



## Case Study – Kensington High School

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



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## Sustainable Comfort Contributes to Pennsylvania's First LEED® Platinum High School

### OBJECTIVES:

When the Philadelphia School District decided to replace a troubled and deteriorating high school with three smaller, magnet-style institutions, AP Construction (AP) and BSI Construction, LLC. (BSI) undertook delivery of a turn-key solution, the Kensington High School for Creative and Performing Arts (KCAPA). AP/BSI sought to develop a bright, comfortable, inspirational environment that would facilitate education and empower students and teachers in an economically challenged neighborhood. The firm aimed to provide sustainable heating, cooling and ventilation in the confines of a dense urban setting while giving teachers the ability to control conditions in their classroom. AP/BSI also wanted the building engineer to have integrated control over all lighting and heating, ventilation and air conditioning (HVAC) functions. Finally, AP/BSI wanted to build the first-ever LEED® Gold high school in Pennsylvania.

### SOLUTION:

Carrier, in conjunction with Alderson Engineering, recommended that AP/BSI use 77 Aquazone™ water source heat pumps paired with custom dual-wheel energy recovery units to provide sustainable geothermal comfort and fresh air to each classroom at KCAPA. This strategy employed the ground beneath the athletic field for 96 vertical geothermal wells, and gave each teacher the power to adjust their classroom temperature and bring in fresh air as needed. The i-Vu® Pro web-based user interface allows the building engineer to monitor and troubleshoot all HVAC and lighting functions. Thanks to sustainable heating, cooling and ventilation as well as other green features, KCAPA became the first high school in Pennsylvania to attain LEED Platinum status, exceeding the builders' LEED Gold ambitions.

*Sustainable geothermal heating and cooling at the Kensington High School for Creative and Performing Arts contributes to an educational atmosphere that has quadrupled test scores and raised the graduation rate by 37 percent.*

### Athletic Field's Geothermal System Contributes to Student Academic Performance





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Drew McFadden,

Senior Mechanical Engineer,  
Alderson Engineering



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### SYNOPSIS:

AP Construction (AP) and BSI Construction, LLC. (BSI) sought to develop a bright, comfortable, inspirational environment at the new Kensington High School for Creative and Performing Arts (KCAPA) to facilitate education and empower students and teachers. The firms aimed to provide sustainable heating, cooling and ventilation; give teachers the ability to control conditions in their classroom; give the building engineer control over all lighting and heating, ventilation and air conditioning (HVAC) functions; and build the first-ever LEED® Gold high school in Pennsylvania.

Carrier, in conjunction with Alderson Engineering, recommended 77 Aquazone™ water source heat pumps, using the ground beneath the athletic field to house a closed loop system of 96 vertical geothermal wells.

Tracey Mechanical, Inc., of Newtown Square, Pennsylvania, provided the installation. Mike Gondek, Project Manager at Tracey Mechanical, said, “The project went very smoothly. Carrier always provides great technical support during installation and start-up, and the equipment and controls worked perfectly from the very beginning. The heat pump units went in easily and ran well.”

Aquazone heat pumps are quiet and reliable, requiring minimal maintenance. In fact, routine filter changes are so simple, they can be performed by any staff member. Also, rather than sacrificing square footage in a confined urban property to a large mechanical room for chiller equipment, the Aquazone heat pumps are housed in closets easily accessible from the hallways. This ensures any repairs or maintenance do not disturb classroom activities.

Each heat pump is connected to a dedicated outdoor air unit with a custom dual-wheel energy recovery unit. This unit is comprised of an enthalpy total energy wheel that recovers exhaust energy and a second sensible wheel to provide free re-heating. An integral water source heat pump provides mechanical cooling and heating as well. Each outdoor air unit is controlled by temperature and CO<sub>2</sub> sensors within the classroom, so fresh air is only brought in as needed, saving additional energy. The variable frequency drives on the outdoor air units provide even greater economy.

Drew McFadden, Senior Mechanical Engineer at Alderson Engineering, explained, “The geothermal array is a departure from the traditional chiller systems used in previous school buildings, but its decentralized nature gives each teacher the power to keep conditions comfortable in their own space. Also, pairing the outdoor air system with each heat pump means the classroom atmosphere never becomes stuffy and stultifying.”

Alderson also specified the i-Vu® Pro web-based user interface in order to allow the building engineer to monitor and troubleshoot all HVAC and lighting functions from any web-enabled location. The i-Vu interface provides data, alarms and trending information that alert the staff to irregular conditions and provide at-a-glance information on each room in the school. The i-Vu interface also coordinates the sensors in each room, ensuring that heating, cooling, ventilation and lighting are returned to their unoccupied setpoints when the room is not in use.

The benefits of the geothermal system, the individual ventilation capabilities and the advanced access and data provided by the i-Vu interface were immediately apparent to the staff at Kensington. Mike McGinley, Facilities Manager at KCAPA, said, “The system works great. The building is comfortable and very easy to control.”

The careful design and construction of the Kensington High School for the Creative and Performing Arts have paid off. KCAPA became the first high school in Pennsylvania to attain LEED Platinum status, exceeding the builders’ LEED Gold ambitions.

Perhaps most encouraging of all, student test scores have quadrupled at KCAPA compared to the previous high school, and graduation rates have increased by 37 percent. Truancy and reportable incidents have also fallen dramatically, indicating the student body’s greater engagement with the educational process in this inspirational building.

### Project Summary

**Location:** Philadelphia, PA

**Project Type:** Heating, cooling and fresh air to individual classroom spaces in urban high school; web-based controls interface to facilitate troubleshooting, maintenance.

**Building Size:** 90,000 square feet

**Building Usage:** Education

**Objectives:** Create a comfortable environment to facilitate education and empower students

and teachers; provide sustainable heating, cooling and ventilation in dense urban setting; attain LEED® Platinum certification.

**Equipment:** 77 Aquazone™ water source heat pumps, including 50PSH, 50PTH and 50PTV; heat recovery ventilators

**Controls:** i-Vu® Pro

**Major Decision Drivers:** Limited space for geothermal field and mechanical equipment; needed reliable units with minimal

maintenance requirements; wanted individually controlled outside air to each classroom space.

**Unique Features:** Vertical geothermal wells located below athletic field; heat pumps installed in classroom closets; outside air dampers paired with each heat pump for maximal occupant control of comfort conditions.

**Installation Date:** 2010

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