

A high school that is ahead of its class

A SeriousGlass application story

PROJECT	Manheim Township High School, Lancaster, Pennsylvania
FIRM	Fanning/Howey Associates, Inc. www.fhai.com
CHIEF ENGINEER	Jeff Harris, P.E., LEED AP, CMVP, CEM, GBE Integrated Holistic Design, LLC
PRODUCTS	SeriousGlass 35% glass coverage
SUMMARY	Addition and renovation project for 1800 student, 432,000 square foot high school. The project was designed to provide significant natural light and openness, with 35% glass coverage, while reducing energy costs and maximizing comfort.



Manheim Township High School is an addition and renovation project for 1800 students of approximately 360,000 square feet.

The envelope, please

Engineering the largest geo-thermal radiant floor slab school building in U.S. was not a small task for Jeff Harris, Chief Engineer and Owner of Integrated Holistic Design, LLC. The school board not only challenged him to deliver the highest performance building he could, but they wanted to push the envelope regarding how far they could cut energy costs.

According to Harris, the tides have turned with regard to the approaches and materials used for buildings, even in the public domain. In the past, school and other public buildings were built in the cheapest fashion possible. Now, designers are asking taxpayers to increase budgets AND they are supplying a handful of reasons to back up the additional spend. "This type of thing is happening more and more and the taxpayers in Manheim Township understand this," says Harris.

Although Harris did need to persuade the architects to rethink some of the buildings' design, "once they saw lifecycle benefit, it was very easy for them to go with it," says Harris.

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"We were interested in the building as an integrated unit. That way, when looked at holistically, we can justify spending extra money for things that offset costs elsewhere," Harris says. "Before we could think about the different systems, we needed to look at the building envelope."

"We decided that we would build significantly above whatever the minimum code standards were. We researched alternative HVAC designs and new lighting system designs - the whole effort was about dialing down the load," Harris adds. "The most inexpensive building to operate is one that relies on as little electricity and fuel costs as possible," says Harris. Once

“When we completed the lifecycle calculation, we determined that the payback on the glass will be seven years, and could be even less if energy costs continue to increase. The building was life cycled for 30 years, so seven years is excellent!”

we established those systems, we just built up from there."

The search for a solution

Harris did a lot of research about high thermal performance glass and decided that a heat mirror product was the best solution for the high school. "We determined that a 1 to 1¼" insulated glass (IG) would result in a very good center-of-glass (COG) performance," states Harris. "And if we added a krypton fill, to that thickness of glass, we could achieve an R-7 to R-9 - well above what one would get for a standard Low-e, well-performing glass."

Harris began putting the specifications together for the project and jumped to the next task of finding a manufacturer of such high performance glass. "There are very few companies in

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North America that could handle a project of this size," says Harris. "When it came time to bid the project, most were unable to meet the various specifications and/or the pricing requirements. We chose Serious Materials, because they had the best product at the best price – their glass achieve the highest performance around, without going into a triple pane

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configuration, which can be very expensive.”

Through multiple simulations and studies using Lawrence Berkeley Laboratory software, they were able to determine the proper light transmission, the proper U-value (insulating level) and the proper solar heat transmission for the high school building. “One consistent error in commercial architecture is using one type of glass for the entire building,” says Robert Clarke the Serious Materials Project Manager.

Harris explains that ‘tuning’ was also unique in the building’s design. For example, two different types of glass were used throughout. The north and east-facing sides uses TC-88 Heat Mirror, where they wanted more light and passive solar warmth. The south and west-facing sides of the school use SC-75 Heat Mirror, which employs a ‘solar control’ glass to dramatically reduce the solar heat transmission. The only exterior walls were the south-facing panels around the pool, which originally had translucent glass. “We wanted to introduce natural light into the pool area, without the concerns of condensation on the interior surface of the glazing,” says Harris. “We installed Heat Mirror Quad Wall at this location. Quad Wall provides significant natural light, good solar performance and center of glass thermal performance of R-12,” adds Harris. “All the other glass installed in this project has a performance of R- 8.”

And, according to Clarke, that is six times that of standard double glazing. “It would take 8 pieces of standard, uncoated, regular glass to equal the performance of the double-paned SeriousGlass we installed at Manheim Township High School,” he says. “The uniqueness of our approach includes a suspended, coated film between two panes of glass that doesn’t increase

the weight and triples the performance of Low-E glass. In addition, improved spacer, fill and frame technologies boost add to the performance even further.”

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LEED the way

According to Clarke, the basic way to get LEED points is to exceed The American Society of Heating, Refrigerating and Air-Conditioning Engineers requirements (ASHRAE). And, the fastest way to earn these points is to increase the overall thermal shell and dynamic thermal performance of a building.

“One of Manheim Township High School’s strongest characteristics is that it is a LEED-certified building, with a high percentage of glass, in a relatively cold climate,” states Clarke. Another important consideration to Manheim was occupant comfort. “With Serious Materials’ solution the winter glass will be 5-10 degrees warmer than it would be with other glass products we looked at,” says Harris. “Then in the summer, super-insulation keeps the inside pane of glass cool, relative to human body temperature. So you are adding to AC, by cooling the environment instead of dumping more cold air on people’s heads from a ceiling AC unit.”

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Lifecycle Analysis

In order to apply for a building’s LEED certification, the developer needs to have a sophisticated annual energy study, projected over its lifetime.

“In the process of getting the project to the street, the school was redesigned once, to keep costs lower,” says Harris. “Along

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with the thermal performance of the building, it also needed to be very resistant to water and moisture penetration. The projected savings from the SeriousGlass was one of the factors that gave us the go-ahead to move forward with this.”

In fact, the high school, in a conventional design to code,

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would have required about 1200 tons of cooling. However, the integrated design of the building, which features a very high performance envelope, thermal-active radiant slab, and displacement ventilation allowed the engineers to decrease the size of the HVAC load. “The integrated design, of which the envelope was a key factor, was so efficient, it allowed us to get down to an 800 ton well field,” says Harris. “When we completed the lifecycle calculation, we determined that the payback on the glass is seven years. The building was life cycled for 30 years, so seven years is pretty good!”



Serious Materials develops and manufactures sustainable green building materials that dramatically reduce energy bills and the greenhouse gas impact of the ‘built environment’. Voted #1 at Cleantech Venture Forum XII, Global Gypsum Product of the Year 2008, and winner of the first Aspen Institute award for innovation in Energy Conservation, the company has also been recognized by TIME/CNN, Fortune, Business Week, AlwaysOn and Red Herring as one of the most promising green technology companies.

SeriousGlass™

SAVES MORE ENERGY THAN ANY OTHER GLASS. PERIOD.

Drawing on more than 25 years of experience, Serious Materials manufactures the highest performing commercial glass and windows worldwide. SeriousGlass® saves more energy than any other commercial glass, providing the utmost architectural freedom to dramatically reduce both energy and lighting costs. SeriousGlass offers super-insulation of up to R-20 and the highest light to solar gain ratios – up to 2.4 – in the industry. All SeriousGlass blocks 99.5% of UV radiation and can be used directly in any choice of framing system. SeriousGlass can contribute up to 19 LEED points in the LEED 3.0/LEED 2009 standards for institutional and commercial projects. SeriousGlass projects include the National Gallery of Art, Art Institute of Chicago, six Smithsonian Institute buildings, Virginia Air & Space Center amongst many others.

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