

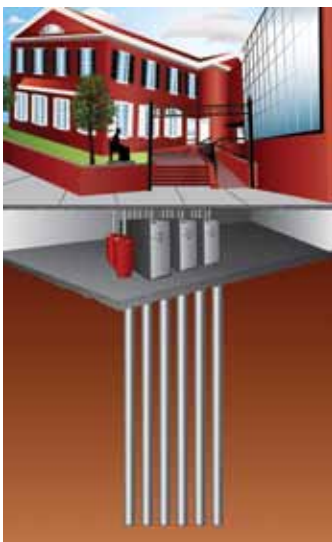


## Case Study – Friends Center

EDUCATION / HEALTH CARE / LODGING / MANUFACTURING / OFFICE BUILDING / RETAIL / SPECIAL



Sustainable Comfort,  
Small Footprint



*Deep wells plus Carrier geothermal heat pumps and controls enabled The Religious Society of Friends to retrofit their historic center-city facility for a sustainable future using 100 percent renewable energy for heating and cooling.*

## Responsible Comfort and LEED® Platinum Certification at Historic Friends Center

### Project Objectives

The Friends Center is a campus of three buildings in central Philadelphia, owned and operated by The Religious Society of Friends, commonly known as the Quakers. The complex includes the historic Race Street Meetinghouse. Faced with the need to renovate the heating and cooling plant, the Friends decided to take this opportunity to eliminate their reliance on fossil fuels and secure the future comfort of worshippers, office inhabitants, and the children and staff of the onsite daycare center using 100 percent renewable energy. Environmental integrity, responsible use of resources and the goal of carbon neutrality were driving forces in the Friends' decision-making process. In addition, their design solution had to take into account the campus's location in center-city Philadelphia.

### Solution

The centerpiece of the \$12.5 million Friends Center renovation is a Carrier geothermal exchange system designed to eliminate the property's reliance on fossil fuels for heating and cooling. Using deep wells installed directly below the Friends Center campus, the new system — which includes Carrier geothermal heat pumps, air handlers, air terminals, fan coil units, hot water coils and digital controls — enabled the Friends to use geothermal technology despite their metropolitan location, in which the extensive surface water-loop of a typical geothermal system would have been impossible. In addition, the i-Vu® open protocol web-based building automation system was specified, enabling Friends Center staff to monitor and control every aspect of the geothermal system as well as other building functions. This forward-looking solution helped the Center attain a Leadership in Energy and Environmental Design (LEED)® Platinum certification.



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*Jonathan Salemo,  
Project Manager,  
Elliott-Lewis*

### Project Synopsis

The Friends Center campus, located just two blocks from City Hall in historic downtown Philadelphia, includes three buildings: the Race Street Meetinghouse, a national historic landmark built in 1856, and two modern facilities that house office and conference space. The 54,000 square foot facility is home to nineteen non-profit organizations and a day care center, and is used by about 300 employees and 75 children each day, plus the congregation of the Central Philadelphia Monthly Meeting.

The Religious Society of Friends felt that the Center required renovation before it could be used to serve the next generation responsibly. In particular, the Friends felt a need to eliminate the Center's dependence on nonrenewable resources and cut greenhouse gas emissions to zero, while still providing a comfortable place for workers and worshippers alike. In addition, the historic integrity of the Race Street Meetinghouse had to be preserved. And finally the Friends hoped to complete the project according to such high standards that it would receive a LEED® Platinum registration.

Geothermal technology was identified as the key to the Friends Center's sustainable future. Robert Diemer of AFK Group, the award-winning firm that created the engineering design, said, "A traditional geothermal system would have required a well field larger than possible within the dense Philadelphia environment, so deep wells were used instead." The six deep wells drilled for the Center are the first in Pennsylvania, each six inches in diameter and more than 1,500 feet deep. Water from the wells is used to supply the geothermal heat pumps, which provide heating and air conditioning for the Center. Carrier geothermal equipment was chosen to transform the latent energy of the well water into comfort for the inhabitants of the Center.

Jonathan Salemo, Project Manager for Elliott-Lewis, the renovation's LEED-experienced contracting firm, selected the equipment for the Center. "We chose Carrier because they provided heat pumps and controls that met our requirements in terms of efficiency, capacity, features and cost. I was very impressed with the operation of the Carrier water-to-water heat pumps and with their ability to operate as both a chiller and a boiler, allowing the system to provide simultaneous heating and cooling." This ability enables Friends Center staff to manage the comfort of the highly diverse areas of the facility using one integrated system that draws solely on renewable energy.

In order to avoid wastefully replacing equipment that was still in good working order, the new system was integrated into some existing components. Dan DeSantis, Senior Sales Engineer for Carrier, said, "Mixed use facilities provide unique design challenges." In the Race Street Meetinghouse facility, which could not use ductwork due to its National Register status, individual water-to-air geothermal heat pumps were used to provide efficient space comfort. In the two newer buildings, water-to-water heat pumps replaced the existing chiller and city steam system. The existing air handler was improved with a variable speed drive, which increases efficiency and extends equipment life, while the air system was upgraded to variable air volume, again an efficiency improvement. Finally, fan coil units were deployed in perimeter spaces to offset heating loads.

Robert Pry, Senior Controls Engineer for Carrier, said, "One of the most significant challenges of the controls design at Friends Center was the integration of water, air and ancillary systems. The equipment was connected via the open protocol i-Vu® system, which allows staff to observe and control the operation of the heating, ventilation, air conditioning (HVAC) and rainwater collection systems."

In the end, the careful process of renovating Friends Center paid off. The Center eliminated its fossil fuel emissions of 326 tons per year, is now positioned for a sustainable future in their center-city location, and was rewarded with a LEED Platinum certification, indicating that the Friends have obtained their goal of responsible comfort and good stewardship of resources.

### Project Summary

**Location:** Philadelphia, PA

**Project Type:** Retrofit of major mechanical systems

**Building Size:** 54,000 square feet

**Building Usage:** Mixed. Office, conference, daycare, worship

**Objectives:** To be fossil fuel free and carbon neutral

**Main Decision Drivers:** Using geothermal heat pumps to eliminate chiller and boiler

**Project Cost:** \$12.5 Million (\$2 million in HVAC)

**Project Date:** 2008

**Equipment:** Carrier water-to-water geothermal heat pumps, water-to-air geothermal heat pumps, fan powered mixing boxes, single duct VAV boxes, fan coils, and one air handler

**Controls:** i-Vu® open protocol control system used to integrate Carrier equipment, existing HVAC equipment, VFD (variable frequency drive) pumps, water valves, and radiant panels.

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