



Voyageur Academy's Consortium College Preparatory High School

Energy-Wise & Beautiful

By Clare Desmond, Contributing Editor

Photos by Jeff Garland Photography

- Load-bearing, masonry cavity wall building envelope to provide thermal mass energy savings with a calculated R-value of 23.76... Check!
- Less than 30 percent glazing-to-opaque walls, below the 30 percent recognized by some experts as "socially responsible." Still, design decisions resulted in light-filled interior spaces... Check!
- Made-in-Michigan Duro-Last® reflective roof membrane to reduce energy consumption and a vegetative "green" roof to control stormwater runoff... Check!
- High-efficiency heating and air conditioning systems with occupancy sensors for lighting, heating and cooling... Check!
- Cash rebates from DTE Energy for energy efficient HVAC, controls, electric motors and lighting... Check!

Sometimes, it's hard to know where to start when describing a construction project brimming with intelligent design and building decisions that combined to create a bright, architecturally interesting and functional building that is also highly energy efficient. Many of those decisions yielded up-front cost savings as well as lifetime cost- and energy-savings. Energy-saving bells and whistles share kudos with other design choices, including varied structural solutions that serve specific purposes, on the project to construct and equip the Voyageur Consortium middle and high school in southwest Detroit. And, the school is a light-filled, fun place where students may find it easier and more compelling to learn.

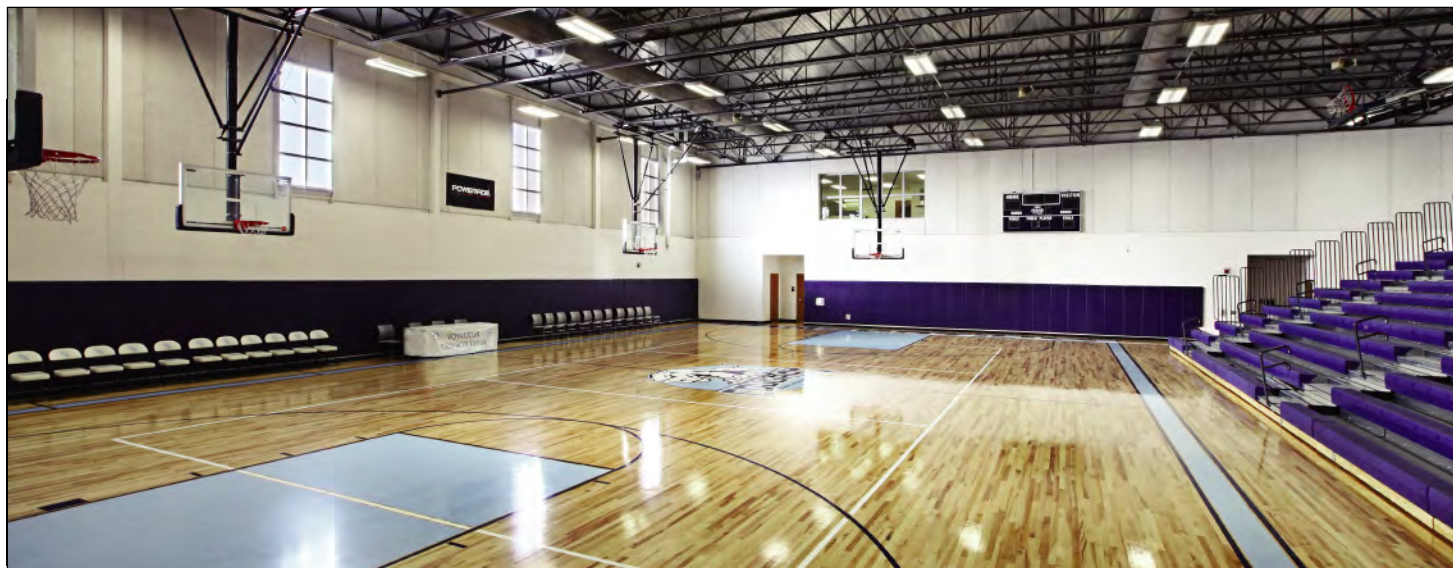
The 110,900-square-foot, two-story school is named the Voyageur Consortium College Preparatory High School, although it serves both high school students in grades 9 through 12 and middle school students in grade 5 through 8. Construction Manager (CM) on the \$11 million project was The Monahan Company, Eastpointe, which last year celebrated its 90th year in business. Stevens Architects LLC, Port Huron, was tasked with designing a school with the high efficiency green technology criteria desired by the owner, Voyageur Academy, Detroit. "Everything was designed toward a LEED

standard," said LeRoy Stevens AIA, NCARB, architect and principal.

Construction ended in September 2012 following a construction start in mid-October 2011. Built on a seven-acre site, the new Voyageur school is a free public school chartered by Ferris State University and managed by the Leona Group LLC, an educational management company headquartered in Phoenix, AZ with offices in several other locations, including Okemos.

Located at 4366 Military Street, Detroit, the school is the first one to be owned by the Voyageur Consortium, which previously held classes in rented space. The new building is across the street from Voyageur's elementary school, which serves students in kindergarten through grade 4 to complete the K-12 campus. Landscaping, parking and playground space are shared by both buildings, with parent drop-off and pickup separated by age. In the new building, high school students occupy the second floor, while middle school students are served on the first floor. There are offices for administration and teachers on both floors, a media resource room, and a 770-square-foot student office for use by such school groups as the National Honor Society and the Student Council.

The school contains 42 classrooms, an art room, dance room (the



Cellular acoustic roof deck and insulated metal wall panels in the school's two gyms ensure noise abatement.



A 3,578-square-foot green roof, in the top photo covered in snow, helps reduce stormwater runoff while providing a learning experience for students.



school has a large dance program), a music room, and a kitchen and cafeteria, complete with a glass curtain wall opening onto an outside patio. Each classroom's décor represents different college or university to encourage students to obtain a higher education. The facility also features two gymnasiums: one for the high school offering bleacher seating for 600, and a smaller gym for the elementary students with seating for 118. Each gymnasium has a high school-sized wood floor court and is equipped with locker rooms.

LOVE THAT PATIO

"The students love the patio off the cafeteria," said Rod Atkins, superintendent of the Voyageur Consortium School District. He said the school has 950 students representing 54 zip codes in Michigan. They also "love" the big gym, he said. "The

amenities are fantastic," Atkins enthused, noting that the hallways are probably double the width of the halls in the rented space they previously occupied. The hallways have a floor-to-ceiling height of 11 feet 8 inches, and rooms have ceiling heights at least 9 feet high. School leaders want to make the school gated, closing off Military Street at both ends, Atkins said. Plans for that are pending approval by the city.

The new school was constructed of load-bearing concrete and brick masonry, and features full fire sprinkler and alarm systems, occupancy sensors for lighting and heating, and high-efficiency heating and air conditioning systems. Each classroom has its own HVAC controls connected to a Web-based computer system with outside fresh air controlled by the sensors.

The project was remarkably trouble-free, said Kevin Monahan, project director for The

Monahan Company. Monahan credited the project's success to the owner and designer bringing the CM into the process early on. "The owner and architect gave us a ton of information as to how we were going to manage the project within their limited budget," he said, allowing that he likes being involved early on in a project. "The preconstruction was the success of the project, in my opinion." Credit is due particularly, Monahan offered, to Joseph Rush, former president of the Voyageur Academy Board of Directors, who acted as the "Owner" and was critical to the project's success. "He made the daily decisions, approved changes and coordinated Owner vendors such as furniture, technology, etc.," Monahan noted. "At the beginning of the project he was School Board President but that position rotated, and Joe stayed through the completion of construction rather than try to transition to another point-person for the Owner." Joseph Monahan was the CM's project superintendent.

The few issues that the team did face occurred and were handled within the first two months of the construction schedule, Monahan noted. Among those early issues was finding about two-and-a-half feet of unsuitable soil on the site; it was stockpiled and used on-site for berms. Additionally, early on the construction team discovered the existence of fiber optic cable that had to be re-routed.

MASONRY – DURABLE AND COST-WISE

After utilities were installed and spread footings and foundation were poured, construction began on the building envelope by Masonry Developers Inc., Rochester. The multi-wythe exterior envelope is an 18-inch-wide load-bearing masonry cavity wall consisting of 8-inch x 8-inch x 16-inch backup concrete masonry units (R-1.14), followed by three inches of spray-applied closed cell polyurethane insulation (R-20.4), a 3-inch airspace (R-0.97), and finished with 4-inch x 12-inch utility brick (R-0.4). Adding minimal R-value for inside and outside air film completed a total calculated R-value of R-23.76, more than 200 percent the code requirement, according to architect Stevens, who sought to provide for

energy efficiencies at least 20 years into the future. The achieved R-value of the building envelope is above the 2007 ASHRAE 90.1, Stevens said, and it also exceeds the requirements of Michigan's code. The bulk of the R-value was achieved with the three inches of foam insulation, which is also a class II moisture vapor retarder, said Masonry Developers' owner and president, Kevin Ryan.

The project received guidance from Dan Zechmeister PE, executive director of the Southfield-based Masonry Institute of Michigan (MIM), Stevens said. "Dan Zechmeister and MIM helped a lot with the masonry construction," Stevens emphasized. "They helped us in the design phase too, particularly in getting the maximum insulation value." He said MIM sent a field representative to the jobsite at no cost to help ensure that the details of construction were carried out to maximize energy efficiencies. "They did a great job with those details and the efficiency of those details," Stevens enthused.

"Originally, the wall was designed for four inches of rigid insulation," Matt Clor, project manager for Stevens Architects, said. "Kevin Ryan suggested, and MIM corroborated, that we could get the same R-value using a 3-inch spray-on closed cell polyurethane foam insulation, and that it could be done because we were having such a mild winter." The building would have had a 2-inch air space with the rigid insulation, Clor said, and there wasn't time to change the design when the decision to go with the spray-on insulation was made. There was no down time on the project for winter weather. "Masonry worked well for this project in terms of cost, sound absorption, and durability," Stevens declared.

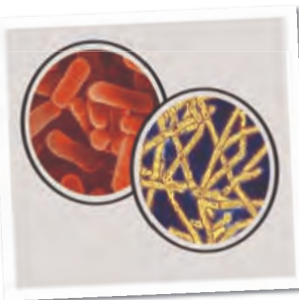
A mixture of tan and salmon-colored utility brick and natural colored burnished CMUs create a clean, modern and inviting look on the exterior. The utility brick "was a value engineering choice and cut approximately \$66,000 from the cost for labor and material," mason contractor Ryan said, "and it reduced construction time, as well." Numerous interior masonry separation walls add to the fire safety of the structure. Burnished CMUs add architectural interest to enhance the appearance at the school's main entrance on the exterior and interior, and at various other positions. The addition of Alucobond® aluminum panels, from 3A Composites, Statesville, NC, at the front entrance and into the first floor vestibule contributes to the modern clean line. The panels consist of two sheets of 0.02-inch aluminum sheets thermobonded to a

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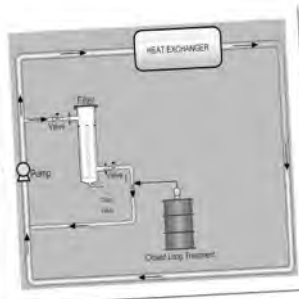
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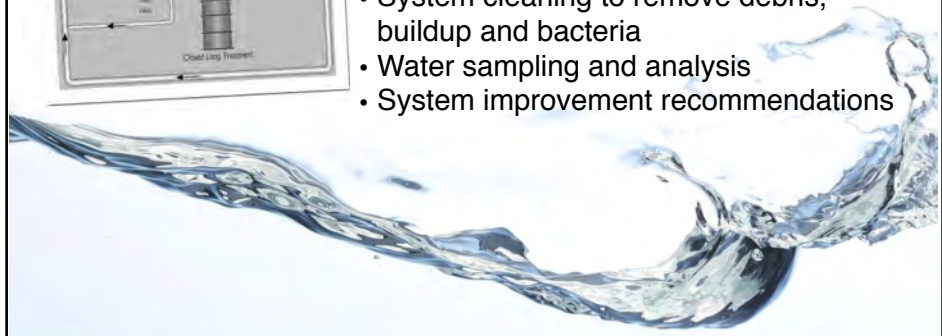
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Students have access to the outdoor patio off the cafeteria. A glass curtain wall on the east elevation and clerestory windows permit lots of natural light to fill the space.

polyethylene core.

The use of masonry and CMUs adds a feeling of permanence and solidity in an older area of Detroit scarred by impermanence and urban decay. The new school's owners, designers and builders can't hide their delight in creating this facility that gives inner-city kids and their parents a school they can be proud of.

"I didn't change anybody's life (on other school projects)," Ryan said, noting that he had worked on schools in Birmingham, Grosse Pointe and other suburban communities. "God bless the people who put this deal together and cared enough about these kids to build them a school they can be proud of and that will affect them, profoundly affect them, in many positive ways." Stevens concurred, noting that many of the school's students come from schools that are 50, 60 even 70 years old. "We built an out-of-the-box great school and in a location in need of a facility they could be proud of and in which they could learn," Stevens said, emphasizing the school's high-efficiency HVAC systems that provide good-for-learning fresh air and air conditioning. "And we built it at a reasonable cost."

AND THAT'S NOT ALL

The judicious use of high-performance Advanced Architectural Glass windows from Guardian Industries, Auburn Hills, used on all exterior windows, allows interior spaces to be light-filled despite a glazing-to-opaque-wall percentage of only 19.3 percent. Exterior corner glass curtain walls, clerestory windows and windows between interior spaces that lead to exterior walls ensure a bright interior, enhanced by a light-colored paint palette. A wall of glass at

the east end of the cafeteria allows for natural light in that large space, and opens onto the popular patio.

Glazing for one second floor classroom overlooks the green roof, providing not only light but a learning experience, as well. The 3,578-square-foot vegetative roof, constructed of materials provided by Spring Lake-based LiveRoof® consists of 6-inch and 4-inch-deep container trays, each 1-foot by 2-feet, planted with drought-resistant plants native to Michigan. The green roof was chosen to help reduce the volume of stormwater runoff, and to serve as a learning science laboratory for students.

To serve as roof deck underneath the green roof and 2nd floor corridor, and as floor deck for the entire second floor, the architects and structural engineer Keith Flemingloss PE, Professional Engineering & Construction Services LLC, Port Huron, selected 8-inch precast concrete hollow core planks from Kerkstra Precast, Grandville. The roof structure was covered with an 8-inch layer (two 4-inch layers, each with an R-value of 25) of rigid closed-cell polyisocyanurate insulation from Johns Manville, which met an R-value of 50 that the architect required. "We chose the precast concrete hollow-core planks for several reasons," Clor said. "They're a fire separation between the first and second floors, they're relatively thin and met the span requirements, and they offer noise abatement."

The precast planks under the vegetative roof were topped with 60-mil. slip-sheet membrane manufactured by Saginaw-based Duro-Last® Inc. to provide a weed barrier, Clor said. Over that, a layer of Duro-Last's 40-mil. single-ply white reflective proprietary thermo-

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One of 42 classrooms in the new Voyageur middle and high school constructed last year in southwest Detroit.

plastic roof membrane finished the roof. The product was selected in part for its reflective ability that reduces the heat island effect, areas where heat tends to build up. The 40-mil. Duro-Last membrane was also used for the remainder of the school's roof. Zimmer Roofing & Construction, Port Huron, did the installation.

MAKE IT BEAUTIFUL & QUIET

Flemingloss selected acoustical cellular roof decking from Vulcraft (division of Nucor Corp., Charlotte, NC), along with 8 inches of rigid insulation, for the two gymnasiums and the cafeteria. "It's one of the design choices I'm really proud of," Flemingloss said. "It looks great and provides sound absorption, and it also effectively hid the roof fasteners." The acoustical deck is composed of two metal pans with factory installed rigid insulation in between. The bottom pan is flat and perforated, while the top pan has 1-1/2-inch-high raised ribs, the hats, every six inches on center that contain the insulation, which is installed at the factory. Approximately 24,000 square feet of the cellular deck was used on the Voyageur school, according to Al Stark, Vulcraft's local representative in New Hudson. The Voyageur project "effectively blended several different structural systems to come

up with the best solutions for the school," Flemingloss noted. Besides the acoustical deck and the precast concrete hollow core planks, there are also steel beams and joists used for the roof structure over classrooms where the project team knew they were going to need dropped ceilings to contain mechanicals.

Care was taken as well to provide sound absorption and R-value in the gymnasiums' walls, Flemingloss said, using Kingspan® insulated metal wall panels, Deland, FL. The panels consist of 4-inch-thick interlocking tongue and groove galvanized metal sheets with foam insulation in between, offering an R-value of 32. The panels are lightweight, weighing only three pounds per-square-foot, and they are manufactured from recaptured metals. Cementitious wood fiber acoustical panels from Tectum Inc., Newark, OH, were applied over the Kingspan to provide sound absorption. The Tectum panels also added to the school's sustainable construction goals because they are manufactured from renewable wood including Aspen trees that don't require replanting, and other sustainable raw materials. Both the Kingspan and Tectum wall panels may contribute to LEED certification.

Other construction details that add to the

energy-conserving properties of the building include low-flow plumbing fixtures to reduce water use, and lighting systems that meet or exceed required levels while reducing energy consumption. The building's high-efficiency heating and air conditioning systems included the installation of occupancy sensors that reset airflows and temperatures when the classrooms are not occupied and turn off lights. Efficient, small heating and air conditioning units were installed in each classroom that may be controlled somewhat by teachers. Those controls, however, are connected to a Web-based computer system with outside fresh air controlled by the sensors for the proper freshness. The school received cash rebates from DTE Energy's "Energy Efficiency Program for Business" incentive program due to its energy efficient HVAC, control, electric motors and lighting.

Floors in the new school are polished concrete, with some of them containing color. Most interior walls are constructed with painted 8-inch x 8 inch x 16-inch CMUs. Navy blue lockers, topped with granite for durability and a touch of luxury, line the hallways.

Students were able to start school on time and moved into the new facility on Sept. 17, 2012. As the man said, it's a great school ... at a great cost! ♦♦