



Housing Vermont -Red Clover Commons

CASE STUDY

Client Profile

Housing Vermont, a nonprofit syndication and development company founded in 1988, creates permanently affordable rental housing throughout the state of Vermont. In 2011, Hurricane Irene devastated Brattleboro, VT, flooding 80 affordable housing units for seniors and the disabled. Housing for this population had to be moved off the flood plain. The new development, named Red Clover Commons, was designed to include 55 housing units, in a three story building with parking in the basement. Red Clover Commons would be a 'green' facility built for a sustainable future including a near net zero HVAC system using a wood pellet boiler and high efficiency air conditioning systems as had been used in earlier 'green' developments. The intent was to demonstrate how energy efficiency can make housing permanently and comprehensively affordable by reducing energy usage and costs.

Challenges

Upon closer examination considering available technology, Housing Vermont realized that a wood pellet boiler and conventional air conditioning system did not meet the sustainability goal because it could produce as much or more CO₂ as coal, and that demand for the pellets contributed to old growth deforestation. The selected site including an existing contaminated Brownfield site with very limited real estate and sloping grade also presented unique challenges.

Solutions

Housing Vermont consulted with Turner Building Science & Design and their distributor partner, Blake Equipment, based on positive results they'd delivered on a similar project in Massachusetts. The team recommended a geexchange solution incorporating an advanced borefield of high efficiency, in-ground heat exchangers, coupled with a near frictionless magnetic bearing chiller, along with new low KWH water circulation pumping technology. These technologies, by design, inherently result in a "Near Net Zero Energy" HVAC system. The inground geexchange borehole field would be installed around the perimeter of the building, adjacent to the existing brownfield area.

Public Housing Built For A Sustainable Future

Goals and Objectives

1. *Economically apply technology that results in a state of the art, energy efficient public housing project with a minimal carbon footprint.*
2. *Develop a model project to reduce CO₂ as an alternative to other "Green" pellet boiler projects.*
3. *Demonstrate how deep energy efficiency can make affordable housing permanently and comprehensively affordable by reducing energy usage and costs.*



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Results

Housing Vermont President, Nancy Owens, shared the results of the project at the Grand Opening of Red Clover Commons, “The geexchange based HVAC system was designed with a new high benchmark level of performance of about 180,000 BTU’s/\$ while also producing a new low of only 8 tons of CO2 per Therm of energy including the off site CO2 generated in the production of electricity used. The piping system makes a giant closed loop down and around 24 geexchange advanced “bore holes”— each 500 feet deep—then back into the building. A “near frictionless chiller” in the central mechanical room utilizes the borefield as an energy source for heating and an energy sink for cooling, the chiller then sends both hot and chilled water off to the apartments to provide either heating or air conditioning as desired. The projected heating and cooling cost is only \$20 per unit per month, which is 75% less than the average costs of a standard apartment building.” Lower utility costs increases continued affordability of properties to low income residents over time. To date, although preliminary, actual costs appear to be notably less than predicted.

Owens also explained that the performance of the system can be tracked remotely through a fully automated web-based data collection and reporting system. Not only does this allow for timely trouble shooting, but the collected data allow Housing Vermont to compare Red Clover Commons’ performance with other buildings and systems in its portfolio and apply what it learns to new projects.

THE TECHNOLOGY



Near Frictionless Magnetic Bearing Chiller

The near frictionless magnetic bearing Thermal Care chiller operates at an average COP of 7.2. The compressor uses 50% less energy than conventional ones. The near frictionless compressor is a very low maintenance machine.



Geexchange Borefield

Use of Versaprofile’s thermally enhanced HDPE, 1-1/4” U-Tube borehole heat exchangers, made with using highly conductive mineral nano-particles reduced vertical feet per ton requirements by about 15% and allow better average operating temperatures for improved operating costs over the life of the system.



Low Temperature Hydronics

Low temperature terminal heating devices sized to use 95°F to 105°F hot water provides another 20% of the energy savings. Grundfos Magna 3 ECM pumps move water through the facility with lower watts / GPM thanks to the pump design and the use of more efficient pipe sizes.

PARTNERS IN SUCCESS

Developers: Housing Vermonts, Burlington Housing Partnerships	Manufacturer: Thermal Care, Versaprofiles
Engineering: Turner Building Science and Design	Manufacturers’ Representative/Distributor: Blake Equipment
Contractors: Adams Plumbing and Heating; Cushing and Sons: Water Wells and Pumps	



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