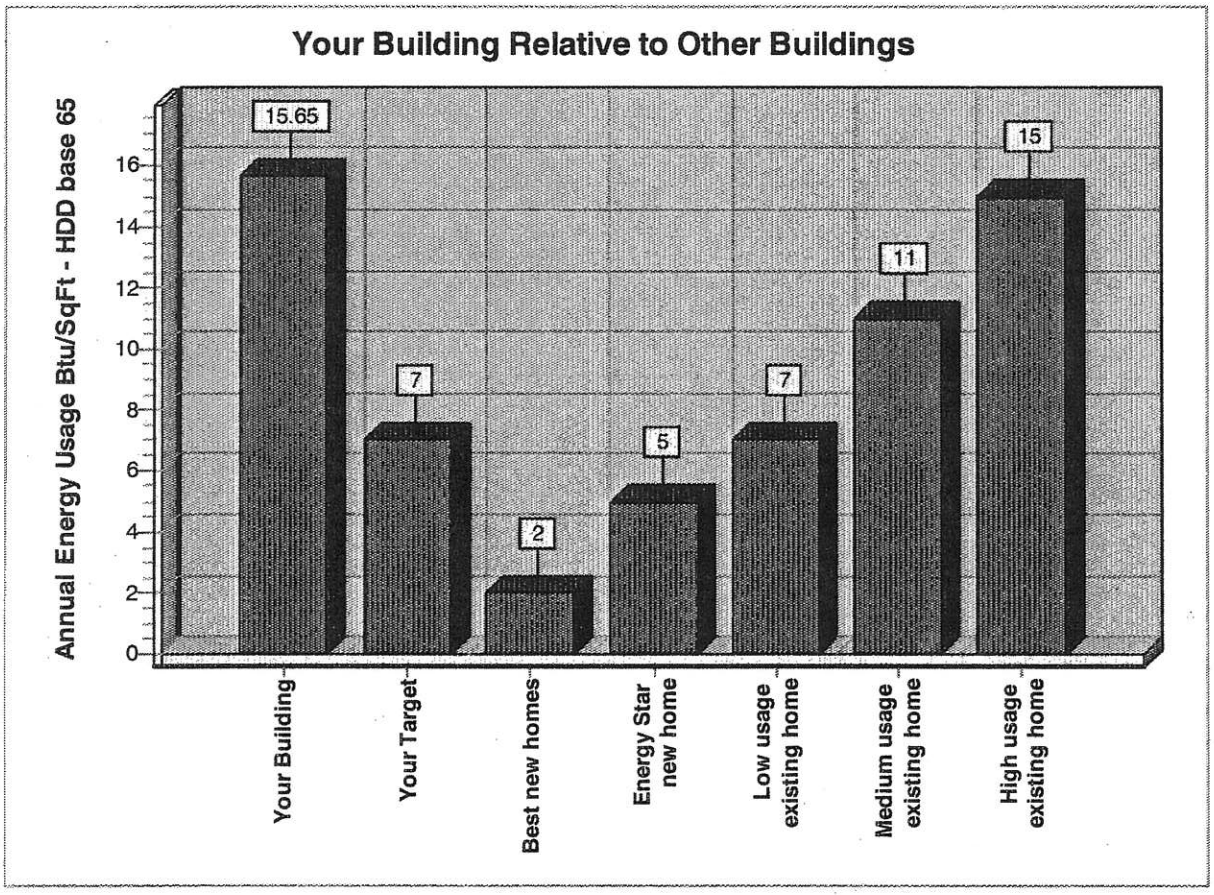
Project name: Meadowview Town Home #7

For : NBHA

By :

Date: 9/2/2009

Billing Period Name: BillingPeriod1



Heating Slope: 19.12

Reference temperature: 61

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.

NORMALIZED MODEL TO BILLING COMPARISON

Project name: Meadowview Town Home #7

For : NBHA

By :

Date: 9/2/2009

Billing Period Name: BillingPeriod1

Model Package Name: Base Building

Natural gas

	Model		Billing Data	
	Consumption Therm	Cost $	Consumption Therm	Cost $
January	2238.68	2542	2066.18	2347
February	1717.67	1953	1665.72	1894
March	1433.73	1632	1453.78	1655
April	983.46	1123	1004.34	1147
May	512.42	591	491.67	568
June	495.89	572	475.81	550
July	512.42	591	491.67	568
August	512.42	591	491.67	568
September	538.90	621	475.81	550
October	853.25	976	743.28	852
November	1293.74	1474	1176.82	1342
December	1821.47	2070	1675.32	1905
Total	12914.03	14737	12212.06	13944
Daily Base Load	16.53	19	15.86	18

Electricity

	Model		Billing Data	
	Consumption kWh	Cost $	Consumption kWh	Cost $
January	8601.14	1515	8939.41	1574

February	7768.78	1370	8074.31	1423
March	8601.14	1515	8939.41	1574
April	8323.69	1467	8651.04	1524
May	8601.14	1515	8939.41	1574
June	8323.69	1467	8651.04	1524
July	11017.79	1938	10367.86	1824
August	11017.79	1938	10118.13	1781
September	8323.69	1467	8651.04	1524
October	8601.14	1515	8939.41	1574
November	8323.69	1467	8651.04	1524
December	8601.14	1515	8939.41	1574
Total	106104.83	18688	107861.54	18996
Daily Base Load	277.46	49	288.37	50

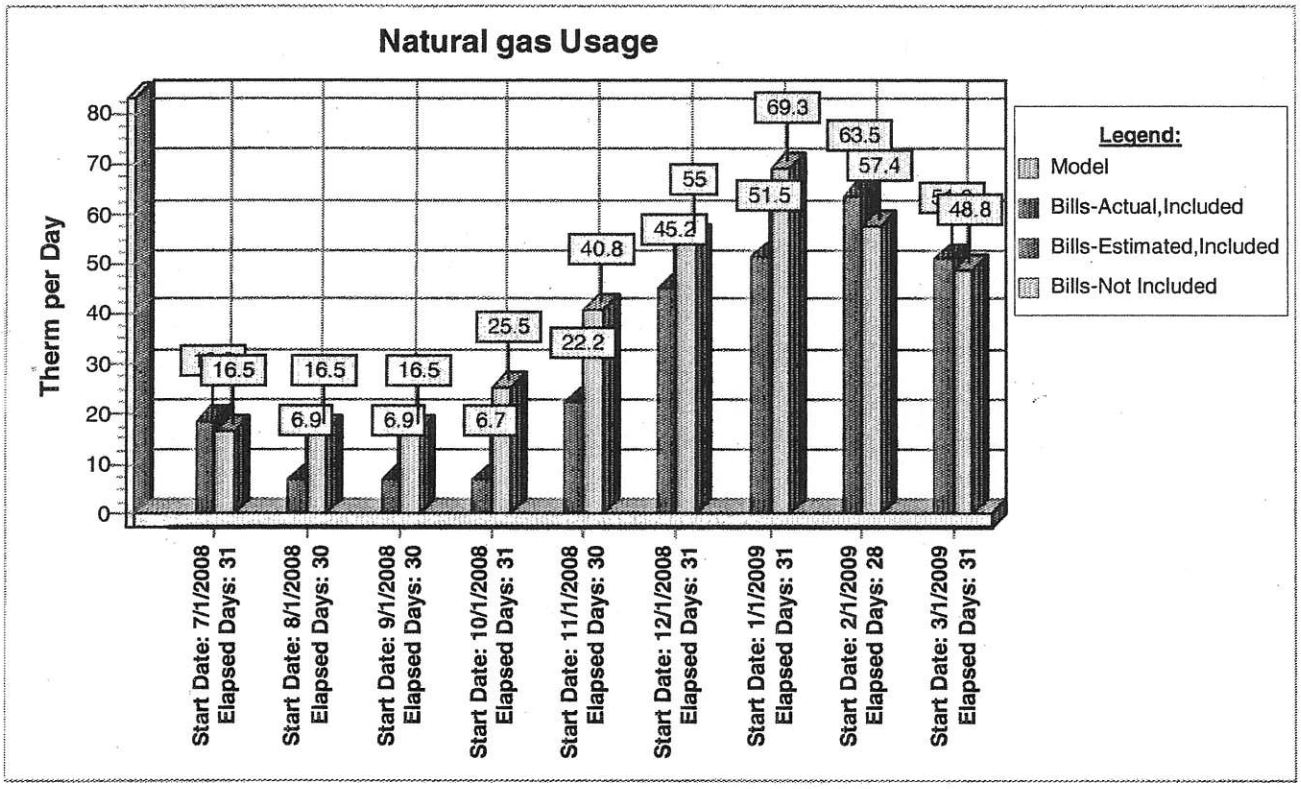
Notes:

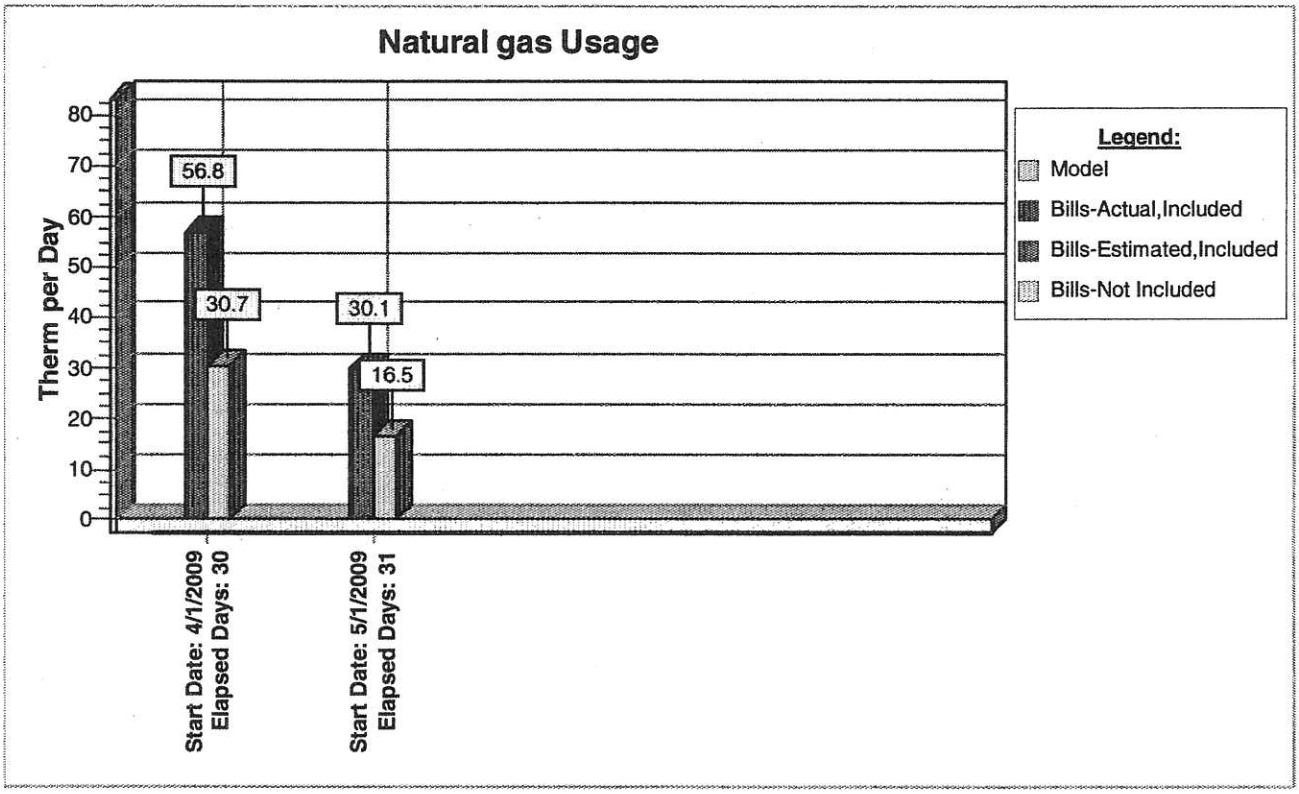
1. The report compares model energy consumption with the consumption calculated using the billing analysis slope and reference temperature. The usage is for normalized thirty year average weather conditions.
2. Monthly fuel cost includes heating, cooling and base load usage and monthly flat meter fee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

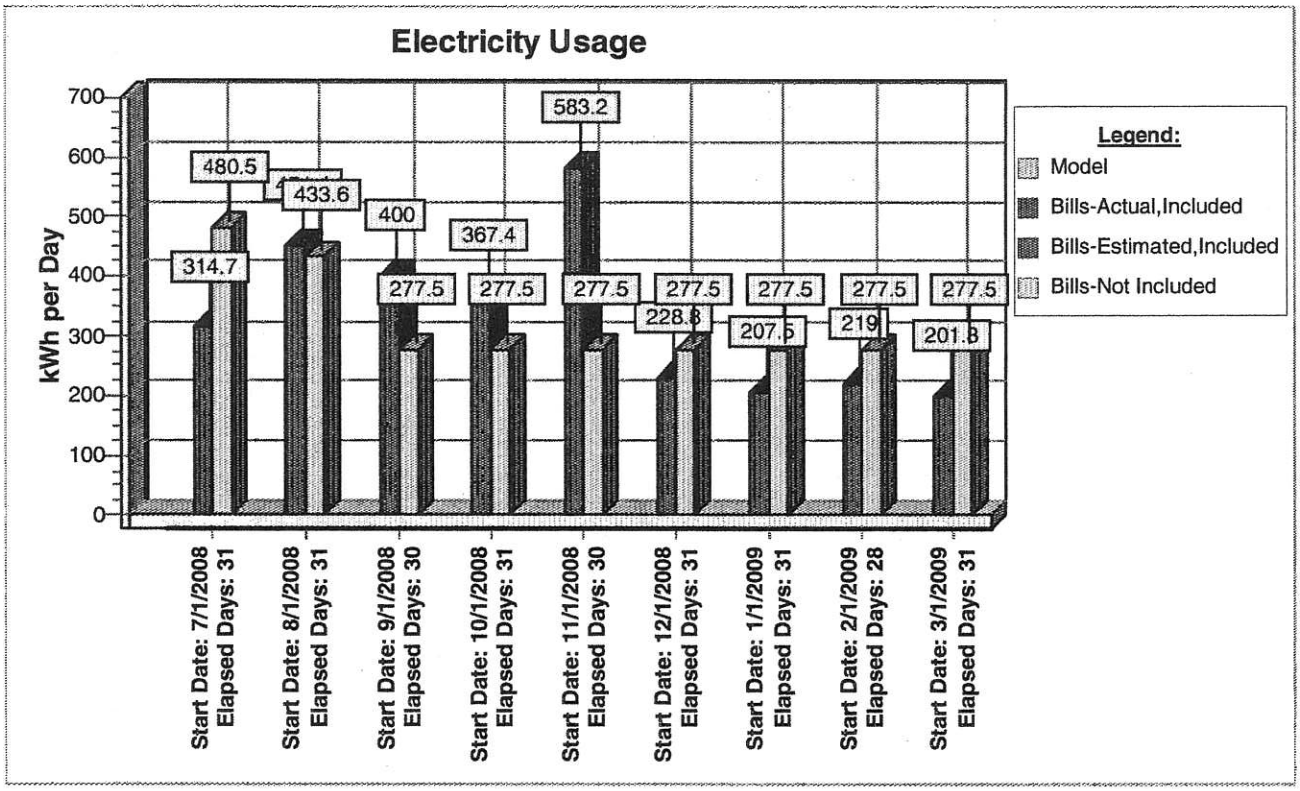
ACTUAL BILLING TO MODEL COMPARISON REPORT

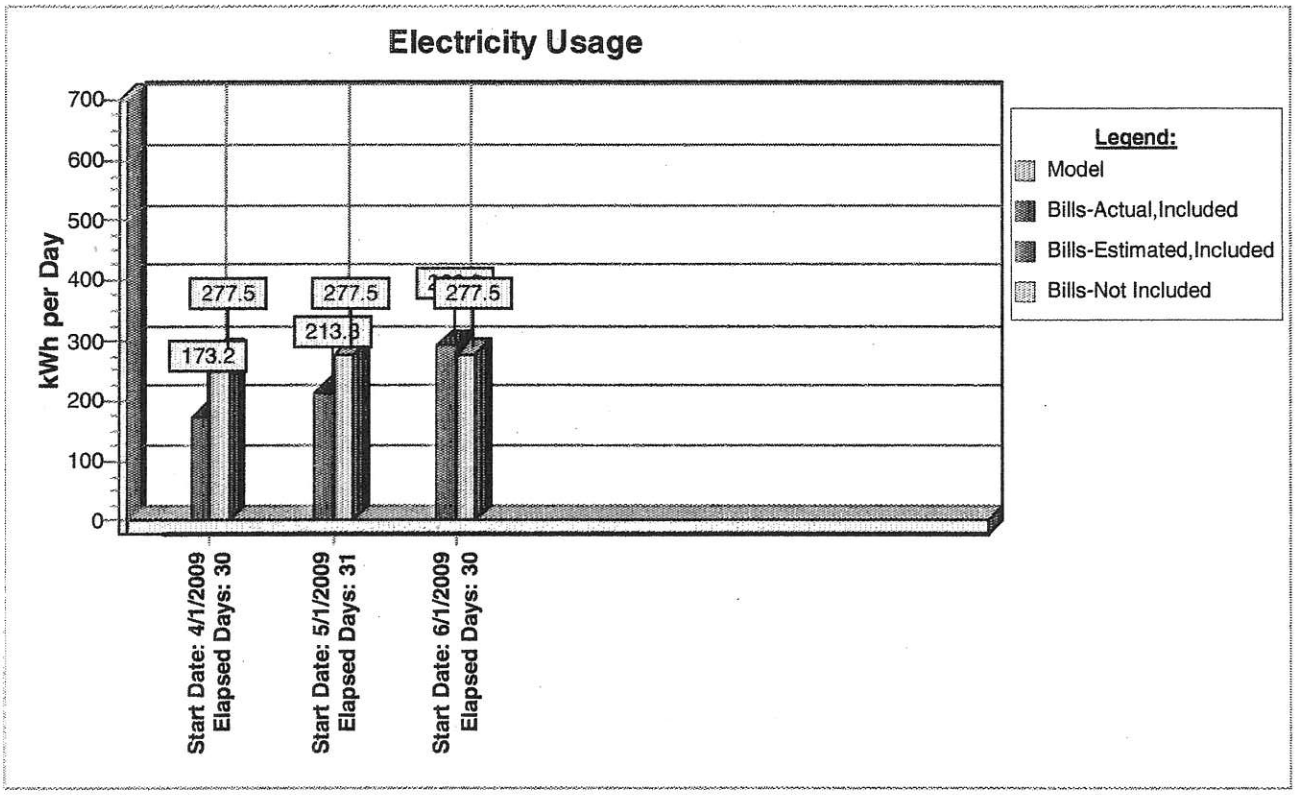
Project name: Meadowview Town Home #7
For : NBHA
By :
Date: 9/2/2009

Billing Period Name: BillingPeriod1
Model Package Name: Base Building




Natural gas Usage
Therm per Day
80
70
60
50
40
30
20
10
0
56.8
30.7
30.1
16.5
Start Date: 4/1/2009
Elapsed Days: 30
Start Date: 5/1/2009
Elapsed Days: 31
Legend:
Model
Bills-Actual,Included
Bills-Estimated,Included
Bills-Not Included


Electricity Usage
kWh per Day
700
600
500
400
300
200
100
0
480.5
314.7
433.6
400
277.5
367.4
277.5
583.2
277.5
277.5
228.8
277.5
207.5
277.5
219
277.5
201.8
Start Date: 7/1/2008
Elapsed Days: 31
Start Date: 8/1/2008
Elapsed Days: 31
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
Start Date: 2/1/2009
Elapsed Days: 28
Start Date: 3/1/2009
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.

APPENDIX B

ECM-1a Lighting Replacements

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

Cost of Electricity: **$0.129 $/kWh**
$14.02 $/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
Apartments	71	I60 Pull-Chain	480	I 60	I60/1	60	28.8	SW	2912	83,866	480	CF 26	CFQ26/1-L	27	13.0	SW	2,912	37,740	46,126	$ 8,628.67	$ 2,400.00	$0	0.3	0.3
	89	2CF23 Clg Mt 1 SW EA (Occ)	540	CF 23 2 LAMP	CFQ22/2	48	25.9	SW	2912	75,479	540	CF 23 2 LAMP	CFQ22/2	48	25.9	SW	2,912	75,479	-	$ -	$ -	$0		
	180	W32CF4-E SW (T8, Occ)	160	T 32 R F 4 (ELE)	F44ILL	112	17.9	SW	2912	52,183	160	T 32 R F 4 (ELE)	F44ILL	112	17.9	SW	2,912	52,183	-	$ -	$ -	$0		
	17	W20CF1-Mag SW (T12, Occ)	172	2' 20 W F 1 (MAG)	F21SS	28	4.8	SW	2912	14,024	172	2' 17 W F 1	F21ILL	20	3.4	SW	2,912	10,017	4,007	$ 749.56	$ 17,415.00	$1,720	23.2	20.9
	115	W20CF2-Mag SW (T12, Occ)	160	W 20 C F 2	F22SS	56	9.0	SW	2912	26,092	160	W 17 W C 2	F22ILL	33	5.3	SW	2,912	15,375	10,716	$ 2,004.64	$ 16,200.00	$1,600	8.1	7.3
Exterior	10	1000 W Pole Basketball Court Lights	5	High Bay MH 1000 50 Feet High	MH1000/1	1080	5.4	Timer	0	-	5	High Bay MH 1000 50 Feet High	MH1000/1	1080	5.4	Timer	0	-	-	$ -	$ -	$0		
	225	70 W HPS C Townhome entrance	30	70 High Pressure Sodium	HPS70/1	95	2.9	SW	2912	8,299	30	70 High Pressure Sodium	HPS70/1	95	2.9	SW	2,912	8,299	-	$ -	$ -	$0		
	144	150HPS Wall or Pole Fixture	40	HPS 150	HPS150/1	188	7.5	Timer	4368	32,847	40	HPS 150	HPS150/1	188	7.5	Timer	4,368	32,847	-	$ -	$ -	$0		
Common Areas	89	2CF23 Clg Mt 1 SW EA (Occ)	100	CF 23 2 LAMP	CFQ22/2	48	4.8	Breaker	8760	42,048	100	CF 23 2 LAMP	CFQ22/2	48	4.8	Breaker	8,760	42,048	-	$ -	$ -	$0		
	6	T34RF4- Mag Hallway	60	T 34 R F 4 (MAG)	F44EE	144	8.6	Breaker	8760	75,686	60	T 28 R F 4	F44SSILL	96	5.8	Breaker	8,760	50,458	25,229	$ 3,746.29	$ 7,875.00	$1,200	2.1	1.8
	100	S34WF-Mag Basement Area	100	S 34 W F 2	F42EE	72	7.2	SW	1000	7,200	100	S 28 W F 2	F42SSILL	48	4.8	SW	1,000	4,800	2,400	$ 714.11	$ 10,800.00	$1,000	15.1	13.7
	100	S34WF-Mag Basement Boiler Room	6	S 34 W F 2	F42EE	72	0.4	SW	2000	864	6	S 28 W F 2	F42SSILL	48	0.3	SW	2,000	576	288	$ 61.46	$ 648.00	$60	10.5	9.6
	6	T34RF4- Mag Community Room	18	T 34 R F 4 (MAG)	F44EE	144	2.6	SW	4368	11,322	18	T 28 R F 4	F44SSILL	96	1.7	SW	4,368	7,548	3,774	$ 633.29	$ 2,362.50	$360	3.7	3.2
	4	2T34RF4- Mag Community Room	4	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.3	SW	4368	1,258	4	2T 17 R F 2 (ELE)	F22ILL	33	0.1	SW	4,368	577	681	$ 114.34	$ 405.00	$40	3.5	3.2
	89	2CF23 Community Room	4	CF 23 2 LAMP	CFQ22/2	48	0.2	SW	4368	839	4	CF 23 2 LAMP	CFQ22/2	48	0.2	SW	4,368	839	-	$ -	$ -	$0		
	89	2CF23 Maintenance Office	1	CF 23 2 LAMP	CFQ22/2	48	0.0	SW	4368	210	1	CF 23 2 LAMP	CFQ22/2	48	0.0	SW	4,368	210	-	$ -	$ -	$0		
	100	S34WF-Old Boiler Room	17	S 34 W F 2	F42EE	72	1.2	SW	4368	5,346	17	S 28 W F 2	F42SSILL	48	0.8	SW	4,368	3,564	1,782	$ 299.05	$ 1,836.00	$170	6.1	5.6
	71	I60-Old Boiler Room	6	I 60	I60/1	60	0.4	SW	4368	1,572	6	CF 26	CFQ26/1-L	27	0.2	SW	4,368	708	865	$ 145.13	$ 30.00	$0	0.2	0.2
	205	EP 110PFMag-Old Boiler Room	4	S 110 P F 2 (MAG) 8' T-12 Egg Crate	F82SHS	257	1.0	SW	4368	4,490	4	S 110 P F 2 (MAG) 8' T-12 Egg Crate	F82SHS	257	1.0	SW	4,368	4,490	-	$ -	$ -	$0		
		Total	**1,907**				**129.0**			**443,626**	**1,907**			**2,400**	**101**			**347,757**	**95,868**	**$17,097**	**$59,972**	**$6,150**		
																			Demand Savings		**27.9**	**$4,702**			
																			kWh Savings		**95,868**	**$12,394**			
																			Total savings			**$17,097**		**3.5**	**3.1**

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

Hours of Operation

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	1000	Y
Med Rooms	1	260	260	Y

APPENDIX C

ECM-1b Install Occupancy Sensors

Energy Audit of North Bergen Housing Authority

CHA Project No. 20241 Meadowview Apartments

ECM-1b Install Occupancy Sensors

Cost of Electricity: **$0.129 $/kWh**

$14.02 $/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
Apartments	71	I60 Pull-Chain	480	I 60	I60/1	60	28.8	SW	2912	83,865.6	480	I 60	I60/1	60	28.8	None	2912	83,865.6	0.0	$0.00	$0.00	$0.00		
	89	2CF23 Clg Mt 1 SW EA (Occ)	540	CF 23 2 LAMP	CFQ22/2	48	25.9	SW	2912	75,479.0	540	CF 23 2 LAMP	CFQ22/2	48	25.9	OCC	1000	25,920.0	49,559.0	$6,407.22	$64,125.00	$10,800.00	10.0	8.3
	180	W32CF4-E SW (T8, Occ)	160	T 32 R F 4 (ELE)	F44ILL	112	17.9	SW	2912	52,183.0	160	T 32 R F 4 (ELE)	F44ILL	112	17.9	OCC	1000	17,920.0	34,263.0	$4,429.68	$19,000.00	$20.00	4.3	4.3
	17	W20CF1-Mag SW (T12, Occ)	172	2' 20 W F 1 (MAG)	F21SS	28	4.8	SW	2912	14,024.2	172	2' 20 W F 1 (MAG)	F21SS	28	4.8	None	2912	14,024.2	0.0	$0.00	$0.00	$0.00		
	115	W20CF2-Mag SW (T12, Occ)	160	W 20 C F 2	F22SS	56	9.0	SW	2912	26,091.5	160	W 20 C F 2	F22SS	56	9.0	OCC	1000	8,960.0	17,131.5	$2,214.84	$19,000.00	$20.00	8.6	8.6
Exterior	10	1000 W Pole Basketball Court Lights	5	High Bay MH 1000 50 Feet High	MH1000/1	1080	5.4	Timer	0	0.0	5	High Bay MH 1000 50 Feet High	MH1000/1	1080	5.4	None	0	0.0	0.0	$0.00	$0.00	$0.00		
	225	70 W HPS C Townhome entrance	30	70 High Pressure Sodium	HPS70/1	95	2.9	SW	2912	8,299.2	30	70 High Pressure Sodium	HPS70/1	95	2.9	None	2912	8,299.2	0.0	$0.00	$0.00	$0.00		
	144	150HPS Wall or Pole Fixture	40	HPS 150	HPS150/1	188	7.5	Timer	4368	32,847.4	40	HPS 150	HPS150/1	188	7.5	None	4368	32,847.4	0.0	$0.00	$0.00	$0.00		
Common Areas	89	2CF23 Clg Mt 1 SW EA (Occ)	100	CF 23 2 LAMP	CFQ22/2	48	4.8	Breaker	8760	42,048.0	100	CF 23 2 LAMP	CFQ22/2	48	4.8	None	8760	42,048.0	0.0	$0.00	$0.00	$0.00		
	6	T34RF4- Mag Hallway	60	T 34 R F 4 (MAG)	F44EE	144	8.6	Breaker	8760	75,686.4	60	T 34 R F 4 (MAG)	F44EE	144	8.6	None	8760	75,686.4	0.0	$0.00	$0.00	$0.00		
	100	S34WF-Mag Basement Area	100	S 34 W F 2	F42EE	72	7.2	SW	1000	7,200.0	100	S 34 W F 2	F42EE	72	7.2	None	1000	7,200.0	0.0	$0.00	$0.00	$0.00		
	100	S34WF-Mag Basement Boiler Room	6	S 34 W F 2	F42EE	72	0.4	SW	2000	864.0	6	S 34 W F 2	F42EE	72	0.4	None	2000	864.0	0.0	$0.00	$0.00	$0.00		
	6	T34RF4- Mag Community Room	18	T 34 R F 4 (MAG)	F44EE	144	2.6	SW	4368	11,321.9	18	T 34 R F 4 (MAG)	F44EE	144	2.6	None	4368	11,321.9	0.0	$0.00	$0.00	$0.00		
	4	2T34RF4- Mag Community Room	4	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.3	SW	4368	1,258.0	4	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.3	None	4368	1,258.0	0.0	$0.00	$0.00	$0.00		
	89	2CF23 Community Room	4	CF 23 2 LAMP	CFQ22/2	48	0.2	SW	4368	838.7	4	CF 23 2 LAMP	CFQ22/2	48	0.2	None	4368	838.7	0.0	$0.00	$0.00	$0.00		
	89	2CF23 Maintenance Office	1	CF 23 2 LAMP	CFQ22/2	48	0.0	SW	4368	209.7	1	CF 23 2 LAMP	CFQ22/2	48	0.0	None	4368	209.7	0.0	$0.00	$0.00	$0.00		
	100	S34WF-Old Boiler Room	17	S 34 W F 2	F42EE	72	1.2	SW	4368	5,346.4	17	S 34 W F 2	F42EE	72	1.2	None	4368	5,346.4	0.0	$0.00	$0.00	$0.00		
	71	I60-Old Boiler Room	6	I 60	I60/1	60	0.4	SW	4368	1,572.5	6	I 60	I60/1	60	0.4	None	4368	1,572.5	0.0	$0.00	$0.00	$0.00		
	205	EP 110PFMag-Old Boiler Room	4	S 110 P F 2 (MAG) 8' T-12 Egg Crate	F82SHS	257	1.0	SW	4368	4,490.3	4	S 110 P F 2 (MAG) 8' T-12 Egg Crate	F82SHS	257	1.0	None	4368	4,490.3	0.0	$0.00	$0.00	$0.00		
		Total	**1,907**				**129.0**			**443,626**	**1,907**				**129**			**342,672**	**100,954**	**13,052**	**$102,125**	**10,840**		
																			Demand Savings	**0.0**	**$0**			
																			kWh Savings	**100,954**	**$13,052**			
																			Total Savings		**$13,052**		**7.8**	**7.0**

APPENDIX D

ECM-1c Install Lighting Replacements and Occupancy Sensors

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

Cost of Electricity: **$0.129 $/kWh**
$14.02 $/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
Apartments	71	I60 Pull-Chain	480	I 60	I60/1	60	28.8	SW	2912	83,866	480	CF 26	CFQ26/1-L	27	13.0	None	2,912	37,740	46,126	$ 8,628.67	$ 2,400.00	$ -	0.3	0.3
	89	2CF23 Clg Mt 1 SW EA (Occ)	540	CF 23 2 LAMP	CFQ22/2	48	25.9	SW	2912	75,479	540	CF 23 2 LAMP	CFQ22/2	48	25.9	OCC	1,000	25,920	49,559	$ 6,407.22	$ 64,125.00	$ 10,800	10.0	8.3
	180	W32CF4-E SW (T8, Occ)	160	T 32 R F 4 (ELE)	F44ILL	112	17.9	SW	2912	52,183	160	T 32 R F 4 (ELE)	F44ILL	112	17.9	OCC	1,000	17,920	34,263	$ 4,429.68	$ 19,000.00	$ 20	4.3	4.3
	17	W20CF1-Mag SW (T12, Occ)	172	2' 20 W F 1 (MAG)	F21SS	28	4.8	SW	2912	14,024	172	2' 17 W F 1	F21ILL	20	3.4	None	2,912	10,017	4,007	$ 749.56	$ 17,415.00	$ 1,720	23.2	20.9
	115	W20CF2-Mag SW (T12, Occ)	160	W 20 C F 2	F22SS	56	9.0	SW	2912	26,092	160	W 17 W C 2	F22ILL	33	5.3	OCC	1,000	5,280	20,812	$ 3,309.81	$ 35,200.00	$ 1,620	10.6	10.1
Exterior																								
	144	150HPS Wall or Pole Fixture	40	HPS 150	HPS150/1	188	7.5	Timer	4368	32,847	40	HPS 150	HPS150/1	188	7.5	None	4,368	32,847	-	$ -	$ -	$ -		
Common Areas	89	2CF23 Clg Mt 1 SW EA (Occ)	100	CF 23 2 LAMP	CFQ22/2	48	4.8	Breaker	8760	42,048	100	CF 23 2 LAMP	CFQ22/2	48	4.8	None	8,760	42,048	-	$ -	$ -	$ -		
	6	T34RF4- Mag Hallway	60	T 34 R F 4 (MAG)	F44EE	144	8.6	Breaker	8760	75,686	60	T 28 R F 4	F44SSILL	96	5.8	None	8,760	50,458	25,229	$ 3,746.29	$ 7,875.00	$ 1,200	2.1	1.8
	100	S34WF-Mag Basement Area	100	S 34 W F 2	F42EE	72	7.2	SW	1000	7,200	100	S 28 W F 2	F42SSILL	48	4.8	None	1,000	4,800	2,400	$ 714.11	$ 10,800.00	$ 1,000	15.1	13.7
	100	S34WF-Mag Basement Boiler Room	6	S 34 W F 2	F42EE	72	0.4	SW	2000	864	6	S 28 W F 2	F42SSILL	48	0.3	None	2,000	576	288	$ 61.46	$ 648.00	$ 60	10.5	9.6
	6	T34RF4- Mag Community Room	18	T 34 R F 4 (MAG)	F44EE	144	2.6	SW	4368	11,322	18	T 28 R F 4	F44SSILL	96	1.7	None	4,368	7,548	3,774	$ 633.29	$ 2,362.50	$ 360	3.7	3.2
	4	2T34RF4- Mag Community Room	4	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.3	SW	4368	1,258	4	2T 17 R F 2 (ELE)	F22ILL	33	0.1	None	4,368	577	681	$ 114.34	$ 405.00	$ 40	3.5	3.2
	89	2CF23 Community Room	4	CF 23 2 LAMP	CFQ22/2	48	0.2	SW	4368	839	4	CF 23 2 LAMP	CFQ22/2	48	0.2	None	4,368	839	-	$ -	$ -	$ -		
	89	2CF23 Maintenance Office	1	CF 23 2 LAMP	CFQ22/2	48	0.0	SW	4368	210	1	CF 23 2 LAMP	CFQ22/2	48	0.0	None	4,368	210	-	$ -	$ -	$ -		
	100	S34WF-Old Boiler Room	17	S 34 W F 2	F42EE	72	1.2	SW	4368	5,346	17	S 28 W F 2	F42SSILL	48	0.8	None	4,368	3,564	1,782	$ 299.05	$ 1,836.00	$ 170	6.1	5.6
	71	I60-Old Boiler Room	6	I 60	I60/1	60	0.4	SW	4368	1,572	6	CF 26	CFQ26/1-L	27	0.2	None	4,368	708	865	$ 145.13	$ 30.00	$ -	0.2	0.2
	205	EP 110PFMag-Old Boiler Room	4	S 110 P F 2 (MAG) 8' T-12 Egg Crate	F82SHS	257	1.0	SW	4368	4,490	4	S 110 P F 2 (MAG) 8' T-12 Egg Crate	F82SHS	257	1.0	None	4,368	4,490	-	$ -	$ -	$ -		
		Total	**1,872**				**120.7**			**435,327**	**1,872**				**92.8**			**245,541**		**29,239**	**162,097**	**0**		
																			Demand Savings		**27.9**	**$4,702**			
																			kWh Savings		**189,786**	**$24,536**			
																			Total Savings			**$29,239**		**5.5**	**5.5**

APPENDIX E

ECM-2 Light Bulb Exchange

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

Cost of Electricity: $0.129 $/kWh
$14.02 $/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
71	I60 (tenants' lamps)	480	I 60	I60/1	60	28.8	SW	500	14,400	480	CF 13	CFQ13/1	17	8.2	SW	500	4,080	10,320	$ 1,334.22	$ 2,400.00	$0	1.8	1.8
72	3 I60 (tenants' lamps)	160	I 60 3 LAMP	I60/3	180	28.8	SW	500	14,400	160	CF 13	CFQ13/3	48	7.7	SW	500	3,840	10,560	$ 1,365.24	$ 2,400.00	$0	1.8	1.8
108	I65 (tenants' lamps)	36	I 65	I65/1	65	2.3	SW	500	1,170	36	CF 13	CFQ13/1	17	0.6	SW	500	306	864	$ 111.70	$ 180.00	$0	1.6	1.6
	Total	**676**				**59.9**			**29,970**	**676**			**82**	**16**			**8,226**	**21,744**	**$2,811**	**$4,980**	**$0**		
																	Demand Savings		**43.5**	**$7,317**			
																	kWh Savings		**21,744**	**$2,811**			
																	Total savings			**$10,129**		**0.5**	**0.5**

CHA Project No. 20241 Meadowview Apartments
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 Toilets with Low Flow Units

North Bergen Housing Authority
CHA #20241
Meadowview Complex

ECM-3a Replace Toilets with Low Flow Units

Apartment Buildings 1-5		
EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$9.00	$ / kGal
Toilets in Building	71	
Average Flushes / Toilet (per Day)	6	
Average Gallons / Flush	3.5	Gal

PROPOSED CONDITIONS		
Proposed Toilets to be Replaced	71	
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	$32,216	

SAVINGS		
Current Toilet Water Use	544	kGal / year
Proposed Toilet Water Use	249	kGal / year
Water Savings	295	kGal / year
Cost Savings	$2,659	/ year
Simple Payback	12.1	year

Note:
This assumes that half of the toilets have been replaced with low flow units

Townhome Buildings 6-8		
EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$9.00	$ / kGal
Toilets in Building	15	
Average Flushes / Toilet (per Day)	6	
Average Gallons / Flush	3.5	Gal

PROPOSED CONDITIONS		
Proposed Toilets to be Replaced	15	
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	$6,806	

SAVINGS		
Current Toilet Water Use	115	kGal / year
Proposed Toilet Water Use	53	kGal / year
Water Savings	62	kGal / year
Cost Savings	$562	/ year
Simple Payback	12.1	/ year

Note:
This assumes that half of the toilets have been replaced with low flow units

APPENDIX G

Not used

APPENDIX H

ECM-3b Replace Showerheads with Low Flow Units

North Bergen Housing Authority
CHA #20241
Meadowview Complex

ECM-3b Replace Showerheads

Apartment Buildings 1-5		
EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$9.00	$ / kGal
Faucets in Building	142	
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	142	
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	$4,793	

SAVINGS		
Current Shower Water Use	648	kGal / year
Proposed Shower Water Use	415	kGal / year
Water Savings	233	kGal / year
Cost Savings	$2,099	/ year
Simple Payback	2.283105	/ year

Townhome Buildings 6-8		
EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$9.00	$ / kGal
Faucets in Building	30	
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	30	
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	$1,013	

SAVINGS		
Current Shower Water Use	137	kGal / year
Proposed Shower Water Use	88	kGal / year
Water Savings	49	kGal / year
Cost Savings	$443	/ year
Simple Payback	2.283105	/ year

APPENDIX I

ECM-4 Thermostats and Control Valves for Steam Radiators

YOUR SUMMARY GARDEN APARTMENTS 1-5

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 Thermostat Improvement 1: Install 2 non-programmable heating/cooling thermostats.	Improve comfort, improve convenience.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 884		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		78.3		
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: 1.1300 $/Therm
- Electricity: 0.1750 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR
Temperature Limiting Thermostats

Meadowview Apartment Bld #1

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Temp Limiting Thermostat Improvement 1

Programmable Thermostat Installation

Install 3 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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 1 5828 Meadowview A
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: Temperature Limiting Thermostats

Billing Period Name: None

	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	12,757	14,415	142,575	22,812		
Billing						
% Difference						

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

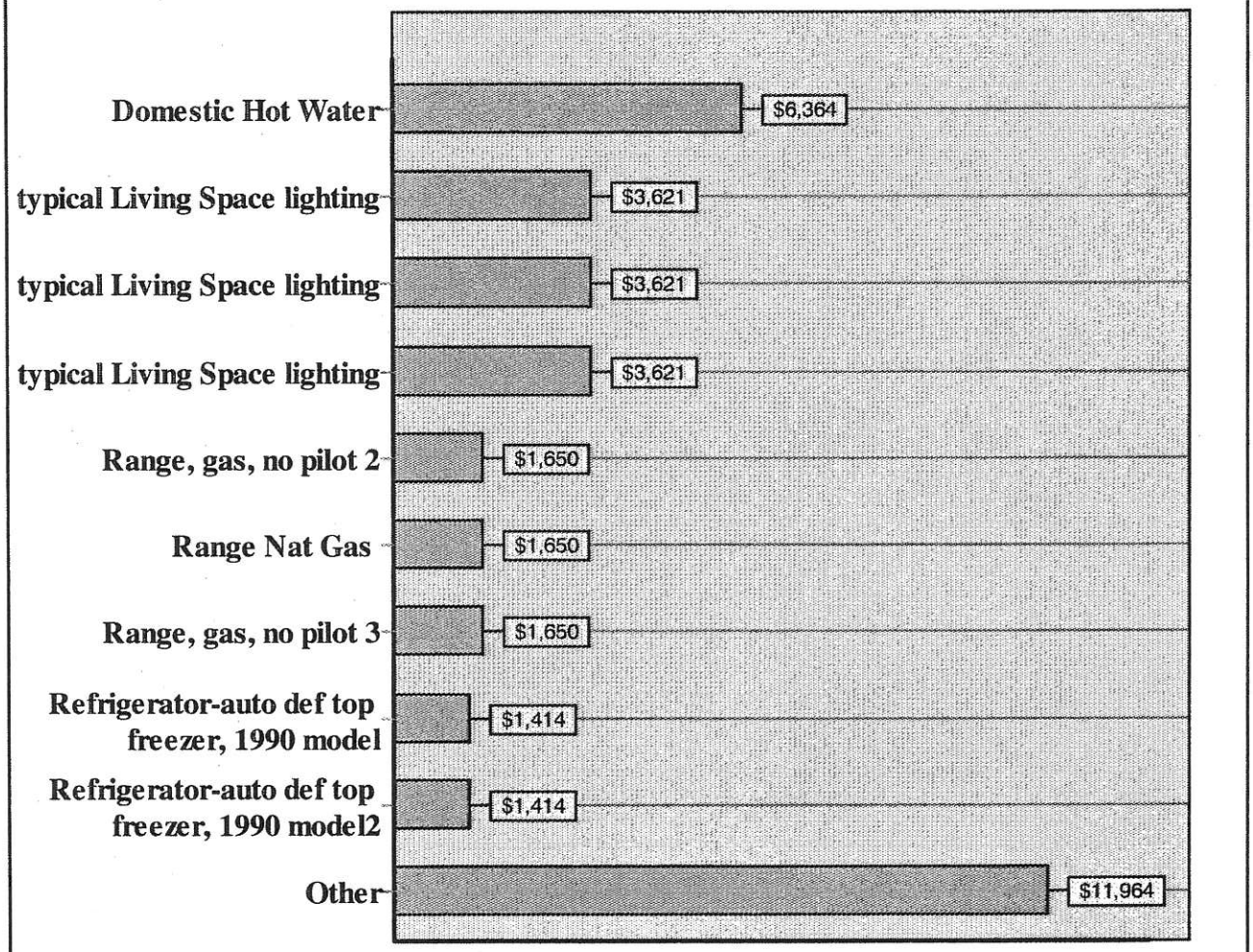
Annual Use of Domestic Hot Water, Appliances, and Lighting

Model Name: Temperature Limiting Thermostats

	Natural gas $1.13 per Therm		Electricity $0.16 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	5,632	6,364	0	0			6,364
2. typical Living Space lighting	0	0	22,630	3,621			3,621
3. typical Living Space lighting	0	0	22,630	3,621			3,621
4. typical Living Space lighting	0	0	22,630	3,621			3,621
5. Range, gas, no pilot 2	1,460	1,650	0	0			1,650
6. Range Nat Gas	1,460	1,650	0	0			1,650
7. Range, gas, no pilot 3	1,460	1,650	0	0			1,650
8. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
9. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
10. Other	2,745	3,102	55,372	8,862			11,964
TOTAL	12,757	14,416	140,942	22,553			36,969

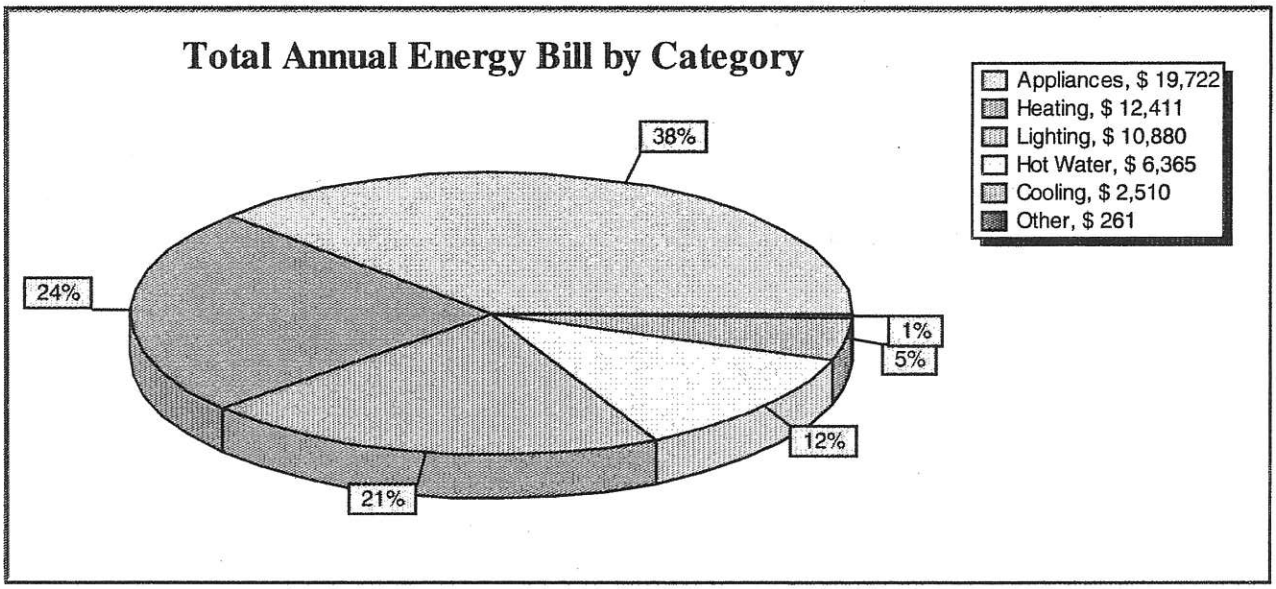
Base Load Energy Users, $/year

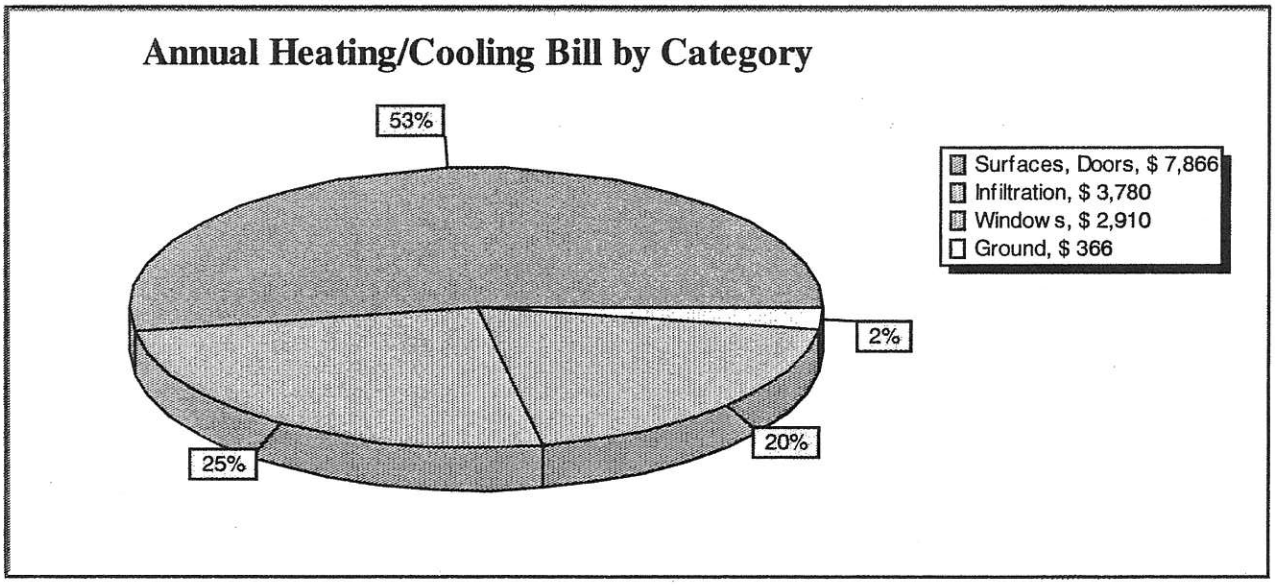
Model Name: Crawl Space Cieling Insulation



MODEL ENERGY REPORT FOR TEMPERATURE LIMITING THERMOSTATS

Meadowview Apartment Bld #1
For: NBHA
By:
Date: 9/2/2009





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

DESIGN HEATING AND COOLING LOADS FOR TEMPERATURE LIMITING THERMOSTATS

9/2/2009
Project Name: Meadowview Apartment Bld #1

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
1st Floor	162207	27	18.4	311
3rd Floor	314528	51	35.8	602
Boiler Room	3825	12	0.4	8
2nd Floor	90938	15	10.3	174

Required Heating Equipment Output Capacity: 671106 Btu/hr
Available Heating Equipment Output Capacity: 700000 Btu/hr
Total flow: 67.1 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 70 %
Calculated Distribution Efficiency: 94 %
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
1st Floor	137412	4999
3rd Floor	351443	12784
Boiler Room	0	0
2nd Floor	118986	4329

Required Cooling Equipment Output Capacity: 651017 Btu/hr

Available Cooling Equipment Output Capacity: 70000 Btu/hr

Total flow: 21528 CFM

Cooling Equipment Efficiency: 10 SEER

Calculated Distribution Efficiency: 100%

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.

YOUR SUMMARY

TOWN HOME APARTMENTS 6-9

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 Thermostat Improvement 1: Install 3 non-programmable heating/cooling thermostats.	Improve comfort, improve convenience.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 3,909		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		345.9		
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: 1.1300 $/Therm
- Electricity: 0.1600 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR
Temperature Limiting Thermostats

Meadowview Town Home #7

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Temp Limiting Thermostat Improvement 1

Programmable Thermostat Installation

Install 2 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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 7 5828 Meadowview
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: Temperature Limiting Thermostats

Billing Period Name: None

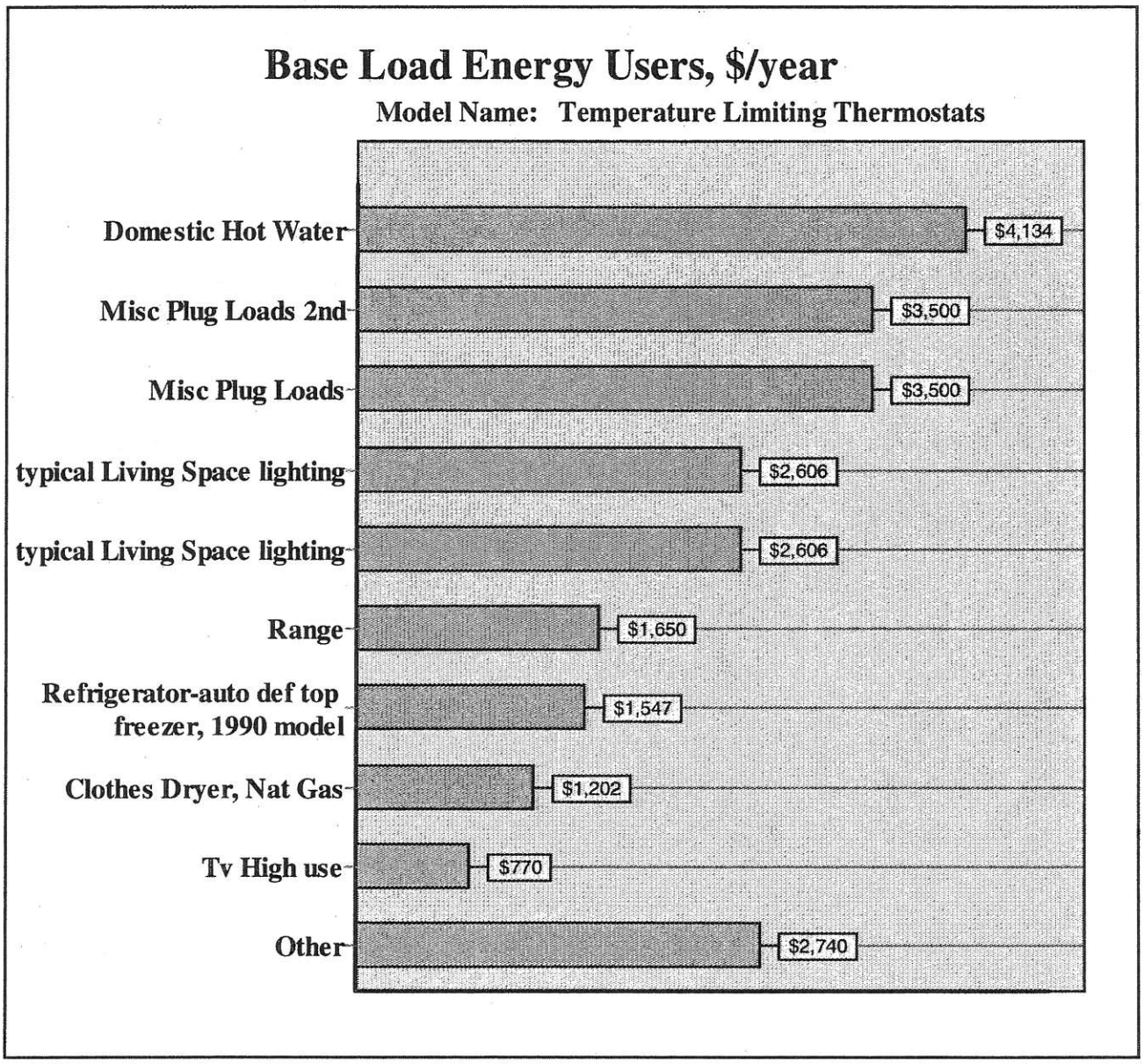
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	6,033	6,817	101,272	17,723		
Billing						
% Difference						

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: Temperature Limiting Thermostats

	Natural gas $1.13 per Therm		Electricity $0.18 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	3,658	4,134	0	0			4,134
2. Misc Plug Loads 2nd	0	0	20,000	3,500			3,500
3. Misc Plug Loads	0	0	20,000	3,500			3,500
4. typical Living Space lighting	0	0	14,892	2,606			2,606
5. typical Living Space lighting	0	0	14,892	2,606			2,606
6. Range	1,460	1,650	0	0			1,650
7. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,547			1,547
8. Clothes Dryer, Nat Gas	915	1,034	960	168			1,202
9. Tv High use	0	0	4,400	770			770
10. Other	0	0	15,654	2,740			2,740
TOTAL	6,033	6,818	99,638	17,437			24,255


Base Load Energy Users, $/year
Model Name: Temperature Limiting Thermostats
Domestic Hot Water
$4,134
Misc Plug Loads 2nd
$3,500
Misc Plug Loads
$3,500
typical Living Space lighting
$2,606
typical Living Space lighting
$2,606
Range
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,547
Clothes Dryer, Nat Gas
$1,202
Tv High use
$770
Other
$2,740

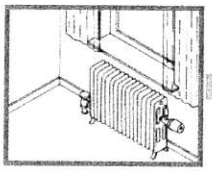
Data sheet

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

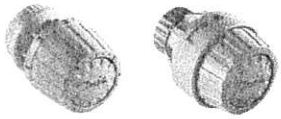
Typical Installation

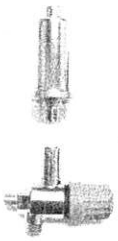
Dial / Operator / Sensor + Valve

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



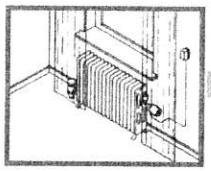


Use air vent

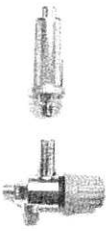
PLUS

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.

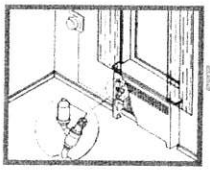


Use air vent

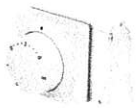
PLUS

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

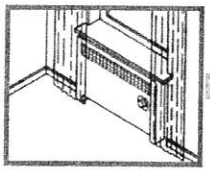


Use operator with combined remote dial / sensor. The dial/sensor and capillary tube may be extended up to 6' and are wall mounted.

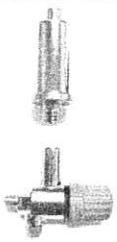


Use air vent
PLUS
Two 45° elbows
PLUS
1/8" one-pipe steam valve

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

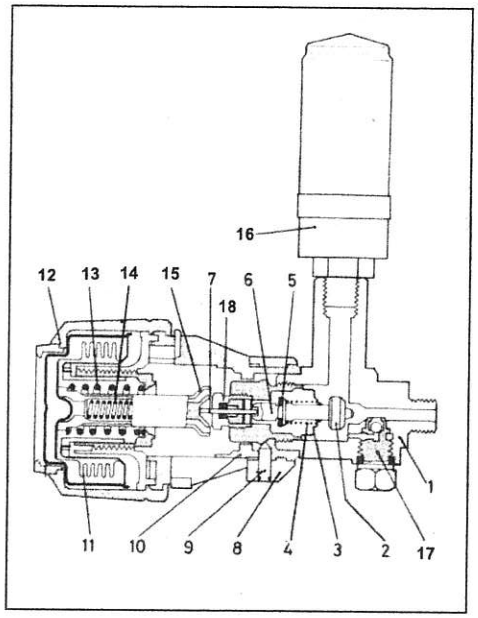
PLUS

1/8" one-pipe steam valve

Data sheet

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

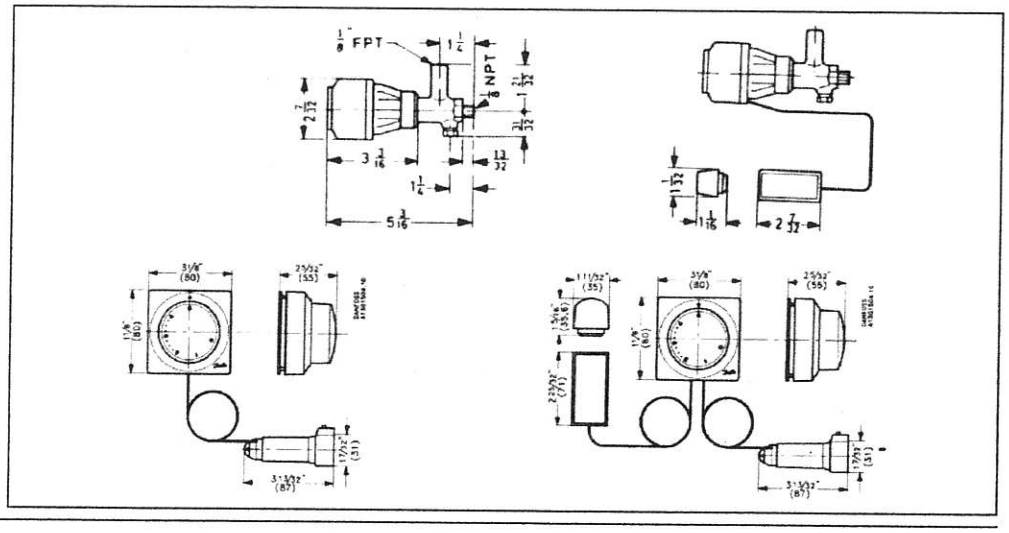
Design & Function



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

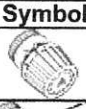
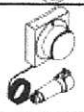
Technical Data

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

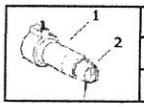
Symbol	Code No.	Description	Sensor	Capillary
	013G8250	Valve mounted dial & sensor	Built-in	-
	013G8252	Valve mounted dial with remote sensor	Remote	6'
	013G8240	Valve mounted dial and sensor, tamper-resistant	Built-in	-
	013G2922	Valve mounted dial with remote sensor, tamper-resistant	Remote	6'
	013G8562	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

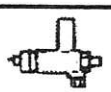
Code No.	Description
013G1236	Screwdriver tool set
013G1215	Limitation pins for RA 8250/52 (30 pcs)
013G1237	Limitation pins for tamper resistant operators RA 8240 / 2922 (30 pcs)
013G5245	Anti-theft protection clips for RA 8250/52 (20 pcs)
013G1232	Locking screw plugs for tamper resistant operators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

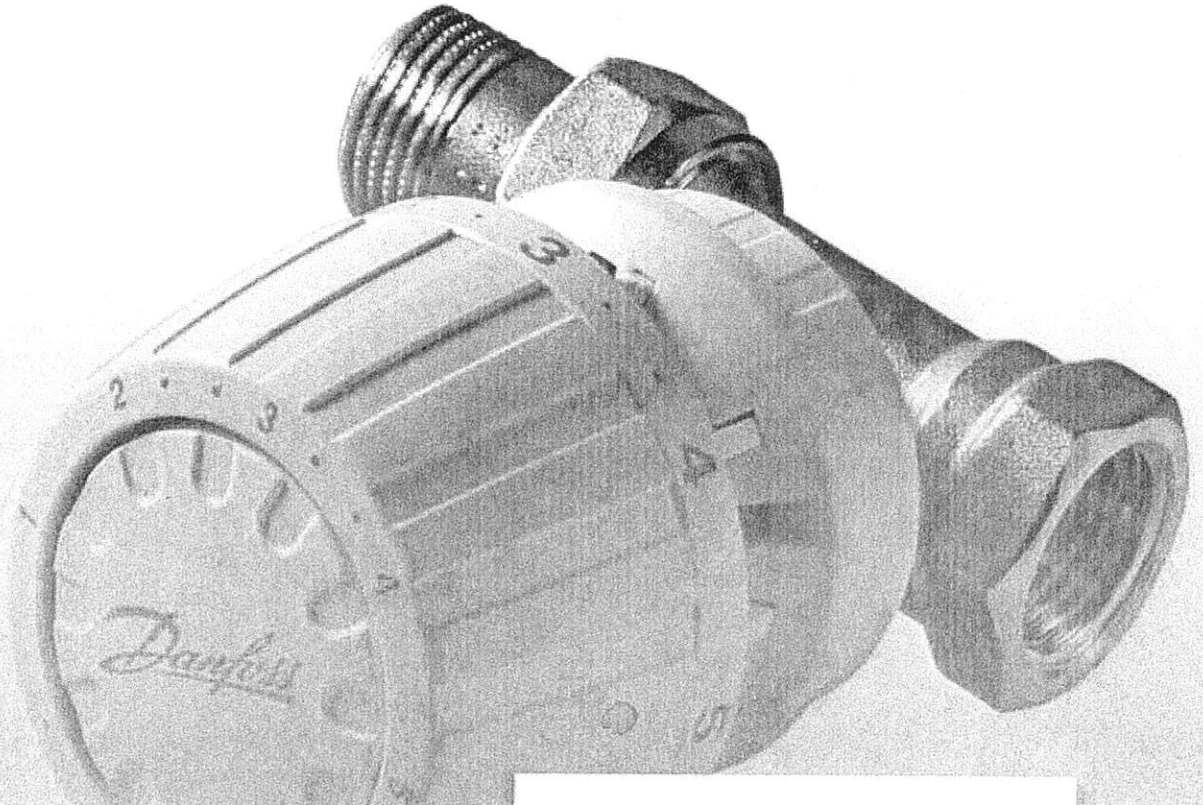
Parts & Accessories For RA2000 1PS Valve

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

MNOONAN@BTMUIRHEAD.COM

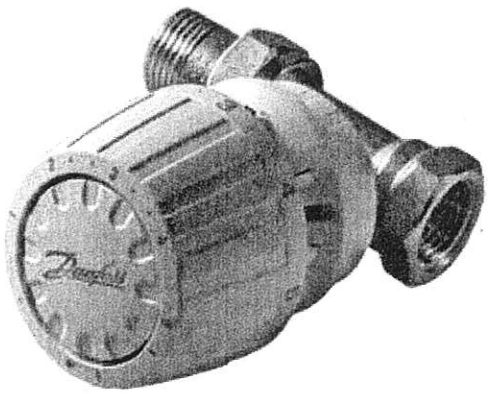
RA 2000
IMPROVE COMFORT AND EFFICIENCY!
THE WORLD'S FIRST RADIATOR THERMOSTAT WAS PRODUCED BY DANFOSS IN 1943

Danfoss



Danfoss Inc.
6711 Mississauga Road, Suite 410
Mississauga, ON, L5N 2W3
Tel.: 905-285-2050, Fax: 905-285-2055

Danfoss Inc.
7941 Corporate Drive
Baltimore, MD 21236 USA
Tel.: 443-512-0266, Fax: 443-512-0270



Thermostatic Radiator Valves

For Use On Hot Water One-Pipe & Two-Pipe
Low Pressure Steam Systems

www.na.heating.danfoss.com

Data sheet

RA 2000
Thermostatic Radiator Valves

Technical Specifications:

Hydronic Hot Water Systems

Maximum Temperature: 250 °F
Maximum Static Pressure: 145 psi
Maximum Test Pressure: 232 psi
Max. Diff. Pressure (water): 15 psi
Max. Sensor Temperature: 140 °F
Adjustable Temp. Range: 45-86°F (7-30°C)

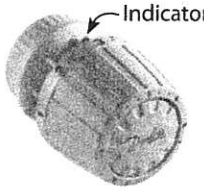
Two-Pipe Low-Pressure Steam Systems

Maximum Temperature: 250 °F
Maximum Test Pressure: 232 psig
Maximum Steam Pressure: 15 psig
Max. Sensor Temperature: 140 °F
Adjustable Temp. Range: 45-86°F (7-30°C)

Comfort Control:

Control of the space temperature at a comfortable level is easily accomplished by adjusting the dial clockwise or counter-clockwise. The dial has a numbered scale of 1 to 5 corresponding to temperatures of approximately 57°F to 79°F (14°C to 26°C).

Should the space be unoccupied for an extended period, the dial can be set to the " * "symbol for freeze protection (50°F or 9°C) to save energy.

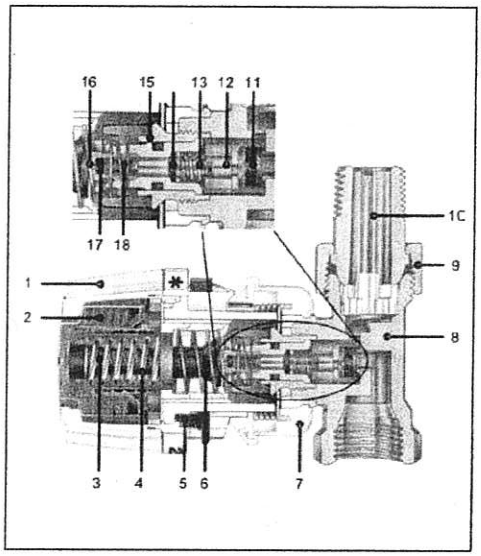


I	*	1	2	3	4	5	I
45	50	57	63	68	73	79	86°F
7	9	14	17	20	23	26	30°C

Indicated temperatures are approximate. Adjust the dial to the desired setting.

Design and Function:

The RA 2000 thermostatic operator consists of a saturated vapor charged bellows and a setting dial. The dial is set to the position equal to the desired temperature. When the ambient temperature lowers, the pressure from the bellows will reduce, allowing the valve to open. A rise of temperature increases the pressure in the bellows closing the valve. The balanced pressures between the adjustment spring and the bellows ensure a smooth and modulating operation of the valve. Danfoss RA 2000 are manufactured to the highest quality standards in an ISO 9001 factory.



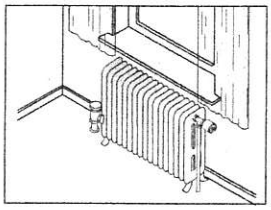
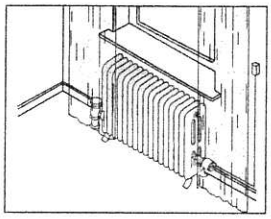
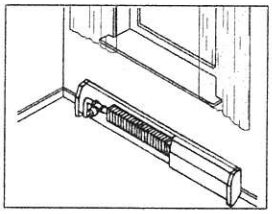
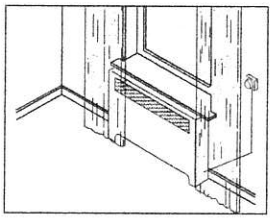
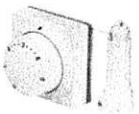
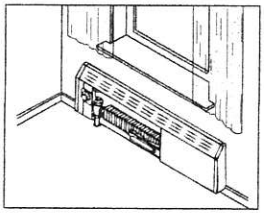
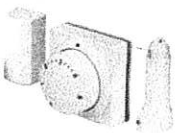
No. Description:

1- Operator setting dial (ABS)
2- Vapor charged bellows
3- Safety spring (steel)
4- Adjustment spring (steel)
5- Locking/limiting pin (steel)
6- Pressure spindle (plastic)
7- Snap-on mounting ring (plastic)
8- Valve body (nickel plated brass)
9- Union nut (nickel plated brass)
10- Tailpiece (nickel plated brass)
11- Valve disc (EPDM)
12- Valve spindle (brass)
13- Valve spring (stainless steel)
14- Back seat washer (EPDM)
15- Valve bonnet (brass)
16- Pressure pin (stainless steel)
17- Packing o-ring (EPDM)
18- Packing gland (DRZ brass)

Data sheet

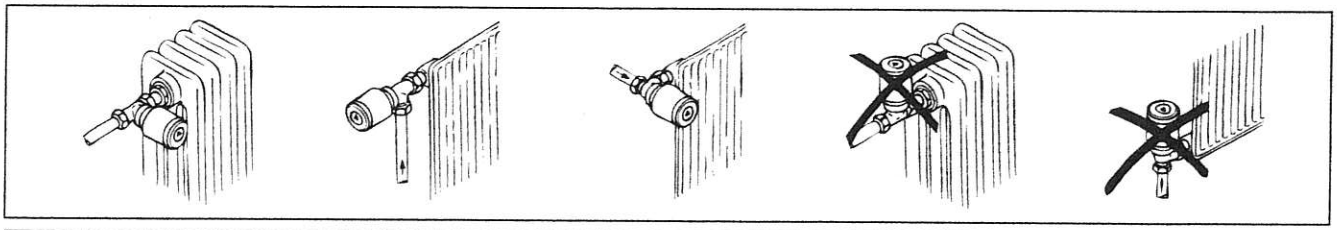
RA 2000
Thermostatic Radiator Valves

Applications:

Typical Installation Configuration		=	Operator Type		+		Valve Type
	**Free-Standing Radiators** The freestanding hot water or low-pressure steam radiator is located where air circulation is unobstructed and passes freely over the operator.	=		Valve -mounted dial and sensor, standard or tamper resistant models. **Always install these operators in a horizontal position.**	+		Straight, Side-Mount Angle or Double Solder Union
	**Free-Standing Radiators** Freestanding hot water or low-pressure steam radiator. Air circulation does not pass freely over the operator due to furniture, drapes, coverings, etc.	=		Valve -mounted dial with remote sensor, standard or tamper-resistant models. The sensor can be mounted on a wall up to 6 feet away in a location free of drafts.	+		Straight, Angle, Side-Mount Angle or Double Solder Union
	**Baseboards/Convectors** The hot water or low-pressure steam fin-tube baseboard or convector is located where air circulation is unobstructed and passes freely over the operator.	=		Valve -mounted dial and sensor, standard or tamper resistant Models. Always install these operators in a horizontal position.	+		Straight, Side-Mount Angle or Double Solder Union
	**Baseboards/Convectors** Hot water or low-pressure steam fin-tube baseboard or convector. Air circulation does not pass freely over the operator due to furniture, drapes, coverings, etc.	=		Combined remote mounted dial and sensor. The dial operators are wall mounted and are available with 6', 16' or 26' long capillary tubes.	+		Straight, Angle, Side-Mount Angle or Double Solder
	**Baseboards/Convectors** The hot water or low-pressure steam fin-tube baseboard or convector arrangement requires the dial and sensor to be mounted separately, away from the valve.	=		Separate remote mounted dial and sensor. The remote dial mounts on the wall or enclosure (max. 6' away). The sensor is mounted beneath the radiation or on a draft free wall 6'away from the dial.	+		Straight, Angle, Side-Mount Angle or Double Solder Union

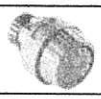
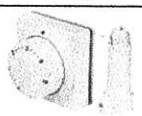
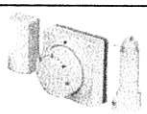
Important!

Valve mounted dial and sensor operators should be installed horizontally.
If mounted vertically, the operators will sense heat radiating upwards from the valve resulting in the premature closing of the valve.



Ordering Information:

RA 2000 Operators

Operator	Code No.	Description	Sensor	Capillary
	**013G8250**	Valve mounted dial and 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 and sensor*	Built-in	6′
	013G8565	Combined remote mounted dial and sensor*	Built-in	16′
	013G8568	Combined remote mounted dial and sensor*	Built-in	26′
	**013G8564**	Separate remote mounted dial and sensor*	Remote	6′ + 6′
	**013G5002**	Manual adjustment handle	-	-

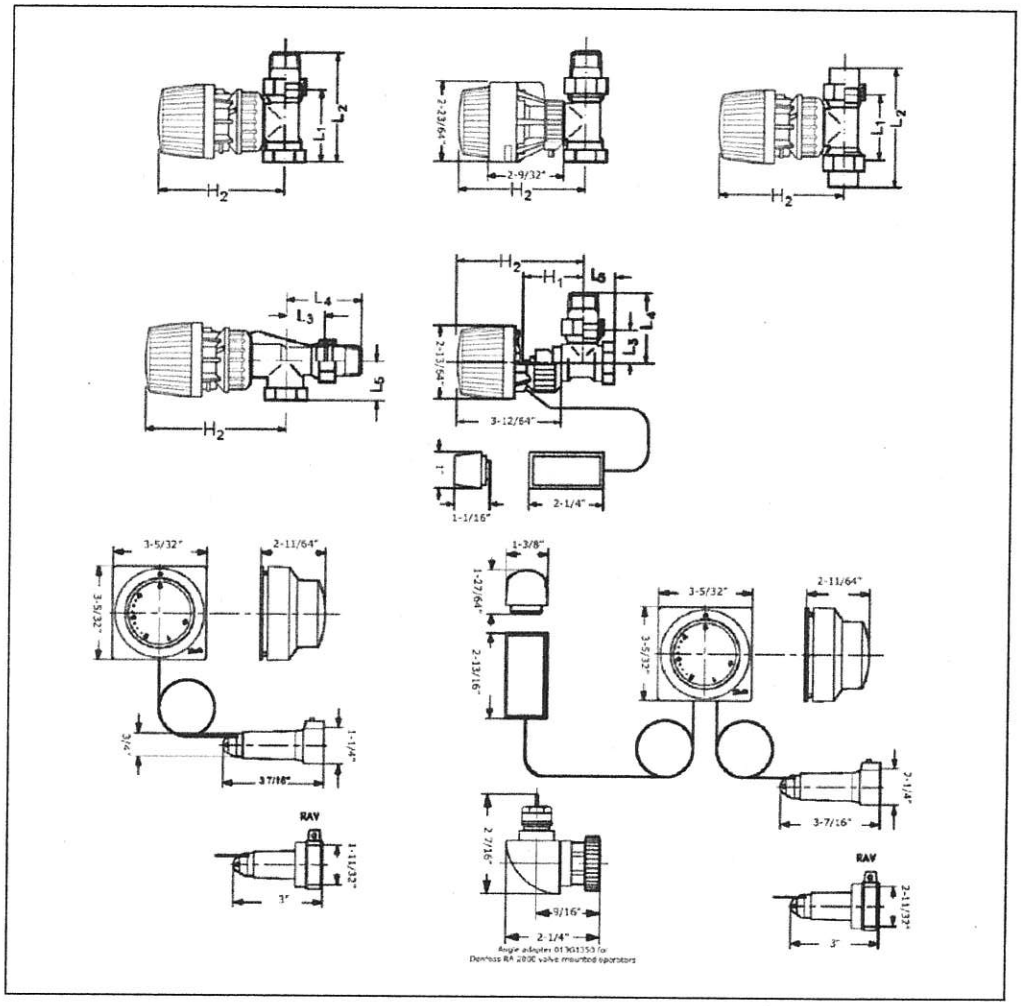
* Includes sockets for use on RAV, KOVM and VMT valve bodies.

RA 2000 Valves

Valve	Code No.	Size	Valve Type	Cv*	Connections (inlet x outlet)
	**013G8015**	1/2″	Straight	1.6	FPT X MPT Union Tailpiece
	013G8020	3/4″		2.7	
	013G8025	1″		2.8	
	013G8032	1-1/4″		2.8	
	**013G8014**	1/2″	Angle	1.6	FPT X MPT Union Tailpiece
	013G8019	3/4″		2.7	
	013G8024	1″		2.8	
	013G8031	1-1/4″		2.8	
	**013G8013**	1/2″	Side Mount Angle	1.6	FPT X MPT Union Tailpiece
	013G8018	3/4″		2.1	
	013G8023	1″		2.8	
	013G8030	1-1/4″		2.8	
	**013G8042**	1/2″	Straight	1.6	Double Solder Union
	013G8044	3/4″		2.7	

* Cv is the water flow rate through the fully open valve at a pressure drop of 1psi. To determine the pressure drop through the valve at other flow rates use the formula: $\Delta P = (Q/Cv)^2$, where Q= water flow in GPM

Dimensions:



Valve Type	Connection Type	L1	L2	L3	L4	L5	H1	H2
Straight	1/2" NPT	2-5/8"	3-3/4"				1-57/64"	3-3/4"
	3/4" NPT	2-29/32"	4-3/16"				2-1/16"	3-15/16"
	1" NPT	3-17/32"	4-31/32				2-1/16"	3-15/16"
	1-1/4" NPT	4-1/4"	5-29/32"				2-9/64"	4-1/64"
Angle	1/2" NPT			1-3/16"	2-9/32"	1-1/64"	1-57/64"	3-3/4"
	3/4" NPT			1-11/32"	2-5/8"	1-9/64"	2-1/16"	3-15/16"
	1" NPT			1-9/16"	3"	1-11/32"	2-1/16"	3-15/16"
	1-1/4" NPT			1-3/4"	3-3/8"	1-9/16"	2-1/16"	3-15/16"
Side Mount	1/2" NPT			1-1/8"	2-1/4"	1-1/64"	2-3/8"	4-1/4"
	3/4" NPT			1-11/32"	2-5/8"	1-9/64"	2-7/16"	4-5/16"
	1" NPT			1-9/16"	3"	1-11/32"	2-3/8"	4-1/4"
	1-1/4" NPT			1-3/4"	3-3/8"	1-9/16"	2-3/8"	4-1/4"
Double Solder	1/2"	2-5/8"	3-15/16"				1-57/64"	3-3/4"
	3/4"	2-15/16"	4-5/8"				2-1/16"	3-15/16"

Data sheet

RA 2000
Thermostatic Radiator Valves

Capacity:

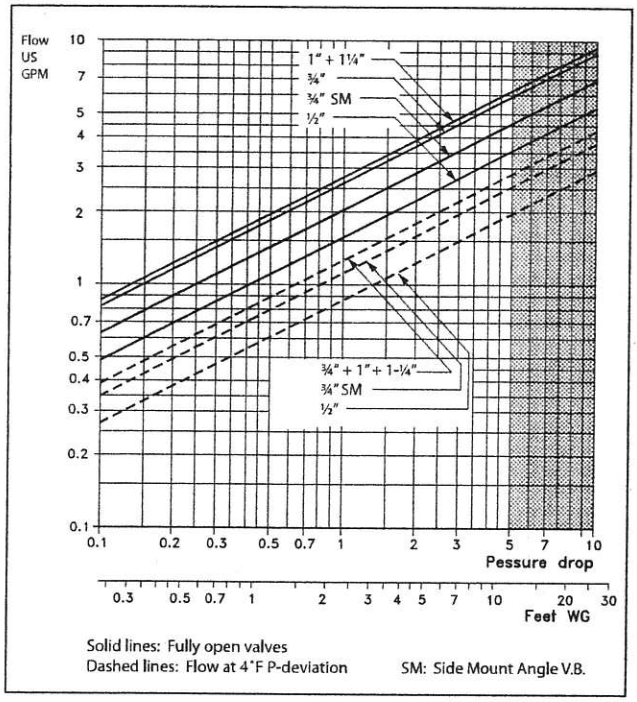
Hydronic Hot Water Applications

Example:
Flow Required:
0.65 US GPM
Pipe Size: 1/2"

Solution:
Draw a line from 0.65 USgpm until it intersects with the dashed line for the 1/2" valve. Draw a vertical line down to find the additional system pressure drop due to the valve will be 0.6 psi.

Note: For best control, select valve based on 4°F P-deviation and maximum
5 psi pressure drop.
P-deviation is the difference between the thermostat setting and the actual space temperature. For best comfort control and long life, valves should be selected to provide design flow at a 4°F P-deviation.

The shaded area represents differential pressure above those recommended for quiet operation. The maximum differential pressure ratings indicate the maximum pressure at which valves regulate satisfactorily. In order to prevent noise, pumps that provide only the required pressure should be recommended. Experience shows that in most systems a differential pressure of
0.5 - 2.5 psi across the valve is sufficient to provide the required flow.



Low Pressure Steam Applications:

Step-by-step selection technique

1. Before selecting valves, consider P-deviation.
2. Check that system pressure is below 15psig.
3. Determine load requirements for each valve.

Example:
Design load: 28MBH
Pipe Size: 3/4"
P-deviation ≤ 4°F

Solution:
From the table below a 3/4" valve will provide 28MBH at a 4°F P-deviation at a pressure drop of 3psi. If the system pressure is 3psi or greater a 3/4" valve can be used.

Pressure Drop		1 psig		2 psig		3 psig		4 psig		5 psig	
P-Deviation °F		4	Fully open	4	Fully open	4	Fully open	4	Fully open	4	Fully open
Valve Size	Rating Code										
1/2"	MBH	10	16	14	22	16	28	20	32	35	62
3/4"	MBH	15	30	20	40	28	50	32	58	60	108
1" & 1-1/4"	MBH	18	40	25	52	30	60	36	72	66	140

Conversion Factors:
Sq. ft. EDR to Btu/hr = Sq. ft. EDR x 240 (steam)

Btu/hr to Sq. ft. EDR = Btu/hr 240

1 MBH = 1,000 Btu/hr

Rating Abbreviations:
MBH = Thousands of Btu/hr.

EDR = Equivalent Direct Radiation

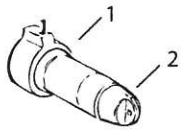
Important
P-deviation refers to the difference between the thermostat setting and the actual space temperature. For best comfort and long life, valves should be selected which provide the design heating load at approximately a 4°F P-deviation.

Spare Parts and Accessories:

	Code No.	Description
RA 2000 Valve Mount Operators **013G8250** **013G8252** **013G8240** **013G2922**	**013G1236**	Screwdriver tool set
	013G1246	Limitation pins for RA 8250/52 (10 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 (10 pcs).
	013G1672	Cover plate for scale window of tamper resistant operators (20 pcs)
	013G1350	Angle Adapter for RA 2000 valves & sensors

RA Socket For RA 2000 Wall Mount Operators

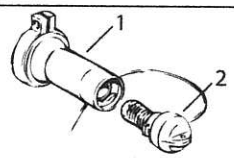
013G8562
013G8565
013G5068
013G8564
013G8568



Code No.	Description	Position No.
013G8591	Socket Body for RA 2000	1
013G5503	Bellows Holder (set of 2 pcs)	2

RA Socket For RA 2000 Wall Mount Operators

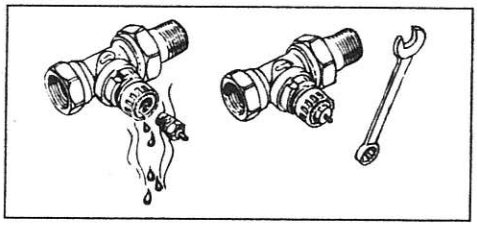
013G8562
013G8565
013G5068
013G8564
013G8568



Code No.	Description	Position No.
013G8593	Socket Body for RAV, VMT and KOVM	1
013G5503	Bellows Holder (set of 2 pcs)	2

	Code No.	Description
RA 2000 Valve Bodies	**013G0290**	Packing Gland
	013G5002	Manual adjustment handle (Water applications only)
	013-7045	Gasket for RA valves
	013G8070	RA to RA 2000 adapter
	013G8072	RAV to RA 2000 adapter
	013G8037	Insert, valve top & gland replacement, 1/2" NPT angle & straight valve
	013G8038	Insert, valve top & gland replacement, 1/2" NPT sidemount angle valve
	013G8039	Insert, valve top & gland replacement, 1/2" solder, & all 3/4", 1", 1-1/4"
	003L0213	Demounting tool for valve tops RA 2000, RA-S, RA-N, FHV-A
	013G1350	Right angle Operator adapter

Changing the Packing Gland:



Should the packing gland on the valve body show signs of weeping, it can be replaced in a few minutes with the system in operation.

Order packing gland 013G0290 for RA 2000 and FHV-A valves.

Data sheet

RA 2000
Thermostatic Radiator Valves

Warning:

Brass products such as Danfoss thermostatic radiator valves should not be installed in hydronic or steam heating systems that are being treated with medias that contain, or that during the process of treatment could develop, agents aggressive to brass. In concentrations larger than shown, agents such as Ammonia (0.2mg/l), Mercury (0.01mg/l), Oxygen (0.01mg/l), Carbon Dioxide (0.05mg/l), or Chloride (20mg/l) must be avoided. Further the pH-value of the medium in contact with the brass products should not exceed 9.5.

Neglecting the above restrictions may in some circumstances cause damage to the brass in the valve allowing the heating fluid to escape, possibly scalding any bystanders.

Note: To avoid internal damage and void the warranty, mineral oils must not come in contact with EPDM valve components.

Typical Specifications:

The thermostatic radiator valve assembly shall be a two part assembly consisting of the brass valve body and thermostatic operator. The brass valve body shall have a packing gland assembly capable of replacement while the system is in operation. The valve shall be available in a straight, angle, or side mount orientation. The thermostatic operator shall be available in either a valve or wall mounted dial operator. The valve mounted dial shall be a vapor charged operator and installed via snap-action mechanism or Allen key. Assembly shall conform to ASHREA / ANSI standard 102-1983.

Danfoss Inc.
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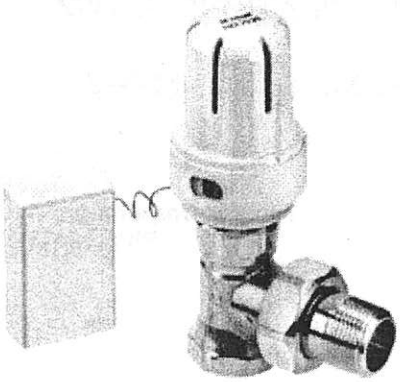
Mississauga, ON, L5N 2W3
Tel.: 905-285-2050, Fax: 905-285-2055
www.na.heating.danfoss.com

Danfoss Inc.
7941 Corporate Drive
Baltimore, MD 21236 USA
Tel.: 443-512-0266, Fax: 443-512-0270
www.na.heating.danfoss.com

REMOTE SENSOR THERMOSTAT MTWZ



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

temperature or temperature range
- Simple one-trade installation
- Sensor guard furnished at no extra cost
- All Macon valves and thermostats conform to ASHRAE Standard 102P-1983 and European Standard EN 215/1215. We are also ISO 9001 certified (2002) and ISO 14001 certified (2002).

SPECIFICATIONS - MTWZ

Max, Min Setting - MTWZ

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

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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

EDR (Equivalent Direct Radiation in ft.^{2}) for hot water

Water Temperature	Cast Iron Radiator	Convector
200°F	209	205
190°F	187	183

BTU/hour = EDR in ft.^{2} x (Appropriate number from above EDR Table)
For example 205 for 200°F water in convector.

****Assumes 20°F drop in water temperature through radiation.**

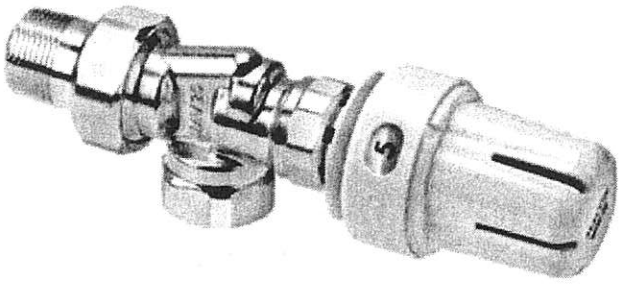
$GPM = C^v\sqrt{P.D.}$

BTU/hour = GPM x 10,000

1Ft. H_2O = .433 psi

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

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

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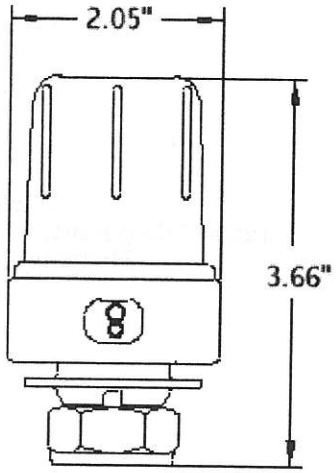
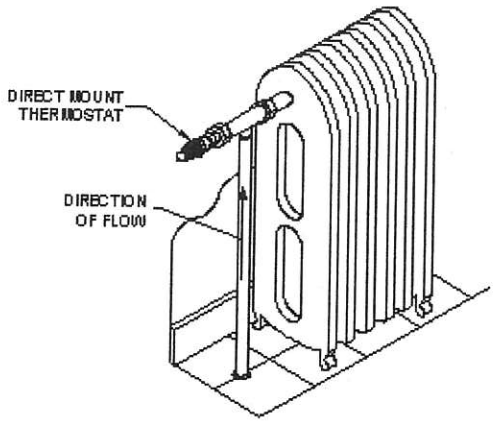
SPECIFICATIONS
MTW



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)

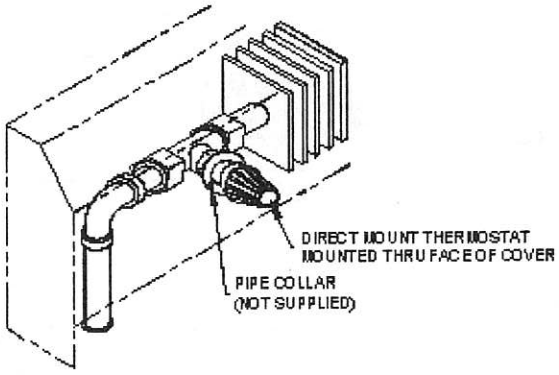


DIAL SETTINGS:

0 = Off
* = 46°F (Frost Protection)

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

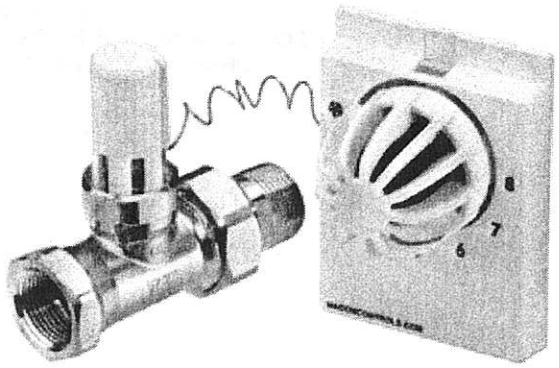
8 = 80°F
9 = 82°F



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

About
Valves
Non-Electric Operators
Electric Operators
One-Pipe Steam
Accessories
Conversion Inserts
Umbrella Adapters
Inlet Orifice
Specifications
Warranty
Literature Downloads
Dimensioning Tools
Questions / Comments
Reps & Distributors
Tunstall Corporation
Links

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

sensors on built-in convectors, etc., and where the valve-mounted sensor is exposed to draft from windows or doors	to ASHRAE Standard 102P-1983 and European Standard EN 215/1215. We are also ISO 9001 certified (1994) and ISO 14001 certified (1998)
Fully automatic - nonelectric, no wiring	

-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: Meadowview Apartments

ECM - 4 Install Thermostats and Control Valves on Steam Radiators

Suggestions

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

Apartments Buildings 1-5

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

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.	COST	
						$ -	$ -	$ -	$ -	
Install 3/4" control valve and thermostat.	615	ea.	$ 100	$ 90		$ 61,500	$ 67,527	$ -	$ 129,027	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.

$ 129,027	Subtotal
$ 12,903	10% Contingency
$ 21,289	Contractor 15% O&P
$ -	0% Engineering
$ 163,219	**Total**

Townhomes Buildings 6-8

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

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.	COST	
						$ -	$ -	$ -	$ -	
Install 3/4" control valve and thermostat.	133	ea.	$ 100	$ 90		$ 13,300	$ 14,603	$ -	$ 27,903	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.

$ 27,903	Subtotal
$ 2,790	10% Contingency
$ 4,604	Contractor 15% O&P
$ -	0% Engineering
$ 35,298	**Total**

APPENDIX J

ECM-5 Air Conditioner Changeout with High EER Units

YOUR SUMMARY GARDEN APARTMENTS 1-5

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
Cooling System Improvement 1: Install 12 SEER 32,000 Btu/hr cooling system. Reuse existing distribution system.	Increase value of building.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 126		
Annual KWh Savings, KWh		719		
Total Energy Savings, MMBtu		2.5		
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: 1.1300 $/Therm
- Electricity: 0.1750 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Cooling Window AC units to 12 EER

Meadowview Apartment Bld #1

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Cooling Window AC EER to 12

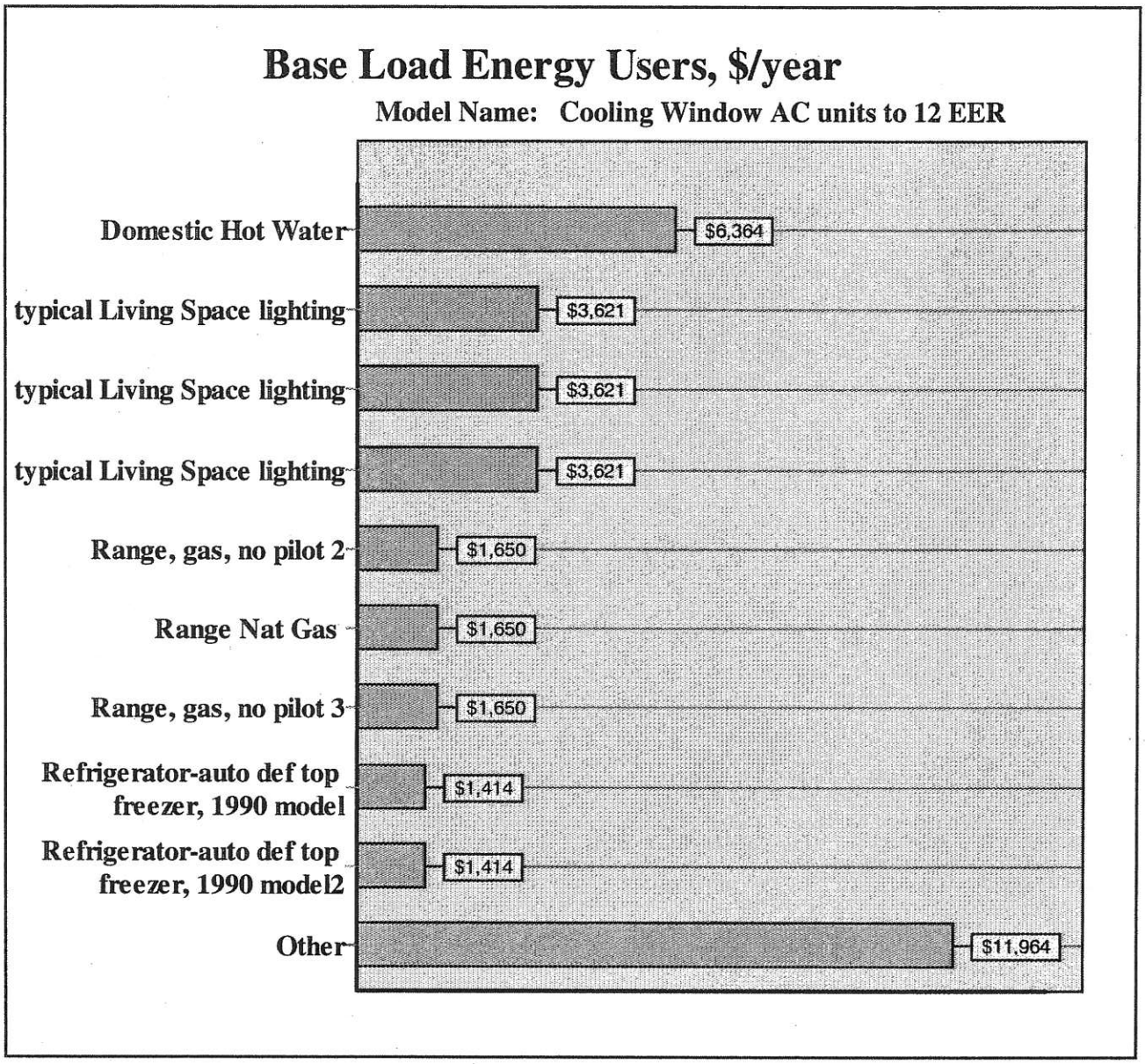
Cooling System Improvement

Input Capacity, Btu/Hr	70000
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.


Base Load Energy Users, $/year
Model Name: Cooling Window AC units to 12 EER
Domestic Hot Water
$6,364
typical Living Space lighting
$3,621
typical Living Space lighting
$3,621
typical Living Space lighting
$3,621
Range, gas, no pilot 2
$1,650
Range Nat Gas
$1,650
Range, gas, no pilot 3
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,414
Refrigerator-auto def top freezer, 1990 model2
$1,414
Other
$11,964

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 1 5828 Meadowview A
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: Cooling Window AC units to 12 EER

Billing Period Name: None

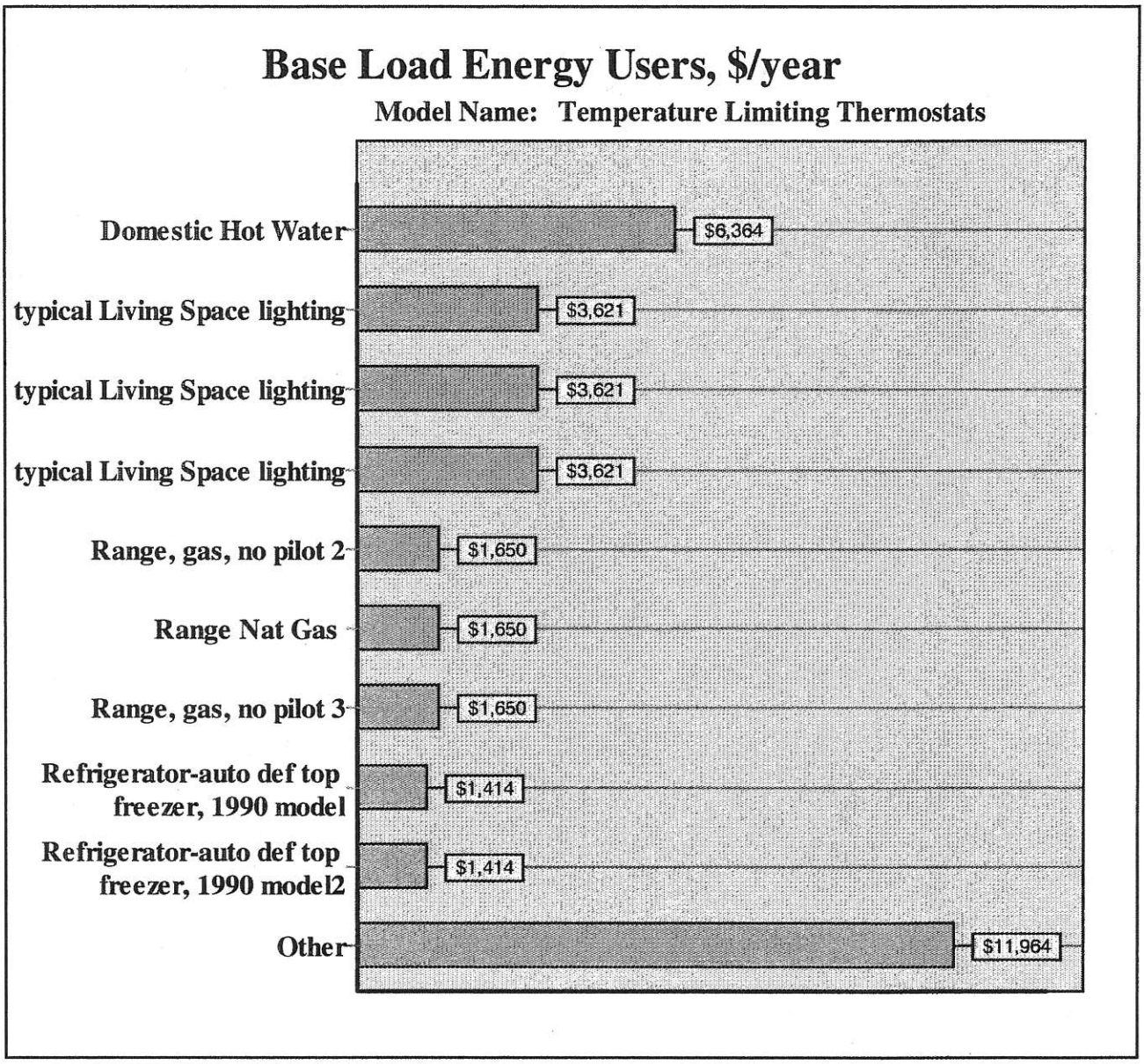
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	12,757	14,415	142,575	22,812		
Billing						
% Difference						

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: Cooling Window AC units to 12 EER

	Natural gas $1.13 per Therm		Electricity $0.16 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	5,632	6,364	0	0			6,364
2. typical Living Space lighting	0	0	22,630	3,621			3,621
3. typical Living Space lighting	0	0	22,630	3,621			3,621
4. typical Living Space lighting	0	0	22,630	3,621			3,621
5. Range, gas, no pilot 2	1,460	1,650	0	0			1,650
6. Range Nat Gas	1,460	1,650	0	0			1,650
7. Range, gas, no pilot 3	1,460	1,650	0	0			1,650
8. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
9. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
10. Other	2,745	3,102	55,372	8,862			11,964
TOTAL	12,757	14,416	140,942	22,553			36,969


Base Load Energy Users, $/year
Model Name: Temperature Limiting Thermostats
Domestic Hot Water
$6,364
typical Living Space lighting
$3,621
typical Living Space lighting
$3,621
typical Living Space lighting
$3,621
Range, gas, no pilot 2
$1,650
Range Nat Gas
$1,650
Range, gas, no pilot 3
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,414
Refrigerator-auto def top freezer, 1990 model2
$1,414
Other
$11,964

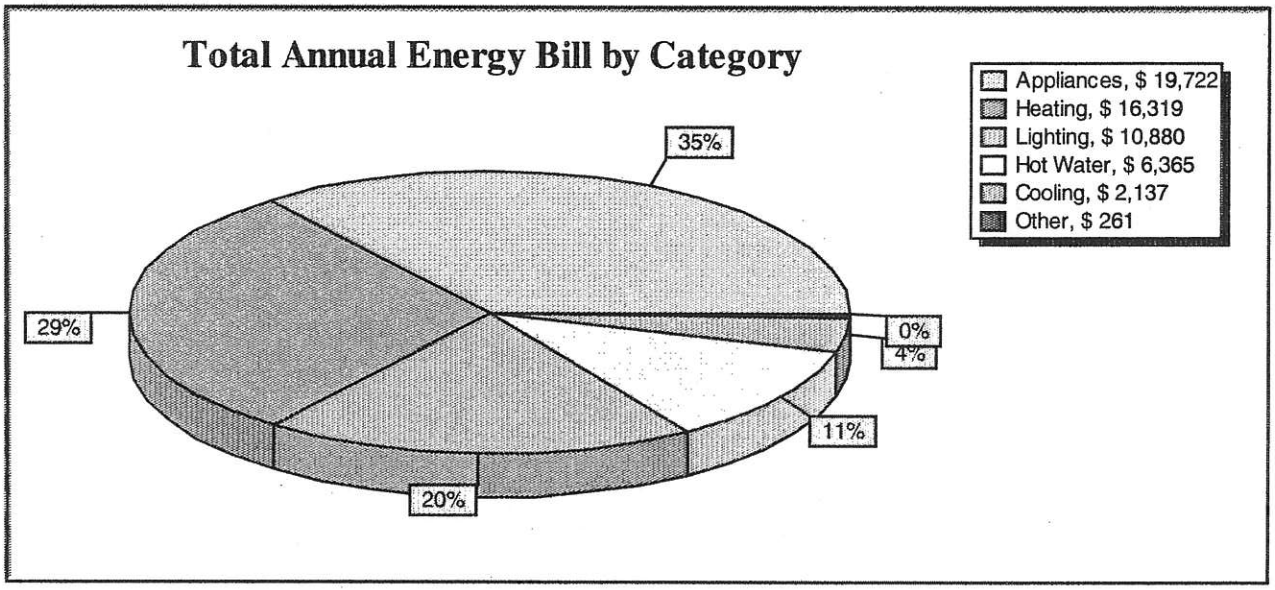
MODEL ENERGY REPORT FOR COOLING WINDOW AC UNITS TO 12 EER

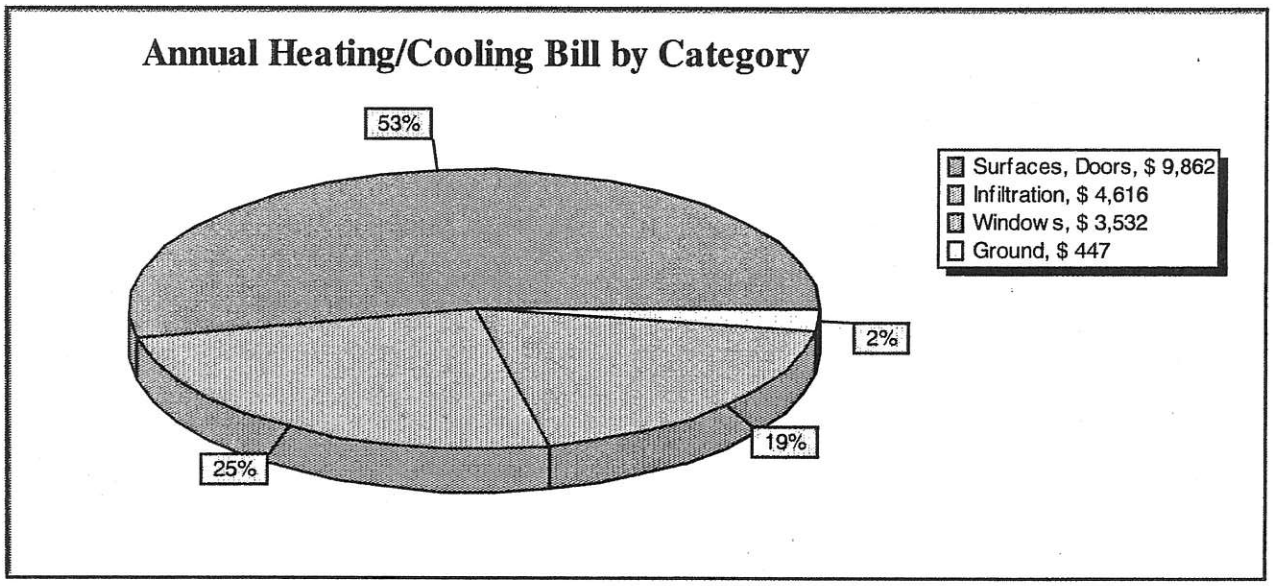
Meadowview Apartment Bld #1

For: NBHA

By:

Date: 9/2/2009





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

DESIGN HEATING AND COOLING LOADS FOR COOLING WINDOW AC UNITS TO 12 EER

9/2/2009
Project Name: Meadowview Apartment Bld #1

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
1st Floor	180179	30	20.5	345
3rd Floor	341203	56	38.8	653
Boiler Room	3825	12	0.4	8
2nd Floor	100713	17	11.4	193

Required Heating Equipment Output Capacity: 734526 Btu/hr
Available Heating Equipment Output Capacity: 700000 Btu/hr
Total flow: 73.5 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 70 %
Calculated Distribution Efficiency: 94 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10
HEATING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED HEATING LOAD.

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
1st Floor	137415	4999
3rd Floor	351443	12784
Boiler Room	0	0
2nd Floor	118986	4329

Required Cooling Equipment Output Capacity: 1856908 Btu/hr

Available Cooling Equipment Output Capacity: 70000 Btu/hr

Total flow: 61406 CFM

Cooling Equipment Efficiency: 12 SEER

Calculated Distribution Efficiency: 35%

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.

YOUR SUMMARY TOWN HOME APARTMENTS 6-8

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
Cooling Window AC EER to 12 : Install 12 SEER 70,000 Btu/hr cooling system. Reuse existing distribution system.	Increase value of building.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 373		
Annual KWh Savings, KWh		2,333		
Total Energy Savings, MMBtu		8.0		
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: 1.1300 $/Therm
- Electricity: 0.1600 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Window AC Units to 12 EER

Meadowview Town Home #7

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Cooling System Improvement 1

Cooling System Improvement

Input Capacity, Btu/Hr	32000
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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 7 5828 Meadowview
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 AC Units to 12 EER

Billing Period Name: None

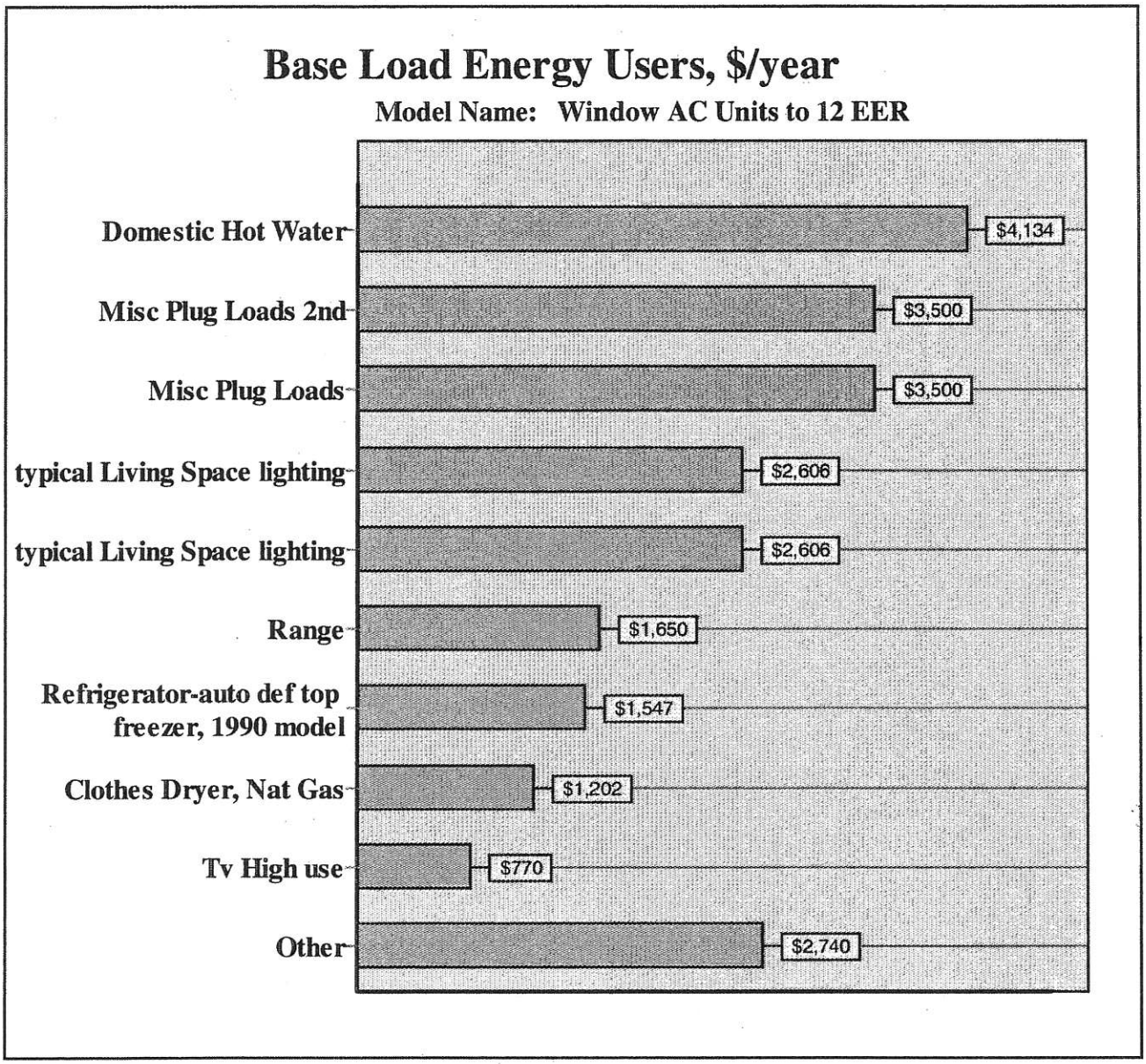
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	6,033	6,817	101,272	17,723		
Billing						
% Difference						

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 AC Units to 12 EER

	Natural gas $1.13 per Therm		Electricity $0.18 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	3,658	4,134	0	0			4,134
2. Misc Plug Loads 2nd	0	0	20,000	3,500			3,500
3. Misc Plug Loads	0	0	20,000	3,500			3,500
4. typical Living Space lighting	0	0	14,892	2,606			2,606
5. typical Living Space lighting	0	0	14,892	2,606			2,606
6. Range	1,460	1,650	0	0			1,650
7. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,547			1,547
8. Clothes Dryer, Nat Gas	915	1,034	960	168			1,202
9. Tv High use	0	0	4,400	770			770
10. Other	0	0	15,654	2,740			2,740
TOTAL	6,033	6,818	99,638	17,437			24,255


Base Load Energy Users, $/year
Model Name: Window AC Units to 12 EER
Domestic Hot Water
$4,134
Misc Plug Loads 2nd
$3,500
Misc Plug Loads
$3,500
typical Living Space lighting
$2,606
typical Living Space lighting
$2,606
Range
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,547
Clothes Dryer, Nat Gas
$1,202
Tv High use
$770
Other
$2,740

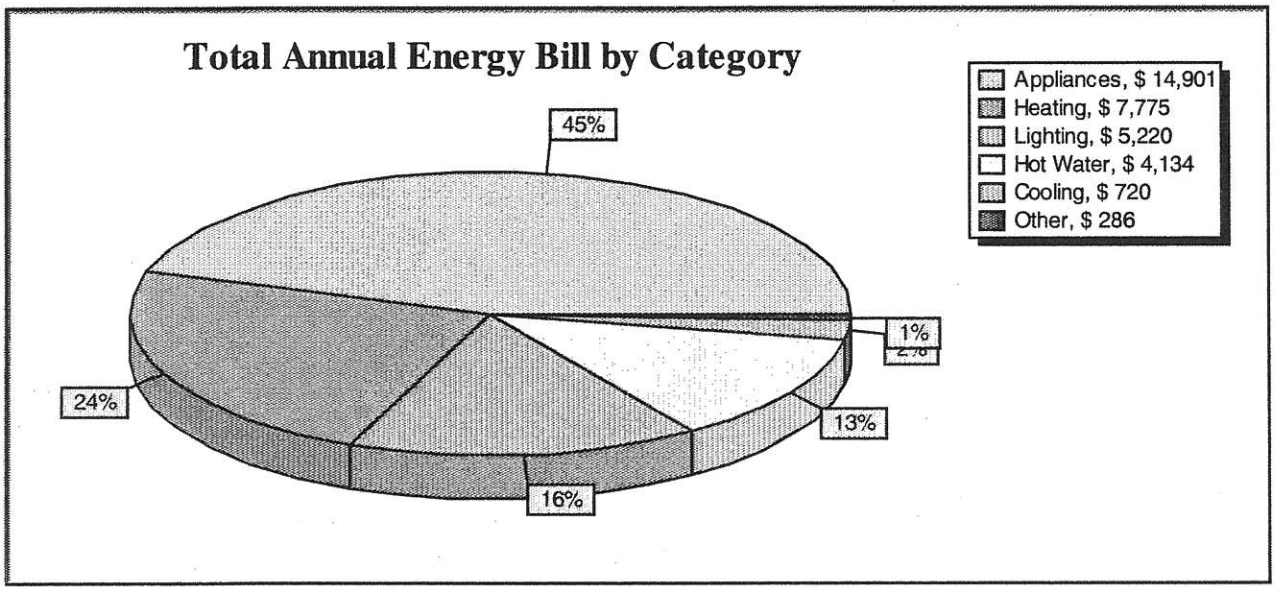
MODEL ENERGY REPORT FOR WINDOW AC UNITS TO 12 EER

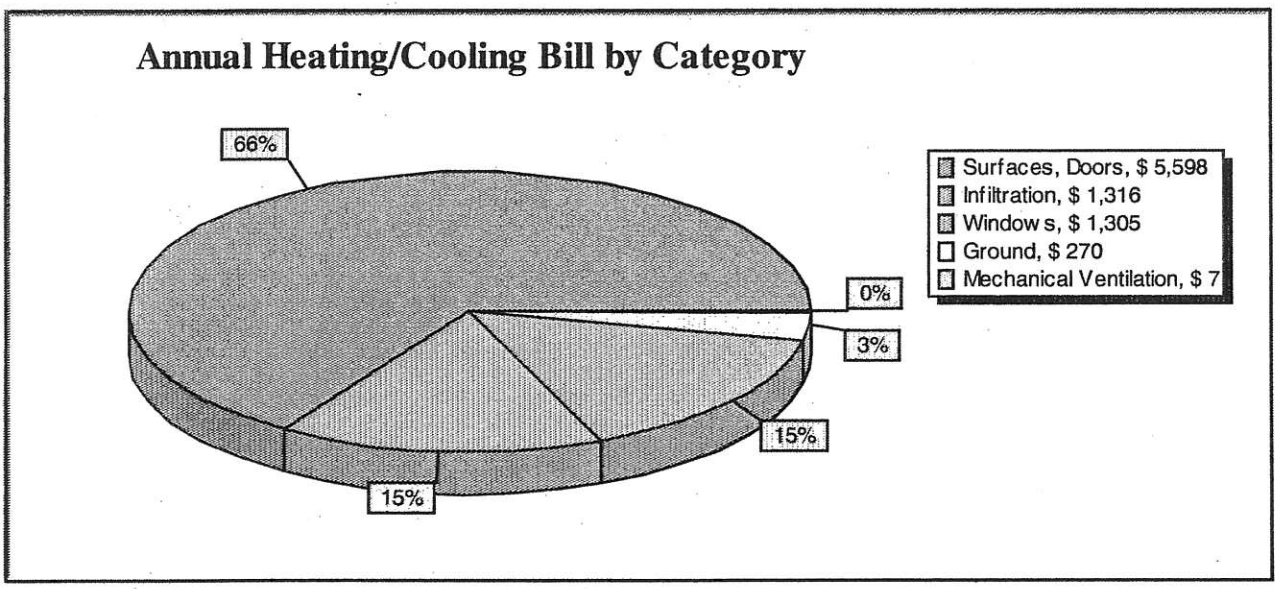
Meadowview Town Home #7

For: NBHA

By:

Date: 9/2/2009





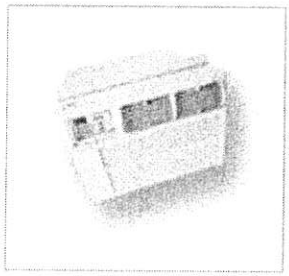
Note: Due to rounding, the sum of percentages may not be equal to 100.

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 K

ECM-6a Boiler Replacement with High Efficiency Hot Water

YOUR SUMMARY GARDEN APARTMENTS 1-5

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 Steam to HW Condensing: Install new natural gas 700,000 Btu/hr boiler with outdoor reset control with efficiency of 92.0 %.	Increased equity.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 1,985		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		175.7		
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: 1.1300 $/Therm
- Electricity: 0.1750 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Boiler Steam to HW Condensing

Meadowview Apartment Bld #1

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Boiler Steam to HW Condensing

New Heating Plant Installation

Heat Plant Type	Boiler, Water with outdoor reset control
Fuel	Natural gas
Input Capacity, Btu/Hr	1000000
Efficiency%	92

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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 1 5828 Meadowview A
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: Boiler Steam to HW Condensing

Billing Period Name: None

	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	12,757	14,415	142,575	22,812		
Billing						
% Difference						

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

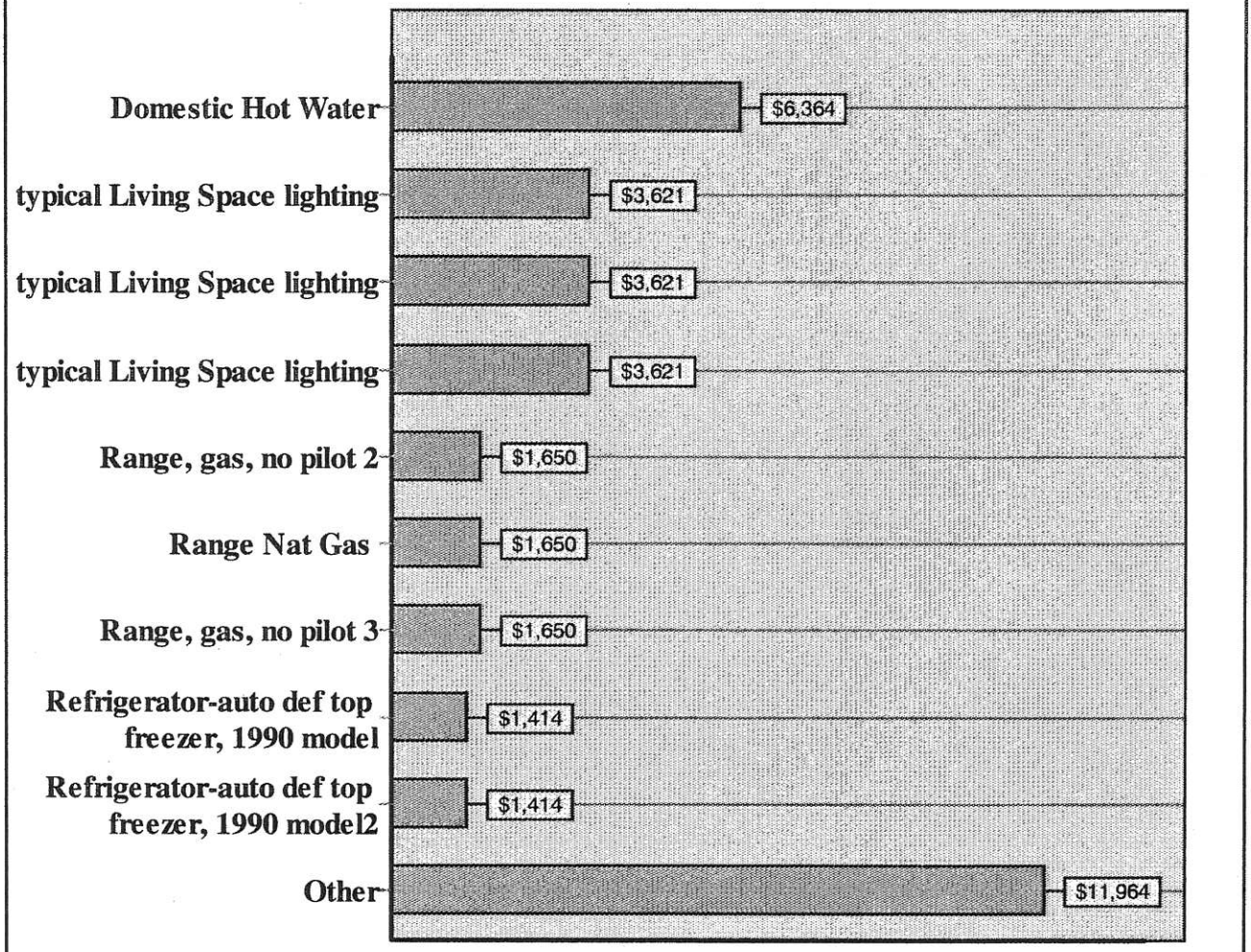
Annual Use of Domestic Hot Water, Appliances, and Lighting

Model Name: Boiler Steam to HW Condensing

	Natural gas $1.13 per Therm		Electricity $0.16 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	5,632	6,364	0	0			6,364
2. typical Living Space lighting	0	0	22,630	3,621			3,621
3. typical Living Space lighting	0	0	22,630	3,621			3,621
4. typical Living Space lighting	0	0	22,630	3,621			3,621
5. Range, gas, no pilot 2	1,460	1,650	0	0			1,650
6. Range Nat Gas	1,460	1,650	0	0			1,650
7. Range, gas, no pilot 3	1,460	1,650	0	0			1,650
8. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
9. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
10. Other	2,745	3,102	55,372	8,862			11,964
TOTAL	12,757	14,416	140,942	22,553			36,969

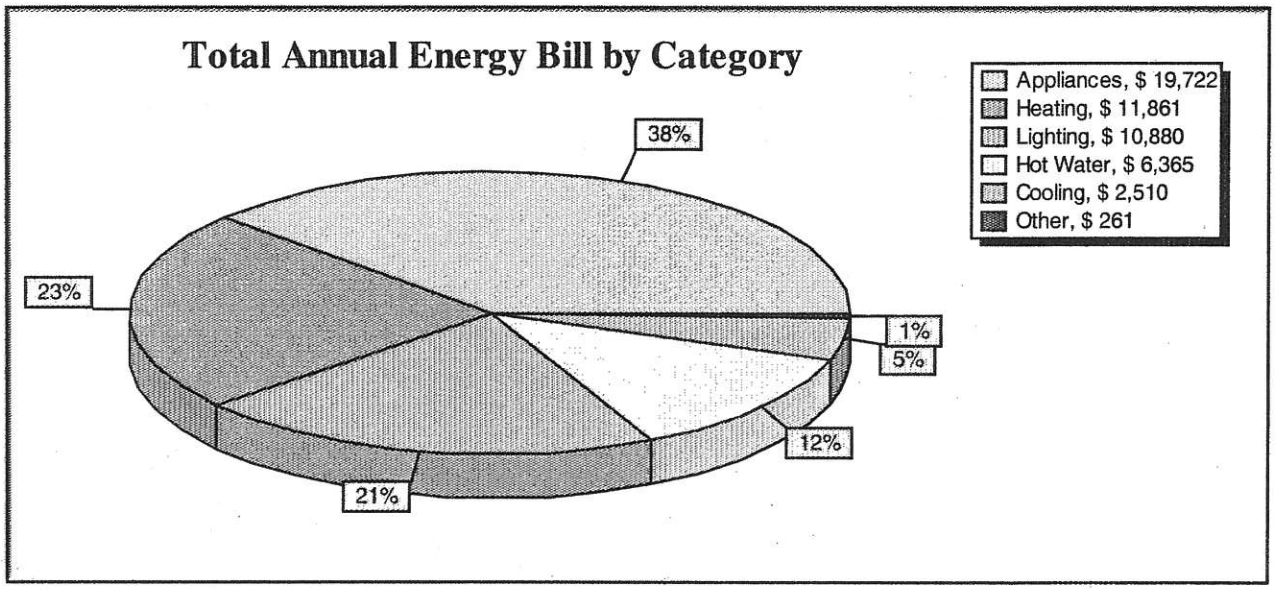
Base Load Energy Users, $/year

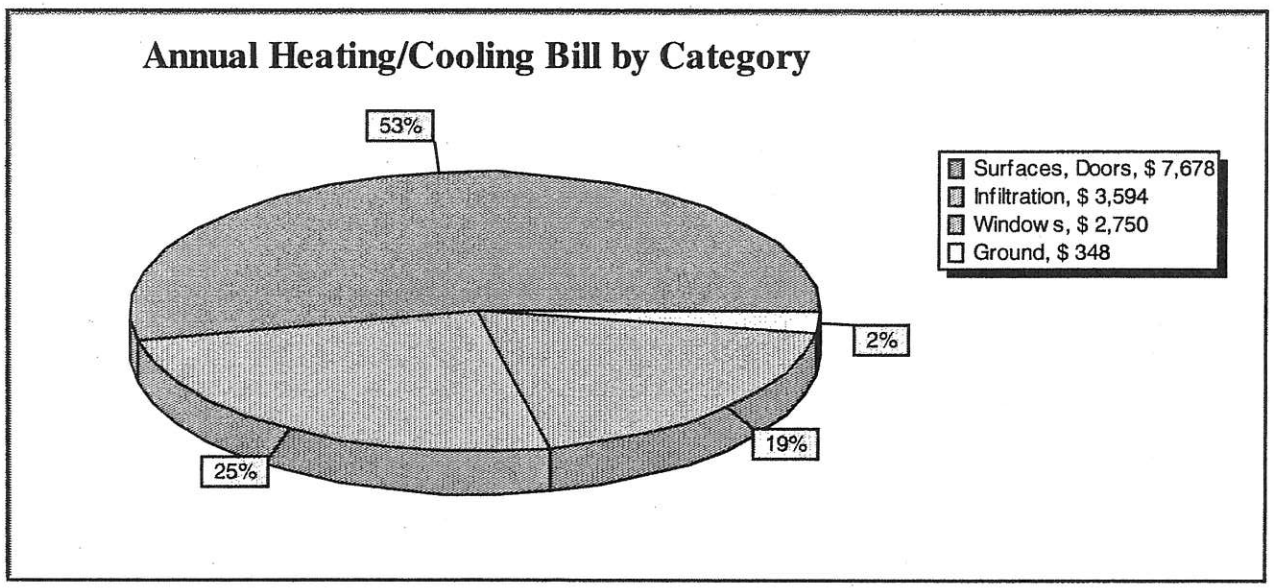
Model Name: R-38 Attic Insulation



MODEL ENERGY REPORT FOR BOILER STEAM TO HW CONDENSING

Meadowview Apartment Bld #1
For: NBHA
By:
Date: 9/2/2009





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

DESIGN HEATING AND COOLING LOADS FOR BOILER STEAM TO HW CONDENSING

9/2/2009
Project Name: Meadowview Apartment Bld #1

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
1st Floor	180179	30	20.5	345
3rd Floor	341203	56	38.8	653
Boiler Room	3825	12	0.4	8
2nd Floor	100713	17	11.4	193

Required Heating Equipment Output Capacity: 701607 Btu/hr
Available Heating Equipment Output Capacity: 920000 Btu/hr
Total flow: 70.2 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 92 %
Calculated Distribution Efficiency: 98 %
Supply Water Temperature: 180 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
1st Floor	137415	4999
3rd Floor	351443	12784
Boiler Room	0	0
2nd Floor	118986	4329

Required Cooling Equipment Output Capacity: 651020 Btu/hr

Available Cooling Equipment Output Capacity: 70000 Btu/hr

Total flow: 21528 CFM

Cooling Equipment Efficiency: 10 SEER

Calculated Distribution Efficiency: 100%

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.

YOUR SUMMARY

TOWN HOME APARTMENTS 6-8

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 Steam to HW Condensing: Install new natural gas 1,000,000 Btu/hr boiler with outdoor reset control with efficiency of 92.0 %.	Increased equity.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 4,459		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		394.6		
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: 1.1300 $/Therm
- Electricity: 0.1600 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Boiler Steam to HW Condensing

Meadowview Town Home #7

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Boiler Steam to HW Condensing

New Heating Plant Installation

Heat Plant Type	Boiler, Water with outdoor reset control
Fuel	Natural gas
Input Capacity, Btu/Hr	700000
Efficiency%	92

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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 7 5828 Meadowview
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: Boiler Steam to HW Condensing

Billing Period Name: None

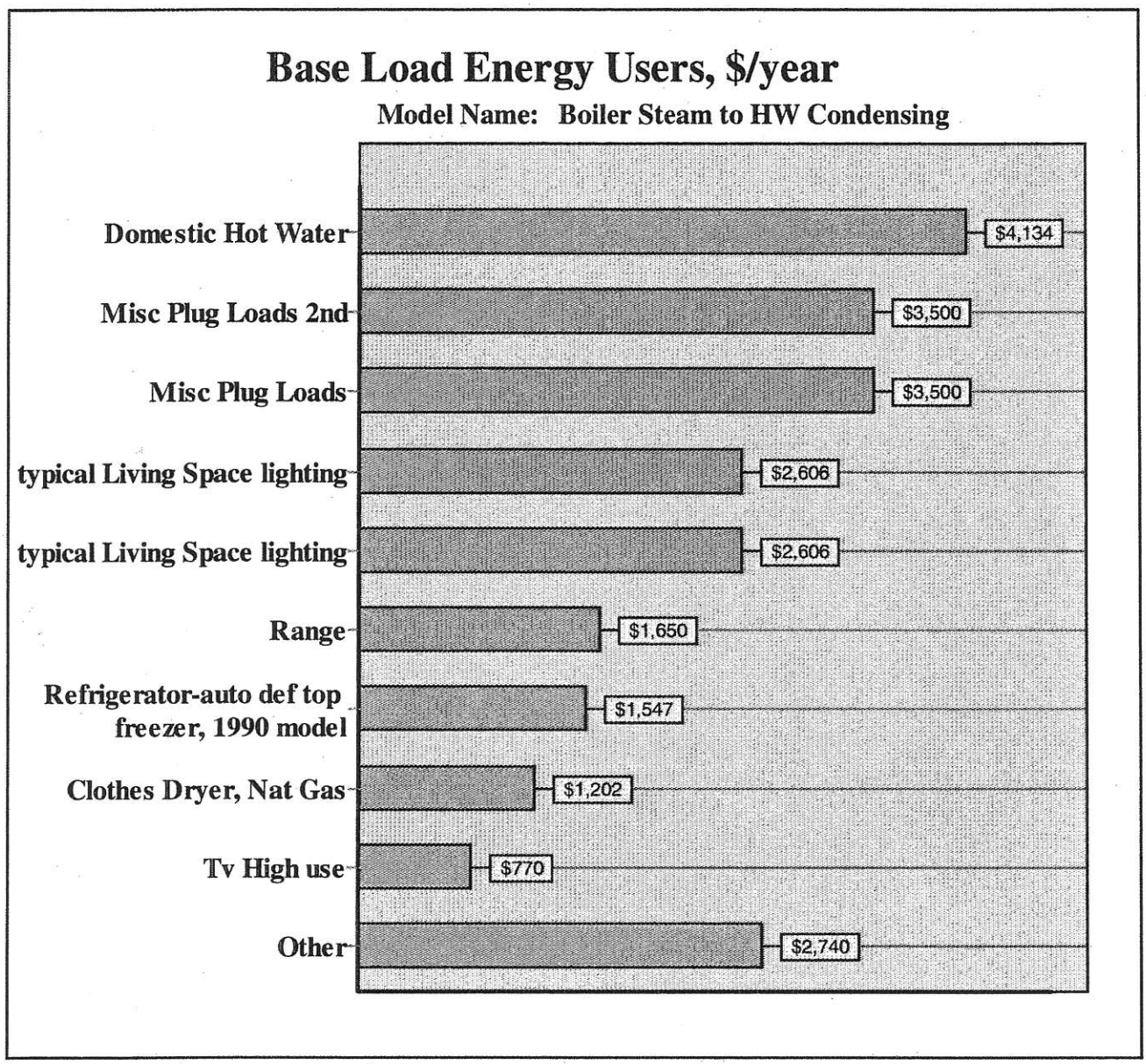
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	6,033	6,817	101,272	17,723		
Billing						
% Difference						

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

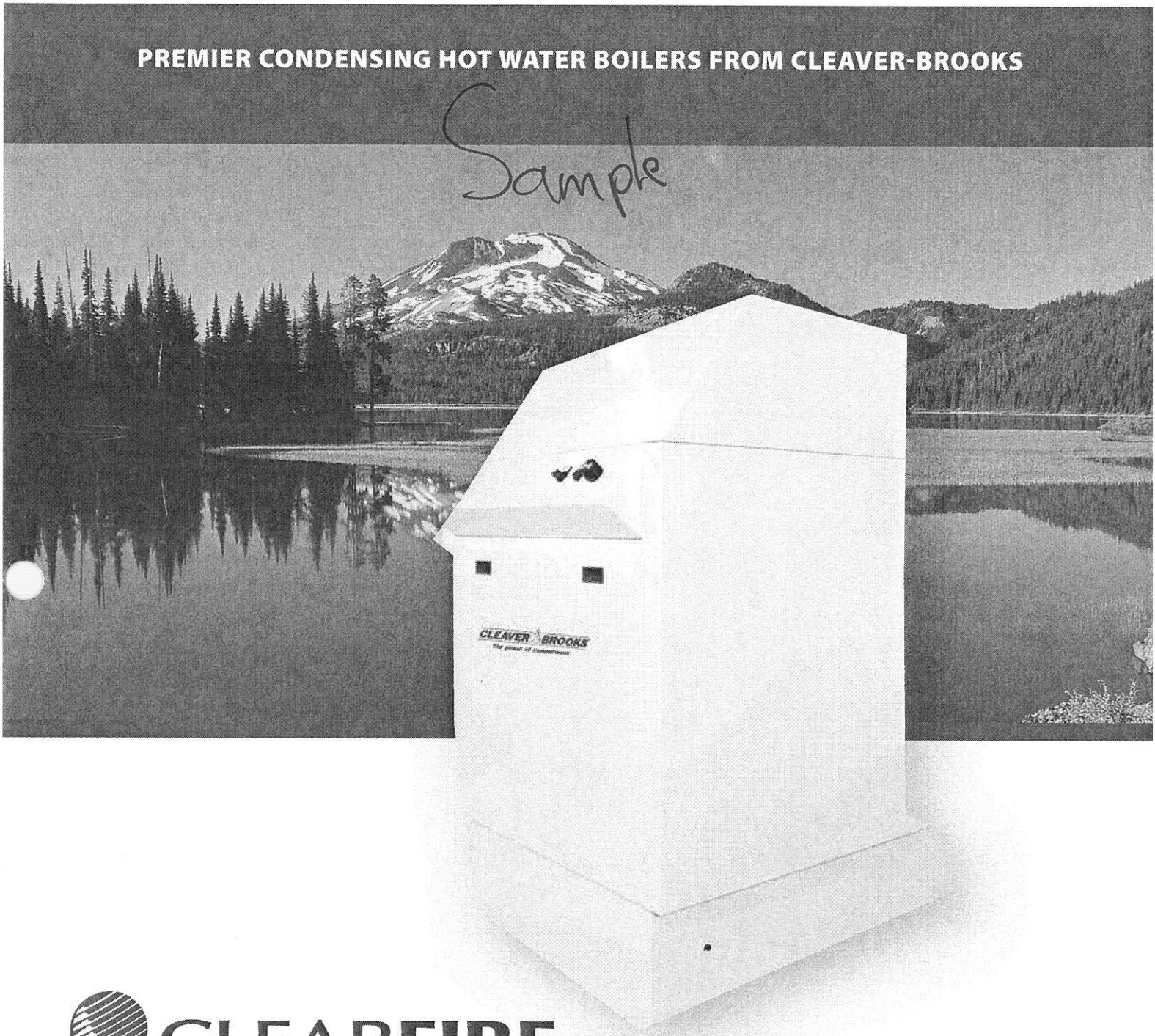
Model Name: Boiler Steam to HW Condensing

	Natural gas $1.13 per Therm		Electricity $0.18 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	3,658	4,134	0	0			4,134
2. Misc Plug Loads 2nd	0	0	20,000	3,500			3,500
3. Misc Plug Loads	0	0	20,000	3,500			3,500
4. typical Living Space lighting	0	0	14,892	2,606			2,606
5. typical Living Space lighting	0	0	14,892	2,606			2,606
6. Range	1,460	1,650	0	0			1,650
7. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,547			1,547
8. Clothes Dryer, Nat Gas	915	1,034	960	168			1,202
9. Tv High use	0	0	4,400	770			770
10. Other	0	0	15,654	2,740			2,740
TOTAL	6,033	6,818	99,638	17,437			24,255


Base Load Energy Users, $/year
Model Name: Boiler Steam to HW Condensing
Domestic Hot Water
$4,134
Misc Plug Loads 2nd
$3,500
Misc Plug Loads
$3,500
typical Living Space lighting
$2,606
typical Living Space lighting
$2,606
Range
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,547
Clothes Dryer, Nat Gas
$1,202
Tv High use
$770
Other
$2,740

CB PACKAGE BOILER®
The power of commitment.™

PREMIER CONDENSING HOT WATER BOILERS FROM CLEAVER-BROOKS



CLEARFIRE
MODEL CFC

CONDENSING MODEL CFC

A BOILER IN TUNE WITH THE ENVIRONMENT AND TODAY'S MARKET NEEDS

Size Range from 500 – 2500 MBH • No Minimum Return Water Temperature
Low NOx Emissions < 20 PPM • Sealed Combustion Option • Whisper Quiet

The CB Commercial ClearFire condensing boiler offers high efficiency/low NOx technology

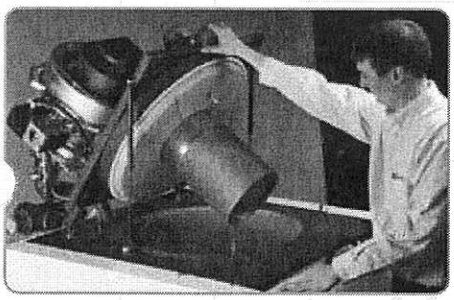
and as such satisfies demands for economy and environmental protection. It features the CB ClearFire combustion system with pre-mix down firing burner. This advanced burner is fundamental to the boiler achieving efficiencies up to 99% and NOx levels to less than 20 PPM. The pre-mix burner is suitable for use with either natural or propane gas. Clearfire condensing boilers are available in 6 sizes with maximum inputs between 500 mmbtu and 2500 mmbtu. They are suitable for central heating and indirect hot water supply for working pressures up to 4 bar depending on the output required.

Construction

The *ClearFire* boiler has a high quality stainless steel combustion chamber with a single pass Alu Fer® tubes made of stainless steel with aluminum alloy finned internal surface. The insulated boiler is encased within powder coated steel panels. Access to the burner and heat exchanger for maintenance is via a hinged cover.

Key Design features:

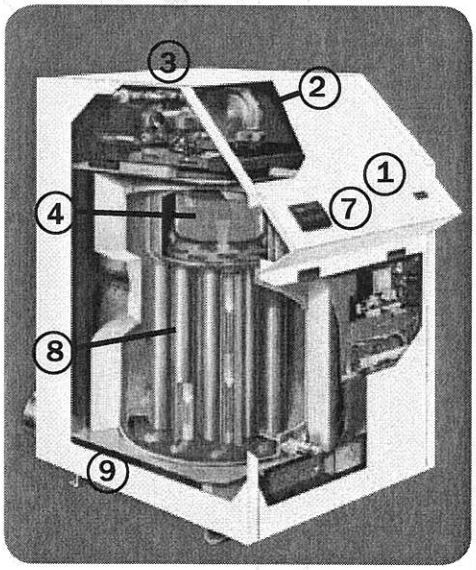
- *Modulating pre-mix burner with 5:1 turndown*
- *Single pass stainless steel combustion chamber and tube sheet*
- *AluFer® tube heat exchanger*
- *Fresh air inlet connection for sealed combustion*
- *Waterside inspection*
- *Low hydraulic resistance*
- *No minimum temperature*
- *Easy access hinged burner boiler lid to aid burner servicing*
- *Low noise < 70 dBA @ 3 feet*
- *Low NOx @ < 20 PPM*



Controls

The control panel is ergonomically designed for ease of operation and is housed within the front of the boiler casing as shown below. It contains as standard the Boiler electronic control module providing:

- *Supply & return water sensor*
- *High limit cut-out with manual reset*
- *Operating temperature display*
- *Integrated frost protection*
- *Connection of optional outdoor sensor for reset of operating temperature*
- *Heating pump control with overrun facility*
- *Facility for control of domestic water pump*
- *Fault diagnostic indication*
- *Low water cutoff protection*
- *Pre and post combustion air purge*
- *Timed trial for ignition*
- *Safety lockout*
- *Electronic Modulation*



Key:

1. *Control panel with control display*
2. *Combustion Air Fan/burner assembly*
3. *Gas valve and control*
4. *Cylindrical metal fiber burner*
5. *Dual Electrode for direct spark ignition (not shown)*
6. *Electrode for flame signal monitoring (not shown)*
7. *Electronic control for modulating burner*
8. *Double wall AluFer® tubes*
9. *Condensation collection reservoir*

Enhanced efficiency with single pass condensing heat exchanger

The single pass stainless steel *ClearFire* boiler has a premix burner downfiring into a vertical water surrounded tube nest made up of high efficiency AluFer® tubes.

The extended heating surface and corrosion resistant properties of the AluFer® tube ensure enhancing heat transfer and peak condensing performance.

Condensate collects into an engineered plastic steel lined reservoir at the base of the boiler. (A trap is required to allow condensate to run by gravity to drain).

A condensate neutralization reservoir can be supplied as an optional extra, if required by local ordinances.

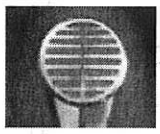
AluFer® Tubes — the formula for maximum condensation

The internationally patented AluFer® tube is the latest CB innovation in advanced heat transfer technology.

The tube is constructed from an inner aluminum alloy finned surface, die fitted within an outer stainless steel tube providing exceptional heat exchange characteristics.

The efficiency of the heat transfer is attributable to the following factors:

- *Heat conductivity of the Alufer® insert is ten times greater than that of carbon steel.*
- *Internal finned surface of the Alufer® tube enlarges the heat exchange surface fivefold.*
- *Inner surface of the tube is divided into eight flow channels to create maximum turbulence and heat transfer.*



The extended internal surface of the AluFer® tube on the gas side ensure that the condensate formed contains less dissolved heavy metals than would be the case with stainless steel.

The construction of the condensing heat exchanger is such that the AluFer® tubes are arranged vertically, therefore the condensate formed does not remain on the heat exchange surface but runs downward to the collection reservoir and drain as can be seen in the cutaway of the boiler.

Premix modulating burner operation

The premix burner controls automatically adjust the air/gas mixture to the correct proportions before it enters the burner.

A symmetrical 360° even temperature heat output is achieved from the burner, giving consistent high efficiency combustion with low NOx emissions. Turndown is 5:1 with standard emissions of < 20 ppm.

Burner Gas Train

Standard components meet the requirements of CSA, ASME CSD-1, GE-GAP/[IRI], and FM. These items include:

- *Low Gas Pressure manual reset.*
- *High Gas Pressure manual reset.*
- *CSD-1 Test Cocks*
- *Manual Test Valve*
- *Dual Safety Shutoff Valves*

Gas Train is factory piped and wired on the burner. Gas supply connection should be made at the rear of the boiler and include a drip leg.

Boiler Trim and Controls

Boiler trim is in accordance with CSA and ASME CSD-1 which includes:

- *High Limit Temperature Control — Manual Reset*
- *Combustion Air Proving Switch*
- *High Air Pressure Switch*
- *Manual Reset Probe Type Low Water Cutoff*
- *ASME Safety Relief Valve set @ 60 psig.*

Quality Assurance

Each *ClearFire* Boiler is manufactured in accordance with ASME Section IV requirements and appropriately stamped. Manufacturing process is according to ISO 9001 standards to ensure the highest quality standards are built into each boiler. The complete package is CSA certified, listed, and labeled.

Warranty

In addition to the standard warranty, the pressure vessel is warranted for 20 years against thermal shock and 10 years against fireside condensation corrosion. The burner cannister is warranted for 5 years.

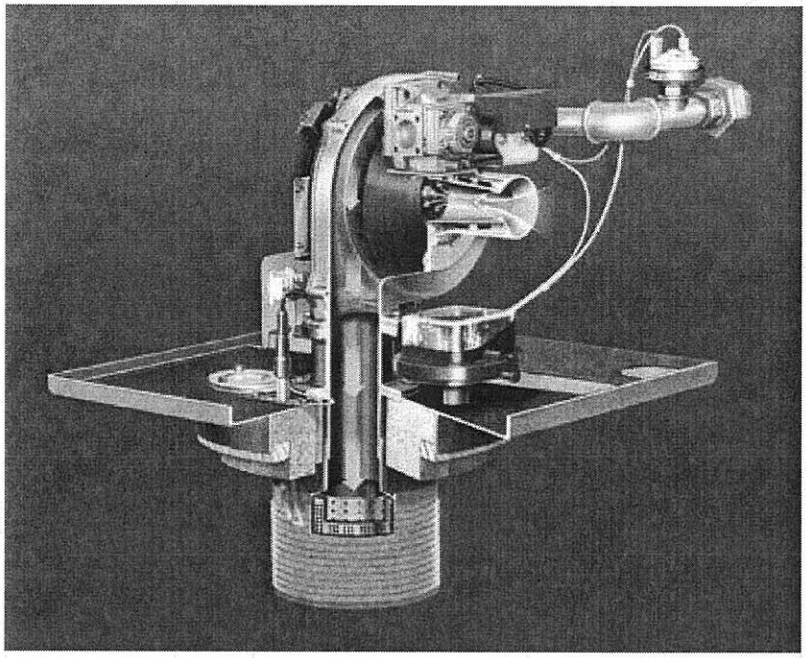
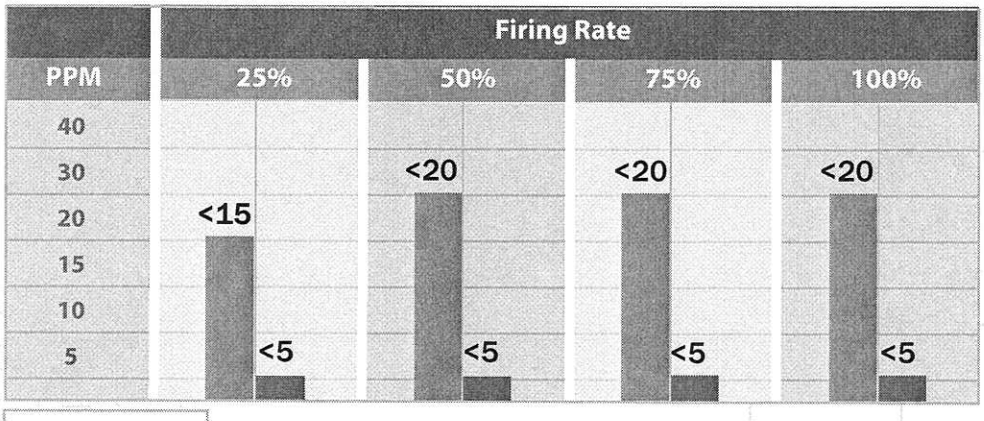


TABLE A-1

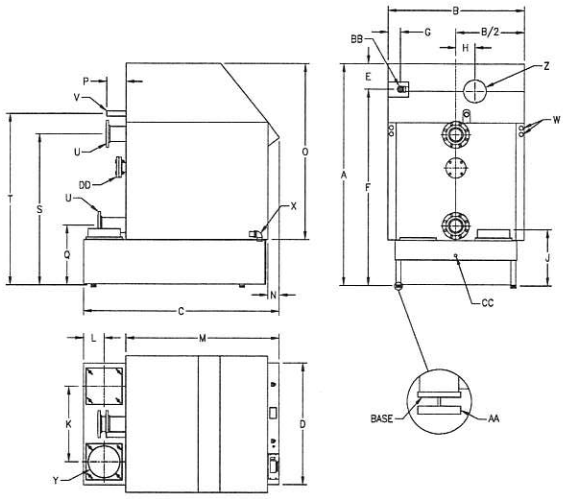
Firing Rate %	Return Water Temperature F					
	68	86	104	122	140	158
20	99	98.4	95.25	90.5	88.5	87.9
50	98.25	97.8	95	89.5	87.9	87.5
75	98	97	93	89	87.5	86.5
100	97.2	96	91.9	88.25	87	86.25
	Fuel To Water Efficiency %					

CERTIFIED EMISSIONS [SCAQMD]

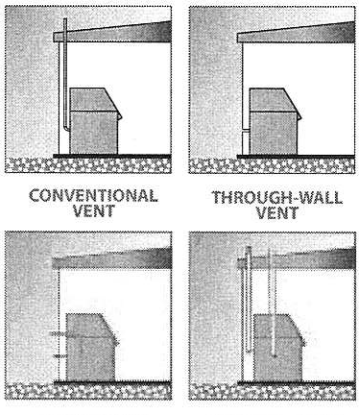


CLEARFIRE
MODEL CFC

DIMENSIONS AND RATINGS



VENTING OPTIONS



CONVENTIONAL VENT

THROUGH-WALL VENT

DIRECT VENT/ SEALED COMBUSTION

VERTICAL VENT/ SEALED COMBUSTION

ITEM	DIMENSIONS	BOILER SIZE					
		500	750	1000	1500	1800	2500
A	OVERALL HEIGHT	71.9"	71.9"	75.4"	81.5"	81.5"	81.9"
B	OVERALL WIDTH	32.3"	32.3"	36.6"	43.7"	43.7"	50.8"
C	OVERALL DEPTH	48.9"	48.9"	64.0"	65.6"	65.6"	72.3"
D	WIDTH LESS CASING	26.8"	26.8"	31.1"	38.2"	38.2"	45.3"
E	GAS CONNECTION TO TOP OF CASING	7.8"	7.8"	9.2"	9.5"	9.5"	9.4"
F	GAS CONNECTION TO FLOOR	64.1"	64.1"	66.2"	72"	72"	72.5"
G	SIDE OF CASING TO GAS CONNECTION	2.5"	2.5"	3.8"	4.9"	4.3"	5.2"
H	BOILER CENTERLINE TO AIR INLET	4.3"	4.3"	3.9"	7.0"	7.0"	7.0"
J	FLOOR TO TOP OF STACK CONNECTION	18.6"	18.6"	18.1"	19.1"	19.1"	20.9"
K	CENTERLINE TO CENTERLINE OF STACK STUB	15.4"	15.4"	16.9"	21.0"	21.0"	28.1"
L	REAR OF BOILER TO CENTERLINE OF STACK STUB	5.4"	5.4"	7.5"	8.1"	8.1"	8.6"
M	FRONT OF BOILER TO REAR OF CASING	38.8"	38.8"	49.6"	49.4"	49.4"	56.5"
N	CONTROL PANEL PROJECTION	4.1"	4.1"	4.1"	4.1"	4.1"	4.1"
O	CASING HEIGHT	56.2"	56.2"	60"	65.4"	65.4"	65.4"
P	AIR VENT LINE PROJECTION	7.87"	7.87"	7.3"	8.1"	8.1"	8.7"
Q	FLOOR TO CENTERLINE OF RETURN CONNECTION	19.3"	19.3"	19.3"	20.3"	21.1"	21.9"
S	FLOOR TO CENTERLINE OF SUPPLY CONNECTION	54.3"	54.3"	55.9"	56.7"	56"	56.8"
T	FLOOR TO CENTERLINE OF AIR VENT	59.9"	59.9"	62"	62.9"	62.9"	64.8"
AA	BOILER ADJUSTMENT FOOT HEIGHT	2.5"	2.5"	2.5"	2.5"	2.5"	2.5"
AB	HEIGHT ABOVE BOILER FOR BURNER SERVICE	14"	14"	14"	14"	14"	14"
	Connections						
U	WATER SUPPLY AND RETURN, 150 RF FLG	2.5"	2.5"	2.5"	3.0"	4.0"	5.0"
V	BOILER AIR VENT, NPT	1.5"	1.5"	1.5"	1.5"	1.5"	1.5"
W	ELECTRICAL CONDUIT, LEFT OR RIGHT	1.6"	1.6"	1.6"	1.6"	1.6"	1.6"
X	BOILER DRAIN, NPT	1.5"	1.5"	1.5"	1.5"	1.5"	1.5"
Y	FLUE GAS NOMINAL OD, LEFT OR RIGHT OPTION	6"	6"	8"	10"	12"	12"
Z	COMBUSTION AIR OPTION	4"	4"	6"	6"	6"	8"
BB	GAS CONNECTION, NPT	1"	1"	1"	1.5"	1.5"	1.5"
CC	CONDENSATE DRAIN, NPT	.75"	.75"	.75"	.75"	.75"	1.0"
DD	WATERSIDE INSPECTION, 150# BLIND FLANGE	3"	3"	3"	3"	3"	3"
EE	RELIEF VALVE @ 60# SETTING	1"	1"	1"	1"	1.25"	1.25"
	RELIEF VALVE @ 30# SETTING	1"	1"	1"	1.25"	2"	2"
	VOLTAGE FAN MOTOR, SINGLE PHASE	115	208-230	208-230	208-230	208-230	115
	VOLTAGE CONTROL CIRCUIT	115/1/60	115/1/60	115/1/60	115/1/60	115/1/60	115/1/60
	Ratings						
	MAXIMUM BTU/HR INPUT @ SEA LEVEL TO 2000'	500,000	750,000	1,000,000	1,500,000	1,800,000	2,500,000
	*BTU/HR OUTPUT @ SEA LEVEL TO 2000' NAT GAS	480,000	720,000	970,000	1,455,000	1,737,000	2,412,500
	SHIPPING WEIGHT, LBS.	1,477	1,477	1,554	1,940	2,061	3,600
	OPERATING WEIGHT, LBS.	2,224	2,224	2,276	2,835	2,932	4,654
	INLET GAS PRESSURE, LO FIRE/HI FIRE "W.C.	7.0/5.0	7.0/5.0	7.0/5.0	10.0/7.0	13.5/10.0	9.5/8.0
	MAX. AMP DRAW FAN @ 230/1/60	N/A	2.15	2.15	5.0	5.0	N/A
	MAX. AMP DRAW FAN @ 115/1/60	4.0	N/A	N/A	N/A	N/A	12.0
	AMP DRAW CONTROL CIRCUIT	1.3	1.3	1.5	1.5	2.0	2.0

NOTE: OUTPUT BASED ON RETURN WATER TEMPERATURE AT 80°F

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CB-7957
05/08

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments

ECM - 6a Replacement of Smith Sectional Boilers with High Efficiency Hot Water Boilers

Garden Apartments - Bldgs. 1- 5

Suggestions

Install six (6) new high efficiency hot water boilers to replace the existing Smith Sectional 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 Hot Water Boilers	6	ea	$ 20,000			$ 120,000	$ -	$ -	$ 120,000	1 MMBH Condensing Boiler
Boiler Control System	5	ea.	$ 1,500			$ 7,500	$ -	$ -	$ 7,500	
System Startup	6	Lot		$ 500		$ -	$ 3,660	$ -	$ 3,660	I day startup
Boiler - Mechanical Removal: remove piping, condensate reciever, sectional boiler.	6			$ 1,875		$ -	$ 13,725	$ -	$ 13,725	Means Mechanical Cost Data - 2009
Boiler - Electrical Removal; remove all electrical feeds to boiler and condensate reciver and feedpump.	6			$ 800		$ -	$ 5,856	$ -	$ 5,856	Means Mechanical Cost Data - 2009
Boiler Installation: Install new boiler; tie in new piping to existing pipe headers; install new flue stack; install new pump; insulate piping.	6	Lot	$ 19,200	$ 13,200		$ 115,200	$ 96,624	$ -	$ 211,824	Means Mechanical Cost Data - 2009
Electrical Installation: Install power to boiler and circualtion pump; wire controls.	6	Lot	$ 1,400	$ 2,600		$ 8,400	$ 19,032	$ -	$ 27,432	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.

$ 389,997	Subtotal
$ 39,000	10% Contingency
$ 64,350	15% Contractor O&P
$ 49,335	10% Engineering
$ 493,346	**Total**

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments

ECM - 6a Replacement of Smith Sectional Boilers with High Efficiency Hot Water Boilers

Townhome Apartments - Bldgs. 6 - 8

Suggestions

Install three (3) new high efficiency hot water boilers to replace the existing Smith Sectional 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 Hot Water Boilers	3	ea	$ 20,000			$ 60,000	$ -	$ -	$ 60,000	1 MMBH Condensing Boiler
Boiler Control System	3	ea.	$ 1,500			$ 4,500	$ -	$ -	$ 4,500	
System Startup	3	Lot		$ 500		$ -	$ 1,830	$ -	$ 1,830	I day startup
Boiler - Mechanical Removal: remove piping, condensate reciever, sectional boiler.	3			$ 1,875		$ -	$ 6,863	$ -	$ 6,863	Means Mechanical Cost Data - 2009
Boiler - Electrical Removal; remove all electrical feeds to boiler and condensate reciver and feedpump.	3			$ 800		$ -	$ 2,928	$ -	$ 2,928	Means Mechanical Cost Data - 2009
Boiler Installation: Install new boiler; tie in new piping to existing pipe headers; install new flue stack; install new pump; insulate piping.	3	Lot	$ 19,200	$ 13,200		$ 57,600	$ 48,312	$ -	$ 105,912	Means Mechanical Cost Data - 2009
Electrical Installation: Install power to boiler and circualtion pump; wire controls.	3	Lot	$ 1,400	$ 2,600		$ 4,200	$ 9,516	$ -	$ 13,716	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.

$ 195,749	Subtotal
$ 19,575	10% Contingency
$ 32,299	15% Contractor O&P
$ 24,762	10% Engineering
$ 247,622	**Total**

APPENDIX L

ECM-6b Boiler Replacement with High Efficiency Steam

YOUR SUMMARY GARDEN APARTMENTS 1-5

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 Replacement Steam 84%: Install new natural gas 700,000 Btu/hr boiler with efficiency of 84.0 %.	Increased equity.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 1,333		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		118.0		
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: 1.1300 $/Therm
- Electricity: 0.1750 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Boiler Replacement Steam to 84%

Meadowview Apartment Bld #1

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Boiler Reaplacement Steam to 78%

New Heating Plant Installation

Heat Plant Type	Boiler, Steam
Fuel	Natural gas
Input Capacity, Btu/Hr	1000000
Efficiency%	84

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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 1 5828 Meadowview A
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: Boiler Replacement Steam to 84%

Billing Period Name: None

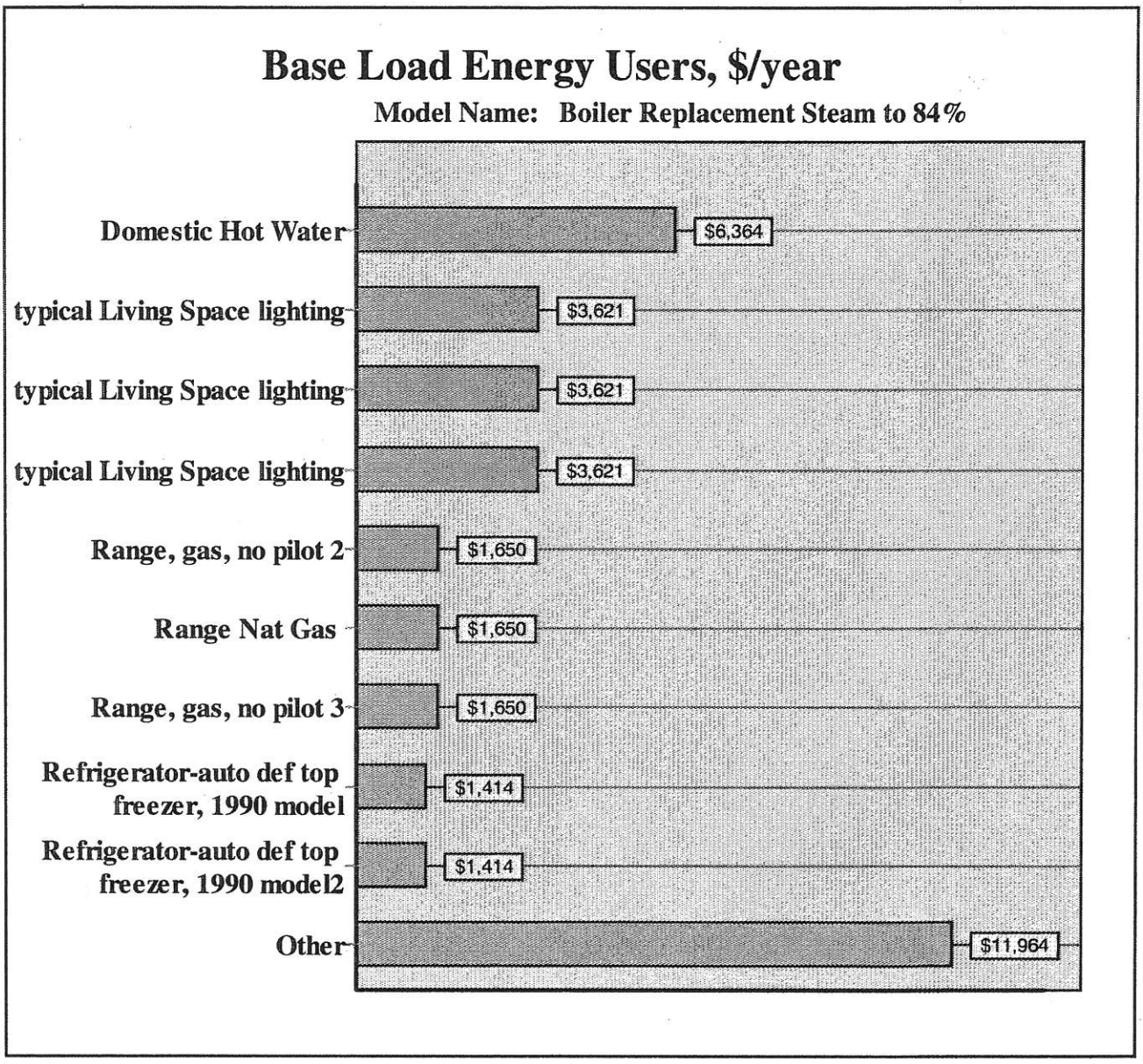
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	12,757	14,415	142,575	22,812		
Billing						
% Difference						

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

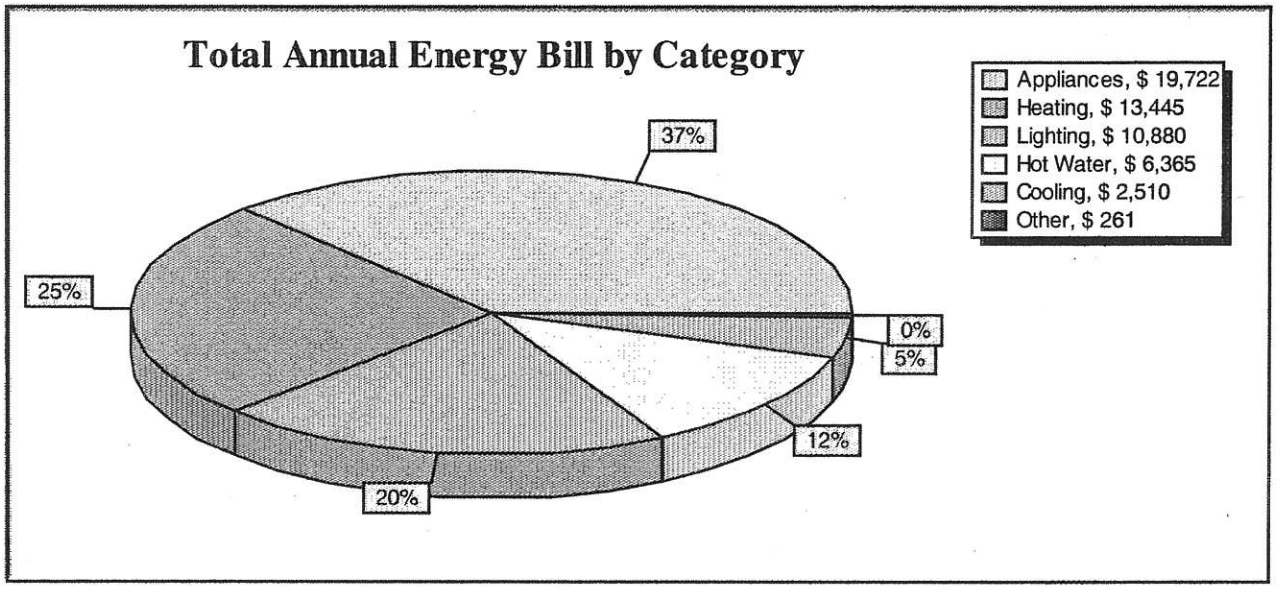
Model Name: Boiler Replacement Steam to 84%

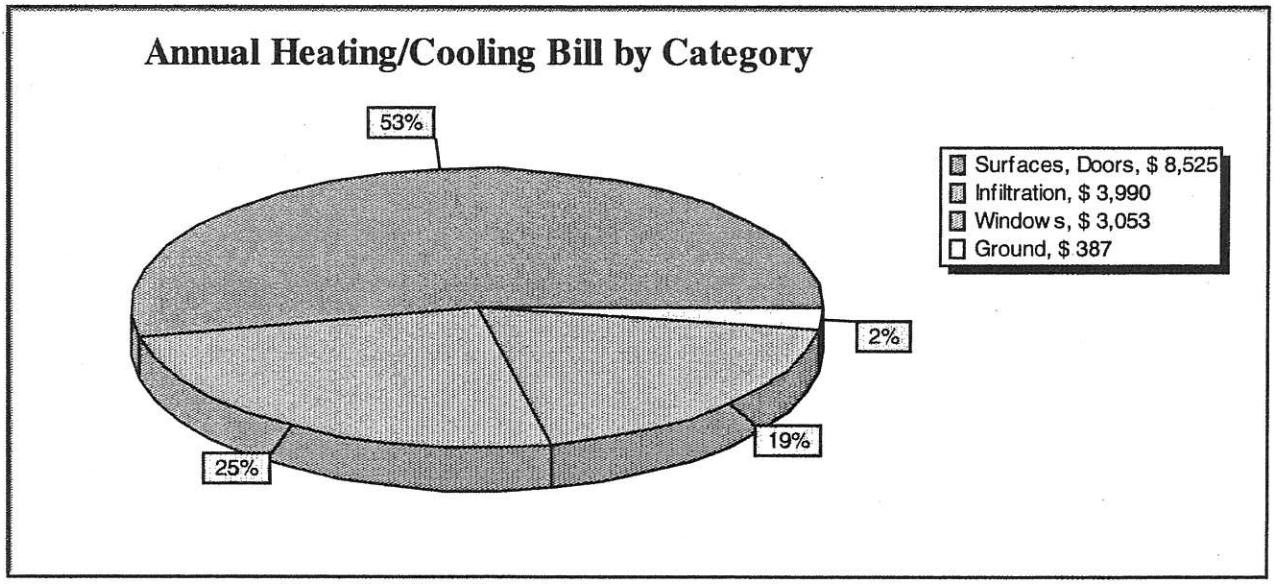
	Natural gas $1.13 per Therm		Electricity $0.16 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	5,632	6,364	0	0			6,364
2. typical Living Space lighting	0	0	22,630	3,621			3,621
3. typical Living Space lighting	0	0	22,630	3,621			3,621
4. typical Living Space lighting	0	0	22,630	3,621			3,621
5. Range, gas, no pilot 2	1,460	1,650	0	0			1,650
6. Range Nat Gas	1,460	1,650	0	0			1,650
7. Range, gas, no pilot 3	1,460	1,650	0	0			1,650
8. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
9. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
10. Other	2,745	3,102	55,372	8,862			11,964
TOTAL	12,757	14,416	140,942	22,553			36,969


Base Load Energy Users, $/year
Model Name: Boiler Replacement Steam to 84%
Domestic Hot Water
$6,364
typical Living Space lighting
$3,621
typical Living Space lighting
$3,621
typical Living Space lighting
$3,621
Range, gas, no pilot 2
$1,650
Range Nat Gas
$1,650
Range, gas, no pilot 3
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,414
Refrigerator-auto def top freezer, 1990 model2
$1,414
Other
$11,964

MODEL ENERGY REPORT FOR BOILER REPLACEMENT STEAM TO 84%

Meadowview Apartment Bld #1
For: NBHA
By:
Date: 9/2/2009





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

DESIGN HEATING AND COOLING LOADS FOR BOILER REPLACEMENT STEAM TO 84%

9/2/2009
Project Name: Meadowview Apartment Bld #1

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
1st Floor	180179	30	20.5	345
3rd Floor	341203	56	38.8	653
Boiler Room	3825	12	0.4	8
2nd Floor	100713	17	11.4	193

Required Heating Equipment Output Capacity: 726162 Btu/hr
Available Heating Equipment Output Capacity: 840000 Btu/hr
Total flow: 72.6 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 84 %
Calculated Distribution Efficiency: 95 %
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
1st Floor	137415	4999
3rd Floor	351443	12784
Boiler Room	0	0
2nd Floor	118986	4329

Required Cooling Equipment Output Capacity: 651020 Btu/hr

Available Cooling Equipment Output Capacity: 70000 Btu/hr

Total flow: 21528 CFM

Cooling Equipment Efficiency: 10 SEER

Calculated Distribution Efficiency: 100%

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.

YOUR SUMMARY TOWN HOME APARTMENTS 6-8

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 Reaplacement Steam to 78%: Install new natural gas 1,000,000 Btu/hr boiler with efficiency of 84.0 %.	Increased equity.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 2,875		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		254.4		
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: 1.1300 $/Therm
- Electricity: 0.1600 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Boiler Replacement Steam to 84%

Meadowview Town Home #7

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Boiler Replacement Steam 84%

New Heating Plant Installation

Heat Plant Type	Boiler, Steam
Fuel	Natural gas
Input Capacity, Btu/Hr	700000
Efficiency%	84

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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 7 5828 Meadowview
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: Boiler Replacement Steam to 84%

Billing Period Name: None

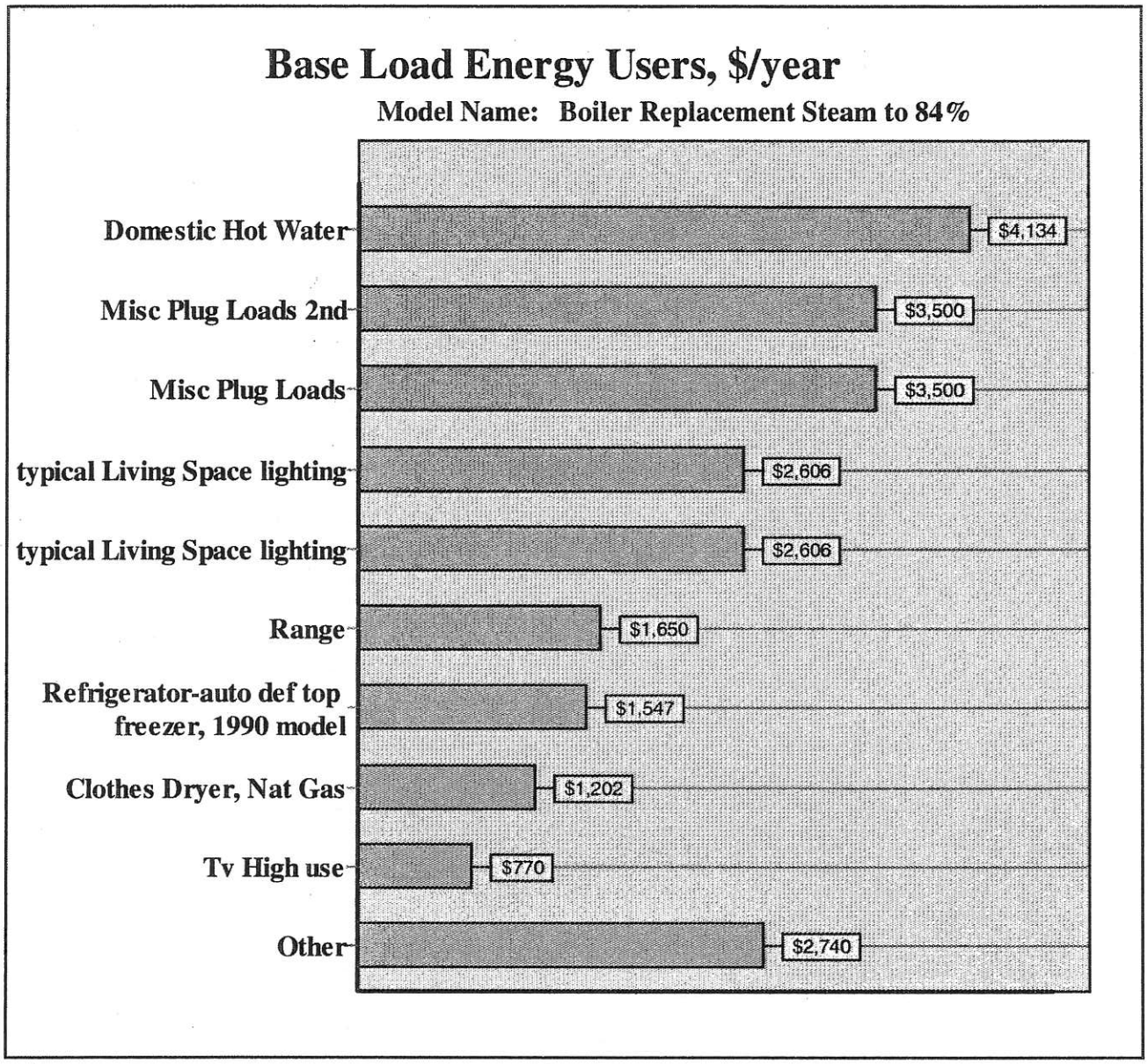
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	6,033	6,817	101,272	17,723		
Billing						
% Difference						

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 Replacement Steam to 84%

	Natural gas $1.13 per Therm		Electricity $0.18 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	3,658	4,134	0	0			4,134
2. Misc Plug Loads 2nd	0	0	20,000	3,500			3,500
3. Misc Plug Loads	0	0	20,000	3,500			3,500
4. typical Living Space lighting	0	0	14,892	2,606			2,606
5. typical Living Space lighting	0	0	14,892	2,606			2,606
6. Range	1,460	1,650	0	0			1,650
7. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,547			1,547
8. Clothes Dryer, Nat Gas	915	1,034	960	168			1,202
9. Tv High use	0	0	4,400	770			770
10. Other	0	0	15,654	2,740			2,740
TOTAL	6,033	6,818	99,638	17,437			24,255


Base Load Energy Users, $/year
Model Name: Boiler Replacement Steam to 84%
Domestic Hot Water
$4,134
Misc Plug Loads 2nd
$3,500
Misc Plug Loads
$3,500
typical Living Space lighting
$2,606
typical Living Space lighting
$2,606
Range
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,547
Clothes Dryer, Nat Gas
$1,202
Tv High use
$770
Other
$2,740

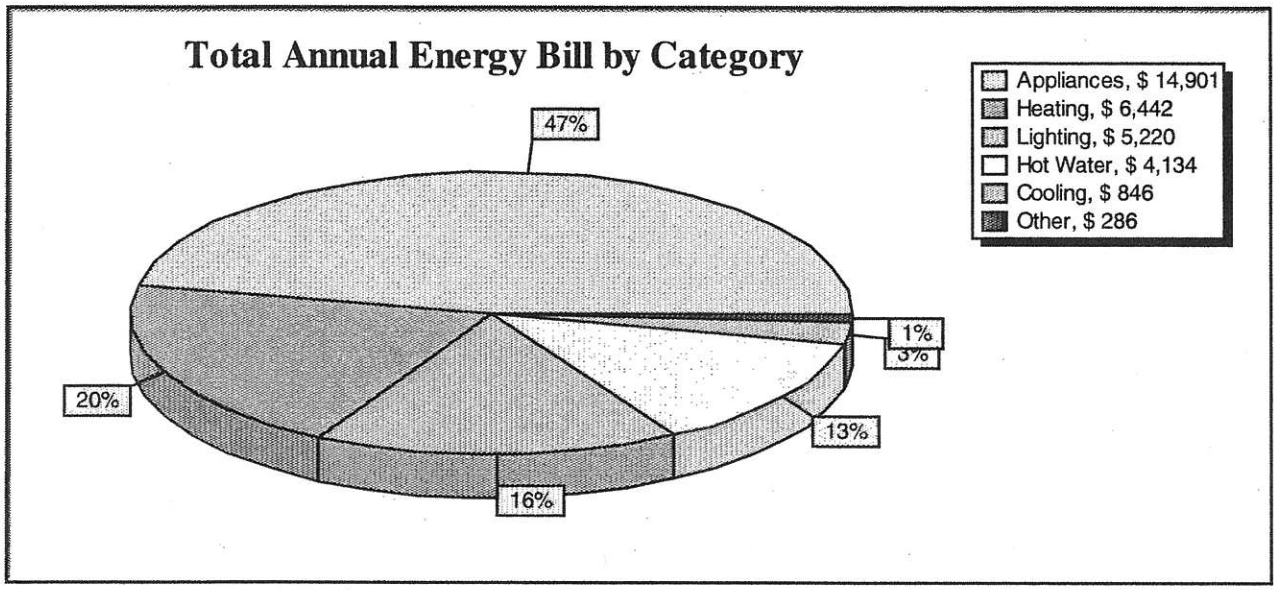
MODEL ENERGY REPORT FOR BOILER REPLACEMENT STEAM TO 84%

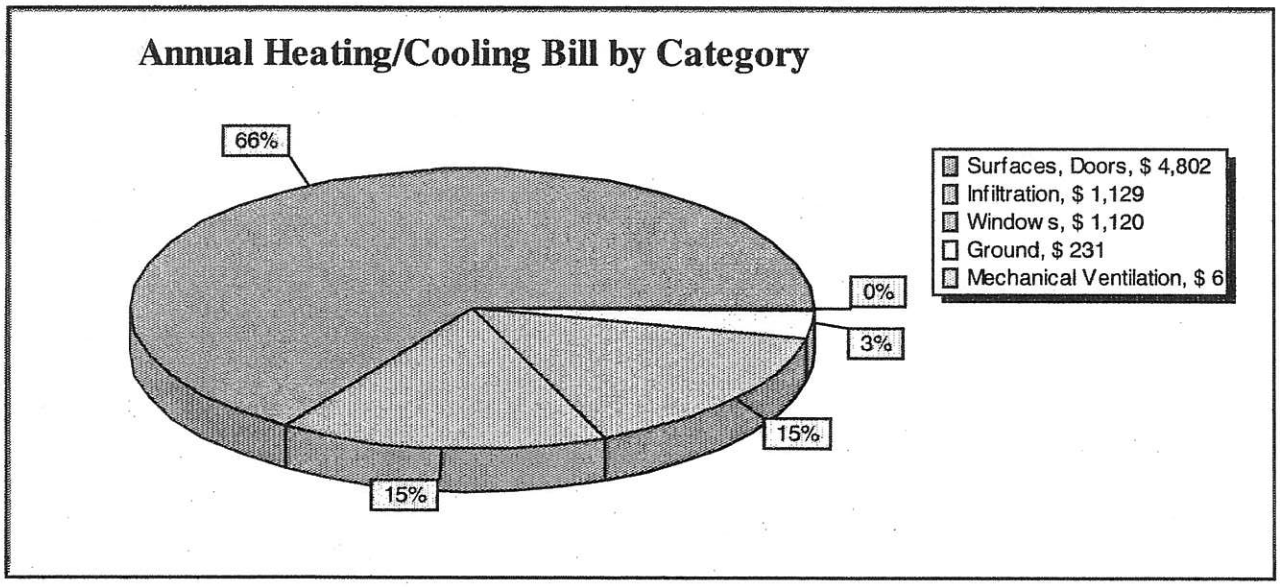
Meadowview Town Home #7

For: NBHA

By:

Date: 9/2/2009





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

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.

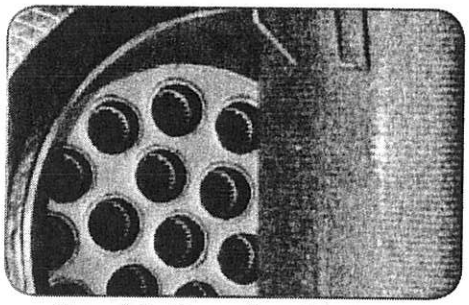
- *Fully-modulating with high turndown via variable speed blower maximizing fuel savings*
- *High efficiencies up to 85%, reduces greenhouse gas emissions*
- *Easily-tuned, zero-governor, premix Burner*
- *More reliable operation with no dampers or linkages*
- *Advanced combustion design eliminates need 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

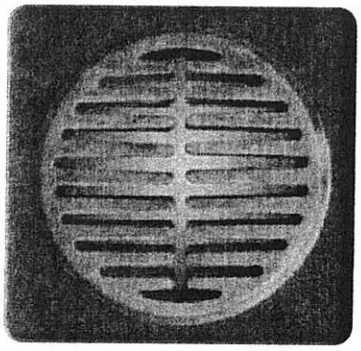
The ClearFire-H's high efficiency is achieved by employing an advanced Fecralloy burner designed to premix air and fuel for optimal combustion and low emissions. A variable speed blower motor provides extended burner turndown capability.



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.*

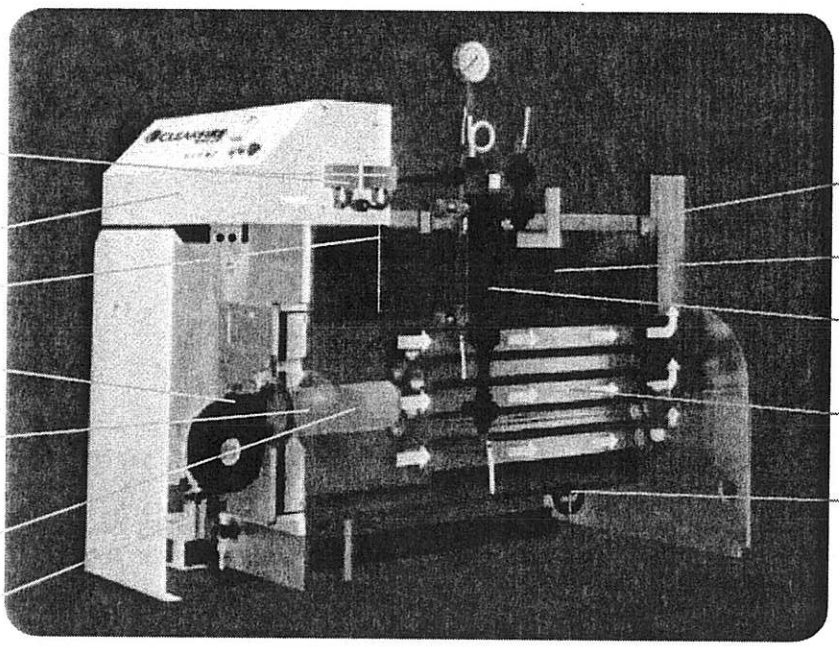
C-B Falcon Control

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

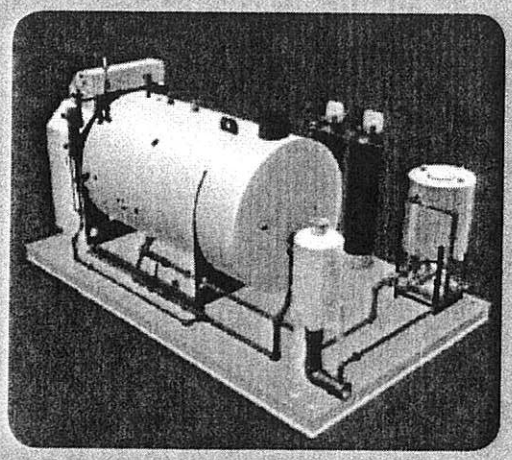
The ClearFire- H Advantage



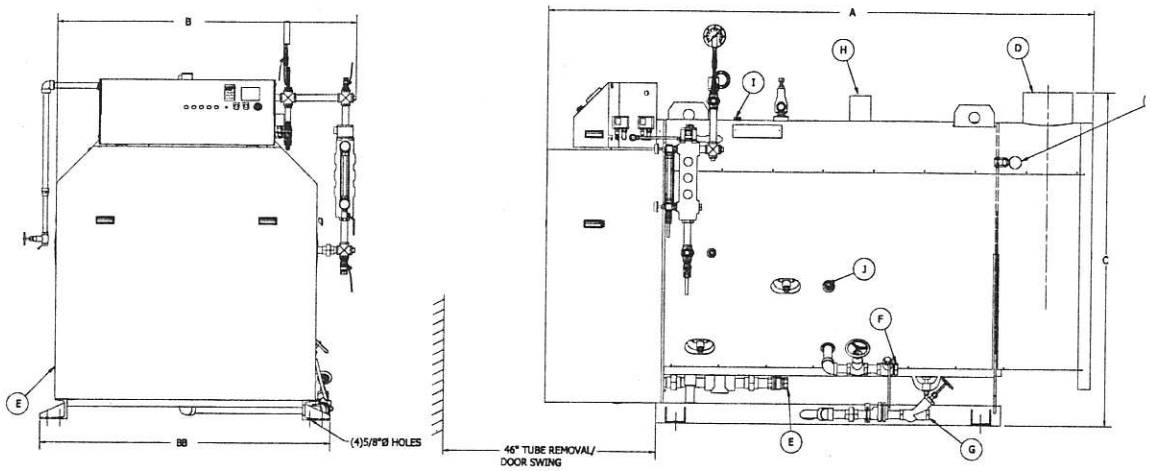
Single Source Skid Package Solutions

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°

CLEAVER BROOKS

The power of commitment.

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CB-8084

06/09

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments

ECM - 6b Replacement of Smith Sectional Boilers with High Efficiency Hot Water Boilers

Garden Apartments - Bldgs. 1- 5

Suggestions

Install six (6) new high efficiency steam boilers to replace the existing Smith Sectional 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	6	ea	$ 20,000			$ 120,000	$ -	$ -	$ 120,000	1 MMBH Condensing Boiler
System Startup	6	Lot		$ 500		$ -	$ 3,660	$ -	$ 3,660	I day startup
Boiler - Mechanical Removal: Remove some piping and the sectional boiler.	6			$ 1,500		$ -	$ 10,980	$ -	$ 10,980	Means Mechanical Cost Data - 2009
Boiler - Electrical Removal; remove all electrical feeds to boilers.	6			$ 200		$ -	$ 1,464	$ -	$ 1,464	Means Mechanical Cost Data - 2009
Boiler Installation: Install new boiler; tie in new piping to existing pipe headers; reinstall flue stack; insulate piping.	6	Lot	$ 5,000	$ 5,200		$ 30,000	$ 38,064	$ -	$ 68,064	Means Mechanical Cost Data - 2009
Electrical Installation: Install power to boiler and circualtion pump; wire controls.	6	Lot	$ 400	$ 800		$ 2,400	$ 5,856	$ -	$ 8,256	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.

$ 212,424	Subtotal
$ 10,621	5% Contingency
$ 33,457	15% Contractor O&P
$ 25,650	10% Engineering
$ 256,502	**Total**

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments

ECM - 6b Replacement of Smith Sectional Boilers with High Efficiency Hot Water Boilers

Townhome Apartments - Bldgs. 6 - 8

Suggestions

Install three (3) new high efficiency steam boilers to replace the existing Smith Sectional 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	3	ea	$ 20,000			$ 60,000	$ -	$ -	$ 60,000	1 MMBH Condensing Boiler
System Startup	3	Lot		$ 500		$ -	$ 1,830	$ -	$ 1,830	I day startup
Boiler - Mechanical Removal: remove piping, condensate reciever, sectional boiler.	3			$ 1,500		$ -	$ 5,490	$ -	$ 5,490	Means Mechanical Cost Data - 2009
Boiler - Electrical Removal; remove all electrical feeds to boiler and condensate reciver and feedpump.	3			$ 200		$ -	$ 732	$ -	$ 732	Means Mechanical Cost Data - 2009
Boiler Installation: Install new boiler; tie in new piping to existing pipe headers; install new flue stack; install new pump; insulate piping.	3	Lot	$ 5,000	$ 5,200		$ 15,000	$ 19,032	$ -	$ 34,032	Means Mechanical Cost Data - 2009
Electrical Installation: Install power to boiler and circualtion pump; wire controls.	3	Lot	$ 400	$ 800		$ 1,200	$ 2,928	$ -	$ 4,128	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.

$ 106,212	Subtotal
$ 5,311	5% Contingency
$ 16,728	15% Contractor O&P
$ 12,825	10% Engineering
$ 128,251	**Total**

APPENDIX M

ECM-7a Insulate Attics

Not used

APPENDIX N

ECM-7b Insulate Crawlspace

YOUR SUMMARY GARDEN APARTMENTS 1-5

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
Crawl Space Cieling Insulation: Upgrade 4,439 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		$ 374		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		33.1		
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: 1.1300 $/Therm
- Electricity: 0.1750 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Crawl Space Cieling Insulation

Meadowview Apartment Bld #1

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Crawl Space Cieling Insulation

Surface Insulation

Upgrade 6241 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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 1 5828 Meadowview A
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: Crawl Space Cieling Insulation

Billing Period Name: None

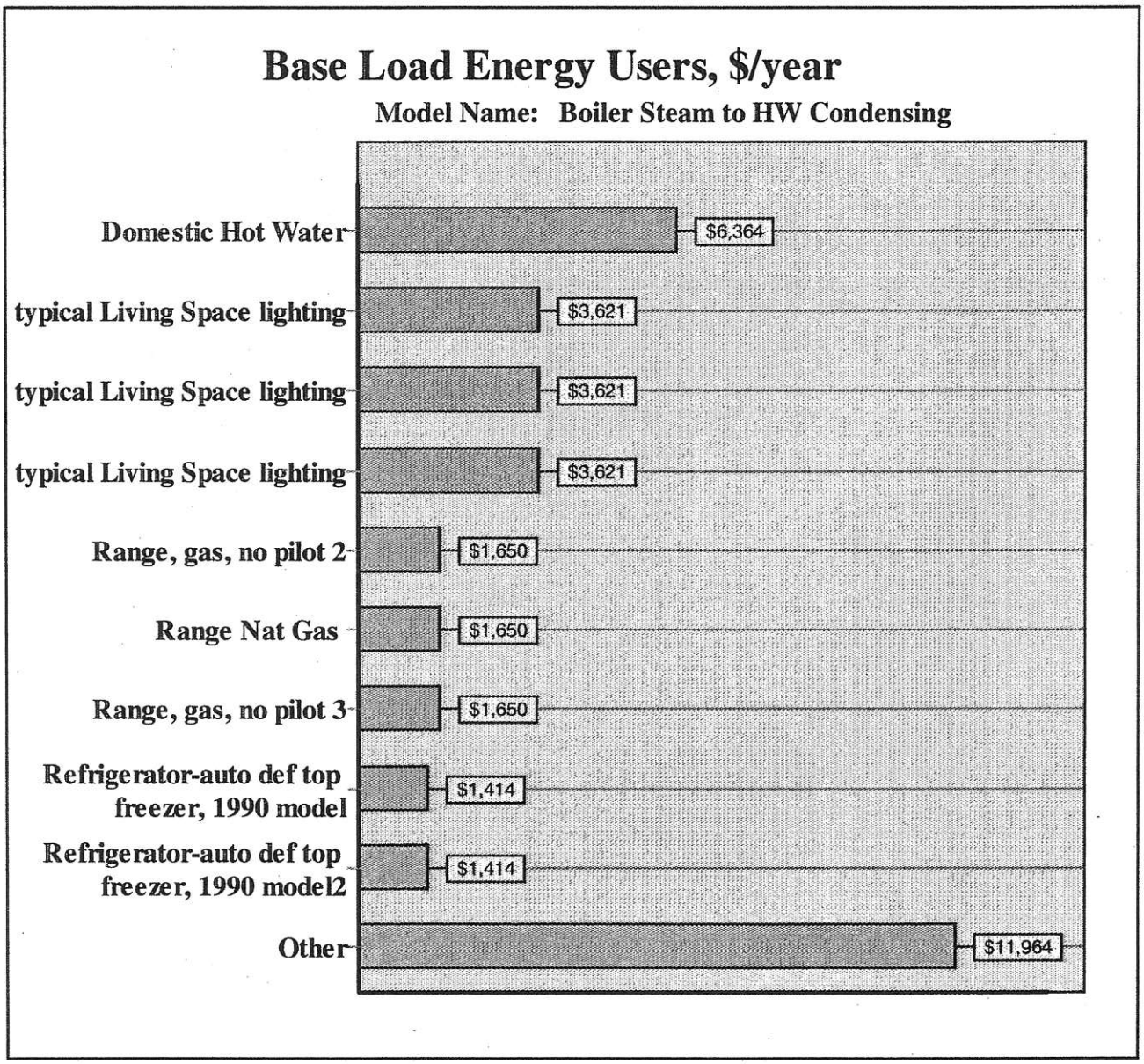
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	12,757	14,415	142,575	22,812		
Billing						
% Difference						

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: Crawl Space Cieling Insulation

	Natural gas $1.13 per Therm		Electricity $0.16 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	5,632	6,364	0	0			6,364
2. typical Living Space lighting	0	0	22,630	3,621			3,621
3. typical Living Space lighting	0	0	22,630	3,621			3,621
4. typical Living Space lighting	0	0	22,630	3,621			3,621
5. Range, gas, no pilot 2	1,460	1,650	0	0			1,650
6. Range Nat Gas	1,460	1,650	0	0			1,650
7. Range, gas, no pilot 3	1,460	1,650	0	0			1,650
8. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
9. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
10. Other	2,745	3,102	55,372	8,862			11,964
TOTAL	12,757	14,416	140,942	22,553			36,969


Base Load Energy Users, $/year
Model Name: Boiler Steam to HW Condensing
Domestic Hot Water
$6,364
typical Living Space lighting
$3,621
typical Living Space lighting
$3,621
typical Living Space lighting
$3,621
Range, gas, no pilot 2
$1,650
Range Nat Gas
$1,650
Range, gas, no pilot 3
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,414
Refrigerator-auto def top freezer, 1990 model2
$1,414
Other
$11,964

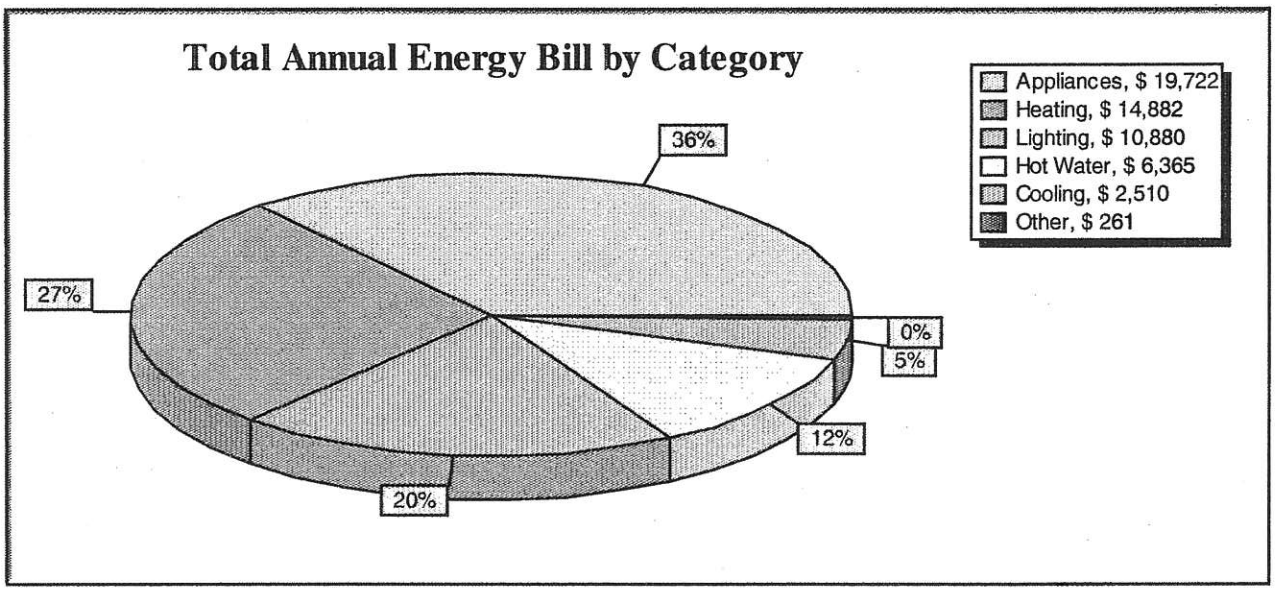
MODEL ENERGY REPORT FOR CRAWL SPACE CIELING INSULATION

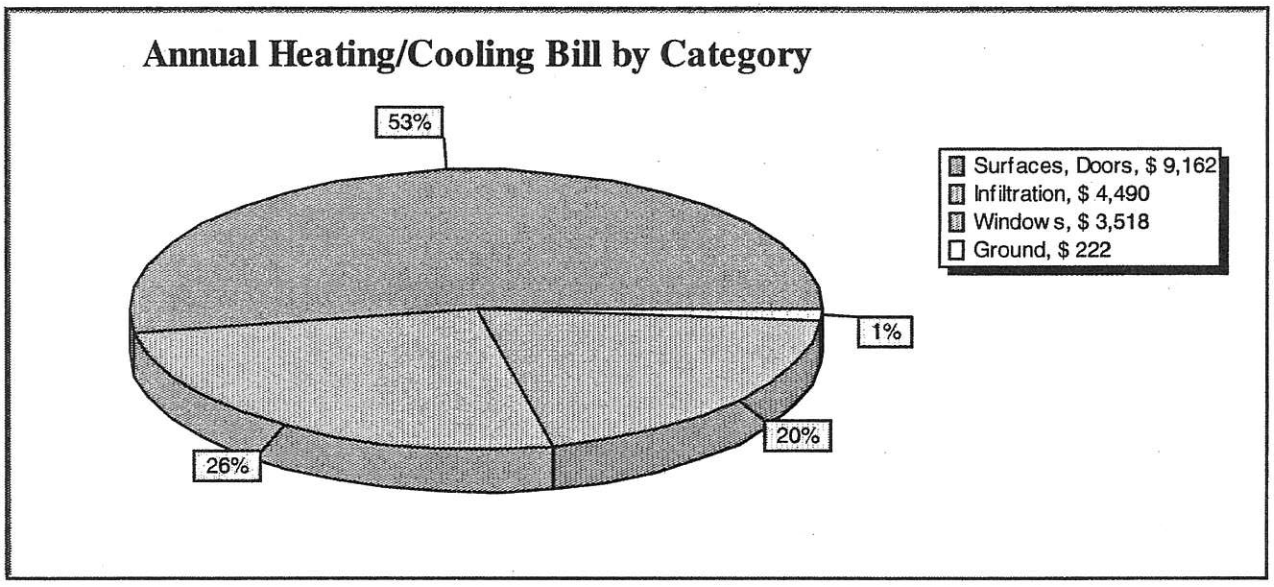
Meadowview Apartment Bld #1

For: NBHA

By:

Date: 9/2/2009





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

DESIGN HEATING AND COOLING LOADS FOR CRAWL SPACE CIELING INSULATION

9/2/2009
Project Name: Meadowview Apartment Bld #1

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
1st Floor	152836	25	17.4	293
3rd Floor	341104	56	38.8	653
Boiler Room	3818	12	0.4	8
2nd Floor	100614	17	11.4	193

Required Heating Equipment Output Capacity: 704217 Btu/hr
Available Heating Equipment Output Capacity: 700000 Btu/hr
Total flow: 70.4 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 70 %
Calculated Distribution Efficiency: 93 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10
HEATING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED HEATING LOAD.

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
1st Floor	136535	4967
3rd Floor	351244	12777
Boiler Room	0	0
2nd Floor	118914	4326

Required Cooling Equipment Output Capacity: 651778 Btu/hr

Available Cooling Equipment Output Capacity: 70000 Btu/hr

Total flow: 21553 CFM

Cooling Equipment Efficiency: 10 SEER

Calculated Distribution Efficiency: 100%

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.

YOUR SUMMARY

TOWN HOME APARTMENTS 6-8

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
Crawl Space Cieling Insulation: Upgrade 6,241 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		$ 1,437		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		127.2		
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: 1.1300 $/Therm
- Electricity: 0.1600 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Crawl Space Cieling Insulation

Meadowview Town Home #7

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Crawl Space Cieling Insulation

Surface Insulation

Upgrade 4438.75 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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 7 5828 Meadowview
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: Crawl Space Cieling Insulation

Billing Period Name: None

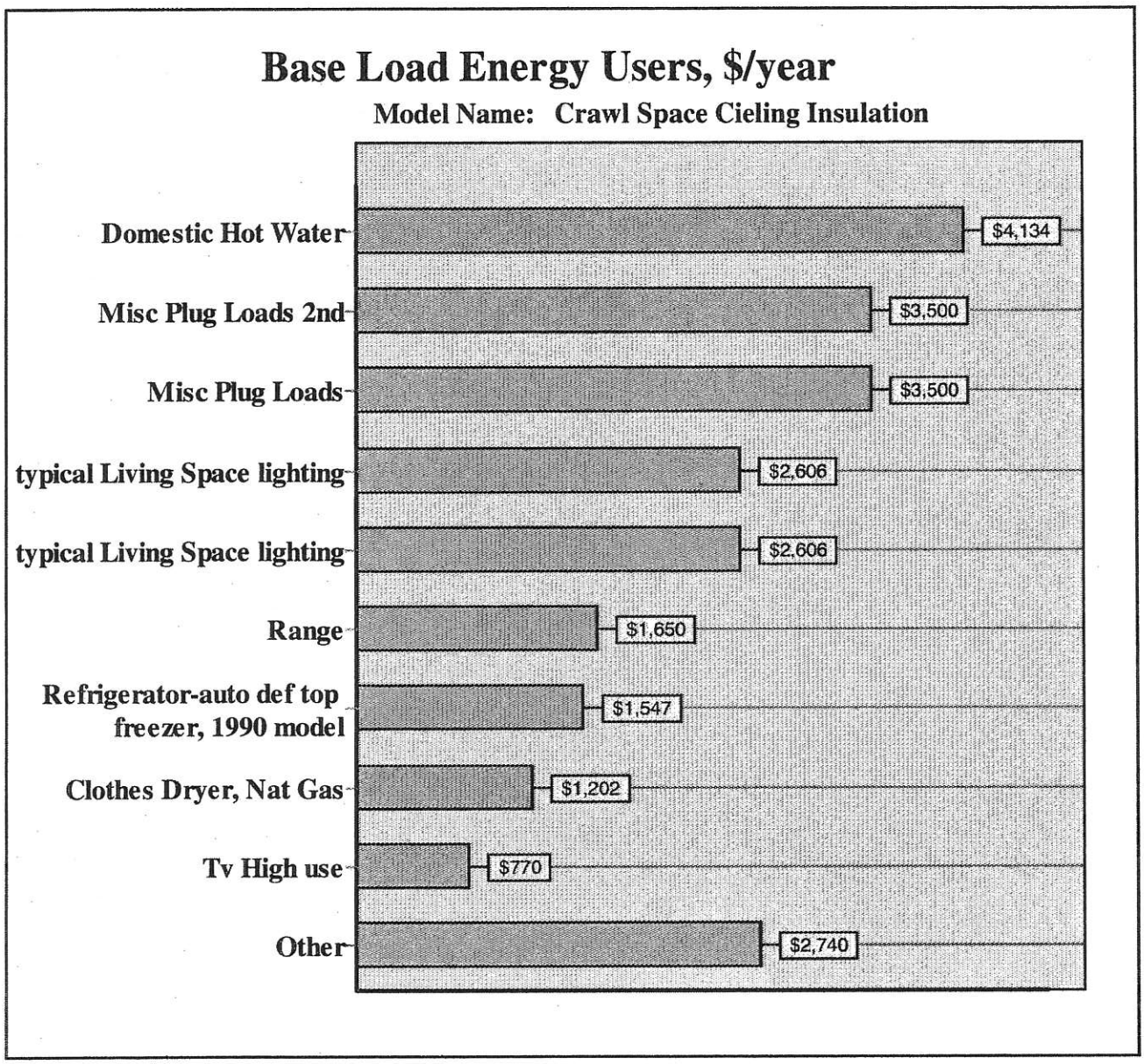
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	6,033	6,817	101,272	17,723		
Billing						
% Difference						

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: Crawl Space Cieling Insulation

	Natural gas $1.13 per Therm		Electricity $0.18 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	3,658	4,134	0	0			4,134
2. Misc Plug Loads 2nd	0	0	20,000	3,500			3,500
3. Misc Plug Loads	0	0	20,000	3,500			3,500
4. typical Living Space lighting	0	0	14,892	2,606			2,606
5. typical Living Space lighting	0	0	14,892	2,606			2,606
6. Range	1,460	1,650	0	0			1,650
7. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,547			1,547
8. Clothes Dryer, Nat Gas	915	1,034	960	168			1,202
9. Tv High use	0	0	4,400	770			770
10. Other	0	0	15,654	2,740			2,740
TOTAL	6,033	6,818	99,638	17,437			24,255


Base Load Energy Users, $/year
Model Name: Crawl Space Cieling Insulation
Domestic Hot Water
$4,134
Misc Plug Loads 2nd
$3,500
Misc Plug Loads
$3,500
typical Living Space lighting
$2,606
typical Living Space lighting
$2,606
Range
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,547
Clothes Dryer, Nat Gas
$1,202
Tv High use
$770
Other
$2,740

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments

ECM - 7a Insulate crawl space with 2" R-10 board insulation.

Suggestions

Insulate the crawl space floors in Garden Apartments 1 - 5 and Townhome Apartments 6 - 8.
Use a 2" Isocyanurate board insulation (R-10). 4' x 8' sheets.

Apartments Buildings 1-5

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.		
						$ -	$ -	$ -	$ -	
2" Isocyanurate Ins. board.	31,000	S.F.	$ 1.50	$ 0.44	$ -	$ 46,500	$ 16,641	$ -	$ 63,141	R.S. Means Construction 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.

$ 63,141	Subtotal
$ 9,471	15% Contingency
$ 10,892	15% Contractor O&P
$ -	0% Engineering
$ 83,504	**Total**

Townhomes Buildings 6-8

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.		
						$ -	$ -	$ -	$ -	
2" Isocyanurate Ins. board.	12,600	S.F.	$ 1.50	$ 0.44	$ -	$ 18,900	$ 6,764	$ -	$ 25,664	R.S. Means Construction 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.

$ 25,664	Subtotal
$ 3,850	15% Contingency
$ 4,427	15% Contractor O&P
$ -	0% Engineering
$ 33,940	**Total**

APPENDIX O

ECM-7c Insulate Condensate Piping

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments
Garden Apartments 1 - 5

ECM-7b 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	Fuel Energy Cost	=							$ 1.13	$/Therm (Nat'l Gas)	
	Operation (Hours/Week)	=							168.00	Hours/Week	
	Operation (Heating Weeks/Year)	=							28.00	Weeks/Year	
	Operation (Hours/Year)	=							2000	Hours/Year	
	Heating Media	=							Steam		
	Piping Material	=							Mild Steel		
	Ambient Temperature	=							65	°F	
			Pipe #1		Pipe #2		Pipe #3		Pipe #4		
	Pipe Diameter	=	3/4	.00 inches	1	inches	1 1/2	0 inches	2	.00 inches	
	Pipe Length	=	20.00	feet	80.00	feet	40.00	feet	10.00	feet	
Assumption	Min. Pipe Insulation Recommended	=	1.50	inches	1.50	inches	1.50	inches	1.50	inches	
	Circulating Temperature	=							210		
									4	°F	
	Heating Efficiency	=							70%		
	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

		Current Transmission Coefficient			Reference Transmission Coefficient							
Piping Correction Factor = (	2.50	/	2.50	) =								**1.00**
	Circulating Temp.		Ambient Temp.		Circulating Temp.		Reference Temp.					
Temperature Correction Factor = (	210	-	65	) / (	210	-	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 (	20.00	) =	2,337	Btuh		
Heat Loss Pipe #2 (Hourly)	= (128.40	) x (	1.00	) x (	1.12	) x (	80.00	) =	11,457	Btuh		
Heat Loss Pipe #3 (Hourly)	= (179.28	) x (	1.00	) x (	1.12	) x (	40.00	) =	7,999	Btuh		
Heat Loss Pipe #4 (Hourly)	= (219.69	) x (	1.00	) x (	1.12	) x (	10.00	) =	2,450	Btuh		
									24,244	**Btuh**		
	Hourly Heat Loss		operating Hours		Heating Efficiency		Factor					
Seasonal Heat Loss	= 24,244	) x (	2,000	) / (	70%	) / (	1,000	) =	**69,268**	**Mbtu**		
	Seasonal Heat Loss		Btu/unit									

Existing Energy Loss		69,268	) / (	100	) =							693	Therm
		Unit		Cost per Unit									
Existing Energy Loss Cost	= (	693	) x (	$ 1.13	) =							$ 783	
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 (	20.00	) =			359	Btuh
Heat Loss Pipe #2 (Hourly)	= (	18.31	) x (	1.00	) x (	1.12	) x (	80.00	) =			1,634	Btuh
Heat Loss Pipe #3 (Hourly)	= (	20.19	) x (	1.00	) x (	1.12	) x (	40.00	) =			901	Btuh
Heat Loss Pipe #4 (Hourly)	= (	20.00	) x (	1.00	) x (	1.12	) x (	10.00	) =			223	Btuh
												3,117	**Btuh**
		Hourly Heat Loss		operating Hours		Heating Efficiency		Factor					
Seasonal Heat Loss	=	3,117	) x (	2,000	) / (	70%	) / (	1,000	) =			8,905	**Mbtu**
		Seasonal Heat Loss		Btu/unit									
New Energy Loss		8,905	) / (	100	) =							89	Therm
		Unit		Cost per Unit									
New Energy Loss Cost	= (	89	) x (	$ 1.13	) =							$ 101	

Result

Existing Heat Loss		**693 Therm**	**$**	**783**	
New Heat Loss		**89 Therm**	**$**	**101**	
Savings	**100%**	**604 Therm**	**$**	**682**	**87.1%**

Comment

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments
Garden Apartments 1 - 5

ECM-7b 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"	20	L.F.	$ 1.68	$ 2.89		$ 34	$ 71	$ -	$ 104	Means Mech. Cost Data 2009.
insulation.						$ -	$ -	$ -	$ -	
Insulate 11/4" BS Pipe w/ 1-1/2"	20	L.F.	$ 1.96	$ 3.18		$ 39	$ 78	$ -	$ 117	Means Mech. Cost Data 2009.
insulation.						$ -	$ -	$ -	$ -	
Insulate 1" BS w/ 1-1/2" insulation.	80	L.F.	1.80	3.02		$ 144	$ 295	$ -	$ 439	Means Mech. Cost Data 2009.
Insulate 2" BS w/ 1-1/2" insulation.	40	L.F.	2.26	3.53		$ 90	$ 172	$ -	$ 263	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.

$	922	Subtotal
$	184	20% Contingency
$	166	15% Contractor O&P
$	-	0% Engineering
$	**1,273**	**Total**

Building # 1
Building # 1-5 **6,697 Total**

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments
Townhome Apartments

ECM-7b 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

Fuel Energy Cost	=							$ 1.13	$/Therm (Nat'l Gas)
Operation (Hours/Week)	=							168.00	Hours/Week
Operation (Heating Weeks/Year)	=							28.00	Weeks/Year
Operation (Hours/Year)	=							2000	Hours/Year
Heating Media	=							Steam	
Piping Material	=							Mild Steel	
Ambient Temperature	=							65	°F
		Pipe #1		Pipe #2		Pipe #3		Pipe #4	
Pipe Diameter	=	3/4 .00	inches	1	inches	1 1/2 0	inches	2 .00	inches
Pipe Length	=	20.00	feet	50.00	feet	40.00	feet	10.00	feet

Assumption

Min. Pipe Insulation Recommended	=	1.50	inches	1.50	inches	1.50	inches	1.50	inches
Circulating Temperature	=							210	
								4	°F
Heating Efficiency	=							70%	
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

		Current Transmission Coefficient				Reference Transmission Coefficient						
Piping Correction Factor = (		2.50	/			2.50	) =					**1.00**
		Circulating Temp.		Ambient Temp.		Circulating Temp.		Reference Temp.				
Temperature Correction Factor = (		210	-	65	) / (	210	-	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 (	20.00	) =	2,337	Btuh	
Heat Loss Pipe #2 (Hourly)	= (	128.40	) x (	1.00	) x (	1.12	) x (	50.00	) =	7,161	Btuh	
Heat Loss Pipe #3 (Hourly)	= (	179.28	) x (	1.00	) x (	1.12	) x (	40.00	) =	7,999	Btuh	
Heat Loss Pipe #4 (Hourly)	= (	219.69	) x (	1.00	) x (	1.12	) x (	10.00	) =	2,450	Btuh	
										19,947	**Btuh**	

	Hourly Heat Loss		operating Hours		Heating Efficiency		Factor				
Seasonal Heat Loss	= 19,947	) x (	2,000	) / (	70%	) / (	1,000	) =	**56,992**	**Mbtu**	
	Seasonal Heat Loss		Btu/unit								

Existing Energy Loss		56,992	) / (	100	) =							**570**	**Therm**
		Unit		Cost per Unit									
Existing Energy Loss Cost	= (	570	) x (	$ 1.13	) =							**$ 644**	
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 (	20.00	) =			359	Btuh
Heat Loss Pipe #2 (Hourly)	= (	18.31	) x (	1.00	) x (	1.12	) x (	50.00	) =			1,021	Btuh
Heat Loss Pipe #3 (Hourly)	= (	20.19	) x (	1.00	) x (	1.12	) x (	40.00	) =			901	Btuh
Heat Loss Pipe #4 (Hourly)	= (	20.00	) x (	1.00	) x (	1.12	) x (	10.00	) =			223	Btuh
												2,504	**Btuh**
		Hourly Heat Loss		operating Hours		Heating Efficiency		Factor					
Seasonal Heat Loss	=	2,504	) x (	2,000	) / (	70%	) / (	1,000	) =			**7,155**	**Mbtu**
		Seasonal Heat Loss		Btu/unit									
New Energy Loss		7,155	) / (	100	) =							**72**	**Therm**
		Unit		Cost per Unit									
New Energy Loss Cost	= (	72	) x (	$ 1.13	) =							**$ 81**	

Result

Existing Heat Loss		**570 Therm**	**$**	**644**	
New Heat Loss		**72 Therm**	**$**	**81**	
Savings	**100%**	**498 Therm**	**$**	**563**	**87.4%**

Comment

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments
Townhome Apartments

ECM-7b 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"	20	L.F.	$ 1.68	$ 2.89		$ 34	$ 71	$ -	$ 104	Means Mech. Cost Data 2009.
insulation.						$ -	$ -	$ -	$ -	
Insulate 11/4" BS Pipe w/ 1-1/2"	20	L.F.	$ 1.96	$ 3.18		$ 39	$ 78	$ -	$ 117	Means Mech. Cost Data 2009.
insulation.						$ -	$ -	$ -	$ -	
Insulate 1" BS w/ 1-1/2" insulation.	50	L.F.	1.80	3.02		$ 90	$ 184	$ -	$ 274	Means Mech. Cost Data 2009.
Insulate 2" BS w/ 1-1/2" insulation.	10	L.F.	2.26	3.53		$ 23	$ 43	$ -	$ 66	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.

$ 561	Subtotal	
$ 112	20% Contingency	
$ 101	15% Contractor O&P	
$ -	0% Engineering	
$ 774	**Total**	**Building #7**
$2,357	**Total**	**Building #6-8**

APPENDIX P

ECM-8 Energy Star Appliances

YOUR SUMMARY

GARDEN APARTMENTS 1-5

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: 10 Refrigerator-auto def top freezer, 1990 model; Added Appliances: 10 Refrigerator - auto def, 15 CF, high efficiency	Increase value of building, reduce environmental risk due to old ozone-depleting refrigerants.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 688		
Annual KWh Savings, KWh		4,360		
Total Energy Savings, MMBtu		8.2		
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: 1.1300 $/Therm
- Electricity: 0.1750 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Energy Star Refrigerators

Meadowview Apartment Bld #1

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Energy Star Refrigerators

Removed Appliances:

Appliance Name	Location	Quantity
Refrigerator - auto def top freezer, 1990 model 3	3rd Floor	10
Refrigerator-auto def top freezer, 1990 model	1st Floor	10
Refrigerator-auto def top freezer, 1990 model2	2nd Floor	10

Added Appliances:

Appliance Name	Location	Quantity
Refrigerator - 1	1st Floor	10
Refrigerator - 3	3rd Floor	10
Refrigerator 2	2nd Floor	10

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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 1 5828 Meadowview A
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: Energy Star Refrigerators

Billing Period Name: None

	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	12,757	14,415	129,495	20,719		
Billing						
% Difference						

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

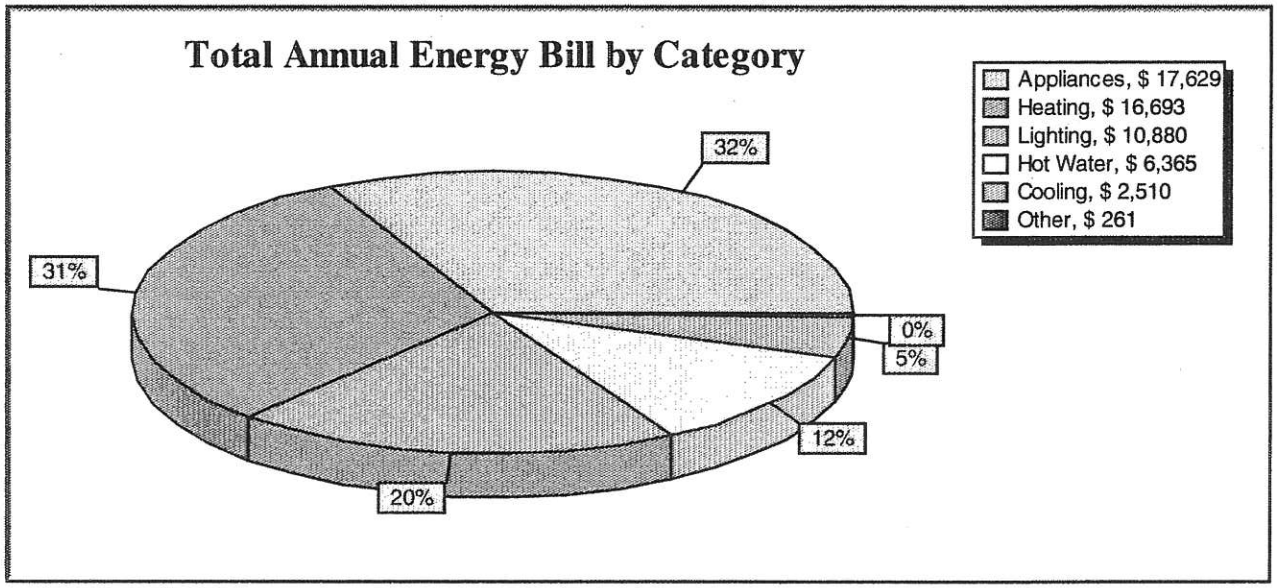
Annual Use of Domestic Hot Water, Appliances, and Lighting

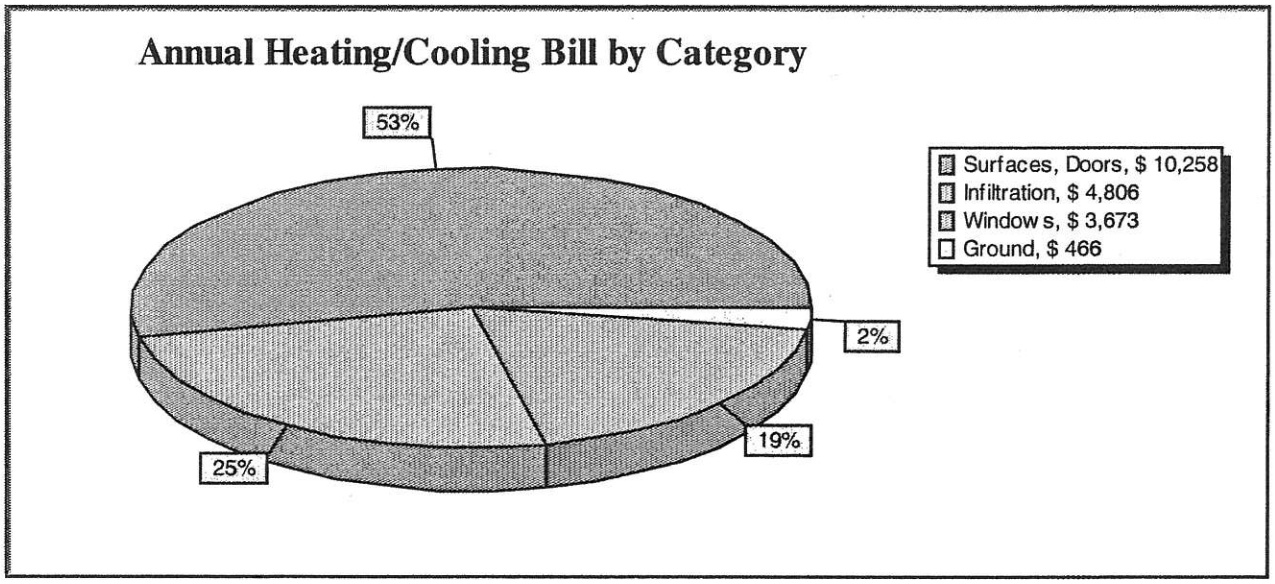
Model Name: Energy Star Refrigerators

	Natural gas $1.13 per Therm		Electricity $0.16 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	5,632	6,364	0	0			6,364
2. typical Living Space lighting	0	0	22,630	3,621			3,621
3. typical Living Space lighting	0	0	22,630	3,621			3,621
4. typical Living Space lighting	0	0	22,630	3,621			3,621
5. Range, gas, no pilot 2	1,460	1,650	0	0			1,650
6. Range, gas, no pilot 3	1,460	1,650	0	0			1,650
7. Range Nat Gas	1,460	1,650	0	0			1,650
8. Clothes dryer, natural gas 3	915	1,034	960	154			1,188
9. Clothes dryer, natural gas 2	915	1,034	960	154			1,188
10. Other	915	1,034	58,052	9,291			10,325
TOTAL	12,757	14,416	127,862	20,462			34,878

MODEL ENERGY REPORT FOR ENERGY STAR REFRIGERATORS

Meadowview Apartment Bld #1
For: NBHA
By:
Date: 9/2/2009





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

DESIGN HEATING AND COOLING LOADS FOR ENERGY STAR REFRIGERATORS

9/2/2009
Project Name: Meadowview Apartment Bld #1

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
1st Floor	181879	30	20.7	348
3rd Floor	342893	56	39.0	656
Boiler Room	3825	12	0.4	8
2nd Floor	102413	17	11.6	196

Required Heating Equipment Output Capacity: 740219 Btu/hr
Available Heating Equipment Output Capacity: 700000 Btu/hr
Total flow: 74.0 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 70 %
Calculated Distribution Efficiency: 94 %
Supply Water Temperature: 220 F
Temperature Drop: 20 F
Heating Safety Factor: 1.10
Distribution Safety Factor: 1.10
HEATING SYSTEM IS UNDERSIZED AND DOES NOT MEET THE REQUIRED HEATING LOAD.

Cooling System:

Space Name	Load, Btu/Hr	Distribution CFM
1st Floor	135713	4937
3rd Floor	349737	12722
Boiler Room	0	0
2nd Floor	117286	4267

Required Cooling Equipment Output Capacity: 645408 Btu/hr

Available Cooling Equipment Output Capacity: 70000 Btu/hr

Total flow: 21343 CFM

Cooling Equipment Efficiency: 10 SEER

Calculated Distribution Efficiency: 100%

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.

YOUR SUMMARY

TOWN HOME APARTMENTS 6-9

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: 10 Refrigerator - auto def top freezer, 1990 model 3, 10 Refrigerator-auto def top freezer, 1990 model, 10 Refrigerator-auto def top freezer, 1990 model2; Added Appliances: 10 Refrigerator - 1, 10 Refrigerator - 3, 10 Refrigerator 2	Increase value of building, reduce environmental risk due to old ozone-depleting refrigerants.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 1,719		
Annual KWh Savings, KWh		13,080		
Total Energy Savings, MMBtu		11.6		
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: 1.1300 $/Therm
- Electricity: 0.1600 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR Energy Star Refrigerators

Meadowview Town Home #7

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. Energy Star Refrigerators

Removed Appliances:

Appliance Name	Location	Quantity
Refrigerator-auto def top freezer, 1990 model	1st Floor	10

Added Appliances:

Appliance Name	Location	Quantity
Refrigerator - auto def, 15 CF, high efficiency	1st Floor	10

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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 7 5828 Meadowview
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: Energy Star Refrigerators

Billing Period Name: None

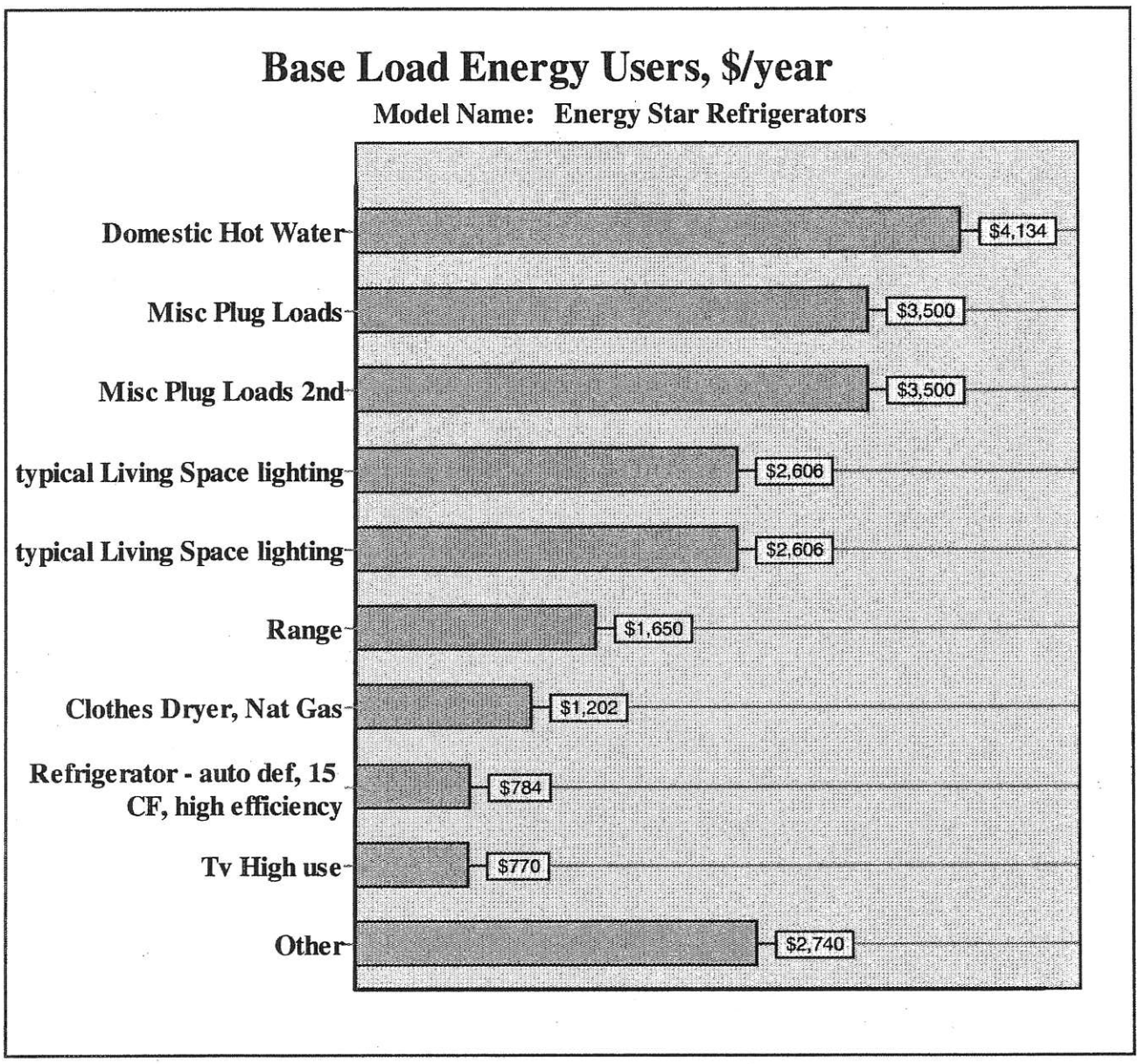
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	6,033	6,817	96,912	16,960		
Billing						
% Difference						

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

	Natural gas $1.13 per Therm		Electricity $0.18 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	3,658	4,134	0	0			4,134
2. Misc Plug Loads	0	0	20,000	3,500			3,500
3. Misc Plug Loads 2nd	0	0	20,000	3,500			3,500
4. typical Living Space lighting	0	0	14,892	2,606			2,606
5. typical Living Space lighting	0	0	14,892	2,606			2,606
6. Range	1,460	1,650	0	0			1,650
7. Clothes Dryer, Nat Gas	915	1,034	960	168			1,202
8. Refrigerator - auto def, 15 CF, high	0	0	4,480	784			784
9. Tv High use	0	0	4,400	770			770
10. Other	0	0	15,654	2,740			2,740
TOTAL	6,033	6,818	95,278	16,674			23,492


Base Load Energy Users, $/year
Model Name: Energy Star Refrigerators
Domestic Hot Water
$4,134
Misc Plug Loads
$3,500
Misc Plug Loads 2nd
$3,500
typical Living Space lighting
$2,606
typical Living Space lighting
$2,606
Range
$1,650
Clothes Dryer, Nat Gas
$1,202
Refrigerator - auto def, 15 CF, high efficiency
$784
Tv High use
$770
Other
$2,740

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments

ECM - 8 Replace Refrigerators with Energy Star Rated Units

Suggestions

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

Apartment Buildings 1-5

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 Meadowview Apartments with Energy Star rated units.	142	ea.	$ 600	$ 20		$ 85,200	$ 3,465	$ -	$ 88,665	Quotes from Home Depot and Lowes.
Disposal cost for each unit.	142	ea.		$ 35		$ -	$ 6,063	$ -	$ 6,063	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 94,728	Subtotal
$ 4,736	5% Contingency
$ -	0% Contractor O&P
$ -	0% Engineering
$ 99,465	**Total**

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

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

Townhome Buildings 6-8

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 Meadowview Apartments with Energy Star rated units.	30	ea.	$ 600	$ 20		$ 18,000	$ 732	$ -	$ 18,732	Quotes from Home Depot and Lowes.
Disposal cost for each unit.	30	ea.		$ 35		$ -	$ 1,281	$ -	$ 1,281	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

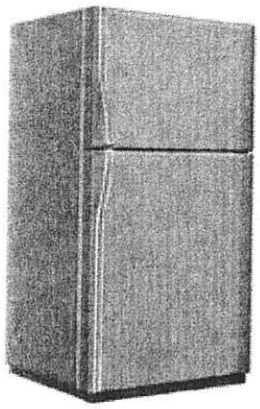
$ 20,013	Subtotal
$ 1,001	5% Contingency
$ -	0% Contractor O&P
$ -	0% Engineering
$ 21,014	**Total**

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

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 Q

ECM-9 Photovoltaic Power Generation

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments

ECM - 9 Photovoltaic Panels for Bldgs. #4, #5 and #7

Cost of Electricity $0.16 $/kWh

ECM-9 Photovoltaic (PV) Rooftop Solar Power Generation-4kW System (Typ. Bldg. #4,#5 and #7)

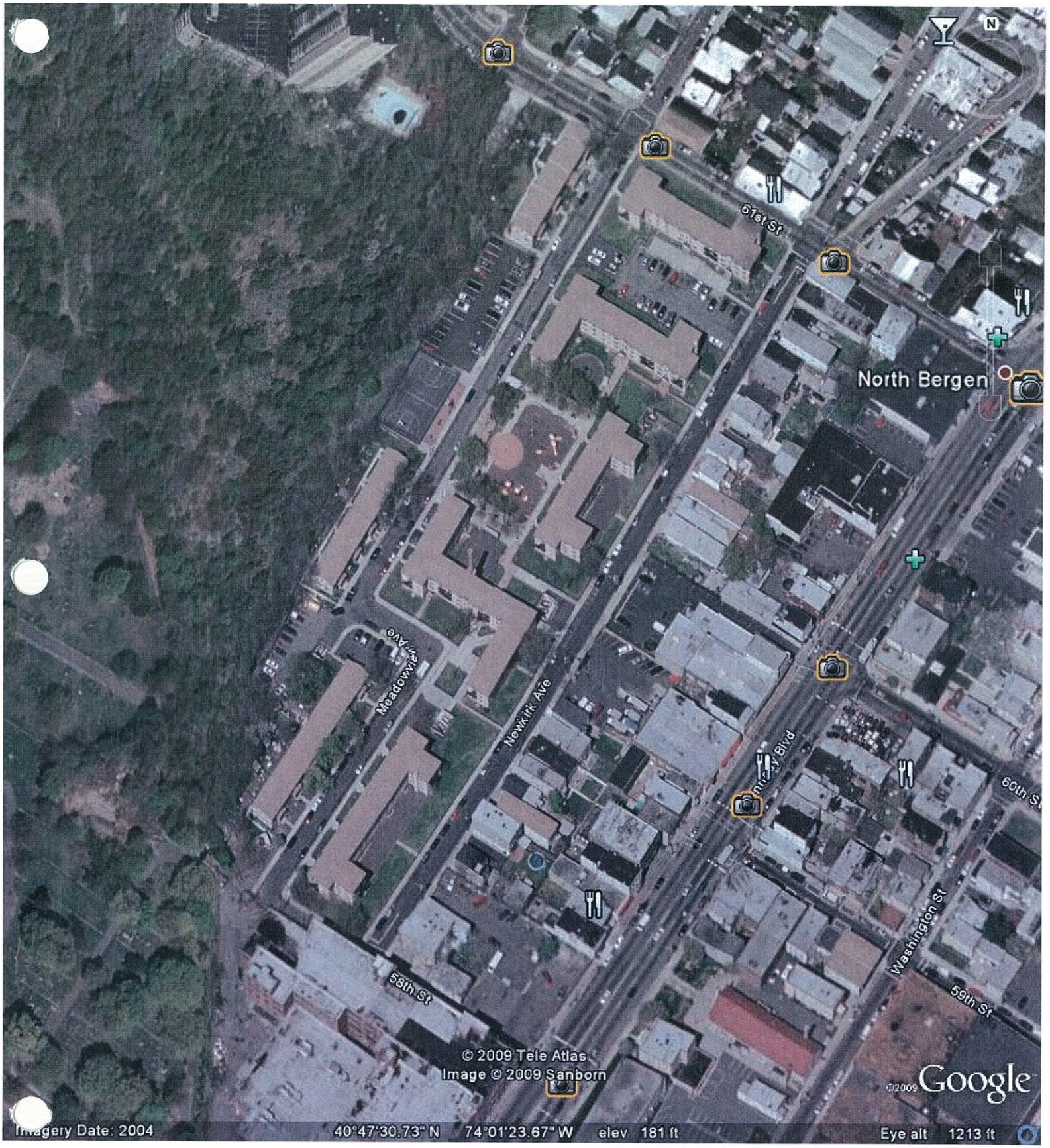
Budgetary	Annual Utility Savings				Estimated	Total	New Jersey Renewable	New Jersey Renewable	Payback	Payback
Cost					Maintenance Savings	Savings	* Energy Incentive	** SREC	(without incentive)	(with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$40,000	**0.0**	**4,732**	**0**	**$757**	**0**	**$757**	**$4,000**	**$2,303**	**>30**	**11.8**

*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**


61st St
North Bergen
Meadowwink Ave
Newkirk Ave
Kennedy Blvd
60th St
Washington St
59th St
58th St
© 2009 Tele Atlas
Image © 2009 Sanborn
©2009 Google
Imagery Date: 2004
40°47'30.73" N 74°01'23.67" W elev 181 ft
Eye alt 1213 ft

APPENDIX R

EPA Energy Star Portfolio Manager Report

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Meadowview Village, Buildings 1-8

Building ID: 1789026
For 12-month Period Ending: May 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: August 28, 2009

Facility
Meadowview Village, Buildings 1-8
Meadowview 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: 1950
Gross Floor Area (ft²): 116,875

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

Site Energy Use Summary[3]

Natural Gas (kBtu)[4]	15,827,164
Electricity (kBtu)	4,278,249
Total Energy (kBtu)	20,105,413

Energy Intensity[5]

Site (kBtu/ft²/yr)	173
Source (kBtu/ft²/yr)	265

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	1,494

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.

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**

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

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	Meadowview Village, Buildings 1-8	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	Meadowview 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		☐

Meadowview Housing (Multifamily Housing)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	116,875 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	80,269.00
02/28/2009	03/30/2009	86,232.00
01/27/2009	02/27/2009	67,942.00
12/31/2008	01/27/2009	72,255.00
12/04/2008	12/30/2008	76,303.00
11/04/2008	12/03/2008	82,612.00
10/03/2008	11/03/2008	97,608.00
09/04/2008	10/02/2008	115,025.00
08/05/2008	09/03/2008	145,092.00
07/04/2008	08/04/2008	182,957.00
06/05/2008	07/03/2008	143,307.00
Electricity Consumption (kWh (thousand Watt-hours))		**1,149,602.00**
Electricity Consumption (kBtu)		**3,922,442.02**
Total Electricity Consumption (kBtu)		**3,922,442.02**
Is this the total Electricity consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Gas (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
03/31/2009	04/29/2009	13,253.00
02/24/2009	03/30/2009	24,151.00
01/28/2009	02/23/2009	22,560.00
12/31/2008	01/27/2009	25,231.00
12/04/2008	12/30/2008	22,619.00
11/04/2008	12/03/2008	19,889.00
10/03/2008	11/03/2008	9,458.00
09/04/2008	10/02/2008	2,929.00
08/05/2008	09/03/2008	2,941.00
07/05/2008	08/04/2008	2,942.00

06/03/2008	07/04/2008	8,191.00
Gas Consumption (therms)		**154,164.00**
Gas Consumption (kBtu)		**15,416,400.00**
Total Natural Gas Consumption (kBtu)		**15,416,400.00**
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
Meadowview Village, Buildings 1-8
Meadowview 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

Meadowview Village, Buildings 1-8	
Gross Floor Area Excluding Parking: (ft²)	116,875
Year Built	1950
For 12-month Evaluation Period Ending Date:	May 31, 2009

Facility Space Use Summary

Meadowview Housing	
Space Type	Multifamily Housing
Gross Floor Area(ft²)	116,875
Number of units°	N/A
Total Number of Bedrooms°	N/A
Number of Floors°	N/A
Percent of square footage devoted to individual units°	N/A
Laundry in each unit°	N/A
Laundry in common area°	N/A
Dishwashers in each unit°	N/A
Percent Heated°	N/A
Percent Cooled°	N/A
Market Rate or Affordable Housing°	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 05/31/2009)	**Baseline** (Ending Date 05/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	173	173	0	N/A	N/A
Source (kBtu/ft²)	265	265	0	N/A	N/A
Energy Cost					
$/year	$ 383,378.24	$ 383,378.24	N/A	N/A	N/A
$/ft²/year	$ 3.28	$ 3.28	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	1,494	1,494	0	N/A	N/A
$kgCO_2e$/ft²/year	13	13	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 S

New Jersey Pay for Performance Program

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.

APPENDIX T

Equipment Inventory

North Bergen Housing Authority
CHA Project No. 20241
Meadowview Apartments Complex
Equipment Inventory

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Date Installed	Useable Life Expectancy	Other Info.
Garden Apartments								
Bldg. #1								
DHW Boiler #1	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #1 Boiler Room	1990	25 to 30 years.	
DHW Boiler #2	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #1 Boiler Room	1990	25 to 30 years.	
HWH Boiler #1	Smith	Series 19	Sectional Low Pressure Steam Boiler	Heating Input - 1,000,000 BTUH Heating Output - 800,000 BTUH	Meadowview Apt. #1 Boiler Room	1968	Near end of life.	
Bldg. #2								
DHW Boiler #1	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #2 Boiler Room	1990	25 to 30 years.	
DHW Boiler #2	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #2 Boiler Room	1990	25 to 30 years.	
HWH Boiler #1	Smith	Series 19	Sectional Low Pressure Steam Boiler	Heating Input - 1,000,000 BTUH Heating Output - 800,000 BTUH	Meadowview Apt. #2 Boiler Room	1968	Near end of life.	
HWH Boiler #2	Smith	Series 19	Sectional Low Pressure Steam Boiler	Heating Input - 1,000,000 BTUH Heating Output - 800,000 BTUH	Meadowview Apt. #2 Boiler Room	1968	Near end of life.	
Bldg. #3								
DHW Boiler #1	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #3 Boiler Room	1990	25 to 30 years.	
HWH Boiler #1	Smith	Series 19	Sectional Low Pressure Steam Boiler	Heating Input - 1,000,000 BTUH Heating Output - 800,000 BTUH	Meadowview Apt. #3 Boiler Room	1968	Near end of life.	
Bldg. #4								
DHW Boiler #1	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #4 Boiler Room	1990	25 to 30 years.	
DHW Boiler #2	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #4 Boiler Room	1990	25 to 30 years.	
HWH Boiler #1	Smith	Series 19	Sectional Low Pressure Steam Boiler	Heating Input - 1,000,000 BTUH Heating Output - 800,000 BTUH	Meadowview Apt. #4 Boiler Room	1968	Near end of life.	
Bldg. #5								
DHW Boiler #1	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #5 Boiler Room	1990	25 to 30 years.	
HWH Boiler #1	Smith	Series 19	Sectional Low Pressure Steam Boiler	Heating Input - 1,000,000 BTUH Heating Output - 800,000 BTUH	Meadowview Apt. #5 Boiler Room	1968	Near end of life.	

North Bergen Housing Authority
CHA Project No. 20241
Meadowview Apartments Complex
Equipment Inventory

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Date Installed	Useable Life Expectancy	Other Info.
Townhome Apartments								
Bldg. #6								
DHW Boiler #1	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #6 Boiler Room	1990	25 to 30 years.	
HWH Boiler #1	Smith	Series 19	Sectional Low Pressure Steam Boiler	Heating Input - 1,000,000 BTUH Heating Output - 800,000 BTUH	Meadowview Apt. #6 Boiler Room	1968	Near end of life.	
Bldg. #7								
DHW Boiler #1	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #7 Boiler Room	1990	25 to 30 years.	
HWH Boiler #1	Smith	Series 19	Sectional Low Pressure Steam Boiler	Heating Input - 1,000,000 BTUH Heating Output - 800,000 BTUH	Meadowview Apt. #7 Boiler Room	1968	Near end of life.	
Bldg. #8								
DHW Boiler #1	PVI	Nickelshield Model 299P-A-PN	Condensing Hot Water Boiler	0.3 MMBtu/hr (input) Natural Gas	Meadowview Apt. #8 Boiler Room	1990	25 to 30 years.	
HWH Boiler #1	Smith	Series 19	Sectional Low Pressure Steam Boiler	Heating Input - 1,000,000 BTUH Heating Output - 800,000 BTUH	Meadowview Apt. #8 Boiler Room	1968	Near end of life.	
Air Conditioning Unit #1	Mitsubishi	PL24AK / EK	Split Air Conditioning Unit	24,000 BTUH Cooling Capacity	Community Rm.			
Air Conditioning Unit #2	Mitsubishi	PL24AK / EK	Split Air Conditioning Unit	24,000 BTUH Cooling Capacity	Community Rm.			
Vending			Snacks		Community Room			
Vending			Pepsi		Community Room			
Vending			Snapple		Community Room			
Refrigerator	Hotpoint	HTR15ABMFRWW	Vertical Type	15 C.F.	Community Room			
Window Air Conditioning Units	Various	Various	Window Mounted Air Conditioning Units.	Various - 5,000 BTUH to 10,000 BTUH	Meadowview Apartments	Various	Various	Total of 191 Units.

Energy Audit of North Bergen Housing Authority
CHA Project No. 20241 Meadowview Apartments
Existing Lighting

Cost of Electricity: **$0.129 $/kWh**
$14.02 $/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
Apartments	**71**	I60 Pull-Chain	480	I 60	I60/1	60	28.8	SW	2912	None	83,866	
	89	2CF23 Clg Mt 1 SW EA (Occ)	540	CF 23 2 LAMP	CFQ22/2	48	25.9	SW	2912	OCC	75,479	
	180	W32CF4-E SW (T8, Occ)	160	T 32 R F 4 (ELE)	F44ILL	112	17.9	SW	2912	OCC	52,183	
	17	W20CF1-Mag SW (T12, Occ)	172	2' 20 W F 1 (MAG)	F21SS	28	4.8	SW	2912	None	14,024	
	115	W20CF2-Mag SW (T12, Occ)	160	W 20 C F 2	F22SS	56	9.0	SW	2912	OCC	26,092	
Exterior	**10**	1000 W Pole Basketball Court Lights (1)	5	High Bay MH 1000 50 Feet High	MH1000/1	1080	5.4	Timer	0	None	-	
	225	70 W HPS C Townhome entrance	30	70 High Pressure Sodium	HPS70/1	95	2.9	SW	2912	None	8,299	
	144	150HPS Wall or Pole Fixture	40	HPS 150	HPS150/1	188	7.5	Timer	4368	None	32,847	
Common Areas	**89**	Building #1 Hall way	20	CF 23 2 LAMP	CFQ22/2	48	1.0	Breaker	8760	None	8,410	
	89	Building #2 Hall way	20	CF 23 2 LAMP	CFQ22/2	48	1.0	Breaker	8760	None	8,410	
	89	Building #3 Hall way	20	CF 23 2 LAMP	CFQ22/2	48	1.0	Breaker	8760	None	8,410	
	89	Building #4 Hall way	20	CF 23 2 LAMP	CFQ22/2	48	1.0	Breaker	8760	None	8,410	
	89	Building #5 Hall way	20	CF 23 2 LAMP	CFQ22/2	48	1.0	Breaker	8760	None	8,410	
	6	Building #1 Hall way	12	T 34 R F 4 (MAG)	F44EE	144	1.7	Breaker	8760	None	15,137	
	6	Building #2 Hall way	12	T 34 R F 4 (MAG)	F44EE	144	1.7	Breaker	8760	None	15,137	
	6	Building #3 Hall way	12	T 34 R F 4 (MAG)	F44EE	144	1.7	Breaker	8760	None	15,137	
	6	Building #4 Hall way	12	T 34 R F 4 (MAG)	F44EE	144	1.7	Breaker	8760	None	15,137	
	6	Building #5 Hall way	12	T 34 R F 4 (MAG)	F44EE	144	1.7	Breaker	8760	None	15,137	
	100	Building #1 Basement	17	S 34 W F 2	F42EE	72	1.2	SW	1000	None	1,224	
	100	Building #2 Basement	17	S 34 W F 2	F42EE	72	1.2	SW	1000	None	1,224	
	100	Building #3 Basement	17	S 34 W F 2	F42EE	72	1.2	SW	1000	None	1,224	
	100	Building #4 Basement	17	S 34 W F 2	F42EE	72	1.2	SW	1000	None	1,224	
	100	Building #5 Basement	17	S 34 W F 2	F42EE	72	1.2	SW	1000	None	1,224	
	100	Building #1 Boiler Room	3	S 34 W F 2	F42EE	72	0.2	SW	1000	None	216	
	100	Building #2 Boiler Room	3	S 34 W F 2	F42EE	72	0.2	SW	1000	None	216	
	100	Building #3 Boiler Room	3	S 34 W F 2	F42EE	72	0.2	SW	1000	None	216	
	100	Building #4 Boiler Room	3	S 34 W F 2	F42EE	72	0.2	SW	1000	None	216	
	100	Building #5 Boiler Room	3	S 34 W F 2	F42EE	72	0.2	SW	1000	None	216	
	100	Building #6 Boiler Room	2	S 34 W F 2	F42EE	72	0.1	SW	1000	None	144	
	100	Building #7 Boiler Room	2	S 34 W F 2	F42EE	72	0.1	SW	1000	None	144	
	100	Building #8 Boiler Room	2	S 34 W F 2	F42EE	72	0.1	SW	1000	None	144	
	6	T34RF4- Mag Community Room (Bldg2)	18	T 34 R F 4 (MAG)	F44EE	144	2.6	SW	4368	None	11,322	
	4	2T34RF4- Mag Community Room (Bldg2)	4	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.3	SW	4368	None	1,258	
	89	2CF23 Community Room (Bldg2)	4	CF 23 2 LAMP	CFQ22/2	48	0.2	SW	4368	None	839	
	89	2CF23 Maintenance Office	1	CF 23 2 LAMP	CFQ22/2	48	0.0	SW	4368	None	210	
	100	S34WF-Old Boiler Room	17	S 34 W F 2	F42EE	72	1.2	SW	4368	None	5,346	
	71	I60-Old Boiler Room	6	I 60	I60/1	60	0.4	SW	4368	None	1,572	
	205	EP 110PFMag-Old Boiler Room	4	S 110 P F 2 (MAG) 8' T-12 Egg Crate	F82SHS	257	1.0	SW	4368	None	4,490	
		Total	**1,907**				**129.0**				**443,194**	

Note: (1) Basketball Court is not in use
(2) Apartment buildings #1 through #5 are identical. Townhomes have no common areas

Energy Audit of North Bergen Housing Authority

CHA Project No. 20241 Meadowview Apartments

Existing Lighting - Apartment Lamps

Cost of Electricity: **$0.129 $/kWh**

$14.02 $/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
71	I60 (tenants' lamps)	480	I 60	I60/1	60	28.8	SW	500	None	14,400	Incandescent
72	3 I60 (tenants' lamps)	160	I 60 3 LAMP	I60/3	180	28.8	SW	500	None	14,400	Incandescents (3)
108	I65 (tenants' lamps)	36	I 65	I65/1	65	2.3	SW	500	None	1,170	Incandescent
	Total	**676**				**59.9**				**29,970**	

MeadowView Village

Building #	Apartment #	# Bedrooms	Heating Type	Appliances	Washer/Dryer	Kitchen Equipment	Windows/Doors	Air Conditioning	Thermostats	Exhaust Fans	Lighting
	1A	1	Radiant Steam	Radio, 42" LCD TV, Stereo, (2) Cable Boxes, DVD Player, (5)75w Lamps, Clock, LG TV	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	GE Mod. # TBX16DAXXRAD Fridge, Hotpoint Stove/Oven, Small Microwave	3/4" Commercial Grade Double Glazed in Good Condition	5,000 BTU, 10.0 EER Window Unit	None	None	I65 Pull Chain, W32CF4-E SW, W20CF1-Mag SW, G13CCF2 SW, W13CCF2 SW, 32/22FRng-Mag SW, W20WF2-Mag SW
	1B	2	Radiant Steam	SM Radio, Med TV, (2) Sm TVs, DVD/VCR, (2)Cable Boxes, LG. Stereo, Record Player, VCR, Sm. Radio	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Tappan 4-Burner Stove, Coffee Pot, Sm. Microwave, Toaster, Frigidaire Fridge: Mod.# FRT17B3AW1	3/4" Commercial Grade Double Glazed in Good Condition	(1) Samsung: 9.2 EER, 8,000BTU (1)Frigidaire: 7,700BTU, Mod.# FAC082H7A1	None	None	(3)-I60 Pull Chain, (3)-2CF23 Clg Mt-SW, W32CF4-E(T8)SW, W20CF1-Mag(T12) SW, W20WF2-Mag(T12) SW, (3)I60 Plug-Ins, (1)3-Bulb I60 Plug-In
	1C	1	Radiant Steam	Med. TV, (2) Cable Boxes, DVD Player, Cellphone Dock, Sm. TV	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Tappan 4-Burner Stove, Hotpoint Fridge Mod.# CTX18CG, Coffee Maker	3/4" Commercial Grade Double Glazed in Good Condition	Carrier-5000BTU, Low EER, Window	None	None	W32CF4-E(T8)SW, (2)W20WF1-Mag(T12)SW, I40 Wall Mt SW, 2CF17C-SW, 2CF23C-SW, I40Clg Fan, I60 Plug-In
	1D	1	Radiant Steam	Desktop Computer, Printer,(2) Sm. TV, Cable Box, DVD, Clock, (500W?) Elec. Fire Place	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Tappan 4-Burner Stove, Hotpoint Fridge Mod.# CTX18CG, Coffee Maker	3/4" Commercial Grade Double Glazed in Good Condition	(2) 5000BTU, 10.0 EER Window	None	None	(3)-I60 Pull Chain, (3)-2CF23 Clg Mt-SW, W32CF4-E(T8)SW, W20CF1-Mag(T12) SW, W20WF2-Mag(T12) SW, (3)I60 Plug-Ins, (1)3-Bulb I60 Plug-In
5802	1E	2	Radiant Steam	Sm. Stereo, (2) Desktop Comp., Printer, Fax, Med TV, (2)Cable Box, (2)DVD, Lg. Stereo, Elect. Piano, (2)Sm. TV, Treadmill, Comm System.	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Tappan 4-Burner Stove, Hotpoint Fridge Mod.# CTX18CG, Coffee Maker, Toaster, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	(2) 7,500BTU Old GE Window Low EER	None	None	(3)-I60 Pull Chain, (3)-2CF23 Clg Mt-SW, W32CF4-E(T8)SW, W20CF1-Mag(T12) SW, W20WF2-Mag(T12) SW, (3)I60 Plug-Ins
	1F	1	Radiant Steam	(2)Lg. TV, (2)DVD, (2)Cable Box, (2)Stereo, (2)Phone, Printer, Desktop Comp., Small Fridge, Video Game Console, (2)Modems	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Tappan 4-Burner Stove, Hotpoint Fridge Mod.# CTX18CG, Coffee Maker, Toaster Oven, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	5000BTU, 10.0 EER Window	None	None	(3)-I60 Pull Chain, (3)-2CF23 Clg Mt-SW, W32CF4-E(T8)SW, W20CF1-Mag(T12) SW, W20WF2-Mag(T12) SW, (5)I60 Plug-Ins

	1G	1	Radiant Steam	Lg. TV, Treadmill, (2)Sm. TV, Desktop Computer	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Tappan 4-Burner Stove, Hotpoint Fridge Mod.# CTX18CG, Toaster	3/4" Commercial Grade Double Glazed in Good Condition	None	None	None	(3)-I60 Pull Chain, (3)-2CF23 Clg Mt-SW, W32CF4-E(T8)SW, W20CF1-Mag(T12) SW, W20WF2-Mag(T12) SW, (5)I60 Plug-Ins
	1H	2	Radiant Steam	Turtle Tank, Med. TV, (3)Cable Box, DVD/VCR, (2)Sm. TV, Desktop Comp, Printer, Recip Fan	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Tappan 4-Burner Stove, Hotpoint Fridge Mod.# CTX18CG, Toaster, Toaster Oven, Coffee Pot, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	Whirlpool Mod.# ACQ062MMQ, 8,000BTU	None	None	(3)-I60 Pull Chain, (3)-2CF23 Clg Mt-SW, W32CF4-E(T8)SW, W20CF1-Mag(T12) SW, W20WF2-Mag(T12) SW, (1)I60 Plug-In, CF23 On Turtle Tank
	1J	1	Radiant Steam	Lg. Stereo, Med. TV, Cable Box, Phone Dock, Sm. TV, Pedistal Fan	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Frigidaire 4-Burner Stove, Firigidaire Mod.# FRT16CRHW3 Fridge, Sm. Sharp Microwave, Toaster Oven, G. Foreman Grill, Toaster	3/4" Commercial Grade Double Glazed in Good Condition	GE Window, 5000BTU, 9.7 EER	None	None	(3)-I60 Pull Chain, (3)-2CF23 Clg Mt-SW, W32CF4-E(T8)SW, W20CF1-Mag(T12) SW, W20WF2-Mag(T12) SW, (3)I60 Plug-Ins
	2A	2	Radiant Steam	Lg. TV, (3)Cable Box, DVD, Lg. Stereo, Med. TV, Desktop Comp., Printer, DVD/VCR, Sm. TV	New Frigidaire Stacked Combo Mod.# FTF530FS1-12A and Mod.# FGQ332ES2-6A, 20000BTU Input	GE Stove Mod.# J247305WH, 9.5KW/220V GE Mod.# GTS18BBSARWWW Fridge, Croc Pot, Med. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	(2) Sharp Mod.# AF-08ERL, 8200BTU, 9.8 EER	None	None	2CF13Clg Mt. SW, W34CF4-Mag(T12)SW, I60Wall Mt. SW, (2)CF13 Plug-In
	2B	2	Radiant Steam	(3)Med. TV, (3)Cable Box, (2)Med. Stereo, (2)Fans, Desktop Computer, Laptop Computer	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Fridigaire 4-Burner Stove, GE Mod.# GTS1818BBSARWWW Fridge, Med. Microwave, Toaster Oven, Coffee Pot	3/4" Commercial Grade Double Glazed in Good Condition	6000BTU Window, Low EER	None	None	2CF13Clg Mt. SW, W34CF4-Mag(T12)SW, I60Wall Mt. SW, (2)CF23 Plug-In
5806											
	2C	2	Radiant Steam	Sm. Stereo, (2)Clock Radio, Night Light	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Fridigaire 4-Burner Stove, GE Mod.# GTS1818BBSARWWW Fridge, Med. Microwave, Toaster Oven, Coffee Pot	3/4" Commercial Grade Double Glazed in Good Condition	Maytag Window, 5000BTU Not Installed	None	None	(2)W20CF1-Mag(T12) SW, 2CF17 Clg Mt SW, W32CF-E(T8)SW, I40 Plug In
	2D	2	Radiant Steam	Cable Box, Med. Flat Screen TV, Stereo, Oxygen Machine, Phone Dock	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Fridigaire 4-Burner Stove, Frigidaire Mod.# FRT17B3AW1 Fridge, Med. Microwave, Croc Pot, Coffee Pot, Mixer	3/4" Commercial Grade Double Glazed in Good Condition	GE Window, 5000BTU, 9.7 EER	None	None	(2)W20CF1-Mag(T12) SW, 2CF23 Clg Mt SW, W32CF-E(T8)SW

6006	14A	3	Radiant Steam	(3)Snake Tanks, Recip. Fan, Sm. TV, (2)Cable Boxes, 52" Fl. Sc. TV, DVD/VCR, VCR, Desktop Comp, Box Fan, (2)Lg. Stereos	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Hotpoint 4-Burner Stove, GE Mod.# GTS1818BBSARWWW Fridge, Sm. Microwave, Toaster Oven, Coffee Pot	3/4" Commercial Grade Double Glazed in Good Condition	(1)Daewoo: Mod.# DWC-052CA, 6000BTU (2)Sharp: 12000BTU, 10.8EER	None	None	I40 Pull Cord, W20RingF-E(T8)SW, w20WF1-Mag(T12)SW, 2CF23ClgMt-SW, MH100 Plug-In, (2)MH175 Plug-In, T34TankMtF2-Mag(T12) Plug-In, (3)I60 Plug-Ins
	14B	3	Radiant Steam	Sm. Fl. Sc. TV, (2)Lg. HDTV, Net Router, (2)Phone Docks, (3)DVD Players, 12W/12.5A Plug-In Elec Heater, VCR, Laptop, Cable Box	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	GE Stove Mod.# J247305WH, GE Mod.# GTS1818BBSARWWW Fridge, Sm. Microwave, G. Foreman Grill, Croc Pot	3/4" Commercial Grade Double Glazed in Good Condition	(1) GE Window: 5000BTU, 9.7EER (1)Whirlpool: 5000BTU, 9.7EER	None	None	(5)2CF23 1SW EA, W20WF1-Mag(T12) SW, (3)I65 Plug-In
6013 (Vacant)		2	Radiant Steam	None	None	Tappan 4-Burner Stove, GE Mod.# GTS1818BBSARWWW Fridge	3/4" Commercial Grade Double Glazed in Good Condition	None	None	None	W34CF4-Mag(T12) Dual SW, 20W&32WFRing SW, (4)2CF23ClgMt 1SW EA, W20CF1-Mag(T12) SW, I40 Wall Mt. SW, No Plug-Ins

Complex Averages

Apartment #	# Bedrooms	Heating Type	Appliances	Washer/Dryer	Kitchen Equipment	Windows/Doors	Air Conditioning	Thermostats	Exhaust Fans	Lighting
Average	1	Radiant Steam	(2)Lg. TV, (2)DVD, (2)Cable Box, (2)Stereo, (2)Phone, Printer, Desktop Comp., Small Fridge, Video Game Console, (2)Modems	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Tappan 4-Burner Stove, Hotpoint Fridge Mod.# CTX18CG, Coffee Maker, Toaster Oven, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	5000BTU, 10.0 EER Window	None	None	(3)-I60 Pull Chain, (3)-2CF23 Clg Mt-SW, W32CF4-E(T8)SW, W20CF1-Mag(T12) SW, W20WF2-Mag(T12) SW, (3)I60 Plug-Ins, (1)3-Bulb I60 Plug-In
Average	2	Radiant Steam	(3)Med. TV, (3)Cable Box, (2)Med. Stereo, (2)Fans, Desktop Computer, Laptop Computer	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	Tappan 4-Burner Stove, Hotpoint Fridge Mod.# CTX18CG, Toaster, Toaster Oven, Coffee Pot, Sm. Microwave	3/4" Commercial Grade Double Glazed in Good Condition	(2) Sharp Mod.# AF-08ERL, 8200BTU, 9.8 EER	None	None	(3)-I60 Pull Chain, (3)-2CF23 Clg Mt-SW, W32CF4-E(T8)SW, W20CF1-Mag(T12) SW, W20WF2-Mag(T12) SW, (3)I60 Plug-Ins, (1)3-Bulb I60 Plug-In
Average	3	Radiant Steam	Sm. Fl. Sc. TV, (2)Lg. HDTV, Net Router, (2)Phone Docks, (3)DVD Players, 12W/12.5A Plug-In Elec Heater, VCR, Laptop, Cable Box	GE Spacemaker Stacked Combo: Mod.# WSM2780WGWWW. Natural Gas, 14.5A, 20,000BTU Input	GE Stove Mod.# J247305WH, GE Mod.# GTS1818BBSARWWW Fridge, Sm. Microwave, G. Foreman Grill, Croc Pot	3/4" Commercial Grade Double Glazed in Good Condition	(1)Daewoo: Mod.# DWC-052CA, 6000BTU (2)Sharp: 12000BTU, 10.8EER	None	None	(5)2CF23 1SW EA, W20WF1-Mag(T12) SW, (3)I65 Plug-In

Complex Averages

	Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
	1	Desktop Computer	1	Tappan Stove	1	5000 BTU, 10.0 EER	3	I60 Pull-Chain	3	I60
	2	Lg. TV	1	Hotpoint Fridge			3	2CF23 Clg Mt SW (Occ)	1	3I60
	2	Cable Boxes	1	Coffee Pot			1	W32CF4-E SW (T8, Occ)		
	2	DVD Players	1	Toaster Oven			1	W20CF1-Mag SW (T12, Occ)		
1-Bed	2	Stereos	1	Sm. Microwave			1	W20CF2-Mag SW (T12, Occ)		
	2	Plug-In Phones								
	1	Printer								
	1	Small Fridge								
	1	Video Game Console								
	2	Net Modems								
		Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps
	3	Med. TV	1	Tappan Stove	2	8200 BTU, 9.8 EER	3	I60 Pull-Chain	3	I60
	2	Med. Stereo	1	Hotpoint Fridge			3	2CF23 Clg Mt SW (Occ)	1	3I60
2-Bed	3	Cable Boxes	1	Coffee Pot			1	W32CF4-E SW (T8, Occ)		
	2	Fans	1	Sm. Microwave			1	W20CF1-Mag SW (T12, Occ)		
	1	Desktop Computer	1	Toaster			1	W20CF2-Mag SW (T12, Occ)		
	1	Laptop Computer	1	Toaster Oven						
		Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps
	1	Sm. TV	1	GE Stove	1	6000 BTU, 9.8 EER	5	2CF23 Clg Mt 1 SW EA (Occ)	3	I65
	2	Lg. TV	1	GE Fridge	2	12000 BTU, 10.8 EER	1	W20CF1-Mag SW (T12, Occ)		
	1	Net Modems	1	G. Foreman Grill						
	2	Phone Docks	1	Sm. Microwave						
3-Bed	3	DVD Players	1	Croc Pot						
	1	12W/12.5A Heater								
	1	VCR								
	1	Laptop Computer								
	1	Cable Box								

Entire Complex Totals: 12 3-Bed APT 102 2-Bed APTs 58 1-Bed APTs

	Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps	
	58	Desktop Computer	58	Tappan Stove	58	5000 BTU, 10.0 EER	174	I60 Pull-Chain	174	I60
	116	Lg. TV	58	Hotpoint Fridge			174	2CF23 Clg Mt 1 SW EA (Occ)	58	3I60
	116	Cable Boxes	58	Coffee Pot			58	W32CF4-E SW (T8, Occ)		
	116	DVD Players	58	Toaster Oven			58	W20CF1-Mag SW (T12, Occ)		
1-Bed	116	Stereos	58	Sm. Microwave			58	W20CF2-Mag SW (T12, Occ)		
	116	Plug-In Phones								
	58	Printer								
	58	Small Fridge								
	58	Video Game Console								
	116	Net Modems								
		Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps
	306	Med. TV	102	Tappan Stove	204	8200 BTU, 9.8 EER	306	I60 Pull-Chain	306	I60
	204	Med. Stereo	102	Hotpoint Fridge			306	2CF23 Clg Mt 1 SW EA (Occ)	102	3I60
2-Bed	306	Cable Boxes	102	Coffee Pot			102	W32CF4-E SW (T8, Occ)		
	204	Fans	102	Sm. Microwave			102	W20CF1-Mag SW (T12, Occ)		
	102	Desktop Computer	102	Toaster			102	W20CF2-Mag SW (T12, Occ)		
	102	Laptop Computer	102	Toaster Oven						
		Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps
	12	Sm. TV	12	GE Stove	12	6000 BTU, 9.8 EER	60	2CF23 Clg Mt 1 SW EA (Occ)	36	I65
	24	Lg. TV	12	GE Fridge	24	12000 BTU, 10.8 EER	12	W20CF1-Mag SW (T12, Occ)		
	12	Net Modems	12	G. Foreman Grill						
	24	Phone Docks	12	Sm. Microwave						
3-Bed	36	DVD Players	12	Croc Pot						
	12	12W/12.5A Heater								
	12	VCR								
	12	Laptop Computer								
	12	Cable Box								
		Appliances		Kitchen Equipment		Air Conditioning		HA Lighting		Lamps
	12	Sm. TV	160	Tappan Stove	58	5000 BTU, 10.0 EER	480	I60 Pull-Chain	480	I60
	306	Med. TV	12	GE Stove	204	8200 BTU, 9.8 EER	540	2CF23 Clg Mt 1 SW EA (Occ)	160	3I60
	140	Lg. TV	160	Hotpoint Fridge	12	6000 BTU, 9.8 EER	160	W32CF4-E SW (T8, Occ)	36	I65
	434	Cable Boxes	12	GE Fridge	24	12000 BTU, 10.8 EER	172	W20CF1-Mag SW (T12, Occ)		
	152	DVD Players	172	Sm. Microwave			160	W20CF2-Mag SW (T12, Occ)		
	116	Stereos	102	Toaster						
	140	Plug-In Phones	160	Toaster Oven						
Totals	58	Printer	160	Coffee Pot						
	58	Small Fridge	12	G. Foreman Grill						
	58	Video Game Console	12	Croc Pot						
	128	Net Modems								
	160	Desktop Computer								
	204	Med. Stereo								
	204	Fans								
	114	Laptop Computer								
	12	12W/12.5A Heater								
	12	VCR								

YOUR SUMMARY

GARDEN APARTMENTS 1-5

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
R-38 Attic Insulation 1: Upgrade 3,960 square feet of existing sloped roof to Gyp Bd, 2x6 24" OC, 12" Fiberglass, R-38	Improve comfort, increase value of building.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 4,387		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		388.2		
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: 1.1300 $/Therm
- Electricity: 0.1750 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR R-38 Attic Insulation

Meadowview Apartment Bld #1

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. R-38 Attic Insulation 1

Surface Insulation

Upgrade 6241 Sq.Ft of existing surfaces to Gyp Bd, 2x6 24" OC, 12" Fiberglass, R-38

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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 1 5828 Meadowview A
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: R-38 Attic Insulation

Billing Period Name: None

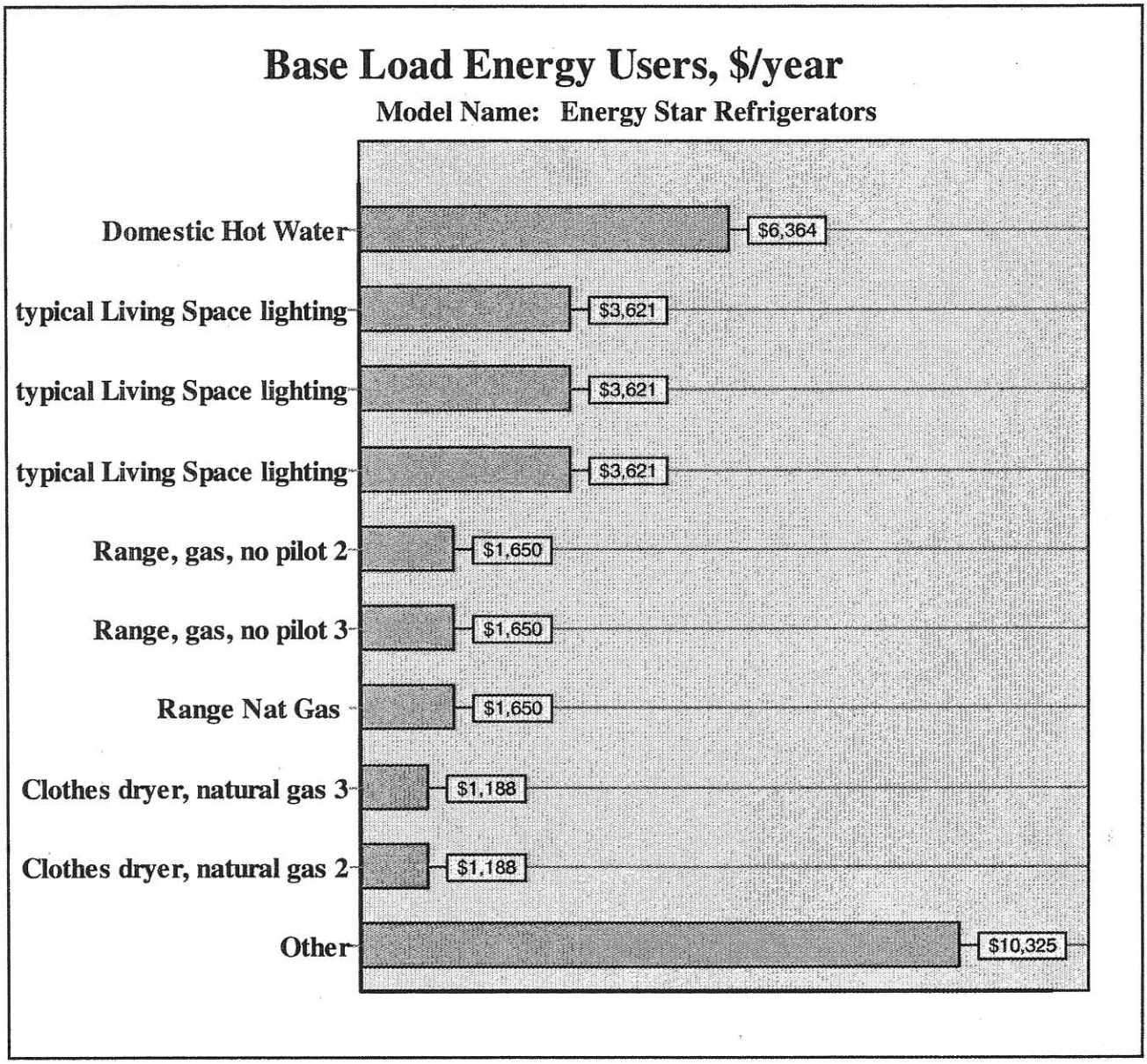
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	12,757	14,415	142,575	22,812		
Billing						
% Difference						

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

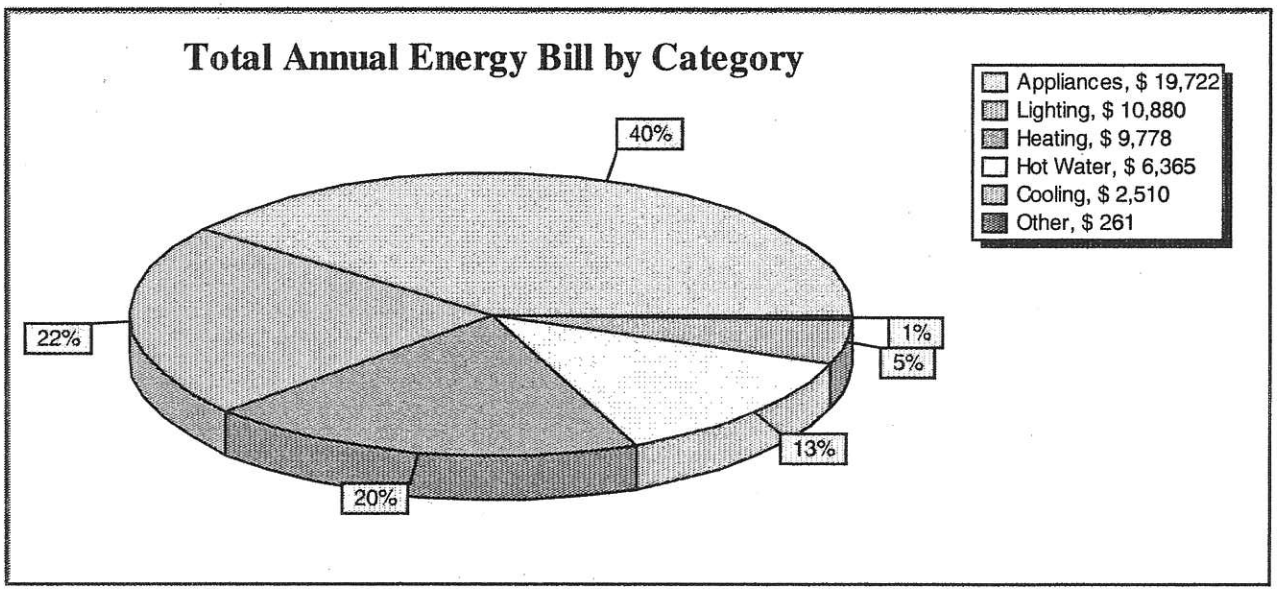
Model Name: R-38 Attic Insulation

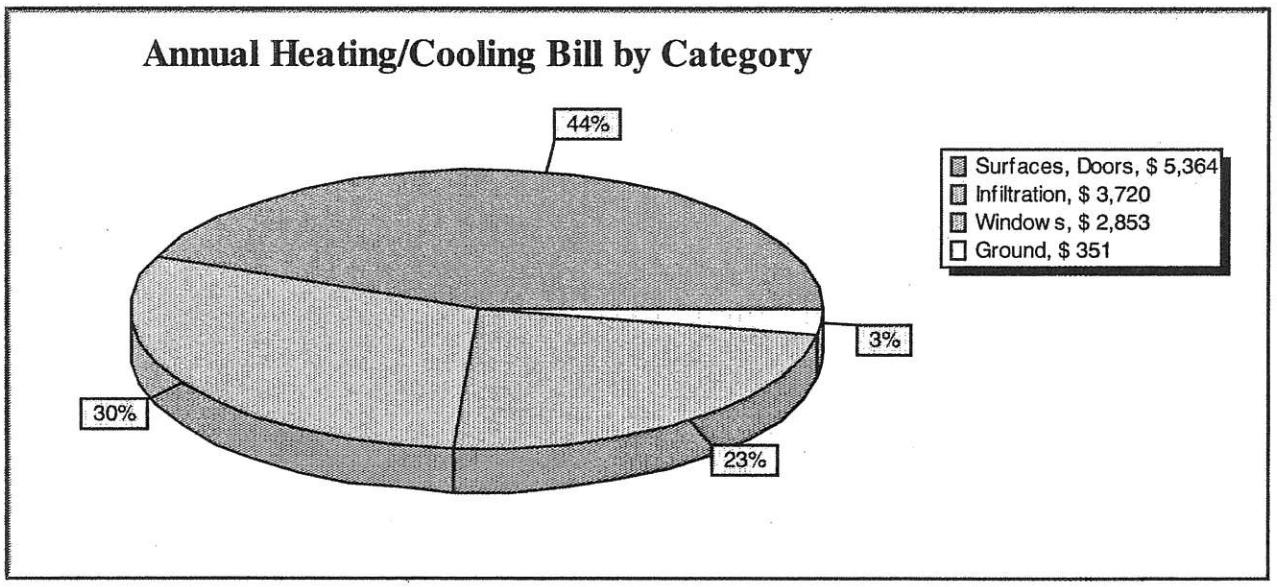
	Natural gas $1.13 per Therm		Electricity $0.16 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	5,632	6,364	0	0			6,364
2. typical Living Space lighting	0	0	22,630	3,621			3,621
3. typical Living Space lighting	0	0	22,630	3,621			3,621
4. typical Living Space lighting	0	0	22,630	3,621			3,621
5. Range, gas, no pilot 2	1,460	1,650	0	0			1,650
6. Range Nat Gas	1,460	1,650	0	0			1,650
7. Range, gas, no pilot 3	1,460	1,650	0	0			1,650
8. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
9. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,414			1,414
10. Other	2,745	3,102	55,372	8,862			11,964
TOTAL	12,757	14,416	140,942	22,553			36,969


Base Load Energy Users, $/year
Model Name: Energy Star Refrigerators
Domestic Hot Water
$6,364
typical Living Space lighting
$3,621
typical Living Space lighting
$3,621
typical Living Space lighting
$3,621
Range, gas, no pilot 2
$1,650
Range, gas, no pilot 3
$1,650
Range Nat Gas
$1,650
Clothes dryer, natural gas 3
$1,188
Clothes dryer, natural gas 2
$1,188
Other
$10,325

MODEL ENERGY REPORT FOR R-38 ATTIC INSULATION

Meadowview Apartment Bld #1
For: NBHA
By:
Date: 9/2/2009





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

DESIGN HEATING AND COOLING LOADS FOR R-38 ATTIC INSULATION

9/2/2009
Project Name: Meadowview Apartment Bld #1

For: NBHA

By:

Date:

Primary Heating System:

Space Name	Load, Btu/Hr	Load, per SF Btu/(Hr-SqFt)	Distribution	
			GPM	Ft of baseboard
1st Floor	180179	30	20.5	345
3rd Floor	160631	26	18.3	308
Boiler Room	3825	12	0.4	8
2nd Floor	100713	17	11.4	193

Required Heating Equipment Output Capacity: 520593 Btu/hr
Available Heating Equipment Output Capacity: 700000 Btu/hr
Total flow: 52.1 GPM
Baseboard Capacity: 575 Btu/Hr-Ft
Heating Equipment Efficiency: 70 %
Calculated Distribution Efficiency: 94 %
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
1st Floor	137414	4999
3rd Floor	193965	7056
Boiler Room	0	0
2nd Floor	118986	4329

Required Cooling Equipment Output Capacity: 486616 Btu/hr

Available Cooling Equipment Output Capacity: 70000 Btu/hr

Total flow: 16092 CFM

Cooling Equipment Efficiency: 10 SEER

Calculated Distribution Efficiency: 100%

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.

YOUR SUMMARY

TOWN HOME APARTMENTS 6-8

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
R-38 Attic Insulation 1: Upgrade 6,241 square feet of existing sloped roof to Gyp Bd, 2x6 24" OC, 12" Fiberglass, R-38	Improve comfort, increase value of building.	$ 0		
Total Installed Cost		$ 0		
Annual Energy Cost Savings		$ 6,542		
Annual KWh Savings, KWh		0		
Total Energy Savings, MMBtu		578.9		
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: 1.1300 $/Therm
- Electricity: 0.1600 $/kWh

DETAILED PACKAGE DESCRIPTION AND WORKSCOPE FOR R-38 Attic Insulation

Meadowview Town Home #7

For: NBHA

By:

Date:9/2/2009

Improvement Information:

1. R-38 Attic Insulation 1

Surface Insulation

Upgrade 3960 Sq.Ft of existing surfaces to Gyp Bd, 2x6 24" OC, 12" Fiberglass, R-38

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.

Base Load Report

Customer Information

Customer Name: NBHA

Address: Building # 7 5828 Meadowview
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: R-38 Attic Insulation

Billing Period Name: None

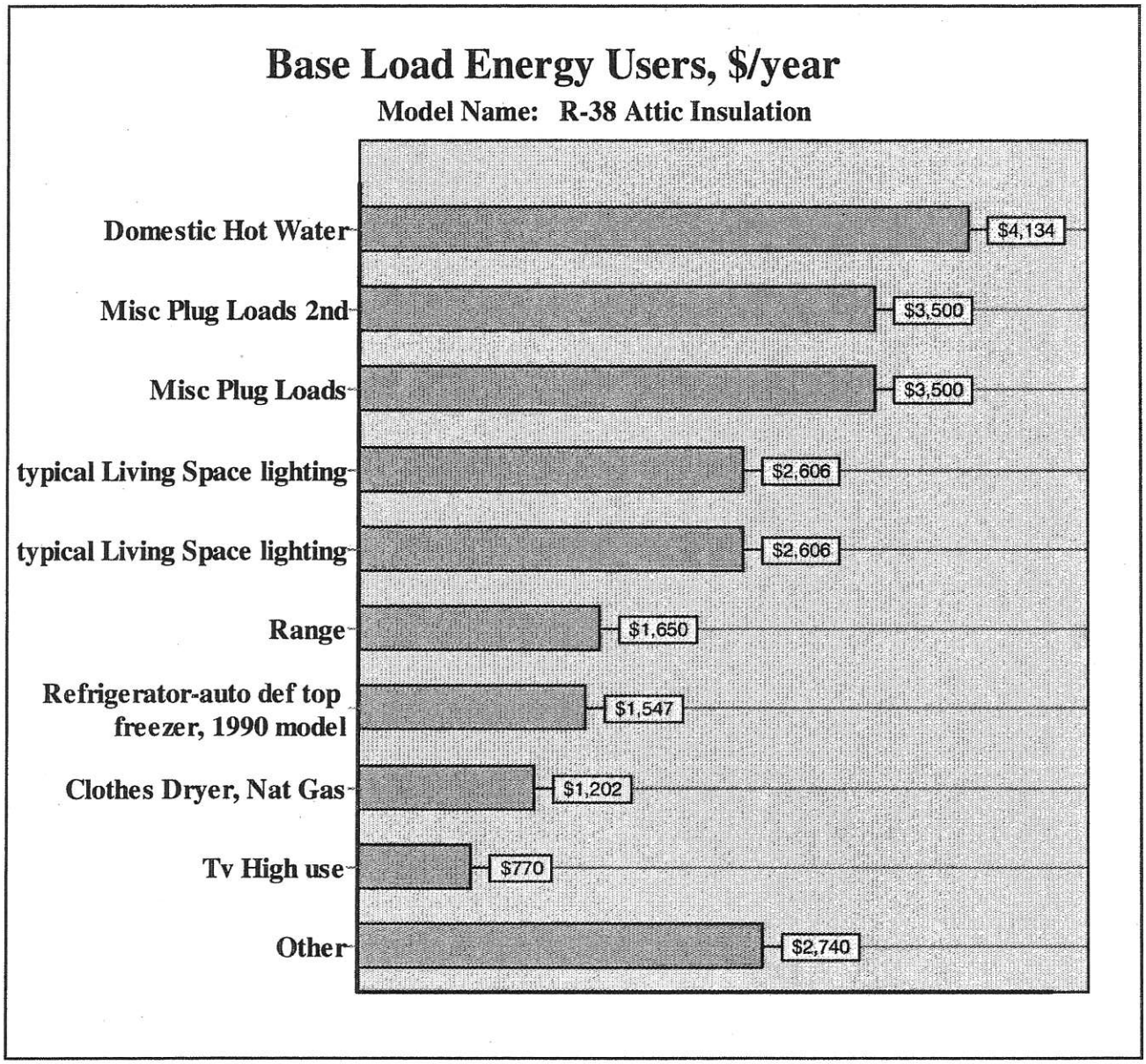
	Natural gas		Electricity			
	Therm	$	kWh	$		
Model	6,033	6,817	101,272	17,723		
Billing						
% Difference						

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: R-38 Attic Insulation

	Natural gas $1.13 per Therm		Electricity $0.18 per kWh				Total
	therms	$	kWh	$			$
1. Domestic Hot Water	3,658	4,134	0	0			4,134
2. Misc Plug Loads 2nd	0	0	20,000	3,500			3,500
3. Misc Plug Loads	0	0	20,000	3,500			3,500
4. typical Living Space lighting	0	0	14,892	2,606			2,606
5. typical Living Space lighting	0	0	14,892	2,606			2,606
6. Range	1,460	1,650	0	0			1,650
7. Refrigerator-auto def top freezer, 1990	0	0	8,840	1,547			1,547
8. Clothes Dryer, Nat Gas	915	1,034	960	168			1,202
9. Tv High use	0	0	4,400	770			770
10. Other	0	0	15,654	2,740			2,740
TOTAL	6,033	6,818	99,638	17,437			24,255


Base Load Energy Users, $/year
Model Name: R-38 Attic Insulation
Domestic Hot Water
$4,134
Misc Plug Loads 2nd
$3,500
Misc Plug Loads
$3,500
typical Living Space lighting
$2,606
typical Living Space lighting
$2,606
Range
$1,650
Refrigerator-auto def top freezer, 1990 model
$1,547
Clothes Dryer, Nat Gas
$1,202
Tv High use
$770
Other
$2,740

North Bergen Housing Authority
CHA #20241
Building: Meadowview Apartments

ECM - 7a Insulate all Meadowview Apartments attic spaces with 12" R-38 insulation.

Suggestions

Insulate Attic Floor with 12" of Batt Fiberglass (R-38).

Apartments Buildings 1-5

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.		
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
Insulate Atic with 12" Insulation	31,000	S.F.	$ 0.19	$ 0.15	$ 0.07	$ 5,890	$ 5,673	$ 2,170	$ 13,733	R.S. Means Construction 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.

$ 13,733	Subtotal
$ 2,060	15% Contingency
$ 2,369	15% Contractor O&P
$ -	0% Engineering
$ 18,162	**Total**

Townhomes Buildings 6-8

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.		
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
Insulate Atic with 12" Insulation	12,600	S.F.	$ 0.19	$ 0.15	$ 0.07	$ 2,394	$ 2,306	$ 882	$ 5,582	R.S. Means Construction 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.

$ 5,582	Subtotal
$ 837	15% Contingency
$ 963	15% Contractor O&P
$ -	0% Engineering
$ 7,382	**Total**