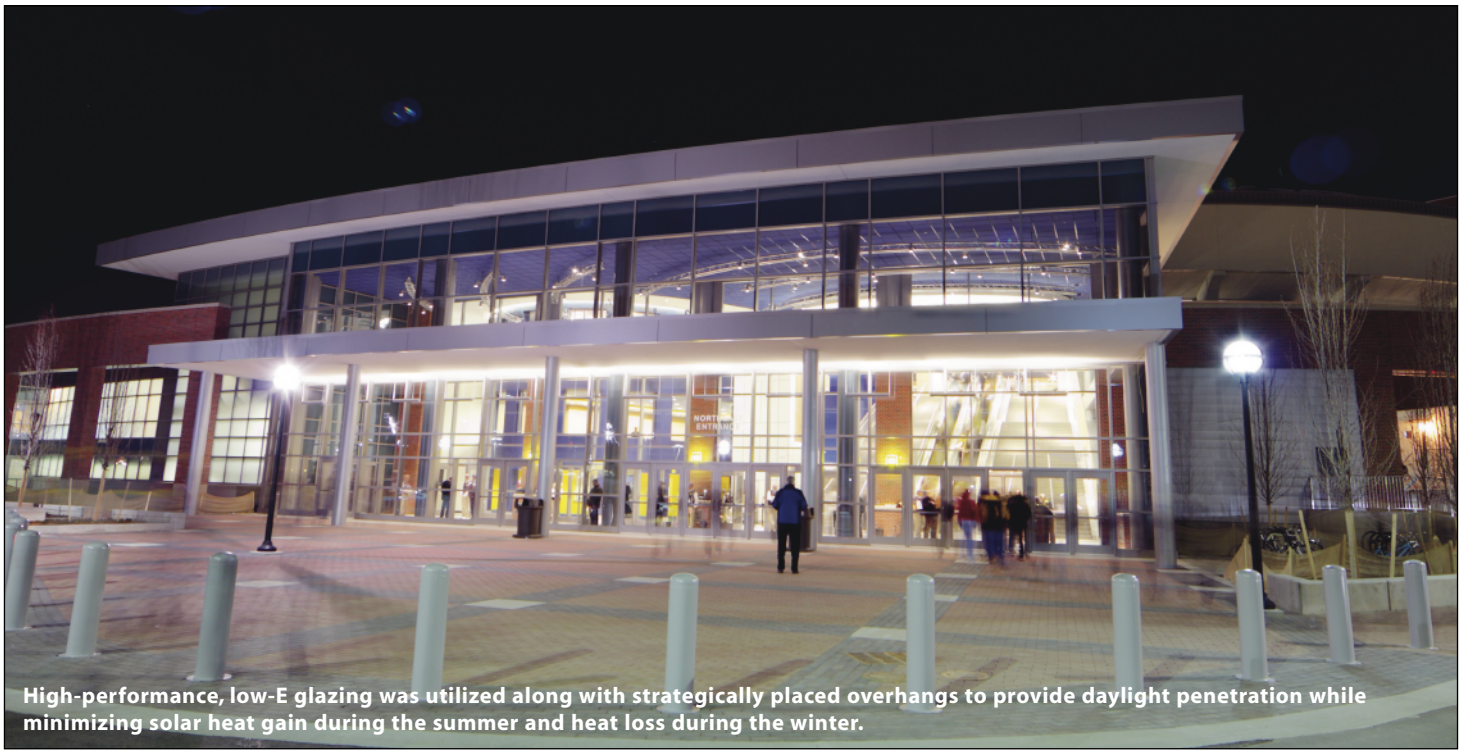


High-performance, low-E glazing was utilized along with strategically placed overhangs to provide daylight penetration while minimizing solar heat gain during the summer and heat loss during the winter.

Crisler Center's Full Court Press for Energy Efficiency

By Camille Sylvain Thompson

Photos Courtesy of The University of Michigan

In Ann Arbor, a winter chill is in the air, and for many that can only mean one thing: Wolverine basketball. Since the start of the season, all eyes have turned to the University of Michigan men's basketball team and to their new energy efficient home court. Aside from a winning team, the University has another goal - designing and maintaining energy efficient facilities on campus capable of standing the test of time and of providing a more sustainable environment for the future.

The $68.4 million Crisler Center includes the new $14.8 million William Davidson Player Development Center and the recently renovated and expanded $53.6 million Crisler Arena. The finishing touches are being completed on this fast-paced renovation and expansion project. The arena has been submitted for LEED Silver certification, and with its energy efficient features, has achieved a 30 percent higher energy efficiency rating than a new building built to the current code based on ASHRAE 90.1-2007 efficiency standards.

Originally constructed in 1967 at a cost of $7.2 million, Crisler Center (prior to the expansion, known as Crisler Arena) has mainly served for over 50 years, as the home of the University of Michigan's NCAA men's and women's basketball teams, and today, also serves as home to its women's gymnastics team. In the early 1990s as the facility approached its 30-year mark, it was beginning to show some signs of wear and tear. The University conducted a facility condition assessment in order to help determine the future of the aging arena and to provide recommendations for repairs, replacements and upgrades. In 2007, Peter Basso Associates (PBA) completed a comprehensive study of the HVAC and electrical systems. For the study, PBA updated the information from the previous facility assessment, based on an extensive examination of the existing building systems.

The University considered the possibility of constructing a new arena. However, since Crisler had "good bones" as former U-M Athletic Director Bill Martin noted, it was determined that a significant facelift, including major updates to its mechanical and electrical infrastructure, would modernize the arena and keep it running effectively and efficiently for decades to come.

In 2009, the announcement was made that the arena would undergo a renovation and an expansion. Additional space would include 63,000 gross square feet of new spectator entrances, retail spaces, ticketing areas and a private club space, as well as 54,000 gross square feet of improved spectator circulation and egress, additional restrooms and concession areas, and ADA accessible seating, all with the common goal of enhancing the overall fan experience, and creating less congestion in the concourse area.

The initial timeline for completion of the renovation and expansion was marked for 2013; however, a strong push was made to have the facility under occupancy for the start of the 2012-2013 basketball

season. The design team included Architect of Record, TMP Architecture; Denver-based architects Sink Combs Dethlefs; Structural Design Inc.; MEP and Lighting Design Engineers, Peter Basso Associates; Spalding, DeDecker Associates; WJHW-Media; TeL Systems; and Hamilton Anderson Associates.

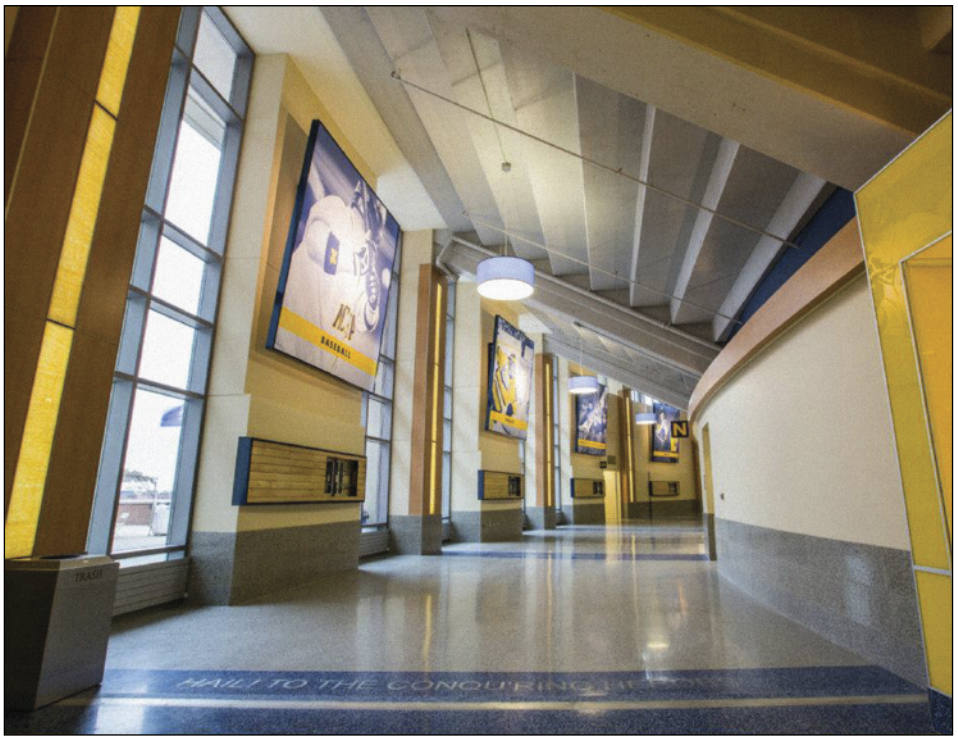
The design team worked together with the constructors under an accelerated construction schedule to complete the project. Construction of the Phase I renovation and infrastructure upgrade was led by Clark Construction Company. Construction of the Phase II renovation and expansion project was led by general contractor Spence Brothers, a Saginaw-based company that incidentally had also served as general contractor for the original Crisler Arena. The Phase II renovation and expansion project was completed nearly a year ahead of schedule.

With the expedited schedule, meeting the challenges of designing and constructing an energy efficient renovation and expansion proved to be a difficult, but manageable task for the experienced team. Adding to the challenge was the University's strong commitment to the project achieving a minimum of Leadership in Energy and Environmental Design (LEED) Silver certification. The project met the challenge and is currently awaiting final review from the Green Building Certification Institute for LEED Silver Certification.

The team used energy modeling to help maximize every possible opportunity to incorporate energy efficient materials and systems into the project's design. Energy conservation opportunities were analyzed on an individual basis, and each measure had to prove its merit based on both energy savings and return on investment. The selected measures were then analyzed on a combined basis, using the energy model to account for interaction among measures and to examine the overall net reduction in energy consumption.

With previous issues of moisture infiltration, lack of insulation and lack of natural daylight penetration, an easy decision was made to improve the performance of the building envelope and its contribution to both energy efficiency and the fan experience. High-performance, low-E glazing was utilized along with strategically placed overhangs to provide daylight penetration while minimizing solar heat gain during the summer and heat loss during the winter. Additionally, the team selected and incorporated locally-based masonry products and additional insulation into the building envelope.

Material selection for the renovated arena was carefully considered. Each material was selected based on its ability to maintain indoor air quality and to provide durability. Low VOC adhesives, sealants, paints, coatings, flooring



Large graphics on the outside walls are illuminated with metal halide spotlights from across the corridor, and are accentuated by a luminous vertical glowing LED element. LED recessed downlights highlight the curvature of the arena and the new and renovated spaces.

systems and composite wood were used. TMP architect and project designer, Dave Larson, explains, "Terrazzo flooring was chosen as a 'forever floor' for the concourse areas, because of its long-lasting, durable nature and ease of maintenance qualities. The University did not want to use future resources to replace flooring with a less durable option. Terrazzo was an excellent choice for this reason. The newly enclosed main entry, along with increased natural light and views to the outdoor plaza, all contributed toward enhancing the indoor environment."

Phase I of the renovation focused on making high-priority infrastructure improvements to the existing facility, including a much needed roof replacement. As with all aspects of the renovation, the team focused on energy efficient options in replacing the arena's roof. An analysis of the roof membrane determined that the energy efficiency benefit typically gained when incorporating a white roof would not be beneficial to this building, which is primarily used during the heating season. By adding a white roof, the University would have been faced with increased maintenance costs to clean the highly visible roof and would have lost the historical value of the original black roof. The design team chose to implement a black, single-ply membrane EPDM roof over six inches of polyisocyanurate insulation.

Maximizing comfort for the building's occupants while upgrading the "heart and lungs" of the building was an underlying theme for Phase I. Important upgrades to the existing electrical and plumbing systems represented a portion of that goal, while the majority of user comfort was linked to much-needed mechanical upgrades. Some of the existing issues that were uncovered included ventilation rates that were not directly tied to occupancy, the use of antiquated pneumatic HVAC controls under the direction of an obsolete master control board (which was inconveniently located next to a trainer's table in the locker room); air handling units with deteriorated insulation exposed to the airstream; inefficient building air distribution; and inadequate ventilation in both the locker rooms and concourse areas.

The mechanical infrastructure upgrades included replacement of the arena air-handling units with new units, each incorporating an array of variable speed fans for increased energy efficiency, low noise

The project marks a new era for Crisler Arena. With its energy efficient features, the facility has achieved a 30 percent higher energy efficiency rating than a new building built to the current code based on ASHRAE 90.1-2007 efficiency standards.

generation, and improved reliability. A fabric duct system was installed in a ring above the entire arena, efficiently and comfortably delivering ventilation air to the spectators and playing floor. Carbon dioxide sensors were installed to automatically adjust outside air ventilation rates in response to real-time occupancy. Locker room ventilation was improved, and exhaust air energy recovery was provided on the locker room HVAC systems to pre-heat and pre-cool incoming ventilation air. Exhaust fans were provided in the concourse to serve a three-fold purpose: to exhaust the ventilation air that was being supplied to the seating bowl, to provide ventilation for the concourse, and to provide emergency smoke purge in the event of a fire.

According to University of Michigan Project Manager, Steve Donoghue, "HVAC efficiency is crucial to a facility of this size. Multiple high-efficiency HVAC measures were designed and implemented, including demand controlled ventilation, which reduces mechanical loads in low occupancy and empty spaces, a high-efficiency air cooled chiller, increased thermostat deadbands (the gap between the heating setpoint and cooling setpoint during which no conditioning is provided), increased exhaust air energy recovery, and automatic duct static pressure reset. All of these measures are adding value and sustainability to our new facility." During construction, the potential for dust accumulation in the HVAC system was avoided, and the building was flushed with outside air prior to occupancy.

Because the plumbing system serves a capacity of over 12,700, water efficiency was a crucial aspect of the arena's overhaul. The building features low-flow plumbing fixtures with automatic controls, providing a 30 percent reduction in water usage as compared to the targeted goals of the Energy Policy Act of 1992. New restrooms are equipped with waterless urinals, dual flush water closets with automatic flush valves, and automatic low-flow lavatory faucets. Kitchen areas feature low-flow sinks, while locker rooms highlight low-flow showerheads.

Lighting strategies played a major role in both energy efficiency and in enhancing the fan experience. Lamp types were selected to provide energy efficiency without sacrificing the desired visual lighting effects. The new light sources are closely inter-related and provide the perfect amount of light both vertically and horizontally, which was a challenge, but through careful coordination and selection, energy efficient and practical lighting implementation was achieved.

Aesthetics, illuminance distribution, energy consumption, and maintenance needs all played a role in determining which lighting system was appropriate for each space. For example, for the tallest spaces metal halide lamps with high color-rendering ceramic arc tube technology were selected because no other light source could create the desired ambience without significantly higher energy use. In addition, the arena's curved trusses were used for mounting and as a perfect platform for the electric maintenance lowering system.

The concourse level relies on four different lighting sources working in unison, because one without the other would limit the stimulating visual effect. All of the concourse lighting is located at the low side of the structure for easy accessibility and consists mainly of custom luminous "drums" with compact fluorescent lamps.

Large graphics on the outside walls are illuminated with metal halide spotlights from across the corridor, and are accentuated by a luminous vertical glowing LED element. LED recessed downlights highlight the curvature of the arena and the new and renovated concession spaces.

The new Crisler Center represents the future of the University of Michigan, a reflection of the rich history and tradition of the University, its commitment to academic and athletic excellence, sustainability, and to its students, staff, faculty and dedicated fan base and support system. Following the expansion and renovation project, Crisler Center's "good bones" have been given new life and the groundwork has been laid for future champions to call Crisler Center "home."

About the Author

Camille Sylvain Thompson is marketing communications coordinator for Peter Basso Associates, Troy.

These custom "drums" have compact flourescent lamps.