

\$42,800
IN
ANNUAL SAVINGS

SUSTAINABLE CPC: A STUDY IN SAVINGS

Heating and Cooling with Air Source Heat Pumps | New Construction



BUILDING PROFILE

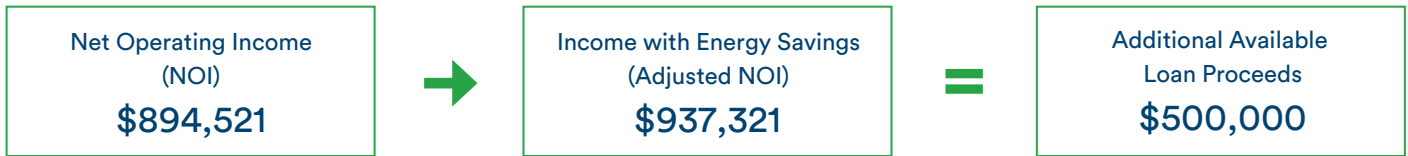
Year Constructed	2016
Size	5 Floors, 48 Apartments, 180 Rooms, 67,900 Gross Square Feet
HVAC System	VRF Heat Pumps
Utilities Provided by Owner	Hot Water, Water & Sewer

The owner of this newly constructed property installed high-efficiency Variable Refrigerant Flow (VRF) heat pump technology for heating, cooling, and humidity control. VRF heat pumps provide unmatched thermal comfort at a fraction of the operating cost of older electric heating systems.

PROJECT PROFILE

Loan Type	Construction and Pemanent Loan
Loan Offering	\$10.5 million

ADDITIONAL LOAN PROCEEDS SUPPORT ENERGY AND WATER EFFICIENCY



SAVINGS SNAPSHOT

Cost and efficiency savings are shared between owners and residents who pay for in-unit electric heating and cooling. On average, residents pay 43% less for essential utilities than they would at a conventionally-designed property.

Additional investments (such as LED lighting, low flow plumbing fixtures, and a planned 7.5 kWh co-generation unit) lower energy consumption and provide additional savings for the owner.

UTILITY	CONVENTIONAL PROPERTY ANNUAL EXPENSE (\$/APARTMENT)	SUBJECT PROPERTY ANNUAL EXPENSE (\$/APARTMENT)	EXPENSE DIFFERENCE
Owner			
Gas (hot water), Water, and Electricity (common area heat, AC, and baseload electric uses)	\$1,350	\$1,250	-7%
Resident			
Electricity (apartment heat, AC, and baseload electric uses)	\$2,100	\$1,200	-43%

OPTIONS FOR ELECTRIC HEATING AND COOLING

New electric heat pump systems provide an all-in-one solution for heating and cooling. Heat pumps can reduce overall utility costs while providing a host of other benefits such as, room-by-room temperature control, improved comfort, and quick installation. Unlike old electric resistance heating, these systems maintain efficiency by transferring air from one place to another (from inside to outside and vice-versa). Increased efficiency drives down fossil fuel usage and, in turn, lowers operating costs, especially when paired with on-site renewable energy like solar.

Below are 4 common systems with recommendations on how to maximize long-term performance.

Best: Ductless Mini-/Multi-Split Heat Pump

Ductless heat pumps provide a complete solution for heating, cooling, humidity control, and air filtration. Improved technology maintains performance in cold temperatures without relying on expensive electric resistance heating. With only two key components, these systems are easily and quickly installed and do not require venting or a designated mechanical room.

- New models can work efficiently down to -17 °F
- Indoor air handlers run quietly and boast a gentle startup
- This system requires only a small wall penetration for piping and doesn't monopolize floor or window space
- State-of-the-art controls allow for separate conditioning zones maintaining comfort throughout the home
- All-electric systems can easily connect to renewable systems, such as solar
- Eliminates the risk of carbon monoxide poisoning or natural gas explosion

Best: Variable Refrigerant Flow (VRF) Heat Pump

VRF heat pumps offers improved heating and cooling performance, as well as comfort across multiple indoor zones or rooms. VRF heat pumps work by efficiently modulating refrigerant flow to meet demand, while maintaining the desired temperature.

- Allows one condenser to serve multiple spaces, ideal for mixed-load applications
- Optional heat recovery feature allows simultaneous heating and cooling in different zones

Good: Packaged Terminal Heat Pump (PTHP)

PTHP are ductless systems that provide heating and cooling. Unlike mini-/multi-split systems, PTHPs are installed through a wall opening typically below a window. PTHPs have gained popularity recently as they deliver an efficient product at a low install cost. However, PTHPs don't provide any zoning control and have poor air circulation when compared to split systems. Additionally, performance drops in cold temperatures at which point, expensive electric resistance heating is commonly used and drives up expenses.

- Easy, direct replacement for older electric resistance models (see below)
- Good HVAC option if Ductless Mini-/Multi-Split Heat Pumps are not feasible
- Inexpensive upfront costs may be negated by high utility bills for residents and owners

Avoid: Package Terminal Air Conditioner (PTAC) Electric Resistance

If installing an all-in-one heating and cooling system, be sure to avoid PTACs that run solely on expensive electric resistance heat. PTACs are easy to install but drive up utility bills and maintenance costs. Improperly-sealed wall openings can cause drafts, waste energy, and lead to water, noise, and pest infiltration.

- Challenges with through-wall installation can lead to issues around noise, air quality, and energy waste
- Loud operating cycle and high operating costs leave residents dissatisfied and uncomfortable

SYSTEM	EQUIPMENT COST (\$/APARTMENT)*	ANNUAL COST TO OPERATE (\$/APARTMENT)*
BEST: Ductless ASHP	\$3,000	\$600
BEST: VRF Heat Pump	\$5,000	\$550
GOOD: PTHP	\$1,500	\$1,150
AVOID: Electric Resistance PTAC	\$1,500	\$1,450

*Example costs only, not intended to be representative of most buildings. Actual costs will vary depending on apartment size, occupant behavior, cost of electricity, and other building components affecting heating and cooling requirements.