ASSOCIATION FOR
ENERGY AFFORDABILITY, INC.

Energy Analysis, Suggested Scope of Work, & Engineering Calculations for Proposed Improvements at
463 West Street, New York, NY (Westbeth Artists Residence)

Report Prepared by: Patrick Brennan (212) 279-3902 ext 8206
Audit Date: August 6, 2010

Report Date: February 23, 2011

BUILDING OWNER: WESTBETH CORPORATION
BUILDING CONTACT: MATTHEW RUSSAS PHONE: (212)691-1500

This Audit was performed by the Association for Energy Affordability
for the Northern Manhattan Improvement Corporation

Performance of this audit was supported by funds from the
New York State Division of Housing and Community Renewal - Energy Services

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Section I: Executive Summary

This report is a comprehensive energy audit, analysis, and scope of work designed for the building located at 55 Bethune Street/463 West Street, New York, NY 10014. It presents specific recommendations to reduce heating, domestic hot water, and electric energy use based on a review of existing building documentation; site visits and interviews; and computer-assisted energy modeling.

Based on our audit findings, we have identified 8 cost effective energy conservation measures, as follows:

- **Weather-strip exterior doors;**
- **Install Low-Flow devices;**
- **Attic Insulation – H Building;**
- **Ventilation System Upgrade;**
- **Heating Plant Upgrade;**
- **Refrigerator Replacement;**
- **In-Unit Lighting Replacement;**
- **Installation of Zone Control Valves;**

In addition to these measures, we have one energy conservation measure deemed "not cost effective" (**Replace Exit Signs**), and three Health and Safety Measures, as well as one measure recommending training of 5 Staff in Energy Efficient Building Operations. The total cost of all of this recommended work, including the energy efficiency measures is **$1,880,542.50**, or about $4,905 per unit. We project that these measures will result in cost savings of **$232,980.00**.

Window replacement was investigated, but not included in the recommended measures, due to the requirement that replacement windows be approved by the Landmarks Commission. The process of obtaining approval has a great deal of uncertainty, and the estimated cost of approvable replacement windows is $3,000 per unit, resulting in an estimated SIR of less than 0.20. Therefore, due to this extremely high cost, and uncertain process of obtaining approval, this measure is not included.

Section II: Methodology

The energy audit of the complex included a review of existing building documentation; multiple site visits and interviews to collect detailed information on the building's conditions, operations, and performance; and computer-assisted energy modeling to develop a comprehensive model of the building's energy use and costs to identify potential improvement opportunities and predicted savings.

<u>Review of Existing Documentation</u>

Building documentation was supplied by the building manager. Provided documentation includes mechanical renovation drawings dated June 1968, fuel oil bills from Hess Oil, as well as two years of monthly fuel oil consumption records, utility bills (Gas and Electric) from Con Edison, a Physical Condition Survey, performed by Rand Engineering, dated June 2006, and various other data. In addition, Carl Stein, of the architecture firm elemental was kind enough to

provide us with AutoCad file drawings of the facility.

Site Visits and Interviews
Site visits and interviews were conducted on August 10, 2010. During this visit detailed information was collected on the building's operations, heating system, envelope, roof, windows, lighting, doors, and appliances. In addition, building staff and tenants were interviewed.

Computer-Assisted Energy Modeling
The TREAT program, Version 3.2.5.2 was used to develop a comprehensive model of the building's energy consumption and to evaluate potential retrofit opportunities. The information entered into the program included data gathered from the existing building documentation, site visits, and interviews.

Section III: Building Management, Staffing, and Occupancy

The building is actually a 13 building complex, located on the block bordered by Bethune St, on the north, Bank St on the south, Washington St on the east, and West St. The complex was the home of Bell Telephone Laboratories 1898 to 1966; it was renovated and opened as Westbeth Artists Community in 1970. The complex was declared a National Historic Landmark in 1975.

Building Management and Staffing
The property is owned by Westbeth Corporation. Matthew Russas is the Property Manager, and Todd Salley is the Superintendant. The remainder of the staff includes 3 Handymen, 2 Painters, 8 Porters, and 11 Security, or which 3 are part time.

Building Occupancy
The building has 384 units, of which 100 are efficiencies, 86 are one bedroom units, 126 are two bedroom units, and 72 are three bedroom units. All residents are professional artists.

Section IV: Building Energy Use as Determined from Existing Building Documentation

Electricity
The residential complex is master-metered for electricity. From October 2008 through October 2010, the building's electricity use amounted to 5,468,080 **Error! Reference source not found.**kWh and its highest demand was 710 kW. The total electricity cost for this period was $1,072,024 or about $.20 per kWh. There are separate electrical meters for the commercial spaces.

Fuel Usage
The heating and domestic hot water plant uses #6 Fuel Oil, supplied by Hess Oil Corporation. From January 2008 through December 2009, a total of 556,558 gallons of fuel oil were delivered, at a total cost of $1,107,517.

Energy Factor
The energy factor for the complex is 12.8 BTU/square foot/Heating Degree Day. For comparison, the average energy factor in New York City multifamily buildings is 22.2 BTU/square foot/Heating Degree Day. Nationally, the average energy factor in multifamily buildings is 15.0 BTU/square foot/Heating Degree Day.

Section V: Building Systems & Existing Conditions

Envelope

Roof
With 13 buildings, Westbeth has a variety of roofs, in a variety of conditions. In general, roofs are old and in poor condition. Following are notes on individual roofs:
The A building has a main roof, and several terraces, including ones the 13th floor The roofs are approximately 20 years old, and leaks have been reported. The 13th floor terraces have decking and are accessible to the tenants.
The roof of B-D buildings has one section on the west side that has been replaced in the past few years, and appears to be in good condition. The balance of this roof is in poor condition, though there do not appear to be leaks.
The roof of C-D buildings is relatively new, in good condition, with masonry pavers, and is accessible to the tenants.
The G building has several roof sections, with a low roof over the boiler room and other spaces, small roof sections on the 2nd and 3rd floor, and a main roof. The main roof have brick pavers. All roofs are in poor condition, and one skylight is also in poor condition.
The H building has a gable roof, with roof tiles, in good condition, relatively new. There is no attic insulation in the H building.
The I building also has an older roof, in poor condition.

Windows
The building has approximately 2,100 windows, almost all of which are double-hung, single pane oversized windows. Window frames are a mixture of wood and metal. Windows are generally in poor condition; caulking has deteriorated, metal is rusted, and wood frames have

deteriorated; many windows are difficult to operate, many are leaky and allow high infiltration rates.
The building is listed in the Historic Register, and so replacement windows would have to be approved by the Landmarks Commission.

Walls
The building is of masonry construction, with cavity wall and face brick. The ground floor of most buildings has stonework.

Doors
The complex has forty-five exterior doors. Most doors do not have weather-stripping or door sweeps.

Mechanical Systems
Heating Plant
The complex has one central heating plant, located in the basement of Building D, which generates heat and domestic hot water for the entire complex. The heating plant consists of two Cleaver Brooks Model CB 655-600 oil-fired scotch marine steam boilers, 600 Hp, with integral burners. One boiler is standby. The boilers date from 1969, and appear to be in fair condition. Fuel is #6 oil. There are three steel fuel oil tanks, located in an adjacent fuel tank room, as well as a fuel oil heating and pumping station. Fuel Oil tank capacity is 18,000 gallons.
The boiler plant also contains a de-aerator tank, which appears to be older than the 1969 boilers, and appears to be in poor condition, though it is reported to be functional. There are two condensate pumps, each at 5 hp, which return the condensate from the de-aerator to the boilers. Pipe and some equipment insulation in the Boiler Room is reported to contain Asbestos.

The heating distribution system for the main residential complex is hydronic – heating hot water, with two shell-and-tube steam-to-hot water heat exchangers, ceiling mounted in an adjacent pump room. Steam is piped directly to Building I, which has steam radiators; steam is also piped to Building L (New School); Building L has its own steam-to-hot water heat exchanger, and its own hydronic heating system.
The heating distribution system had 10 zone control valves, each controlled by an electric thermostat located in a representative space for each zone. The zone control valves have been long removed. Heat is provided to each space by a cast-iron radiator, which are original to the building, and previously were steam radiators. There is no in-unit heat control.

Table 1: Boiler Combustion Eff Results	**Blr 1**	**Blr 2**
Stack Temperature (°F)	254	212
CO_2 (%)	9	10.4
Combustion Efficiency (%)	86	88.5
Draft	-.6	0.01
CO - flue (ppm)	60	68

Domestic hot water is generated using tank-less coils in the two boilers.

CO – ambient (ppm)	0	0

Combustion efficiency results for the heating plant are listed in Table 1.

Lighting

Apartments: Kitchens generally have a 6-foor T-12 under-cabinet fixture; hallways have a 60 watt incandescent fixture, and bathrooms also have an incandescent fixture.
The existing public hallway lighting consists of compact fluorescent bulbs, while the stairways and basement have electronically ballasted T-8 fluorescent lamps.

Appliances

Faucets and Showerheads

Based on our survey of the building's bathrooms, approximately 230 shower heads can be replace with low-flow type, while 460 faucets can be replaced with low flow aerators.

Refrigerators

The building has approximately 384 refrigerators, of which 116 can be cost-effectively replaced with Energy-Star rated units.

Ventilation & Infiltration

The building has mechanical ventilation which exhausts kitchens and bathrooms air in most units. Fans are roof-mounted, "mushroom" type, approximately 40 years old, in poor condition. According to the mechanical drawings, there are a total of 33 bathroom exhaust fans, and 21 kitchen exhaust fans, with a total of approximately 385 bathroom exhaust grilles, and 245 kitchen exhaust grilles.
It is reported several roof fans have been removed, and the duct shafts sealed, during a roofing project, at the south-west part of Building C.
In addition, corridors have supply air ventilation, supplied by two steam-fired Heating and Ventilation (H&V) units located in the basement. These units are not functional at present, and appear to be in very poor condition.

Section VI: Energy Use Modeling

Energy use data collected from the existing building documentation was input into the TREAT Program to determine the building's annual energy consumption. The complete dataset in 'normalized' in the TREAT program based on the number of heating degree days for New York City.

Next, information about the building's systems gathered during the site visits and interviews was input into TREAT to develop a comprehensive model of the building's fuel consumption for heating and domestic hot water.

Appendix C, Comparison Billing Data to Model Data, demonstrates the relationship between the building's actual heating fuel usage as determined from utility records and the building's fuel

usage as calculated by the TREAT program based on the building system inputs. The model estimates that the building uses 304,617 gallons of #6 fuel oil annually while the actual building fuel usage totaled 297,669 gallons, a difference of less than 3%, suggesting that the model is a strong fit to the actual data.

Modeling Assumptions
Some modeling assumptions were made when information was unavailable. Those assumptions include the day and nighttime apartment temperatures and the number of occupants during the day and night. Heating and domestic hot water efficiencies were also adjusted to account for standby losses and overall system inefficiencies. Boiler thermal efficiency was modeled at 82%; this is a high efficiency, considering that the boilers are approximately 40 years old.
The TREAT program cannot model the interaction of ventilation savings and infiltration, (the fact that the savings from reduced exhaust ventilation come from a reduction in infiltration, but the infiltration reduction is not equivalent to the reduction in exhaust ventilation). This calculation was performed outside of TREAT, and the results were entered into the Table 2 for these measures. Therefore, the savings shown in the TREAT output do not equal the savings shown in Table 2, but the sums of both measures are equal.

Section VII: Evaluated Measures

The TREAT building model was used to evaluate potential retrofit opportunities. Table 4 lists the opportunities evaluated for this project within the following categories: Most Cost Effective Measures; Measures Eligible Under WAP but Deemed, “Not Cost Effective”; and Operation and Maintenance Measures. For each of the proposed measures, the table includes information on the estimated retrofit cost, projected monetary savings within one year of retrofit installation, the retrofit’s savings-to-investment ratio (SIR), and the retrofit’s cost if paid for under the American Recovery and Reinvestment Act (ARRA). The SIR is the amount of savings generated by each dollar of investment and takes into account the lifetime of the proposed measure. Please note that it was not possible to determine an estimate for some measures. In all, measures were recommended for an estimated grand total of $1,883,543 and an estimated $4,905 per unit. The projected first year savings of all of these measures is $232,982. We project that these measures will help the building reduce its energy factor from 12.8 BTU/sq.ft./HDD to 8.58 BTU/sq.ft./HDD. This represents a 33% savings.

Table 2: Evaluated Measures

Proposed Scope of Work - WAP
463 West Street

Proposed Retrofit		Non-ARRA Retrofit Cost	Projected 1st Year Monetary	S.I.R.	ARRA Cost
Health and Safety and Immediately Hazardous Conditions					
1	**Asbestos Abatement in Boiler Room** Complete abatement	$117,000.00	N/A	N/A	$140,400.00
2	**Install Smoke/CO Detectors in apartments** Estimated quantity of 85 Smoke/CO detectors	$12,750.00	N/A	N/A	$15,300.00
3	**Clean Exhaust Ducts and Ventilation Registers** Clean quantity of approx. 675 registers and approx. 55 ducts.	$45,000.00	N/A	N/A	$54,000.00
H&S SUBTOTAL		**$174,750.00**	**$0.00**		**$209,700.00**
Measures					
4	**Weatherstrip Exterior Doors** Weatherstrip approx total 45 exterior Doors	$10,000.00	$15,818.00	16.82	$12,000.00
5	**Install Low-Flow devices** Quantities: approx 230 shower heads & 460 faucet aerarors	$6,500.00	$5,200.00	9.55	$7,800.00
6	**Attic Insulation - H Bldg** Install 12" cellulose insulation in attic + air seal	$8,000.00	$2,036.00	3.79	$9,600.00
7	**Ventilation System Upgrade** Replace exhaust fans, H&V Units; clean ducts	$385,000.00	$69,206.00	2.15	$462,000.00
8	**Upgrade Heating Plant** Replace boilers, convert to DHW system	$800,000.00	$95,459.00	2.08	$960,000.00
9	**Refrigerator Replacement** Replace approx 116 inefficient refrigerators with Energy-Star rated units	$47,000.00	$6,522.00	1.99	$56,400.00
10	**Upgrade In-unit Lighting** Replace existing in-unit lighting according to the lighting audit.	$220,000.00	$19,711.00	1.07	$264,000.00
11	**Install Zone Control Valves** Install approx 10 Zone Control Valves, along w/ control system, including 60 wireless sensors; re-	$185,000.00	$16,080.00	1.04	$222,000.00
SUBTOTAL		**$1,661,500.00**	**$230,032.00**		**$1,993,800.00**
Work scope Eligible under WAP but not deemed Cost Effective					
12	**Replace Exit Signs** Replace with LED signs approx 200 exit signs	$42,292.50	$2,950.00	0.83	$50,751.00
Recommended					
13	**Training for Staff in Energy-efficient Building Operation (5 persons)**	$5,000.00	N/A	N/A	$5,000.00
SIR<1 SUBTOTAL		**$42,292.50**	**$2,950.00**		**$50,751.00**
GRAND TOTAL		**$1,883,542.50**	**$232,982.00**		**$2,259,251.00**
PER UNIT		**$ 4,905.06**			**$ 5,883.47**

Health and Safety Measures

Asbestos Abatement in the Boiler Room
Complete abatement of asbestos in the Boiler Room

Measure #2: Install Smoke/CO detectors in Apartments
Estimated quantity of 85 detectors to be installed.

Measure #3: Clean Exhaust Ducts and Ventilation Risers.
We recommend cleaning of approximately 675 registers and 55 ducts.

Most Cost Effective Measures

Measure #4: Weather-strip Exterior Doors

We recommend that the Exterior Door be sweeped and/or weather-stripped, as applicable, in order to reduce infiltration.

Measure #5: Install Low-flow water-saving devices

We recommend the installation of ~230 shower heads and 460 faucet aerators with low-flow units. Maximum flow rates are 1.5 gpm for the faucet aerators and 2.0 gpm for the showerhead.

Measure #6: Install Attic Insulation in Building H.

We recommend the installation of 12" cellulose or fiberglass batt insulation, as well as air sealing around ceiling penetrations.

Measure #7: Ventilation System Upgrade

Main elements of the work include:

- Inspect and clean duct and shaft risers; clean and seal apartment registers;
- Seal duct and shaft risers, using a method which sprays sealant on the inside of the ducts and shafts;
- Replace roof-mounted toilet and bathroom exhaust fans with units approximately 30% smaller than existing (Quantities of 33 and 21 fans, respectively);
- Install CAR dampers at apartment registers for automatic regulation of air flow. (Quantity of approximately 630 registers;
- Replace the two existing non-functional Heating and Ventilation (H&V) units which provide outside air to the corridors; install a heat exchanger, and glycol system, to preclude freeze damage to the heating coils.
- Restore ventilation to the south-west part of Building C, where several ducts reportedly have been sealed as part of a roof replacement project.

Measure #8: Upgrade Heating Plant.

Convert to Dual-Fuel Hot Water Boiler Plant; main elements of the work include:

- Abate asbestos in boiler room (owner's responsibility; cost is not included in estimate);
- Install new natural gas service to building (Owners' responsibility; to be done according to Owner's schedule; cost is not included in estimate);
- Demolish boilers and all steam and condensate accessories, including de-aerator tank. Since there is a standby boiler, work can be staged so that a temporary boiler should not be required;
- Install new high-efficiency dual-fuel hot water boilers, tied into existing hot water distribution system using primary/secondary piping configuration; suggested boilers are Buderus cast-iron, which would be field assembled on site; the maximum size of this boiler is approx 140 Hp, so, preliminarily, 5 boilers would be needed, one being a standby unit.
- Install new boiler breeching and chimney lining;

- Install indirect domestic hot water generation and storage
- Clean and test oil tanks, convert fuel oil system from #6 to #2 fuel oil;
- Replace the existing steam-to-hot water converter in Building L (New School) with a hot water-to-hot water heat exchanger; use existing steam lines for hot water service to Building L;
- Convert Building I from steam to hot water heat; use existing steam lines for hot water service to Building I; install a water-to-water heat exchanger, so that Building I would be isolated from the main hot water loop.
- Replace hot water circulation pumps.

Measure #9: Install Energy Efficient Refrigerators
We recommend the installation of ~116 refrigerators. Refrigerators should be replaced with Energy Star labeled energy efficient refrigerators that are rated to consume 386 kWh per year.

Measure #10: Replace In-Unit Lighting
Replace apartment lighting according to the attached lighting audit.

Measure #11: Install Zone Control Valves on the Hydronic Distribution System
Install 10 Zone Control Valves on the hydronic system as replacements for the ones that were originally in place. Control system should include approximately 6 wireless sensors for each valve, located in representative spaces, with a control algorithm that modulates each valve in response to apartment temperatures. All sensors and valve parameters are to be reported to a computer in at least one location in the building, either via an internet-based or local system.

Energy Efficiency Measures Deemed "Not Cost Effective"(SIR is less that 1.0)

Measure #12: Replace Exit signs with LED units
We recommend replacing approximately 200 exit signs.

Operations and Maintenance Measures

Measure #12: Send Building Building Operations Personnel to EEBOPS Course
All buildings that go through the WAP are encouraged to send at least one building manager or superintendent to the Energy Efficient Building Operations Specialist (EEBOPS) class. In addition, the appendices provide a suggested regular maintenance checklist that we recommend for implementation

Section VIII: Disclaimer

Disclaimer

The owner(s) and manager(s) of the building are reminded that the scope of work presented in this report is not intended to correct or interfere with any in effect building code violations. Any improvements or work suggested in this energy audit report must be performed in accordance with all local, state, and federal laws and regulations that apply by case. Particular attention must be paid to any work that involves the disturbance of products containing asbestos or lead. The TREAT program models a building's fuel consumption for heating and domestic hot water to estimate energy consumption and to evaluate potential retrofit options. TREAT does not, however, model health and safety and immediately hazardous conditions. Using engineering calculations and standard industry practices, AEA has examined these potential applications as well. Retrofits or repairs are not evaluated on energy and monetary savings alone. Environmental considerations, capital improvement needs, health and safety concerns, or attainment of various standards or codes are also taken into account. In addition, to ensure the predicted life expectancy of recommended measures, it is occasionally necessary to perform one or more related, but not analyzed measures. In modeling the building for TREAT purposes, concrete information was needed, but where the information was not available during the walk through or has several building dependant variables, such as average winter day and night temperature of the apartment, either a default value was used or the value entered is derived from the building manager, the super, or interviews with the building occupants.

Section IX: Appendices

Appendix A: Lighting Audit

Agency	**AEA**
Job Location	**add address**
Estimate Date	**date**
Job Contact	**Ellen Zuckerman**

No. Floors	0
No. Units	380
$/kWH	$0.20

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Assumed Life Cycle	15
Discount Rate	3.00%

Input Data in 'Data Entry Tab' ONLY

					EXISTING			REPLACEMENT				SAVINGS				
Item #	**Floor / Bldg**	**Qty**	**Location**	**Hours/ Day**	**Existing Fixture**	**Existing Annual kWh**	**Replacement Fixture**	**New Qty**	**New Watts/ Fixture**	**New Annual kWh**	**Total Costs (if non-ARRA)**	**Total Costs (if ARRA)**	**Annual kWh savings**	**Annual Energy Cost Savings**	**SIR**
In Unit															
1	pt 1025 (Studio	48	Foyer	4	25w Inc	1,752	1 Circline Lamp 22w - Ceiling Mounted Round Fixture	48	21	1,472	$4,178.40	$5,378.40	280	$56	**0.16**
2	0	96	Foyer	4	25w CFL	3,784	n/a	96	27	3,784	$0.00	$0.00	0	$0	**n/a**
3	0	48	Kitchen	4	1f72	5,326	6' undercabinet T-8	48	57	3,995	$11,040.00	$12,773.76	1,332	$266	**0.29**
4	0	144	Living Room	4	25w Inc	5,256	Spring lamp CFL	144	17	3,574	$1,296.00	$1,296.00	1,682	$336	**3.10**
5	0	48	Bathroom	2.5	25w CFL	1,183	2' - 1F17T8 - Wall Mounted Vanity Fixture	48	18	788	$6,254.40	$7,214.40	394	$79	**0.15**
6	0	240	Living Room	4	25w CFL	9,461	n/a	240	27	9,461	$0.00	$0.00	0	$0	**n/a**
7	0	96	Loft	24	100w Hal	84,096	n/a	96	100	84,096	$0.00	$0.00	0	$0	**n/a**
8	pt 1024 (Studio	48	Kitchen	4	1f72	5,326	6' undercabinet T-8	48	57	3,995	$11,040.00	$12,773.76	1,332	$266	**0.29**
9	0	48	Foyer	4	25w Inc	1,752	1 Circline Lamp 22w - Ceiling Mounted Round Fixture	48	21	1,472	$4,178.40	$5,378.40	280	$56	**0.16**
10	0	48	Bathroom	2.5	25w Inc	1,095	2' - 2F17T8 - Wall Mounted Vanity Fixture	48	36	1,577	$6,350.40	$7,310.40	-482	-$96	**-0.18**
11	0	96	Living Room	4	150w Inc	21,024	Spring lamp CFL	96	27	3,784	$864.00	$864.00	17,240	$3,448	**47.64**
12	0	48	Living Room	4	100w Inc	7,008	Spring lamp CFL	48	27	1,892	$432.00	$432.00	5,116	$1,023	**28.27**
13	0	48	Living Room	4	25w CFL	1,892	n/a	48	27	1,892	$0.00	$0.00	0	$0	**n/a**
14	0	48	Living Room	4	100w Inc	7,008	Spring lamp CFL	48	27	1,892	$432.00	$432.00	5,116	$1,023	**28.27**
15	0	144	Living Room	4	25w Inc	5,256	Spring lamp CFL	144	17	3,574	$1,296.00	$1,296.00	1,682	$336	**3.10**
16	Apt 507A (1BR	85	Kitchen	4	1f72	9,432	6' undercabinet T-8	85	57	7,074	$19,550.00	$22,620.20	2,358	$472	**0.29**
17	0	85	Foyer	4	25w CFL	3,351	1 Circline Lamp 22w - Ceiling Mounted Round Fixture	85	21	2,606	$7,399.25	$9,524.25	745	$149	**0.24**
18	0	85	Bathroom	2.5	25w CFL	2,094	2' - 1F17T8 - Wall Mounted Vanity Fixture	85	18	1,396	$11,075.50	$12,775.50	698	$140	**0.15**
19	0	170	Bedroom	3	25w CFL	5,026	n/a	170	27	5,026	$0.00	$0.00	0	$0	**n/a**
20	0	340	Living Room	4	40w Inc	19,856	Spring lamp CFL	340	27	13,403	$3,060.00	$3,060.00	6,453	$1,291	**5.04**
21	0	170	Living Room	4	100w Inc	24,820	Spring lamp CFL	170	27	6,701	$1,530.00	$1,530.00	18,119	$3,624	**28.27**
22	0	170	Living Room	4	20w CFL	5,460	n/a	170	22	5,460	$0.00	$0.00	0	$0	**n/a**
23	Apt 206(3BR)	73	Foyer	4	25w Inc	2,665	1 Circline Lamp 22w - Ceiling Mounted Round Fixture	73	21	2,238	$6,354.65	$8,179.65	426	$85	**0.16**
24	0	73	Hallway	4	25w Inc	2,665	n/a	73	25	2,665	$0.00	$0.00	0	$0	**n/a**
25	0	146	Bedroom	3	25w Inc	3,997	Spring lamp CFL	146	17	2,718	$1,314.00	$1,314.00	1,279	$256	**2.32**
26	0	146	Bedroom	3	60w Inc	9,592	Spring lamp CFL	146	27	4,316	$1,314.00	$1,314.00	5,276	$1,055	**9.59**
27	0	73	Bedroom	3	25w Inc	1,998	Spring lamp CFL	73	17	1,359	$657.00	$657.00	639	$128	**2.32**
28	0	365	Living Room	4	25w Inc	13,323	Spring lamp CFL	365	17	9,059	$3,285.00	$3,285.00	4,263	$853	**3.10**
29	0	73	Living Room	4	25w CFL	2,878	n/a	73	27	2,878	$0.00	$0.00	0	$0	**n/a**
30	0	292	Living Room	4	25w Inc	10,658	Spring lamp CFL	292	17	7,247	$2,628.00	$2,628.00	3,411	$682	**3.10**
31	0	438	Living Room	4	25w Inc	15,987	Spring lamp CFL	438	17	10,871	$3,942.00	$3,942.00	5,116	$1,023	**3.10**
32	0	73	Bathroom	2.5	25w Inc	1,665	2' - 1F17T8 - Wall Mounted Vanity Fixture	73	18	1,199	$9,511.90	$10,971.90	466	$93	**0.12**
33	0	73	Kitchen	4	1f72	8,100	6' undercabinet T-8	73	57	6,075	$16,790.00	$19,426.76	2,025	$405	**0.29**
34	Apt 330 (2BR)	130	Foyer	4	25w Inc	4,745	1 Circline Lamp 22w - Ceiling Mounted Round Fixture	130	21	3,986	$11,316.50	$14,566.50	759	$152	**0.16**
35	0	130	Hallway	4	25w Inc	4,745	n/a	130	25	4,745	$0.00	$0.00	0	$0	**n/a**
36	0	260	Bedroom	3	25w Inc	7,118	Spring lamp CFL	260	17	4,840	$2,340.00	$2,340.00	2,278	$456	**2.32**
37	0	260	Bedroom	3	60w Inc	17,082	Spring lamp CFL	260	27	7,687	$2,340.00	$2,340.00	9,395	$1,879	**9.59**
38	0	650	Living Room	4	25w Inc	23,725	Spring lamp CFL	650	17	16,133	$5,850.00	$5,850.00	7,592	$1,518	**3.10**
39	0	130	Living Room	4	25w CFL	5,125	n/a	130	27	5,125	$0.00	$0.00	0	$0	**n/a**
40	0	520	Living Room	4	25w Inc	18,980	Spring lamp CFL	520	17	12,906	$4,680.00	$4,680.00	6,074	$1,215	**3.10**
41	0	780	Living Room	4	25w Inc	28,470	Spring lamp CFL	780	17	19,360	$7,020.00	$7,020.00	9,110	$1,822	**3.10**
42	0	130	Bathroom	2.5	25w Inc	2,966	2' - 1F17T8 - Wall Mounted Vanity Fixture	130	18	2,135	$16,939.00	$19,539.00	830	$166	**0.12**
43	0	130	Kitchen	4	1f72	14,425	6' undercabinet T-8	130	57	10,819	$29,900.00	$34,595.60	3,606	$721	**0.29**

A Quip Report (In-Un		TREAT Report (In-Unit)	
	Previous	Energy Efficient Measures	New
	432,164	Annual kWh	307,275
	261,934	Total Wattage	171,302
	779	**Weighted Avg In-Unit On**	**4.04**
	4.00	**Qty Fixtures**	**7,298**
		Calculated Watts/Fixture	**28.56**
	432164.38		
	$216,158	EE Total Cost	
	$24,978	EE Savings	
	1.38	**EE SIR**	
		H&S Measures	
	0	QTY	
	$0	Cost	
		$247,308.48	
		$0.00	

Quantity of Fixtures	
old	new
2,172	
1,810	
1,486	
343	
1,486	
7298	

COMMON AREA

1	0	200	COMMON AREA	24	ix Incand/C	21,024	LED Exit Sign 2/3 Head Combo	200	5	8,760	$33,834.00	$39,834.00	12,264	$2,453	**0.87**
2172															

ort (Interior Public Sp		TREAT Report (CA)	
	Previous	Energy Efficient Measures	New
	21,024	Annual kWh	8,760
	2,400	Total Wattage	1,000
	#DIV/0!	**Weighted Avg CA On**	**24.00**
	24.00	**Qty Fixtures**	**200**
		Calculated Watts/Fixture	**5.00**
	#DIV/0!		
	$33,834	EE Total Cost	
	$2,453	EE Savings	
	0.87	**EE SIR**	
		H&S Measures	
	0	QTY	
	$0	Cost	
		$39,834.00	

Appendix B: Suggested Regular Maintenance Checklist

FOR BOILER AND RELATED EQUIPMENT

DAILY

- Check fuel level – if near red marker, fill tank

WEEKLY

- If chemically treated, check water chemicals
- Check oil strainer for impurities; clean fire eye and smoke detector Lenses
- Check condition of brickwork in fire chambers
- Check color and characteristics of flame
- Check for soot in fire chamber, tubes and/or heat exchanger areas–clean as needed
- Check barometric damper is operating properly; check combustion efficiency
- Check level of lubrication in all motors, burners, etc.
- Sweep-up any soot or debris in boiler room
- Check for chimney soot build-up, clean if necessary

LESS REGULAR MAINTENANCE

- Have service company check combustion efficiency (CE)
- Get boiler cleaned, water treated, burner serviced, new parts (AT LEAST once before, once during, and at the end of – the heating season)
- Get all service recommendations in writing (including CE)
- Check pop safety valve (every six months)
- Clean boiler room vent to ensure adequate air for combustion
- Check condition of all insulation in boiler room and basement
- Get timing device calibrated by manufacturer every two years

FOR DISTRIBUTION SYSTEMS

BASEMENT

- Check for heating system or domestic hot water (DHW) leaks. Repair as needed
- Repair all torn/broken insulation (note: if you think that it may contain asbestos, call an asbestos testing firm)
- Check all insulation – if warm to the touch, re-insulate
- Seal all basement openings that are not in use
- Weather-strip (WS), sweep (S), render self-closing (RSC) and caulk (C) all doors leading into the basement and boiler room

APARTMENTS

- Check for lines, risers and/or radiators that do not get hot
- Replace or repack leaking valves
- Repair all valves so that they are capable of 100% shutoff
- WS/C/S/RSC doors and windows in drafty apartments, as needed

COMMON AREAS

- WS/S/RSC front, vestibule, roof and other entrance doors
- Adjust chains/balances/locks on hallway windows and WS
- Replace/repair cracked glass, rotted wood and putty
- Seal all unused hallway penetrations
- Seal dumbwaiter access openings in basement, hallways and roof
- Seal all unused chimney openings on roof as well as any unused apartment chimney
- Openings
- Caulk skylights, window-and-door frames, and any other cracks as needed
- Repair roof flashing where cracked or missing

ABBREVIATIONS USED ON THIS REPORT

- WS = Weather-strip
- S = Add door sweep
- RSC = Render self-closing
- C = Caulk
- CE = Combustion Efficiency

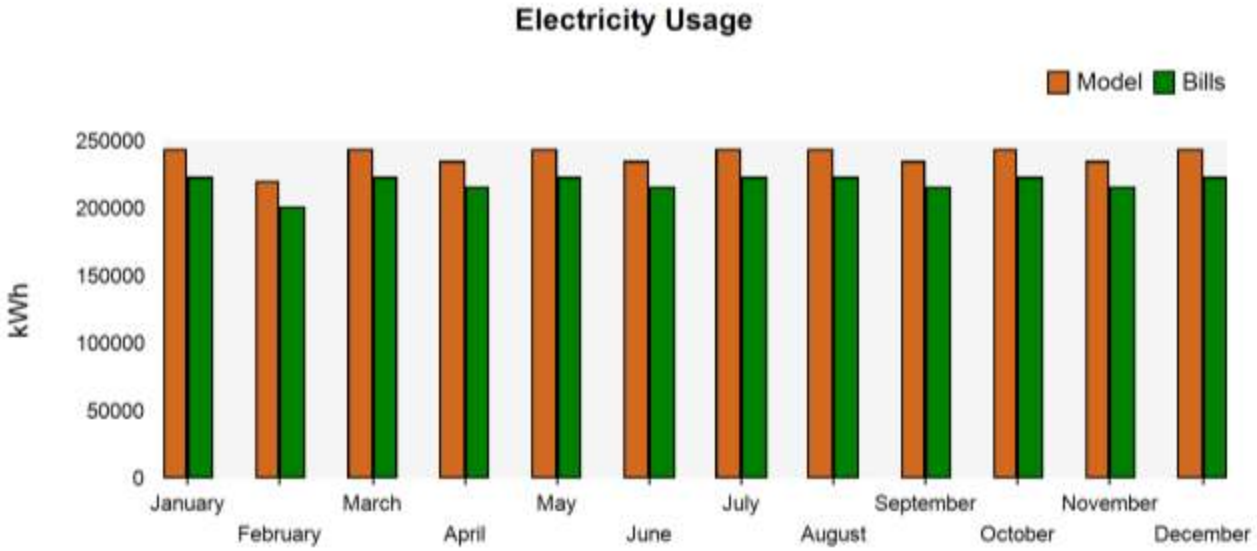
Appendix C: TREAT Reports

- COMPARISON OF BILLING TO MODEL DATA
- TREAT DATA INPUT FILE
- ENERGY COST COMPARISON OF EXISTING (BASE) TO PROPOSED
- MODEL BASE ENERGY USE AND COST BREAKDOWN
- SAVINGS AND COSTS ANALYSIS
- DESIGN HEATING LOADS
- ANALYSIS OF SAVINGS FOR RECOMMENDED MEASURES

AEA used TREAT Version 3.2 software to model the current consumption of heating and domestic hot water fuel of the building in order to analyze energy use and energy conservation opportunities in multifamily dwellings. TREAT is an approved software program of the United States Department of Energy, New York State Department of Housing and Community Renewal, and the New York State Energy Research and Development Authority.

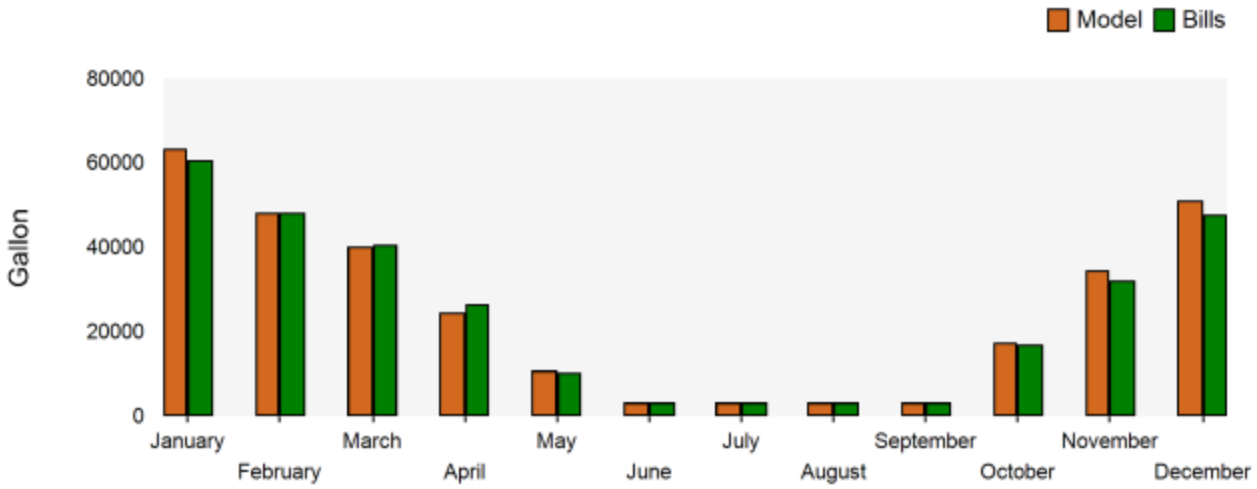
The estimated savings projected in this report are intended to help guide the owner and Weatherization Director. The costs and savings described are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, labor, and other factors difficult to predict. Although this report does not guarantee savings or costs, it is suggested that it be used for economic analysis of the building and as a means to estimate future cash flow.

Comparing normalized bills in billing period 'BillingPeriod1' with normalized consumption for model 'Base Building'



	Model		Billing Data	
	kWh	Cost	kWh	Cost
January	244,415	$48,883	223,547	$44,709
February	220,762	$44,152	201,913	$40,383
March	244,415	$48,883	223,547	$44,709
April	236,530	$47,306	216,336	$43,267
May	244,415	$48,883	223,547	$44,709
June	236,530	$47,306	216,336	$43,267
July	244,415	$48,883	223,547	$44,709
August	244,415	$48,883	223,547	$44,709
September	236,530	$47,306	216,336	$43,267
October	244,415	$48,883	223,547	$44,709
November	236,530	$47,306	216,336	$43,267
December	244,415	$48,883	223,547	$44,709
Total	2,877,787	$575,557	2,632,084	$526,417
Daily Base Load	7,884.35	$1,577	7,211.19	$1,442

Oil #6 Usage



	Model		Billing Data	
	Gallon	Cost	Gallon	Cost
January	63,412	$107,801	60,570	$102,970
February	48,549	$82,534	48,242	$82,011
March	40,295	$68,501	40,973	$69,653
April	24,969	$42,447	26,622	$45,257
May	10,808	$18,374	10,351	$17,597
June	3,219	$5,472	3,350	$5,695
July	3,326	$5,655	3,461	$5,884
August	3,326	$5,655	3,461	$5,884
September	3,219	$5,472	3,350	$5,695
October	17,721	$30,126	16,986	$28,876
November	34,558	$58,749	32,236	$54,801
December	51,213	$87,063	48,067	$81,713
Total	304,617	$517,848	297,669	$506,038
Daily Base Load	107.30	$182	111.66	$190

Project Name	City	State	Zip	House Type	Stories	Units	Occupancy	Bedroom Qty
Westbeth 463 West Street	New York	NY	10014	Detached	10	384	750	641

Year Built	Building Type	Wall Color	Roof Color	Shielding Class	Avg Entering Water Temp	Heated Area	Summer Shade Coef
1900	Very Leaky	2	3	3	50	569340	0.8

Summer Threshold CDD	Winter Threshold Hdd
25	50

Name	Room Type	Floor Area	Ceiling Height	Hours Per Day	People	Elevation	has Natural Ventilation	Is Heated
Totals/Avg.->		577540						
A Bldg Apartment	Living Space	137445	12	24	223	0	True	True
B-C Bldg Apartments	Living Space	115200	12	24	186	0	True	True
D Bldg Apartments	Living Space	93690	12	24	152	0	True	True
H + G1 Apartments	Living Space	94300	12	24	152	0	True	True
G2 Apartments	Living Space	21675	12	24	36	0	True	True
I Bldg	Office Area	33140	12	12	20	0	True	True
L Building	Office Area	20200	12	12	5	0	True	True
Basement A thru L	Other Heated Area	29000	10	12	5	0	True	True
Basement I Bldg	Unheated Low ACH	8200	8	0	0	0	True	False
Studio + Gallery	Other Heated Area	5740	13	12	5	0	True	True
Cherry Pit Theatre	Other Heated Area	4250	13	4	5	0	True	True
Cunningham Dance Studio	Other Heated Area	8800	18	8	10	0	True	True
Synagogue	Other Heated Area	5900	12	1	5	0	True	True

Name	Kind	Space	Exposure	Tilt	Wall Height	Wall Length	Adjacent To	Elevation	Frame
	Wall	A Bldg Apartment	270	90	130	185	Outdoors	0	Block 12"
	Wall	A Bldg Apartment	0	90	130	138	Outdoors	0	Block 12"
	Wall	Synagogue	90	90	13	60	Outdoors	0	Block 12"
	Wall	Synagogue	270	90	13	32	Outdoors	0	Block 12"
	Wall	A Bldg Apartment	180	90	130	132	Outdoors	0	Block 12"
	Wall	Synagogue	0	90	13	20	Outdoors	0	Block 12"
	Wall	H + G1 Apartments	90	90	130	165	Outdoors	0	Block 12"
	Wall	Cunningham Dance Studio	90	90	18	130	Outdoors	0	Block 12"
	Wall	Cunningham Dance Studio	0	90	18	82	Outdoors	0	Block 12"
	Wall	Cunningham Dance Studio	270	90	18	120	Outdoors	0	Block 12"
	Wall	A Bldg Apartment	90	90	130	88	Outdoors	0	Block 12"
	Wall	H + G1 Apartments	270	90	130	78	Outdoors	0	Block 12"
	Wall	B-C Bldg Apartments	0	90	130	236	Outdoors	0	Block 12"
	Wall	B-C Bldg Apartments	180	90	130	236	Outdoors	0	Block 12"
	Wall	G2 Apartments	0	90	40	34	Outdoors	0	Block 12"
	Wall	D Bldg Apartments	0	90	130	88	Outdoors	0	Block 12"
	Wall	D Bldg Apartments	270	90	130	56	Outdoors	0	Block 12"

Insulation	RValue	OHProj	Left SFProj	Right SFProj
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0

Wall	D Bldg Apartments	180	90	130	65	Outdoors	0	Block 12"
Wall	H + G1 Apartments	180	90	130	74	Outdoors	0	Block 12"
Wall	H + G1 Apartments	0	90	130	77	Outdoors	0	Block 12"
Wall	L Building	0	90	40	69	Outdoors	0	Block 12"
Wall	L Building	270	90	40	133	Outdoors	0	Block 12"
Wall	L Building	180	90	40	69	Outdoors	0	Block 12"
Wall	L Building	90	90	40	32	Outdoors	0	Block 12"
Wall	D Bldg Apartments	90	90	130	93	Outdoors	0	Block 12"
Wall	G2 Apartments	270	90	40	3	Outdoors	0	Block 12"
Wall	G2 Apartments	180	90	40	93	Outdoors	0	Block 12"
Wall	Cunningham Dance Studio	180	90	18	82	Outdoors	0	Block 12"
Wall	G2 Apartments	90	90	40	23	Outdoors	0	Block 12"
Wall	Studio + Gallery	0	90	13	116	Outdoors	0	Block 12"
Wall	Studio + Gallery	270	90	13	50	Outdoors	0	Block 12"
Wall	Studio + Gallery	180	90	13	116	Outdoors	0	Block 12"
Wall	Studio + Gallery	90	90	13	50	Outdoors	0	Block 12"
Wall	Cherry Pit Theatre	0	90	13	103	Outdoors	0	Block 12"
Wall	Cherry Pit Theatre	270	90	13	50	Outdoors	0	Block 12"
Wall	Cherry Pit Theatre	180	90	13	74	Outdoors	0	Block 12"
Slab below grade	Basement A thru L	-1	0	275	250	Ground	0	Concrete 8"

XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
XPS	11.23	-1	0	0
None	0.57	-1	-1	-1

Slab below grade	Basement I Bldg	-1	0	55	150	Ground	0	Concrete 8"
Wall	Basement A thru L	270	90	3	145	Outdoors	0	Concrete 8"
Wall	Basement A thru L	180	90	2.3	215	Outdoors	0	Concrete 8"
Wall	Basement A thru L	0	90	3	370	Outdoors	0	Concrete 8"
Wall	I Bldg	180	90	40	75	Outdoors	0	Concrete 8"
Flat roof	Basement A thru L	-1	0	137	75	Outdoors	10	Concrete 8"
Wall	I Bldg	90	90	40	168	Outdoors	0	Concrete 8"
Wall	I Bldg	270	90	40	179	Outdoors	0	Concrete 8"
Wall	I Bldg	0	90	40	8	Outdoors	0	Concrete 8"
Floor above grade	I Bldg	-1	0	60	135	Basement I Bldg	0	Wood 2x8
Sloped roof	Cunningham Dance Studio	270	25	60	130	Outdoors	18	Wood 2x4
Flat roof	I Bldg	-1	0	60	135	Outdoors	12	Wood 2x4
Flat roof	A Bldg Apartment	-1	0	55	200	Outdoors	12	Concrete 4"
Flat roof	H + G1 Apartments	-1	0	77	71	Outdoors	12	Concrete 4"
Flat roof	G2 Apartments	-1	0	90	100	Outdoors	12	Concrete 4"
Flat roof	L Building	-1	0	54	120	Outdoors	12	Concrete 4"
Flat roof	B-C Bldg Apartments	-1	0	64	200	Outdoors	12	Concrete 4"
Flat roof	D Bldg Apartments	-1	0	90	115	Outdoors	12	Concrete 4"
Sloped roof	H + G1 Apartments	90	25	77	94	Outdoors	12	Wood

None	0.57	-1	-1	-1
XPS	5.57	-1	0	0
XPS	5.57	-1	0	0
XPS	5.57	-1	0	0
XPS	5.57	-1	0	0
XPS	5.57	0	0	0
XPS	5.57	-1	0	0
XPS	5.57	-1	0	0
XPS	5.57	-1	0	0
None	4.55	-1	0	0
Air	4.17	-1	0	0
Cellulose	12.3	0	0	0
XPS	14.05	0	0	0
XPS	14.05	0	0	0
XPS	14.05	0	0	0
XPS	14.05	0	0	0
XPS	14.05	0	0	0
XPS	14.05	0	0	0
XPS	5.84	0	0	0

Description	Location	Exposure	Quantity	Door Height	Door Width	Door UValue
Solid core flush door	A Bldg Apartment	0	4	6.7	3	0.4
Solid core flush door	A Bldg Apartment	270	3	6.7	3	0.4
Solid core flush door	A Bldg Apartment	270	1	6.7	4	0.4
Solid core flush door	A Bldg Apartment	180	1	6.7	3	0.4
Solid core flush door	D Bldg Apartments	0	1	6.7	3	0.4
Solid core flush door	H + G1 Apartments	180	1	6.7	4.5	0.4
Solid core flush door	H + G1 Apartments	90	1	6.7	3	0.4
Solid core flush door	G2 Apartments	180	1	6.7	3	0.4
Solid core flush door	I Bldg	0	1	6.7	3	0.4
Solid core flush door	I Bldg	180	2	6.7	3	0.4
Solid core flush door	I Bldg	270	2	6.7	3	0.4
Panel door with 7/16-in. panels	I Bldg	270	3	12	10	0.57
Solid core flush door	I Bldg	90	3	6.7	3	0.4
Solid core flush door	L Building	0	3	6.7	3	0.4
Solid core flush door	L Building	270	3	6.7	3.5	0.4
Solid core flush door	L Building	270	1	6.7	4	0.4
Solid core flush door	Studio + Gallery	270	1	6.7	2.5	0.4

Solid core flush door	Studio + Gallery	270	2	6.7	3	0.4
Solid core flush door	Studio + Gallery	90	1	6.7	3	0.4
Solid core flush door	Cherry Pit Theatre	0	2	6.7	3	0.4
Solid core flush door	Cherry Pit Theatre	270	5	6.7	3	0.4
Solid core flush door	Cunningham Dance Studio	270	4	6.7	3.6	0.4
Solid core flush door	Synagogue	270	2	6.7	3.5	0.4

Framing	Glazing	Location	Exposure	Quantity	Window Height	Window Width	UValue
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	0	113	7.5	4.5	0.5
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	0	28	7.5	3.5	0.5
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	0	4	7.5	4	0.5
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	0	2	7.5	5	0.5
Operable, Wood/vinyl, Operable	1/4" single acrylic, clear	A Bldg Apartment	0	2	10	13	0.83
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	270	56	7.5	3.5	0.9
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	270	2	7.5	4	0.91
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	270	144	7.5	4.6	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	270	3	7.5	6.5	0.94
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	270	4	6	5	0.91
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	180	61	7.5	3.5	0.9
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	180	3	7.5	4	0.91

Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	180	30	7.5	4.5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	180	8	7.5	5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	180	1	10	12	0.97
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	90	15	7.5	3.5	0.9
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	90	17	7.5	4	0.91
Operable, Wood/vinyl, Operable	1/8" single glass, clear	A Bldg Apartment	90	80	7.5	4.5	0.92
Operable, Wood/vinyl, Operable	1/4" single acrylic, clear	A Bldg Apartment	90	2	10	14	0.83
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	B-C Bldg Apartments	180	117	7.6	3.5	1.01
Operable, Wood/vinyl, Operable	1/8" single glass, clear	B-C Bldg Apartments	0	126	7.5	4.5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	B-C Bldg Apartments	0	126	7.5	5	0.92
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	B-C Bldg Apartments	180	117	7.6	5	1.02
Operable, Wood/vinyl, Operable	1/8" single glass, clear	D Bldg Apartments	0	106	7.5	4.5	0.92

Operable, Wood/vinyl, Operable	1/8" single glass, clear	D Bldg Apartments	0	6	4	2.5	0.82
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	D Bldg Apartments	270	72	7.5	4.5	1.02
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	D Bldg Apartments	270	1	4	2.5	1
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	D Bldg Apartments	180	17	7.5	4.5	1.02
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	D Bldg Apartments	180	2	5	3	1
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	D Bldg Apartments	180	1	4	2.5	1
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	D Bldg Apartments	180	48	7.5	3.5	1.01
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	D Bldg Apartments	90	88	7.5	3.5	1.01
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	D Bldg Apartments	90	3	6	3.5	1.01

Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	G2 Apartments	0	12	7.5	4	1.01
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	G2 Apartments	0	1	7.6	6	1.02
Operable, Wood/vinyl, Operable	1/8" single glass, clear	G2 Apartments	180	7	7.5	4	0.91
Operable, Wood/vinyl, Operable	1/8" single glass, clear	G2 Apartments	180	17	7.5	4.5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	G2 Apartments	180	2	7.5	6	0.93
Operable, Wood/vinyl, Operable	1/8" single glass, clear	G2 Apartments	90	3	7.5	4	0.91
Operable, Wood/vinyl, Operable	1/8" single glass, clear	G2 Apartments	90	3	7.5	5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	0	9	7.5	3.5	0.9
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	0	13	7.5	4	0.91
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	0	55	7.5	4.5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	0	12	7.5	5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	0	2	4	2.5	0.82

Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	270	10	7.5	3	0.89
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	270	4	7.5	3.5	0.9
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	270	84	7.5	4	0.91
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	270	1	5	3	0.86
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	180	45	7.5	4.5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	180	9	7.5	5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	H + G1 Apartments	180	2	5	3	0.86
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	H + G1 Apartments	90	23	7.5	3.5	1.01
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	H + G1 Apartments	90	62	7.5	4	1.01
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	H + G1 Apartments	90	62	7.5	4.5	1.02
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	H + G1 Apartments	90	4	5	3	1

Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	H + G1 Apartments	90	30	9.5	4	1.02
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	I Bldg	270	35	7.6	3.5	1.01
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	I Bldg	270	44	5	3	1
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	I Bldg	180	9	7.5	3.5	1.01
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	I Bldg	180	24	5	3	1
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	I Bldg	90	6	5	3	1
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	I Bldg	90	21	4	2.5	1
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	I Bldg	270	4	7.5	4	1.01

Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	L Building	0	1	5	3	1
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	L Building	270	2	9.5	3	1.01
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	L Building	180	7	7.5	4.5	1.02
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	L Building	180	6	11	4.5	1.02
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	L Building	180	2	9.5	3	1.01
Fixed, Wood/vinyl, Fixed	1/8" single glass, clear	Basement A thru L	0	10	1.5	3	0.87
Fixed, Wood/vinyl, Fixed	1/8" single glass, clear	Basement A thru L	270	10	1.5	3	0.87
Operable, Wood/vinyl, Operable	1/8" single glass, clear	Studio + Gallery	0	12	7.5	4.5	0.92
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	Studio + Gallery	180	6	10	13	1.03

Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	Cherry Pit Theatre	0	1	7.5	3	1.01
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	Cherry Pit Theatre	0	4	10	12	1.03
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	Cherry Pit Theatre	270	1	10	14	1.03
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	Cherry Pit Theatre	270	1	6	10	1.02
Operable, Wood/vinyl, Operable	1/8" single glass, clear	Cherry Pit Theatre	180	4	7.5	4.5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	Cunningham Dance Studio	0	3	7.5	4.6	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	Cunningham Dance Studio	270	6	7.5	4.5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	Cunningham Dance Studio	180	5	7.5	3.5	0.9
Operable, Wood/vinyl, Operable	1/8" single glass, clear	Cunningham Dance Studio	90	2	7.5	3.5	0.9
Operable, Wood/vinyl, Operable	1/8" single glass, clear	Cunningham Dance Studio	90	10	7.5	4.5	0.92
Operable, Wood/vinyl, Operable	1/8" single glass, clear	Cunningham Dance Studio	270	6	7.5	4.5	0.92

Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	Synagogue	270	1	10	15	1.03
Operable, Aluminum w/o thermal break, Operable	1/8" single glass, clear	Synagogue	90	2	5	3.5	1.01

ACH	Location	Is Heated
0.2	Basement I Bldg	False

CFM50 Infiltration	ACH
-1	0.65

Heat Plant Type	Fuel	Input Capacity	Annual Efficiency	Is Primary	Location	Year M	Listed Annual Efficiency
		20000000					
Boiler, Steam	Oil #6	20000000	82	True	Basement A thru L	1960	75

Heating Distribution Type	Location	Distribution Efficiency	Supply Area	Return Area	Percent Supply	Percent Return	Supply RValue
Water	Basement A thru L	85	11827.424	11827.424	49	49	0
Water	Basement A thru L	85	11827.424	11827.424	49	49	0
Water	Synagogue	85	11827.424	11827.424	0	0	0
Water	Synagogue	85	11827.424	11827.424	0	0	0
Water	Cunningham Dance Studio	85	11827.424	11827.424	1	1	0
Water	Cunningham Dance Studio	85	11827.424	11827.424	1	1	0
Water	Cherry Pit Theatre	85	11827.424	11827.424	0	0	0
Water	Cherry Pit Theatre	85	11827.424	11827.424	0	0	0
Water	Studio + Gallery	85	11827.424	11827.424	1	1	0
Water	Studio + Gallery	85	11827.424	11827.424	1	1	0
Water	Basement I Bldg	85	11827.424	11827.424	0	0	0
Water	Basement I Bldg	85	11827.424	11827.424	0	0	0
Water	A Bldg Apartment	85	11827.424	11827.424	13	13	0

Listed SSEfficiency	87

80

Return RValue	Supply Duct Leakage	Return Duct Leakage	Supply Duct Pressure	Return Duct Pressure	Is Primary
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True

Water	A Bldg Apartment	85	11827.424	11827.424	13	13	0
Water	L Building	85	11827.424	11827.424	2	2	0
Water	L Building	85	11827.424	11827.424	2	2	0
Water	I Bldg	85	11827.424	11827.424	3	3	0
Water	I Bldg	85	11827.424	11827.424	3	3	0
Water	G2 Apartments	85	11827.424	11827.424	2	2	0
Water	G2 Apartments	85	11827.424	11827.424	2	2	0
Water	H + G1 Apartments	85	11827.424	11827.424	9	9	0
Water	H + G1 Apartments	85	11827.424	11827.424	9	9	0
Water	D Bldg Apartments	85	11827.424	11827.424	9	9	0
Water	D Bldg Apartments	85	11827.424	11827.424	9	9	0
Water	B-C Bldg Apartments	85	11827.424	11827.424	11	11	0
Water	B-C Bldg Apartments	85	11827.424	11827.424	11	11	0

0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True
0	-1	-1	-1	-1	True

Cool Plant Type	Fuel	Quantity	Capacity	SEER	Design Supply Cool Temp	Year M

Cooling Distribution Type	Location	Distribution Efficiency	Supply Area	Return Area	Percent Supply	Percent Return	Supply RValue	Return RValue

Supply Duct Leakage	Return Duct Leakage	Supply Duct Pressure	Return Duct Pressure

Lighting Description	Location	Watts	Hours Per Day
typical Living Space lighting	A Bldg A	40	4
typical Living Space lighting	B-C Bldg	40	4
typical Living Space lighting	D Bldg A	40	4
typical Living Space lighting	H + G1 A	40	4
typical Living Space lighting	G2 Apart	40	4
typical Office Area lighting	I Bldg	60	12
typical Office Area lighting	L Buildi	60	12
typical Other Heated Area lighting	Basement	60	12
typical Other Heated Area lighting	Studio +	100	12
typical Other Heated Area lighting	Cherry P	100	2

typical Other Heated Area lighting	Cunningh	100	6
typical Other Heated Area lighting	Synagogu	60	2
Exit Fixtures	A Bldg A	13	24

Thermostat Location	Location	Heating Set Point	Heating Set Back Temperature	Heating Set Back Hours Per Day	Cooling Set Point	Cooling Set Back Temperature	Cooling Set Back Hours Per Day
B-C Bldg Apartments	Main Bldg	76	76	0	-1	-1	-1
D Bldg Apartments	Main Bldg	76	76	0	-1	-1	-1
H + G1 Apartments	Main Bldg	76	76	0	-1	-1	-1
G2 Apartments	Main Bldg	76	76	0	-1	-1	-1
I Bldg	Main Bldg	76	76	0	-1	-1	-1
A Bldg Apartment	Main Bldg	76	76	0	-1	-1	-1
Studio + Gallery	Main Bldg	76	76	0	-1	-1	-1
Cunningham Dance Studio	Main Bldg	76	76	0	-1	-1	-1
Synagogue	Main Bldg	76	76	0	-1	-1	-1
Cherry Pit Theatre	Cherry Pit	70	70	0	-1	-1	-1
Basement A thru L	Basement	70	70	0	-1	-1	-1
L Building	L Building	70	70	0	-1	-1	-1

Fan Name	Location	Daily Hours On	HRVEfficiency	Is Input ACH
Fan 1	A Bldg Apartment	24	0	False
Fan 1	B-C Bldg Apartments	24	0	False
Fan 1	D Bldg Apartments	24	0	False
Fan 1	H + G1 Apartments	24	0	False
Fan 1	G2 Apartments	24	0	False
Fan 1	Basement A thru L	24	0	False
Fan 1	Studio + Gallery	24	0	False
Fan 1	Cunningham Dance Studio	24	0	False

Appliance Name	Location	Quantity	Percent Loss To Room	Primary Fuel	Annual Usage1	Demand1	Secondary Fuel	Secondary Energy Unit	Annual Usage2	Annual Water Usage Gal Per Yr
Refrigerator -auto def top freezer, 1990 model	A Bldg Apartment	116	100	Electricity	700	0			0	0
Computer, typical usage	A Bldg Apartment	114	100	Electricity	130	0			0	0
Color TV, typical usage	A Bldg Apartment	114	100	Electricity	110	0			0	0
Range, electric	A Bldg Apartment	114	100	Electricity	1200	0			0	0
Oven, electric	A Bldg Apartment	114	25	Electricity	1000	0			0	0
Refrigerator -auto def top freezer, 1990 model2	B-C Bldg Apartments	100	100	Electricity	600	0			0	0
Color TV, typical usage1	B-C Bldg Apartments	95	100	Electricity	110	0			0	0
Computer, typical usage2	B-C Bldg Apartments	95	100	Electricity	130	0			0	0
Range, electric2	B-C Bldg Apartments	95	100	Electricity	1200	0			0	0
Oven, electric2	B-C Bldg Apartments	95	25	Electricity	1000	0			0	0
Color TV, typical usage2	D Bldg Apartments	78	100	Electricity	110	0			0	0
Computer, typical usage3	D Bldg Apartments	78	100	Electricity	130	0			0	0

Oven, electric3	D Bldg Apartments	78	25	Electricity	1000	0	0	0
Refrigerator -auto def top freezer, 1990 model3	D Bldg Apartments	75	100	Electricity	600	0	0	0
Range, electric3	D Bldg Apartments	78	100	Electricity	1200	0	0	0
Refrigerator -auto def top freezer, 1990 model4	H + G1 Apartments	75	100	Electricity	600	0	0	0
Color TV, typical usage4	H + G1 Apartments	78	100	Electricity	110	0	0	0
Range, electric4	H + G1 Apartments	78	100	Electricity	1200	0	0	0
Oven, electric4	H + G1 Apartments	78	25	Electricity	1000	0	0	0
Computer, typical usage4	H + G1 Apartments	78	100	Electricity	130	0	0	0
Range, electric5	G2 Apartments	18	100	Electricity	1200	0	0	0
Computer, typical usage5	G2 Apartments	18	100	Electricity	130	0	0	0
Color TV, typical usage5	G2 Apartments	18	100	Electricity	110	0	0	0
Refrigerator -auto def top freezer, 1990 model5	G2 Apartments	18	100	Electricity	600	0	0	0
Oven, electric5	G2 Apartments	94	25	Electricity	1000	0	0	0

Computer, typical usage6	I Bldg	384	100	Electricity	130	0	0	0
Computer, typical usage7	L Building	384	100	Electricity	130	0	0	0
Clothes washer, warm-warm water cycle	Basement A thru L	10	50	Electricity	156	0	0	55000
Clothes Dryer, electric	Basement A thru L	10	20	Electricity	1664	0	0	0

Type	Quantity	Location	Fuel	Volume Gal	Rated Input Btu Per Hr	Setpoint F	People Served	Recovery Efficiency	Energy Factor	Standby Loss	Non Heat Season Efficiency
					20000000						
Space-heating boiler w/tankless coil	1	Basement A thru L	Oil #6	100	20000000	130		75	-1	1	3

Pipe Area	Insulation RValue	Is Recirculating
750	1.5	True

Location	Percent Piping
Basement A thru L	85
Synagogue	0
Cunningham Dance Studio	0
Cherry Pit Theatre	0
Studio + Gallery	0
Basement I Bldg	15
A Bldg Apartment	0
L Building	0

Added RValue	Solar Fraction	Year M
5	0	1960

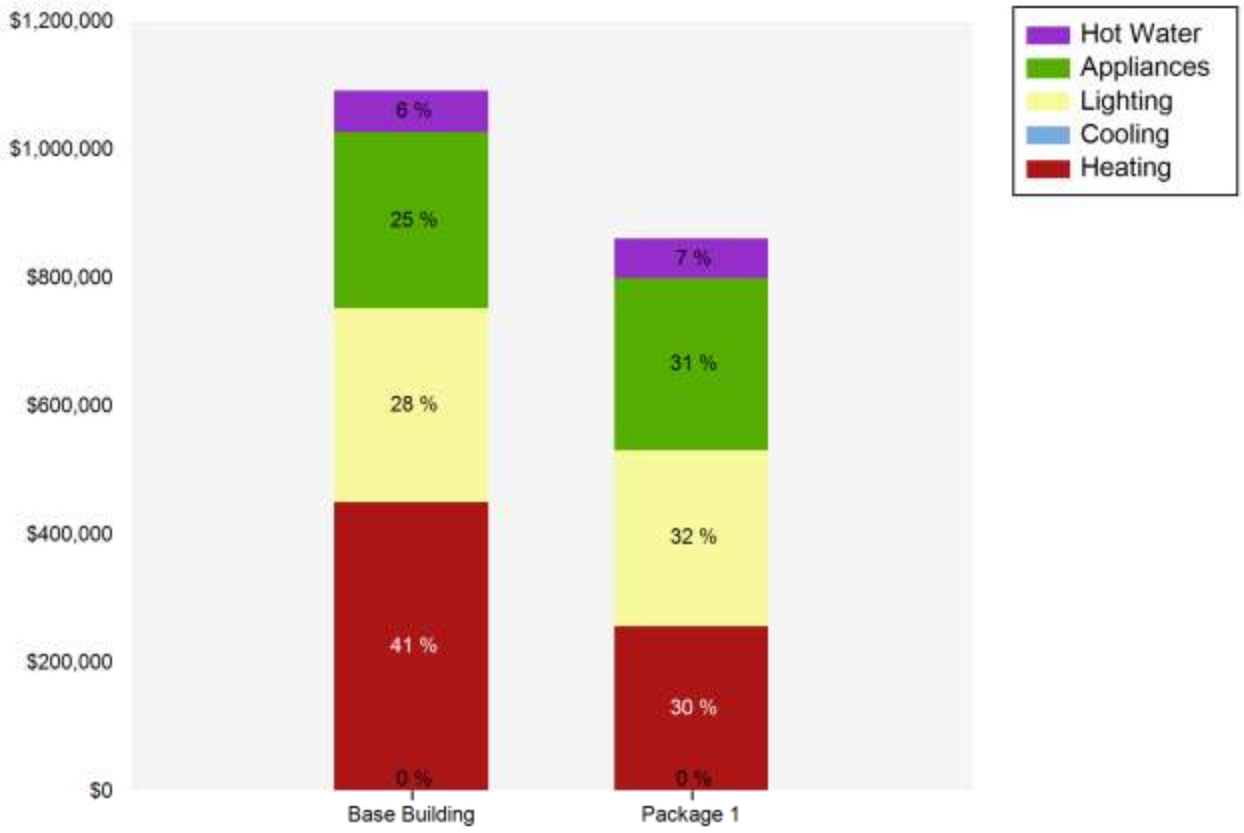
I Bldg	0
G2 Apartments	0
H + G1 Apartments	0
D Bldg Apartments	0
B-C Bldg Apartments	0

Show GPM	Low Flow Shower GPM	Low Flow Shower Fraction	Faucet GPM	Low Flow Faucet GPM	Low Flow Faucet Fraction	Usage Adjustment	Are Dishes Handwashed
3	2	0.2	2.5	2	0.1	0.9	True

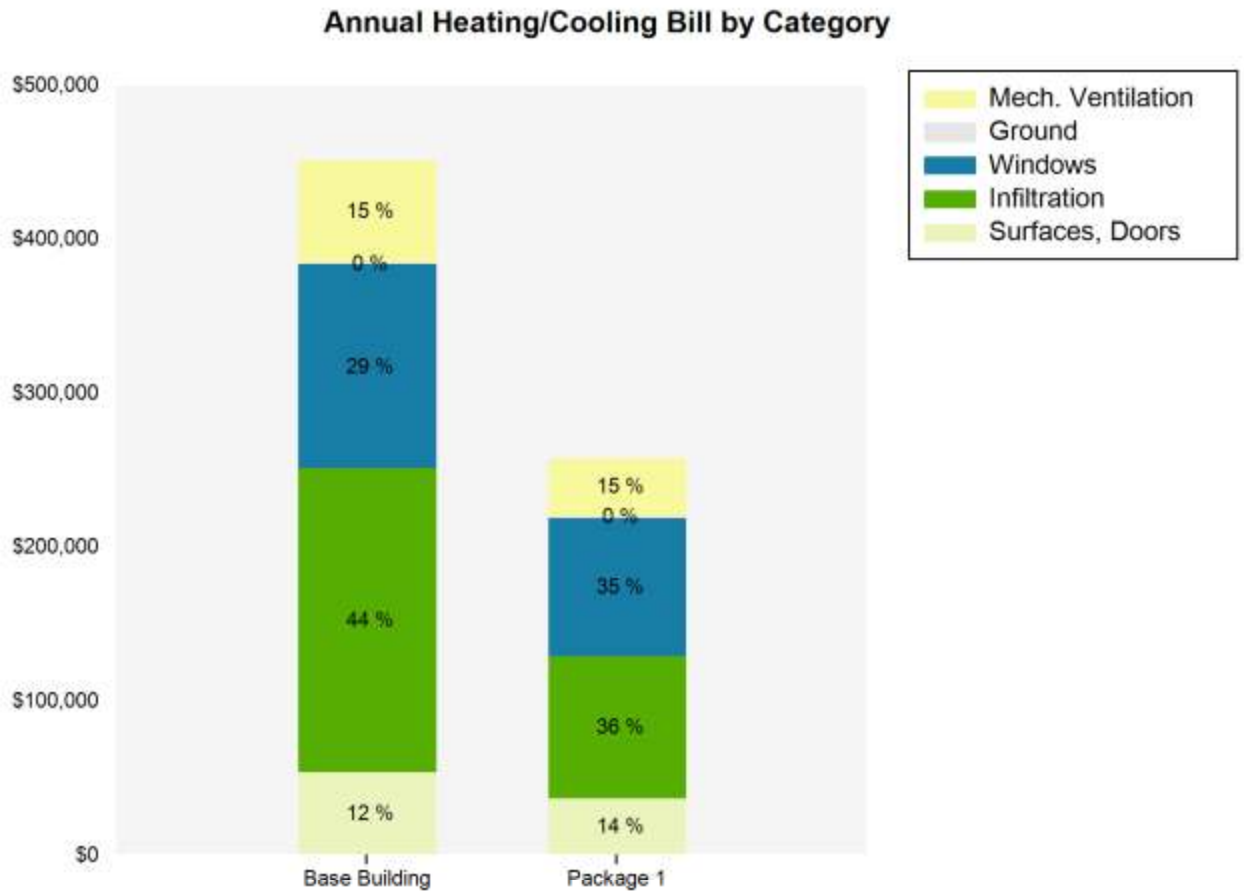
Type	Location	MValue	Units	Cost	Date	Comment	Recommended Action

Component Type	Component Name	Condition	Date	Recommended Action	Cost

Total Annual Energy Bill by Category



	Base Building	Package 1	**Savings**
Heating	$451,268	$258,177	$193,091
Cooling	$0	$0	$0
Lighting	$301,353	$274,411	$26,942
Appliances	$274,112	$266,363	$7,749
Hot Water	$66,581	$61,381	$5,200
Total	$1,093,313	$860,332	**$232,981**

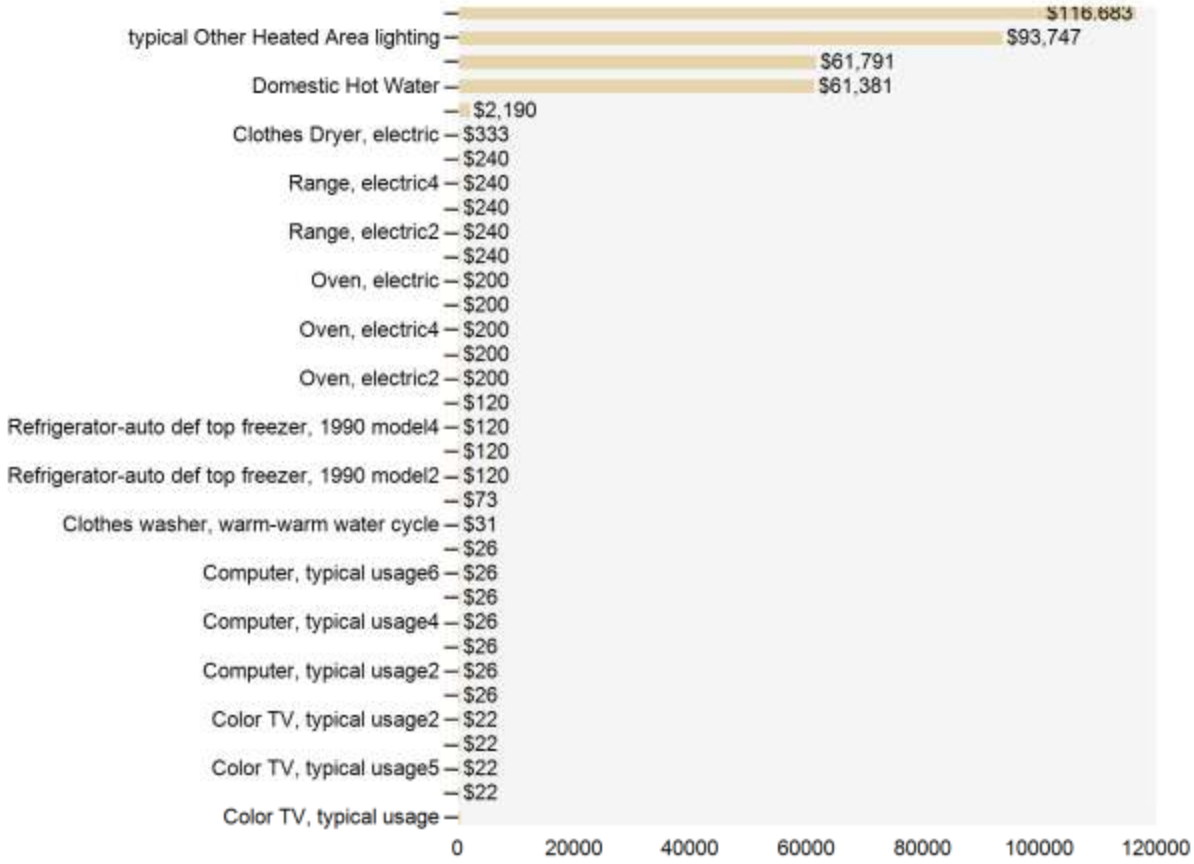


	Base Building	Package 1	**Savings**
Surfaces, Doors	$53,869	$36,841	$17,028
Infiltration	$196,970	$91,932	$105,038
Windows	$132,510	$90,406	$42,105
Ground	$1,061	$809	$253
Mechanical Ventilation	$66,857	$38,189	$28,668
Total	$451,268	$258,177	**$193,091**

Notes:

1. Costs for annual heating/cooling bills are calculated by taking the combined heating and cooling loads and multiplying by the average cost per BTU of heating and cooling fuel use. Differences in load profile or HVAC system efficiencies are not accurately reflected in this report.

Base Load Use and Cost Breakdown



Annual Use of Domestic Hot Water, Appliances and Lighting

Model Name: Package 1

	Electricity		Oil #6		Total
	kWh	$	Gallon	$	$
typical Office Area lighting	583,416	$116,683			$116,683
typical Other Heated Area lighting	468,733	$93,747			$93,747
In Unit BC	308,955	$61,791			$61,791
Domestic Hot Water			36,107	$61,381	$61,381

	Electricity		Oil #6		Total
	kWh	$	Gallon	$	$
LED Exit Sign	10,950	$2,190			$2,190
Clothes Dryer, electric	1,664	$333			$333
Range, electric	1,200	$240			$240
Range, electric2	1,200	$240			$240
Range, electric3	1,200	$240			$240
Range, electric4	1,200	$240			$240
Range, electric5	1,200	$240			$240
Oven, electric2	1,000	$200			$200
Oven, electric3	1,000	$200			$200
Oven, electric4	1,000	$200			$200
Oven, electric5	1,000	$200			$200
Oven, electric	1,000	$200			$200
Refrigerator-auto def top freezer, 1990 model2	600	$120			$120
Refrigerator-auto def top freezer, 1990 model3	600	$120			$120
Refrigerator-auto def top freezer, 1990 model4	600	$120			$120
Refrigerator-auto def top freezer, 1990 model5	600	$120			$120
New Refrigerators	366	$73			$73
Clothes washer, warm-warm water cycle	156	$31			$31
Computer, typical usage	130	$26			$26
Computer, typical usage2	130	$26			$26
Computer, typical usage3	130	$26			$26
Computer, typical usage4	130	$26			$26
Computer, typical usage5	130	$26			$26

	Electricity		Oil #6		Total
	kWh	$	Gallon	$	$
Computer, typical usage6	130	$26			$26
Computer, typical usage7	130	$26			$26
Color TV, typical usage	110	$22			$22
Color TV, typical usage4	110	$22			$22
Color TV, typical usage5	110	$22			$22
Color TV, typical usage1	110	$22			$22
Color TV, typical usage2	110	$22			$22
Total	1,389,100	$277,820	36,107	$61,381	**$339,201**

Notes:

1. Energy use and costs are for a typical year.

Primary Heating System

Space Name	Load (Btu/Hr)	Load (Btu/Hr-SqFt)	Distribution GPM	Ft of baseboard
A Bldg Apartment	2,566,378	19	292	4,910
B-C Bldg Apartments	2,423,813	21	276	4,637
D Bldg Apartments	1,639,940	18	186	3,137
H + G1 Apartments	2,019,188	21	230	3,863
G2 Apartments	370,997	17	42	710
I Bldg	754,931	23	86	1,444
L Building	304,374	15	35	582
Basement A thru L	188,333	6	21	360
Studio + Gallery	131,755	23	15	252
Cherry Pit Theatre	87,835	21	10	168
Cunningham Dance Studio	402,517	46	46	770
Synagogue	30,696	5	3	59

Required Heating Equipment Output Capacity: 12,070,427 Btu/hr

Available Heating Equipment Output Capacity: 164,000,000 Btu/hr

Total Flow: 1,207 GPM

Baseboard Capacity: 575 Btu/Hr-Ft

Heating Equipment Efficiency: 82%

Calculated Distribution Efficiency: 99%

Supply Temperature: 200 F

Temperature Drop: 20 F

Heating Safety Factory: 1.10

Distribution Safety Factor: 1.10

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.
3. 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.
7. TREAT load sizing has been tested in minimize calculation time mode and results were compared to Manual J. TREAT heating and cooling loads proved to be slightly more conservative. Please use professional judgement in applying the results to sizing heating and cooling systems.

Evaluated Packages

	Cost	Annual Savings MBTU	Annual Savings $	% Savings	Payback Years	Cashflow $/Year	SIR
Package 1	$1,703,793	18,508.0	$232,981	33 %	7.3	$82,960	1.89

Package Descriptions

Package 1

	Cost	Annual Savings MBTU	$	Payback Years	Cashflow $/Year	Imp. Life Years	SIR in Package
Refrigerator Replacement	$47,000	21.3	$6,522	7.2	$2,383	15	1.67
In-unit lighting replace	$220,000	63.1	$19,711	11.2	$340	15	1.08
Infiltration Reduction - Vent/Weatherstrip Doors	$10,000	6,512.8	$72,081	0.1	$71,201	10	61.76
Ventilation System Replacement	$385,000	1,169.4	$12,943	29.7	($20,957)	20	0.50
Heating Plant Replacement	$800,000	8,625.0	$95,459	8.4	$25,018	20	1.79
Zone Valve Installation	$185,000	1,452.9	$16,080	11.5	($209)	15	1.04
Exit Sign Replace	$42,293	9.7	$2,950	14.3	($774)	15	0.84
Low Flow Device Installation 1	$6,500	469.8	$5,200	1.3	$4,627	10	6.85
Attic Insulation - H Building	$8,000	184.0	$2,036	3.9	$1,332	20	3.82
Total for Package	$1,703,793	18,508.0	$232,981	7.3	$82,960	N/A	1.89

Non-Energy Benefits:

1. Refrigerator Replacement: Increase value of building, reduce environmental risk due to old ozone-depleting refrigerants.
2. In-unit lighting replace: Reduce maintenance, reduce replacement cost (fluorescent bulbs last 10,000 hours whereas incandescent bulbs typically last less than 1,000 hours).
3. Infiltration Reduction - Vent/Weatherstrip Doors: Reduce drafts.
4. Ventilation System Replacement: Improve indoor air quality, increase value of building.
5. Heating Plant Replacement: Increased equity.
6. Zone Valve Installation: Improve comfort, improve convenience.
7. Exit Sign Replace: Reduce maintenance, reduce replacement cost (fluorescent bulbs last 10,000 hours whereas incandescent bulbs typically last less than 1,000 hours).
8. Low Flow Device Installation 1: Reduce water use.
9. Attic Insulation - H Building: Improve comfort, increase value of building.