

GEO OUTLOOK

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Neptune Township Schools Pass the **Sustainability** Test

By Kelly Green



A rendering of the aerial view of the Neptune Community School. The facility will employ an energy-efficient ground source heat pump system.

Poor indoor air quality, bad lighting, and inefficient heating and cooling can all be contributors to a sub-standard learning environment. But what happens when these and other environmental concerns are addressed? If you ask David Mooij, superintendent of the Neptune Township school district in Neptune, N.J., the results are better attendance, better test scores, happier students and an overall healthier atmosphere.

“They (the New Jersey School Development Authority (SDA)) did a very smart thing solving our building problems,” Mooij said. “Now, there are really only two things that need to be done here: make sure we have the right curriculum for our kids and make sure that curriculum is being delivered. That’s the real business of education.”

Neptune is one of 31 districts in the state of New Jersey classified as an Abbott or special needs district. This classification results from a 1990 state Supreme Court ruling that found children in these districts received an inadequate and unconstitutional education. The state was required to provide more than \$6 billion to help these schools implement a comprehensive set of programs and reforms, including standards-based education, supplemental programs, pre-school education and school facilities improvement.

When it came to facility improvements, Mooij wanted to not only meet the needs of his district but also make a statement to his students about the importance of renewable technologies and sustainability. “As the superintendent, I was very interested in getting ideas across to our students of the need to protect our dwindling resources,” Mooij said. “We had this real concern that our dependence on foreign oil was really going to hamstring the United States in the future and we needed to make that case in a very visible way to our students.”

Guided by these concerns, Neptune along with SDA,

designed its two new facilities, Summerfield Elementary and Neptune Community School, to meet standards outlined in the United States Green Building Council’s Leadership in Energy and Environmental Design (LEED) program. The schools were constructed with features such as daylighting, raised floor displacement ventilation, waterless urinals, metering faucets, and geo-



Summerfield Elementary School opened in spring 2006. The facility’s designers expect the school to earn LEED Gold.

thermal heating and cooling. While neither school has officially received its LEED award, Mooij and the design team are confident both facilities will earn a Gold rating.

Summerfield Elementary opened in spring 2006 to an excited community of students, parents, teachers and administrators. Neptune Community School is set to open in fall 2008. “The community is just enthralled with it,” Mooij said. “Honestly, we’re an urban district, and if this was something that was asked of the voters it probably never would have happened, but as a result of (state) Supreme Court rulings and this legislation, the students now have the best facilities that anybody could buy or build them.”

A Side By Side Comparison

Courtesy of Michael Fischette, Concord Engineering Group

Summerfield Elementary School

Mechanical contractor: Epic Mechanical
GHPs manufactured by WaterFurnace

- Raised floor displacement ventilation
- Closed-loop vertical bore geothermal heat pumps
- Classroom heat pumps—horizontal, ceiling corridor
- Heat recovery of ventilation air—heat wheels
- Supplemental hot water boilers
- Daylighting – manual switched
- Light shelves
- Waterless urinals, metering faucets
- Rain water collection

Neptune Community School

General contractor: Binsky & Synder
GHPs manufactured by Florida Heat Pump

- Raised floor displacement ventilation
- Closed-loop vertical bore geothermal heat pumps
- Classroom heat pumps—vertical closets, corridor access
- Humidity control—hot gas reheat coil in heat pumps
- Heat recovery of ventilation air in heat wheels and geothermal hot water preheat coils
- Daylighting—dimnable ballasts
- Light shelves
- Waterless urinals, metering faucets
- Green roof
- Green power photovoltaics

Geothermal's Sustainable Advantage

Geothermal was selected for the schools' heating and cooling systems for one main reason: low lifecycle costs. "With geothermal there is a higher upfront expense, but the lifecycle analysis with increasing costs for utilities really was the selling point as to why the district went in that direction," Mooij said.

Michael Fischette, principle at Concord Engineering Group and engineer of record for the Neptune Community School project, is also a big believer in geothermal. He believes the systems are an ideal fit for schools, especially those looking for LEED certification. "Geothermal heating and cooling and LEED sustainable design are really perfect together," Fischette said. "It (geothermal) is inherently sustainable because it's renewable and it provides the savings we need over conventional systems to get those (LEED) points."

At the Neptune Community School, Fischette de-

signed custom, sound-proof closets for each classroom that house the heat pump units. The units sit at waist level in the closet making filter changes and other routine maintenance a cinch for the school's maintenance staff. At Summerfield, the heat pumps are located outside the classrooms in a corridor in the ceiling. While the maintenance staff does have to use a ladder to access these units, they can be inspected without interrupting the classrooms.

At both facilities, classrooms are equipped with their own heat pump unit and an individual thermostat. This allows teachers the freedom to adjust the temperature in their classrooms. The building automation system sets the midpoint temperature at 71 degrees fahrenheit. Teachers can adjust the temperature 3 degrees up or down to meet their needs.

The heat pumps in each school are served by a closed-loop, vertical ground heat exchanger, which Mooij said

is buried under parking lots. The schools are comparable in size, about 150,000 square feet, and required about 100 holes each drilled to a depth of 470 feet.

Breathing Easier

To increase comfort, improve air quality and achieve more LEED points, the district also decided to install a raised floor displacement ventilation system at both schools. This ventilation system requires a raised floor into which tempered air is directed replacing ductwork typically found in the ceiling. The floor registers discharge the air at a very low velocity, so low that it cannot even be felt at times, Fischette said. This creates a layer of heated or cooled air right where the students sit, in the zero to three foot elevation region. It also eliminates the need for high-powered fans to distribute the air and the blasts of air accompanied by those fans.

“If you have a duct coming out of the ceiling, there’s a lot of horsepower and a lot of air volume that’s required to push the temperate air down to where the students are,” Mooij said. “If you have it coming out of the floor, the first things it’s going to impact are the students and the staff.”

Fischette said in addition to comfort, the raised floor displacement ventilation system also improves indoor air quality. “That type of system gets an extra LEED point for ventilation effectiveness because pollutants such as carbon dioxide, which is lighter than air, rise to the top of the ceiling and are exhausted,” Fischette explained. “The new fresh air coming in from the floor is what you breathe.”

The system is also equipped with sensors that open dampers to let in more fresh air if carbon dioxide levels get too high. Mooij said the teachers have even reported an increase in the alertness of their students, which they attribute to greater amounts of clean, fresh air. “I honestly think it makes a difference,” Mooij said.

Success with a Design Build School

On top of containing some of the latest and greatest green building features, the Summerfield School possesses another impressive attribute – it was a design build project. “It (Summerfield) was the only one in the \$6

billion that the state has spent that was design build, and it was a real success,” Mooij said. The school was completed in 19 months with a final cost of about \$198 per square foot, including land acquisition and its typically higher priced green features. “Schools were coming in New Jersey in excess of \$250 (per square foot) and some upwards of \$330 to \$340 per square foot,” Mooij continued. “In essence this contractor was able to put a more expensive upfront system into the building and build it for less.”

The design build process differs from the typical construction process in the sense that it is qualitative instead of quantitative, Fischette explained. Contractors are awarded the project based on their overall design, not just their price. The school district used Concord Engineering’s plan for the Neptune Community School as a model and developed a request for proposals (RFP) for the Summerfield project. The RFP outlined a design concept and a wish list of features that included LEED certification, geothermal, raised floor displacement ventilation and others.

“What’s unique about this is even though it was design build, they were able to make sustainability and efficiency a very high rank in the evaluation process, which is why we got geothermal in both,” Fischette said.

Live Event Learning

With Summerfield complete, the administration wasted no time incorporating the school’s green technologies into the curriculum. They coined the phrase “live event learning,” which refers to the times the students actually use their building as a textbook, Mooij said. When it comes to understanding the geothermal technology heating and cooling their facility, the students see video of the boreholes being drilled, they see the temperature of the water in the ground loops, and they see the heat pumps themselves.

“The students have an opportunity to understand what geothermal is, and hopefully, when they become the decision makers of tomorrow, they will choose to look for renewable resources,” Mooij said.

The success of these projects and the ways Neptune has used the state funds available to them as an

Abbott district has not gone unnoticed by the community. Mooij said ten years ago at least 25 percent of the children in his district attended private school. Now, that number is down to about 10 percent. “I think that’s a public endorsement,” Mooij said. “What it says to me is the people in town that can afford private school are taking a look at the public schools and saying, ‘I like what’s here.’”

Fischette said he works frequently with schools in New Jersey and believes the environmental leadership shown by the Neptune administration is also important to note. “Some districts are very conservative and not willing to take a chance on new technologies even if they recognize there is a benefit to them,” Fischette said. “This district just has good leadership and just has ultimate confidence in the technology and in the professionals they have, so they were able to really find a much better solution.”

Mooij believes when all is said and done these improvements truly empower the staff to focus on learning, which is what is really important. “When all the



The entrance to Summerfield Elementary School. Educators use the energy-saving systems at work around them to teach students about renewable resources.

issues of comfort in a building – clean air, fresh air, good lighting – are resolved we felt it had an impact on education,” Mooij said. Only time will tell if he is right, but so far the signs point to a positive outcome for the students at Summerfield Elementary and Neptune Community School.

Photos courtesy of EI Associates.

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