

**Energy Audit Report for  
West End Place Condominium  
1099 22<sup>nd</sup> Street, NW  
Washington, DC 20037**



Thank you for choosing Elysian Energy for your energy evaluation. Building owners request energy audits for a variety of good reasons: Skyrocketing utility bills, comfort issues, and environmental concerns. Regardless of your motivation, this report is your roadmap toward a more comfortable, sustainable and energy efficient building.

## Methodology

The ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) Level I energy audit was selected as the means of determining the potential savings while balancing initial capital expenditures. *(Procedures followed are ASHRAE's Procedures for performing Energy Audits prepared under ASHRAE Research Project RP-669 and ASHRAE Special Project SP-56 in cooperation with TC 7.6 Systems Energy Utilization)*

### Level 1

- Rapid assessment of building energy systems
- Building energy benchmark
- High-level definition of energy system optimization opportunities Outline applicable incentive programs

The Level 1 audit alternatively is called a “simple audit”, “screening audit” or “walk-through audit” and is the basic starting point for building energy optimization. It involves brief interviews with site operating personnel, a review of the facility’s utility bills and other operating data, and an abbreviated walk-through of the building. The ASHRAE Level-1 audit is geared toward the identification of the potential for energy improvements, understanding the general building configuration, and defining the type and nature of energy systems. The audit results in a preliminary, high-level, energy-use analysis for the entire facility, and a short report detailing the findings, which may include identifying a variety of recognizable efficiency opportunities. Usually this report does not provide detailed recommendations, except for very visible projects or operational faults.

The ASHRAE Level-1 audit is intended to help the energy team understand where the building performs relative to its peers; establish a baseline for measuring improvements; deciding whether further evaluation is warranted; and if so, where and how to focus that effort. The Level-1 also will outline the range of potential financial incentives available from Federal, State, Local, and Utility sources.

## **BASELINE FACILITY DESCRIPTION**

### **Executive Summary**

The West End Place Condominium is a residential, multifamily building with 11 stories, 67 condo units encompassing 103,906 square feet. An underground parking facility for the tenants occupies 2 floors below the building. Construction of the property was completed in 1985.

The use of the building is residential. Occupancy is 24/7. The management team including maintenance staff and property manager are in the building 8am through 5pm weekdays. Reception desk is also 24/7.



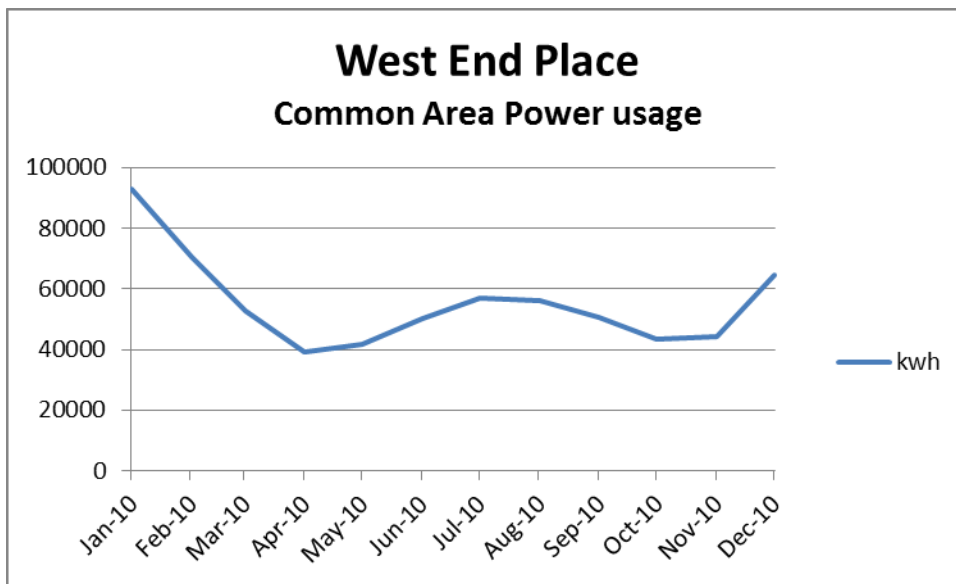
Basic construction is steel and concrete with a brick façade. The roof is a vinyl roofing system with gravel ballast. Glazing is double pane metal framed storefront style in the lobby areas. Tenant spaces incorporate the original structure with double pane metal framed window units. Some tenant units have upgraded window units.

All tenant water closets were upgraded to 1.6gpf in 2000. Common area hallway HVAC units were replaced this year.

A survey of the building mechanical systems, lighting, envelope and appliances were conducted. Additional visual surveys of several tenant spaces were also conducted including extensive envelope testing utilizing a blower door and energy modeling on a single tenant space.

## Energy usage

Electrical usage for the common area and tenant space (estimate) are typical for an all electrical system with electric heat. The large increase in usage during the winter months is created by the electric resistance heat and the increase in outdoor lighting use with shorter daylight hours. It will be important to monitor this peak in the future given the changes that were made to several of the hallway fan coil units and lobby HVAC equipment. Monitoring the temperature setpoints of the spaces and making prudent adjustments to the setpoints can temper the winter peak and save operating expenses.



It is helpful to compare the operation of the building with other similar buildings. The US Department of Energy in its' "Buildings Energy Data Book", surveys and compares commercial and residential buildings throughout the US. A copy of the relevant data for this application is in the Resources section. According to this survey, a multifamily building of comparable size will have an Energy Utilization Index (EUI) of 69.8kBtu/ft<sup>2</sup>, a building of a similar vintage will have an EUI of 51.9kBtu/ft<sup>2</sup>. West End Place has an EUI of 52.8kBtu/ft<sup>2</sup>. (remember this is an estimate based on the data from a very small sample of condo units.)

ENERGY PERFORMANCE SUMMARY (2010)								
Energy Type	Total Annual Use					Total Annual Cost		
	Common	Condos (est)	Total kWh	conv	Thousands Btu	Common (.115/kWH)	Condos (est) (.14/kwh)	Total \$
Electricity	754,880	842,035	1,596,915	3.413	5,450,272	87,234	117,885	205,119
Energy Utilization Index ( Total usage / gross floor area) EUI							52.028 kBtu/ft2/yr	
Cost index (Total cost/ gross floor area)							0.703 \$/ft2/yr	
Total water use					3389 ccf/yr	27112.000 \$/yr		
Cost index, including water (Total energy and water/ gross floor area)							2.217 \$/ft2/yr	

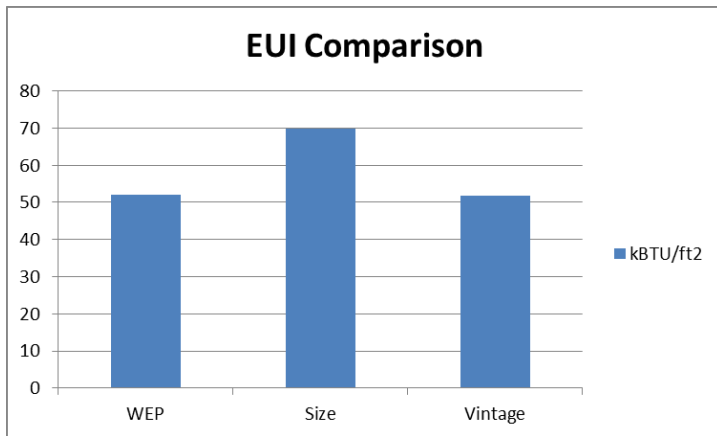
**METERED CONSUMPTION MONTHLY DATA: (2010)**

Utility Company, PEPCO Account #7603103035

Electricity Supplier, INTEGRYS energy services Account #879927

Water/Sewer Supplier, DC Water and Sewer Authority Account #0079232-5

\*Data was obtained for 2009 & 2010 for common area meters. Water meter data is incomplete and shows many discrepancies that could not be explained. Additional tenant unit data will increase meaningfulness of condo estimate.



Another source for comparison is Energy Star Portfolio Manager. An account has been set-up for West End Place with the available data. Portfolio Manager is a great tool to track progress as changes to energy usage are made. Currently, Energy Star does not rate Multifamily dwellings but is compiling data to issue ratings in the future. Links to the site with username and password information are included in the Resources of the report.

## Building and Systems Report

### Mechanical Systems

West End Condo is heated and cooled with a variety of mechanical systems. Historically the entire building was connected to a common chilled water system that supplied condenser water to the hallway fan coil units, lobby heat pump system and individual condo heat pump units. Recently, upgrades were made to the hallways and lobby units to split systems that are connected to several new air cooled condensers located on the patio and garage areas. Given the significant peak in winter electricity usage due to the equipment operation as an electric furnace, it is prudent to change equipment type as upgrades are made.

Inventory of Mechanical Equipment	
	Model #
Common Areas	
Cooling tower	BAC-3235
Heat Exchanger	Superchanger U4-416-HP-96
Condenser water pumps	Gould 10hp
	GE 25hp
	GE 25hp
Hallway units	fan coil units at windows in hallway
Air cooled condenser	Carrier Gemini
Generator (elevator back-up)	75ROz81
Fitness Room Packaged unit	TRANE
Lobby Area Packaged Units	
Garage Exhaust fans (2)	1 hp
Garage circulating fans (3)	1/2 hp
Condo units	
Individual unit HVAC (ex)	Carrier Mod #50RVR036LCC31130
Individual unit water heater	

### Cooling tower loop

During several visits to the site, surveys of the cooling tower, heat exchanger and condenser water loop pumps in the mechanical area on the roof were conducted. The cooling tower fill is fouled at both faces of the tower. This fouling affects the efficiency of the cooling tower to reject heat and should be addressed. The tower fan and pumps were continuously running during the day that we were on site. Given that at least part of the condo owners would have been at work, load on these systems should have been minimized and the towers and pumps would be cycling.



It was also observed that one of the condenser water pumps was operated on ‘Hand’. This would cause the pump to run continuously. Allen Bradley controls are installed but may not be operating.



Before any additional studies on the condenser loop components are conducted, it is recommended that the cooling tower, heat exchangers and piping loops be thoroughly cleaned and all equipment and controls be inspected and recommissioned by the HVAC contractor.

### Condo unit equipment

The individual condo units that were surveyed had a variety of equipment types. The original equipment was a Water source heat pump. This heat pump was connected to the condenser water loop piping which provides cool water for the heat rejection of the A/C cycle of the equipment. The typical operating cycle for this equipment would have it connected to a boiler loop in the winter heating mode as a source of heat for the heat pump. In the case of West End Place, a boiler is not connected to the loop and therefore the heat pumps must be run as an electric furnace to supply heat in the winter i.e. resistance heating coils typically used as “back-up” or

emergency heat are run exclusively. This heating mode explains the significant peak that is seen in electricity usage in the winter months.

An alternative equipment type is the air source heat pump. At least one of the condo units had this type of equipment recently installed. Implementing this type of equipment is tricky given the limited access to outdoor space adjacent to each condo unit. This equipment should result in a lower peak in the winter months.

Individual condo units should be utilizing programmable thermostats for maximum energy savings. Upgrading to an Energy Star rated programmable thermostat is a low cost project with energy savings benefits.

### **Parking garage exhaust fans**

The garage exhaust fans currently run 24/7. The function of these exhaust fans is to remove car fumes, etc from the space so that carbon monoxide levels are maintained at a safe level. It is recommended that a carbon monoxide sensor control be installed to operate the exhaust fans. ASHRAE HVAC Applications handbook states that control of fans by CO level can result in 30% energy savings as compared to continuously operated fans.



### **Lighting Systems**

A survey of condo common area lighting and controls revealed that upgrades to CFL's have previously been implemented. Further upgrades to the interior lighting systems should include photosensors in hallways and lobbies. The light levels during the day in these areas is sufficient without additional artificial light sources. (measurements of 40 – 70 lux in hallways) Reduction of operating hours on with the current fixtures and lamps will result in energy savings with these systems.





Stairwell lighting is currently on 24/7. Motion sensors can be installed in the stairwells to reduce operating hours of these fixtures.

Parking garage lighting is also currently on 24/7. Installing motion sensors near elevator exits and door entrances will reduce operating hours of these fixtures. During the survey maintenance staff indicated most owners do not move their cars during the week. Once PMI closes for the day the lights will cycle off. It is also recommended that separate metering (submetering) be installed to better quantify energy use for the garage area.

## **Building Envelope**

The survey of the building envelope was a visual inspection of the main building entrances and windows. In addition wall interfaces to the garage area were scanned. A blower door test was performed on one condo space. Weatherstrips and door thresholds and sweeps on the entrance doors to the lobby should be monitored and replaced when worn. Inspection of the caulking around the inside and outside of the window systems should be included in routine maintenance. Any piping penetrations from utility service or new and existing HVAC equipment should be sealed to prevent air infiltration.

The blower door testing in one condo space revealed major leakage in the mechanical closet and around door frames. Encouraging the condo owners to inspect and seal areas around ductwork and piping in the mechanical closets will reduce this infiltration. A recommendation of sealing and insulating the steel columns in the condos is a low cost project with comfort benefits.

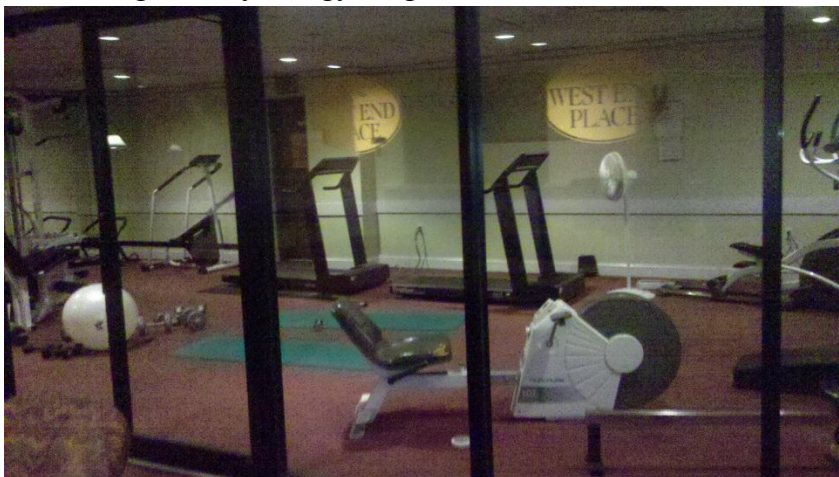


## Appliances

Replacing appliances with Energy Star appliances should be added to all purchasing requisitions for common area office and common area room equipment. Many purchases qualify for utility rebates and tax credits. The party room refrigerator is used by the office and maintenance staff on a daily basis but is very old. This refrigerator should be replaced with a smaller refrigerator that is Energy Star rated.

## Fitness room

The fitness equipment is in standby 24/7. A cursory survey of the O&M manuals of the equipment did not reveal any detriment to powering down the equipment when not in use. We recommend placing the equipment on timers to reduce start up delays prior to busy use times and eliminating standby energy usage.



**Individual condos**

In general, throughout the building, unplug/ disconnect televisions, DVD players, electronics charges, cell phone charges, etc. when not in use. Additional information regarding these issues is available here <http://standby.lbl.gov/standby.html>

Encourage condo owners to upgrade to Energy Star clothes washers and refrigerators when they replace them. The washers use less energy and less water than standard models.

Additional monitoring of individual appliances with a “Kill-A-Watt” meter will help quantify the impact of replacing disconnecting these appliances.

***Energy Analysis Summary***

The recommendations for Energy Conservation Measures are summarized below:

Summary of Energy Conservation Measures					
	Current kwh	Proposed kwh	Delta kwh	Savings \$	
<b>Building envelope</b>					
seal leaks	1596915	1117841	479075	\$55,361.86	
<b>Lighting</b>					
Hallways	13910.88	5531.94	8379	\$968.27	
Stairwells	21444.48	2680.56	18764	\$2,168.36	
Common areas	10733.92	5710.06	5024	\$580.56	
Garage	42293.28	17414.88	24878	\$2,874.95	
<b>Appliances</b>					
Fitness room equipment x3	315.36	52.56	263	\$30.37	
<b>HVAC</b>					
Proper maintenance and controls					
Garage fans	13069.92	9148.944	3921	\$453.11	

## **Operation and Maintenance**

The suggested changes to be made to facility current procedures:

Annual maintenance of all HVAC equipment

Clean cooling tower and heat exchanger

Update water treatment analysis

Update purchasing agreements to reflect updated lighting requirements

Encourage condo owners to replace filters in HVAC units monthly

## **Next Steps:**

Collect additional energy usage data for more condo units and enter into Portfolio Manager

Install submeter for garage lighting and fans, etc.

Contract HVAC contractor to evaluate controls and recommission equipment.

Perform building envelope leakage testing on greater sample of condo units.

## ***Resources***

Standby power loss

<http://standby.lbl.gov/standby.html>

Energy Usage comparisons

<http://buildingsdatabook.eren.doe.gov>

Energy Star info on Multifamily housing

[http://www.energystar.gov/index.cfm?c=multifam\\_housing.bus\\_multifam\\_housing](http://www.energystar.gov/index.cfm?c=multifam_housing.bus_multifam_housing)