CPI Daylighting, Inc.-Featured Project

Mt. Angel School

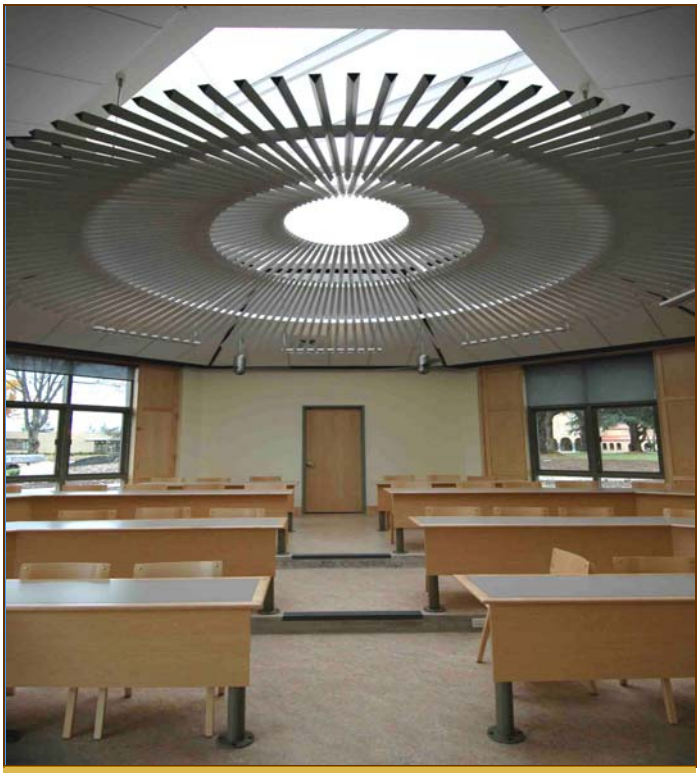
ControLite™ Intelligent Daylighting System

THE CHALLENGE! In 2003 the Building Research Laboratory at the University of Oregon under the direction of Professor Brown (known to all as Charlie) were commissioned to work on a new design for schools. Their challenge was to create a new classroom design that would increase energy efficiency by 85% and incorporate all of the known benefits of Natural Daylighting, but not cost any more per square foot to build.

The team conducted a long and detailed research and testing program, reviewing available materials and experimenting with various layouts. By the beginning of 2005 they had a design that "on paper", produced results they were looking for. Now they needed to erect a full size mock up to put their theories to the test.

A local architectural firm was busy working on an addition to a school campus in Mt. Angel, Oregon. It was decided that this project would provide the perfect opportunity to put the U of O design to the test. The Northwest Alliance for Energy Conservation, a not for profit organization funded by the utility companies, provided the funds and the Mt. Angel school provided a building on campus to build and test a full size project mock up.

Professor Brown and his team had a few short weeks to design and build the mock up. According to the Professor, in order for the design to be a success, they needed a Daylighting system that would give large amounts of natural daylight, but was controllable and capable of reacting to the many changing light conditions found in a climate that constantly varies from cloudy to sunny.



"It works and is due almost entirely to ControLite. We couldn't have done this without it."

~Professor Brown~

THE SOLUTION! After searching the entire Daylighting Market, the team decided that CPI's automated ControLite was the only system available that could provide the degree of controlled Daylighting required for this project. Given the approximate value of daylight provided by ControLite (60% max), they decided that each unit would need to be at least 14' 0" x 14' 0". Beneath the skylight there would be a deflector suspended at a predetermined height to efficiently spread the daylight around the room. CPI rose to the challenge and provided a *ControLite Intelligent Daylighting System* skylight that met the University's demanding requirements.

THE RESULT! The final result was a resounding success, meeting all of the design and performance goals of the project! The energy efficiency of the building was increased by more than 85% and construction costs were kept in line. The best recommendation we could have possibly had came from Professor Brown who said: "It works and it is due almost entirely to ControLite, we could not have done this with out it". The new school addition is in construction and CPI has an order for the first real application of this revolutionary design.

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Green Buildings Start To Sprout Cash for Classrooms

Education - Schools are discovering that energy-efficient structures save on costs over time

Wednesday, January 04, 2006
STEVEN CARTER
The Oregonian

Perched on the hilltop home of Mount Angel Abbey sits a mock school classroom that is illuminated entirely with natural light. The energy bill: zero. The 30-by-30-foot space was built to prove that a classroom can be constructed at a competitive cost with no need for artificial lighting during daylight hours, even in the rainy Northwest.

A scale model of the classroom so impressed the architect for the abbey's new academic building that he incorporated its features into classrooms and meeting rooms. Building officials from 10 school districts toured the mock classroom during the fall and came away with ideas for future projects.

The High Performance Classroom is the latest innovation in "green" school design that has seen big gains in energy savings in the Northwest. Betty Merrill, director of the building technologies section of the Oregon Department of Energy, says the movement has been aided by grants and tax credits that make energy-efficient design more affordable. The payback for designing energy-efficient schools, or retrofitting schools with energy-efficient features, she said, is about 15 years, far less than the life span of the buildings.

Oregon schools are using groundwater for heating and cooling; employing skylights, clerestory windows and light shelves to reduce or eliminate the need for artificial lighting; and using natural ventilation to lower heating and cooling bills. District building managers report energy savings of as much as 50 percent in the new buildings. Ross Cain, facilities manager for The Dalles School District, said the energy-efficient middle school built two years ago is saving the district about $50,000 a year in energy costs.

Dave Church, physical plant director for the North Clackamas School District, said the energy bill at the 264,000-square-foot Clackamas High School is similar to those of smaller, older district schools that are used far less than the new high school. "And we thought the building, with all its energy-efficient features, would cost a lot more to build," Church said. "But it didn't. It was about $120 per square foot, which was among the lowest cost for a high school at the time." Energy bills for large school districts eat up millions of dollars.

North Clackamas paid more than $1.5 million last school year for lighting and heating, Church said. Portland Public Schools spent more than $6 million last school year, according to Catherine Diviney, the district's new energy specialist.

More money for teaching

A new building that uses less power -- or an older building retrofitted with energy- saving features -- saves money that can go into instruction, school officials say.The Mount Angel prototype classroom was designed by G. Z. "Charlie" Brown, a University of Oregon architecture professor and manager of the UO's Energy Studies in Buildings labs in Portland and Eugene; Heinz Rudolf, a founding partner of BOORA Architects in Portland and designer of highly energy-efficient schools in the Northwest; and Mike Hatten, a principal with SOLARC Architecture and Engineering in Eugene.

BetterBricks, a program of the Northwest Energy Efficiency Alliance, paid the costs. Rudolf, who has designed green schools in the Northwest for years, said natural light provides a better work and study environment for students than artificial light, in addition to saving energy. The Mount Angel classroom has a 10-foot-square skylight that allows natural light to spill into the room. A rectangle called a halo hangs below the skylight, deflecting some of the light toward the walls. Computer-controlled louvers in the skylight regulate the amount of light entering the room so it does not become too hot and bright on sunny days or too cold and dim on overcast days.

"The thing that strikes you when you walk into the room is just how even the distribution of light is," said Diviney, the Portland energy specialist. "Even on an overcast day, when I visited, the classroom was very, very bright." Energy-efficient design, such as skylights and natural ventilation, are being incorporated into the district's newest school, New Columbia Elementary, Diviney said. Brown, the UO professor, said technology has advanced to the point it's possible to build school classrooms that use no energy for heating, cooling or ventilation during daylight hours.

As a practical matter, schools are still built with mechanical ventilation systems to cover nighttime use, extreme weather conditions or emergencies. Kent Duffy, the architect who designed the new education building at Mount Angel Abbey, said the skylight design and halo reflector in the mock classroom have been changed slightly for the new building. When the building is done, he said, it's expected that lights won't be needed in the classrooms 95 percent of the time.

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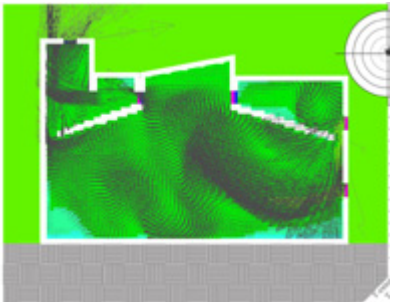
A LESSON IN DAYLIGHTING

Source: ARCHITECTURAL LIGHTING Magazine
Publication date: 2006-05-09

By A|L Staff

Three of the Northwest's experts on energy efficiency prove what daylight can do.

As sustainability and energy efficiency have come to occupy an ever-greater role in mainstream architecture, no building type has embraced these principles more than schools. Maybe it is a result of the reported higher test scores that come when students learn in naturally lit classrooms, or the reduced operating expenses that ease the burden of constricted education budgets. No matter the motivation, the Northwest is now dotted with elementary, middle, and high schools that offer better learning environments and significantly reduced operating expenses through sustainable high-performance design.



Mount Angel classroom prototype

Recently, a trio of the Northwest's foremost experts on energy-efficient design resolved to build a full-scale mockup of a K-12 classroom: G.Z. Brown, professor of architecture at the University of Oregon and director of the Energy Studies in Buildings Laboratory in Portland and Eugene, Oregon; Mike Hatten, principal of SOLARC Architecture and Engineering; and Heinz Rudolf, principal with BOORA Architects and designer of several nationally renowned LEED-rated Northwest schools. Responding to utility company and lighting designers' doubts that a high-performance classroom could be constructed using available light and outside air so that no electric lights, heating, or air conditioning would ever be needed during the day, the three came together to create a classroom that adeptly employed these principles. They also wanted to prove that such a space could be built and priced at a lower cost than the current standard construction rates for a regular K-12 classroom.

RETHINKING THE SKYLIGHT

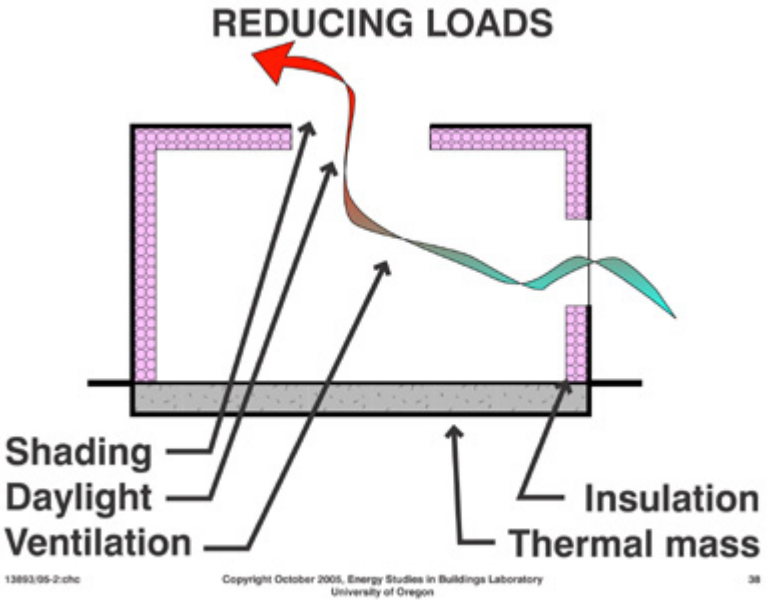
Their approach starts with a wide skylight in the middle of the room. But this is no ordinary skylight. 'In order to meet the required light levels on overcast days you need a large opening,' Brown explains. 'But that means the rest of the time, it's too big.' As a result, the skylight, constructed of polycarbonate, is outfitted on top with a succession of integrated louvers that automatically adjust based on sensor readings, opening and closing in relation to the amount of available sunlight, so that a minimum interior light level of 20 to 40 footcandles (a range chosen by the team because it represents existing national and international standards) is maintained at all times during daylight hours.

Another issue of concern was the distribution of light from the center to the perimeter areas of the classroom. A specially designed apparatus called the 'halo,' a rectangular-shaped fixture that hangs below the central skylight, addresses this. Each of its four sides consists of translucent cellular plastic that reflects a portion of the light from above onto the ceiling and walls. 'The edge of the classroom gets two sources of light: from the skylight, called the sky component, and reflected light off the halo and ceiling,' Brown explains. 'The middle of the room gets light reflected around the room and light that penetrates through the halo.'

Part of what Brown, Hatten, and Rudolf hoped to illustrate with the prototype was that a classroom could be lit during the day without any electric light. The team based this premise on the assumption that classrooms are primarily occupied only during these hours, but because there are times when K-12 facilities are used at night, Brown and his team decided an electric source was also needed to round out the halo's functionality. 'What contributes to the cost of a lighting system is the number of fixtures that the wires must travel to,' Brown continues. 'So we used one big light, put it in the middle of the room, and shined it toward the ceiling. We light the whole space with just that one fixture, a 450W HID pointed upward.'

THEORY INTO PRACTICE

The classroom that Brown, Hatten, and Rudolf envisioned has been built on the Mount Angel Abbey campus in Saint Benedict, Oregon, about an hour's drive from Portland. Although the team always intended for its idea to move from model to full-scale mockup, it owes its speedy realization to happy circumstance. During a visit to the Energy Studies in Buildings Laboratory in Portland, architect Kent Duffy, principal at SRG Partnership, saw Brown studying a model of the classroom. Intrigued, Duffy asked about using the prototype classroom concept for a new academic building consisting of classrooms and offices SRG was designing at the seminary. The Mount Angel Abbey Academic Center is currently under construction, slated for completion by end of summer 2006. Meanwhile, the full-scale mockup remains available for testing purposes and is housed in a warehouse at the school.



Mount Angel classroom prototype

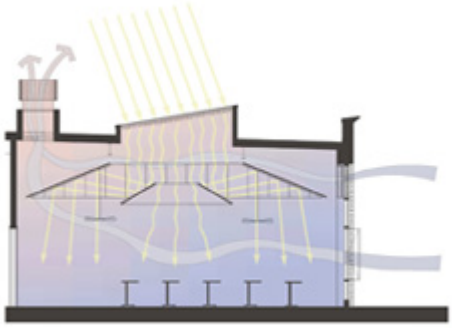
The results of the Mount Angel prototype are impressive. 'We're looking at some fairly phenomenal Energy Use Index numbers,' Hatten says of the seminary building's classrooms, based on monitoring of the prototype. 'We're projecting 28,400 BTUs per square foot annually. The base-case code-compliant classroom would be 73,200. That's 62 percent better than code.' Brown believes that with additional insulation, energy savings could be even higher: as much as 70 percent better than code requirements.

FROM THE GROUND FLOOR UP

Although the classroom mockup is complete, Brown and Hatten believe there is still opportunity for further experimentation. For example, the current version is designed to meet weather conditions specifically west of the Cascades, where the climate is moderate. Ultimately, it is hoped a modified configuration could be adapted to the range of temperatures east of the mountains, or perhaps another climate altogether. 'It is likely to require some aspect of supplemental heating and/or cooling,' Hatten says. The classroom layout is also geared specifically for single-story structures, but a version of the design could be adapted to two-story buildings using light shafts between the upper and lower floors.

The efforts of design experts like Brown, Hatten, Rudolf, and Duffy will continue, as more and more institutions embrace the opportunity for enhanced human performance and energy efficiency that comes with sustainable schools. The Mount Angel prototype is merely one step in a longer journey, but it is also something not to be forgotten anytime soon: the project proves that even in the Northwest, it is entirely possible to light, heat, and cool classrooms using only the natural resources of sun and wind. **Brian Libby**

A freelance writer living in Portland, Oregon, Brian Libby's focus is on architecture and film.



Mount Angel classroom

DETAILS

project Bazacle Causeway, Garonne River, Toulouse, France
lighting designer Concepto, Bagneux, France
technical design Beture Infrastructure, Maisons-Alfort, France communication Agence MC3, Toulouse, France
installation engineers AMEC SPIE, Toulouse, France
civil engineers SPIE Batignolles, Cergy-Pontoise, France
photographer Roger Narboni, Bagneux, France
project size 886 linear feet
project cost approximately $600,000 (500,000 Euros)
watts 2W per fixture