

SECTION III: CALCULATIONS

Original System

Calculations were completed to determine relative values for the indicators of success

a. Total energy use for LEED rating

The original system was modeled as variable air volume with baseboard heating. Exhaust fans, supply fans, FCU fans, cooling towers, and circulation pumps were selected to match the design specifications from the TRACE library. The chillers, boilers, and DHWH data was taken from the specified manufactures websites and created in the equipment design option. This included modeling the unloading curves, efficiencies, and produced temperatures. (E -1)

Energy Consumption:

Apartment Lighting	344925	kw hr
Shared Space Lighting	49631	kw hr
FCU Supply Fans	1082	kw hr
Chiller Cooling	29534	kw hr
Cooling Tower	46478	kw hr
Condenser Loop Pump	49829	kw hr
Chilled Water Circulating	1694	kw hr
Boiler Forced Draft Fan	6563	kw hr
Hot Water Circulating	15094	kw hr
Exhaust Fans	1940	kw hr
Boiler	5040	Therms
DHWH	500	Therms

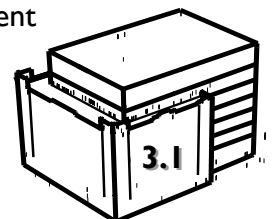
Total Lighting kw/hr	394556	kw hr
Total Site therms	5540	Therms
Total Mechanical kw/hr	152214	kw hr

b. Resident's utility and building fee costs

Each energy consumption was separated into its utility rate structure. In this case, only the apartment lighting consumption will be metered and billed by a residential structure. The remainder of mechanical and lighting was metered with a commercial peak/off peak, summer / non summer utility rate. (C-2)

To simulate the charges that residents would see from the building owner having to manage and maintain this central mechanical system, a typical building maintenance cost was estimated and added to the total utility cost (C-5a). To simulate the quantity of the building costs each apartment would receive, each apartment was given an arbitrary rating based on its square feet, location, and views. This is a typical method to break up shared building expenses.

To cover the full range of apartment utility costs, the costs for the smallest apartment on the North side of the building, apartment 2C, and the largest duplex on the South/Western side were calculated, apartment 6B7B.



The typical expected monthly utility bills for two apartments (C-5b):

Apartment
2C

J	F	M	A	M	J	J	A	S	O	N	D	Total
\$118	\$109	\$118	\$105	\$114	\$145	\$156	\$162	\$136	\$107	\$106	\$119	\$1,494

Apartment 6A7B

J	F	M	A	M	J	J	A	S	O	N	D	Total
\$288	\$266	\$288	\$256	\$283	\$371	\$401	\$416	\$349	\$264	\$259	\$291	\$3,730

c. Price of the total system to the building owner

I have used the estimated bid price to compare each system on a relative basis. The estimated bid amount for the design system is 1.2 Million.

d. Condominium price to buyers

For relative quantities, I assume that the owner has enough overhead to charge each condominium purchaser for the true cost of the design mechanical system, so each apartment which will cost between \$26,000 and \$68,000

e. Emissions

Electric emissions were estimated from US Department of Energy's emissions from grid-source electric mix, and natural gas boiler and DHWH were estimated from the New Jersey's Environmental Protection's regulations and the mechanical specifications. The total emissions due to the mechanical system (C-4) (not including apartment or shared spaces lighting)

	Pounds Particles per Year	Pounds SO2 per year	Pounds NO2 per year	Pounds CO2 per year
BH design	98	1,148	676	301,927

