



The Willow School

A complete green education

Answers for infrastructure.

SIEMENS



A Green Education: A Physical Part of the Curriculum

The Willow School is an independent K-8 school located in Gladstone, New Jersey. The school's 34-acre property includes an 1800's era house, an old barn with a connecting horse stable and one 13,500-square-foot structure which can house up to 250 students.

Client Objectives:

In 2002, The Willow School administrators began planning a renovation and new construction project to expand its facility and infrastructure. To serve the upcoming 2003 New Jersey State High-performance Building Design mandate, school administrators wanted emphasis placed on the four aspects of a high-performance school as defined by the mandate — a building that is healthy, smart, green and cost-effective.

School leaders also wanted the ability to use the campus as a framework for the curriculum. They wanted to include the sustainable design strategies for the buildings and landscape as part of the daily teaching process — a live demonstration of how a building and its infrastructure work. Administrators wanted to promote a deeper understanding of the environment in the student's daily interaction.

Siemens Solutions:

From the start, Siemens wanted to provide quick, comprehensive solutions for the school. To bid the project, the building automation division collaborated with its colleagues in the fire and security divisions to create a single bid — with all systems in an integrated package — a concept that the school's owners liked.

The Willow School wanted to incorporate the latest building technologies, maintain a very green environment and incorporate a whole-building and integrated-design approach. The design team needed the expertise to be able to evaluate all building elements, materials and systems as integral parts of the entire building rather than looking at each item solely on the basis of its own individual merit and cost. Siemens Building Technologies had the breadth and depth of project experience that The Willow School was seeking.

The LEED® Green Building Rating System, developed by the U.S. Green Building Council, was used as a framework to set goals for environmental performance for the school and the design team. The framework focuses on the general categories of healthy plant/animal habitat, water quality and conservation, energy, material resources efficiencies and indoor environmental air quality.

Site commissioning procedures were key to the success of this LEED-certified project. The Siemens commissioning plan included a seven-step process for each individual system: submittal approval, requested documentation submittal, model verification, installation, operations, sensor calibration and device calibration. To ensure success, the facility's owner, commissioning agent and mechanical contractor were present for each system test.

A Siemens APOGEE® Building Automation System now controls this innovative, high-performance school campus. In accordance with LEED, occupancy sensors are placed throughout the facilities to monitor carbon dioxide and relative humidity levels, as well as the temperature and air-based pollutants in each of the classrooms. In addition, vent call units are present in each room so outside air can be brought in through a dedicated variable air volume (VAV) box. As radiant floor heating has been installed through much of the facility, the system also monitors slab temperature.

Incorporating Essential Green Elements

Environmentally sensitive local building products and renewable raw materials were used throughout this project. The timber frame structures holding up the two main buildings were fabricated from salvaged lumber — without the use of nails or steel. Other materials were salvaged and recycled to make the windows, doors, ceilings, roofs, sidewalks, paving and tile. The few trees that were cut down for construction were sent to woodworkers to create furniture for the school. Contractors also recycled approximately 90 percent of the construction waste generated from the construction site.

Throughout the campus, Siemens systems interfaced with:

- An energy-efficient lighting and electrical system
- The control and monitoring of a radiant floor heating system
- Clerestory windows (for daylighting) and acoustic panels (to manage sound) in the ceiling of each classroom
- The monitoring of two 50,000-gallon, underground grey water storage tank made of 100 percent recycled materials to conserve water
- The control and monitoring of a complex air handling system with a heat recovery wheel for the exhaust air
- The monitoring of renewable energy sources, including a 39Kw Solar PV system and solar arrays on clerestory roofs

Client Results:

The project's first phase was completed in 2003. It included the construction of a 13,500-square-foot classroom building and site infrastructure, such as roadways, parking lots and a stormwater and wastewater management system.

Phase two — the 13,000-square-foot Arts Barn — was completed in September 2007. It has surpassed pre-construction energy-efficient goals through the design of a highly efficient building envelope, naturally day-lit spaces and a solar energy system.

Direct Benefits:

- The school has reduced its water usage by harvesting rainwater that falls on the 85 percent recycled stainless steel roof in two 50,000-gallon underground tanks and using it to flush toilets in the building, thus reducing storm water run off and preserving potable water for human drinking needs. The building also utilizes an innovative "constructed wetland" wastewater management system, where plants are grown hydroponically in septic water. This septic water is treated and cleaned to recreational-quality standards in the plant bed before it is returned to the ground. This promotes local ground water recharge, reduces the burden on the municipal sewage system and reduces energy usage, all resulting in an estimated 50-to-60 percent annual water savings.
- At the project's start, the school debated the installation of air conditioning — to help minimize the use of electricity. However, learning that the system could be installed in conjunction with a light-alert system that informs teachers in the classrooms when the outside air is sufficient to cool the building — air conditioning was added back into the

project. The building's site orientation and layout plan, along with super-insulated walls and ceilings, high-performance windows, high-efficiency heating and cooling systems, and innovative daylighting strategies (including automatic photocell-based daylight dimming controls for interior light systems), provides maximum energy performance. These strategies, monitored by the Siemens APOGEE system, help save The Willow School an estimated 70 percent in conventional power costs.

- Siemens systems are also included in the school's curriculum to help students see the consequences of their actions. Reports generated by the building's control systems are studied to reduce energy use. The man-made wetlands wastewater treatment system serves as its own classroom. The system is fed in part by the rain water collected off rooftops and contains diverse plants of a local ecotype. The ongoing school design and construction process — in addition to the day-to-day facility operations — are used as an educational opportunity for students, faculty and the community alike.
- In addition, the school's lobby has a monitor that displays the school's electrical, HVAC and plumbing systems. Students and visitors to the school can literally see the consequences of using extra water and light.
- The school is eligible for federal and state solar rebates.

The Willow School was ranked the number two school in *The Green Guide's* annual list of the "Top 10 Green Schools in America (2006)." In 2008, The Travel Channel recognized Willow as the most eco-friendly school in the country. Willow was the first private learning institution to achieve LEED NC Gold certification from the U.S. Green Building Council and the second school in the country to achieve this rating. The School's second building, completed in 2007, earned USGBC LEED NC Platinum certification, making it New Jersey's first LEED Platinum building.

Siemens Building Technologies

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