Building Green for the Future

Case Studies of Sustainable Development in Michigan

IHM Motherhouse, Monroe

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Ann Arbor, Michigan

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The Motherhouse retains its historic 1930s appearance while being completely and sustainably renovated inside.

Project type	Residential
Project scale	Building
Construction type	Renovation - Urban
Date completed	January 2003
Address	610 West Elm Avenue, Monroe, MI 48162
Subjects	Energy Efficiency
	Water Efficiency
	Materials Use
	Development Processes
	Social Benefits
Total project costs	$56 million
Building square footage	376,000 sq. ft.
Cost / square foot	$150 / sq. ft.

Monroe, Michigan

IHM Motherhouse

History

In 1845, the Sisters, Servants of the Immaculate Heart of Mary (IHM), founded a ministry of education in Monroe, Michigan. Since then, the IHM community has expanded greatly, teaching in schools and communities throughout the world and promoting a sense of spiritual connection between humanity and the environment. The 280-acre campus in Monroe remains the "home office" of the IHM community. Today, its centerpiece, the 376,000 square-foot Motherhouse, provides space for worship, administrative offices, and residences for aging IHM Sisters whose healthcare needs require special accommodations.

Following the destruction of the previous structure by fire, the existing Motherhouse was constructed in the early 1930s. Despite the hardships of the Great Depression, the community was able to fund reconstruction and employ builders who took great pride in their craftsmanship. The 18-inch-thick brick and concrete walls and the interior spaces of the Motherhouse, finished with terrazzo, Flint Faience tiles, and period chandeliers, convey a sense of elegant permanence. Estimates of the life of the structure extend into the 23rd century.

In the 1990s, the Sisters determined that the Motherhouse no longer met the changing needs of the IHM community. The utility systems throughout the building were outdated and failing; a complete reinstallation of plumbing, electrical, and HVAC systems was required. Faced with the option of building a completely new structure, the Sisters instead chose to renovate the Motherhouse, reusing the site and building shell but replacing most of the interior. By sustainably renovating the Motherhouse, the IHM community emphasized their strong belief in responsible stewardship and educated the construction industry and the general public about the principles of green living.

"Earth-friendly can be done in an old building, and cost effectively."

- Sr. Janet Ryan

The Geothermal System

232 holes, 450 feet deep

54 miles of closed-loop pipe

Underground temperature: 55°

Temperature of water when entering building: 72° (due to friction)

Energy Efficiency

Conversion to energy efficient lighting is one of the least labor intensive components of green development. At the Motherhouse, Depression-era lighting fixtures were adapted to use compact fluorescent bulbs, reducing energy costs and requiring less maintenance. The appropriate lighting was carefully selected for each space, reducing the amount of over-lighting. The large number of windows throughout the Motherhouse allows the residents to take full advantage of natural daylight; the installation of both occupancy sensors and light meters allows the lights to be turned on only when needed. In 2004, despite tripling the building's electrical capacity, the Sisters saved over $187,000 on electricity.

As part of the renovation, 800 windows were removed, refurbished (instead of purchasing new windows), and reinstalled with high-efficiency glass and operating sashes that allow the residents to control fresh air, heating, and cooling in their rooms. In addition to the windows, individual thermostats were installed in each room to minimize unnecessary heating and cooling of large spaces, and a heat recovery system was installed on the ductwork to prevent warmed air from escaping the building.

One of the many unique features of the Motherhouse renovation is the building's source of heating and cooling energy for the building. A closed-loop geothermal energy system circulates water through the building and into the earth, providing heat in the winter and removing heat in the summer. In addition to the thermal mass of the building structure, which evens out the indoor temperature, the geothermal system allows supplemental heating and cooling systems to work less often than typically needed in Michigan. The system, which effectively "uses the Earth as a giant radiator," is the largest residential geothermal field in the country.

Interior spaces combine green technology, such as energy-efficient lighting and low-VOC paints, with elegant features of the Depression-era original construction.

geothermal - *Geothermal power is energy generated by utilizing naturally occurring geological heat sources. It is a form of renewable energy.*

The Sisters chose to refurbish 800 original windows, simultaneously saving costs and reducing wastes. The windows can now be opened, allowing residents to control room temperature and fresh air supply.

Water Efficiency

One challenge to the Sisters' efforts toward sustainability was their desire to convert common bathroom facilities on each floor into private baths in each resident's room, resulting in the installation of 300 new toilets and over 250 individual showers, more than double the previous amount. To counterbalance this increased demand, low-flow fixtures were installed, including showerheads that use only 1.8 gallons of water per minute (a typical shower uses 4.5 gallons per minute (gpm), bathroom faucets that use 1.5 gpm instead of the usual 4 gpm, and high-velocity toilets that use less water per flush.

Water Savings

5000 fewer gal/day as compared to pre-renovation structure

Est. 7500 fewer gal/day as compared to traditional installation of new configuration

In 2004, water bills were 50% less than pre-renovation expenses

Source: IHM Motherhouse

The original 1930s-era plumbing required complete replacement; as a result, the Sisters decided to further reduce their use of potable water by installing a graywater system in the Motherhouse. Wastewater from sinks and showers travels through a separate network of pipes to a constructed wetland behind the building. In 7-10 days, the plants and soils in the wetland filter the graywater, which is then returned to the Motherhouse, marked with a biodegradable blue dye, and used only for flushing toilets throughout the building. Only then, after being used twice, is the wastewater sent to the municipal sewer system.

According to the EPA average water use in the Great Lakes region is 287 gallons per person per day; at this rate, the 210 residents of the Motherhouse would use over 60,000 gallons of water each day. Even without accounting for the thrifty water use of the IHM Sisters, the water-saving renovation measures result in more than 12% less water use as compared to a traditionally built structure.

Materials Use

The Sisters specified the use of many sustainable materials as part of the renovation. New Interface tiled carpets have the dual benefits of not off-gassing after installation and of being easily replaceable if necessary: a single 12"x12" tile can be replaced instead of an entire room. Cork flooring, used throughout the building, is sustainably harvested, provides superior sound-absorption capacity, and lasts for decades without an appreciable loss in quality. Cork was one of the original flooring materials in the 1932 Motherhouse and the tiles that remain today cannot be distinguished from the newly installed cork floors.

Green Building Materials in the Motherhouse

Renewable cork and linoleum flooring

Interface carpeting

Benjamin Moore low-VOC paints

Trex recycled plastic and wood product on veranda

Natural gypsum wallboard

Mineral wool insulation

graywater - *Wastewater discharged from sinks, showers, kitchens, or other non-industrial operations, excluding toilets and kitchen solid-waste disposal systems.*

off-gassing - *The emission of chemical compounds from a newly-painted, finished, carpeted, or furnished room into the air.*

Development Processes

Throughout the renovation process, the IHM community illustrated its commitment to the environment by using sustainable methods and products. Materials removed from the building were recycled, reused in the renovated building, and otherwise diverted from the normal waste stream. Lynn Rogien, of the Christman Company and construction manager for the project, estimates that recycling alone "probably saved 20% in dump fees." Concrete from demolished walls and floors was crushed and used on the site as temporary roads for construction traffic, and removed marble slabs were reinstalled as counters and windowsills.

Eight hundred windows were made operable and reused, along with over 500 refurbished cherry doors. More than 45,000 square feet of carpeting was removed from the old Motherhouse; half of the carpet was recycled and the remainder was sent to an incinerator. Recycle Ann Arbor, a private non-profit organization, hauled away - at no cost - over five truckloads of reusable toilets, sinks, and other materials still of functional use. Rogien said, "We were still sending away the same amount of material [from the site], but it cost us less" to send wastes to a recycler than to a landfill.

Concurrent with the structural renovation of the Motherhouse, the Sisters educated themselves about sustainable site planning and restored much of the campus grounds, preserving working agricultural fields and a unique oak savanna ecosystem present on the site. Five acres of turf grass lawn were converted to prairie meadows, requiring fewer chemical inputs and less overall maintenance, and providing habitat for wildlife. The stormwater runoff from the building, parking lots, and driveways is now handled by a system of vegetated swales that allow the water to percolate into the ground rather than being conveyed off site by storm sewers.

Social Benefits

Part of the sustainability of the Motherhouse and campus comes from its ability to be adaptively reused as the physical needs of the IHM community change. Each resident's room in the Motherhouse was redesigned so that, with the removal of selected walls, the building can be converted to private apartments when no longer needed to house the IHM Sisters. Additionally, plans are being created for the future development of a sustainable community on the campus, organized around a covenant of sustainable principles including pedestrian-focused travel, shared amenities, and common green spaces.

For more than 150 years, the mission of the IHM community has been to educate; this call continues today as the Sisters share their experience and knowledge about green development. The Sisters established a non-profit organization, the River Raisin Institute, to disseminate information on sustainable living, manage a tour program at the Motherhouse, and coordinate a series of speakers and consultation services for organizations interested in implementing sustainability. In the fall of 2005, the Motherhouse will host a conference for construction tradespersons learning how to incorporate green practices and materials into their future building projects.

The renovation project of the IHM Motherhouse succeeded in having a minimal impact on the environment but a profound impact on everyone involved. Sharon Venier, of the River Raisin Institute, says, "The IHM community, architects, construction company, and its subcontractors learned together how sustainable renovation and restoration can have [a] beneficial environmental impact." As with the 1930s construction workers involved in building the original Motherhouse, the contractors and tradespersons who worked on the Motherhouse renovation carry with them a sense of pride and a new understanding of the impacts of their work. "The contractors and subcontractors who worked on this project are now, in turn, implementing earth-friendly practices on other projects, thus changing the marketplace of the future," says Venier.

Awards

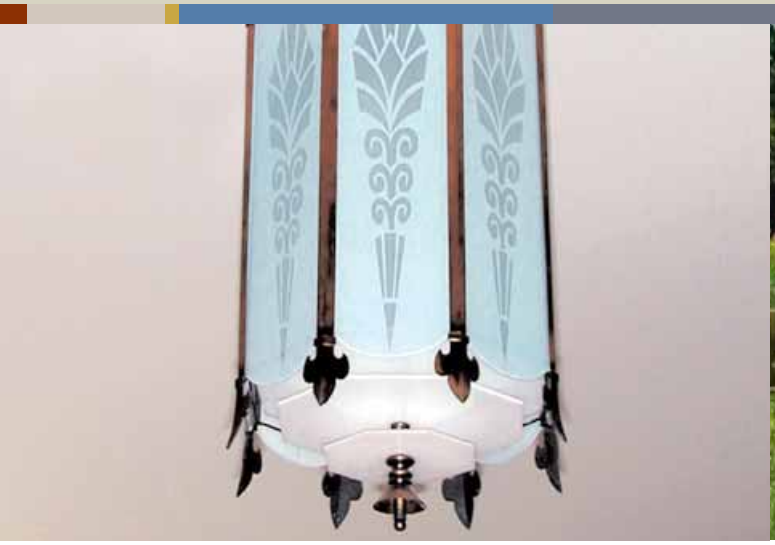
- 2003 EPA Clean Air Excellence award - Community Projects category
- 2003 Build Michigan award - Over $5 million category
- Michigan Historic Preservation Network Building award
- Registered for LEED certification (silver certification expected)

"The Sisters gave us an education on what green was."

- Lynn Rogien

The Bottom Line

Sister Janet Ryan, a member of the project team, promotes the Motherhouse renovation as an example of how "Earth-friendly [renovations] can be accomplished in an old building, and [accomplished] cost effectively". While its sheer magnitude places the project in a unique class, the opportunities for demonstrating innovative sustainable systems makes the Motherhouse renovation an extraordinary example for developers throughout the state. A truly sustainable practice propagates itself by demonstrating its benefits and educating others; by that measure, the IHM Motherhouse will positively impact the environment and the community for generations to come.



Instead of replacing the original light fixtures, the Sisters cleaned and updated the lights to use compact fluorescent bulbs, saving energy costs.

Three acres of constructed wetlands behind the Motherhouse filter wastewater from sinks and showers. In seven to ten days, this recycled graywater returns to the building to flush toilets.

References

Mission for the Millennium booklet and fact sheets (from IHM)

IHM website - www.ihmsisters.org

EPA. "How We Use Water In These United States" (www.epa.gov/water/you/chap1.html)

Interview with Sharon Venier, 1/26/2005

Interview with Sister Janet Ryan, IHM, 2/9/2005

Interview with Lynn Rogien, 2/21/2005

Contact Information

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Resources for further information

IHM Website - www.ihmsisters.org

Urban Catalyst Associates

Urban Catalyst Associates

Urban Catalyst Associates (UCA) is an interdisciplinary team of recent University of Michigan graduate students who have combined their experiences, interests, and educations to create a positive impact on the future of the State of Michigan. The team holds a strong passion for fostering innovative, sustainable development that will shape the evolution of the new urban environment.

In collaboration with the Michigan Department of Environmental Quality, Urban Catalyst Associates developed this handbook to serve as inspiration and ready reference to the development community and other interested groups. As the State furthers its investment in green development, the UCA team hopes that this handbook will encourage developers to infuse elements of environmental sustainability into their planning and development processes.

Urban Catalyst Associates can be contacted via email at uca@uca-michigan.com. See the contact information below for information on contacting individual team members.

Zeb Acuff

Zeb holds Master's degrees from the School of Natural Resources and Environment and the Taubman College of Architecture and Urban Planning, both at the University of Michigan in Ann Arbor. He is also a 2001 graduate of the College of Agriculture and Natural Resources at the University of Delaware. Zeb has extensive experience in farmland preservation and local planning research, as well as familiarity working with demographic and social science media. His professional interests include parks and recreation planning, non-motorized transportation, trails and greenway development, and public transit systems. Zeb and his wife currently reside in Dexter, Michigan. Zeb can be contacted via email at zeb@theacuffs.com.

Bryan Magnus

Bryan graduated from the University of Michigan in April, 2005, with an MBA from the Ross School of Business and a MS from the School of Natural Resources. His undergraduate degree is in Finance and Actuarial Math from Bryant University in Smithfield, Rhode Island. Bryan has extensive knowledge of socially and environmentally responsible business with an emphasis on renewable energy and alternative transportation. He has interned with General Motors' Fuel Cell Activities Group as well as Honeywell's Transportation Systems, and is currently employed by Honeywell TS as a Marketing Analyst. Bryan, his wife Lynn, and their "child" Meadow (dog) live in Ann Arbor, Michigan. Bryan can be contacted via email at magnusb@umich.edu.

Aaron Harris

Aaron will complete his final year at the University of Michigan in spring 2006 with both an MBA from the Ross School of Business and an MS from the School of Natural Resources and Environment. Prior to Michigan, Aaron co-founded Harris Brothers LLC, a real estate development/management company based in Chicago and focused on green building design and environmentally sensitive renovation projects. Upon completion of graduate studies, Aaron plans to return to the real estate field to pursue urban brownfield redevelopment projects. Aaron graduated from the University of Wisconsin-Madison with a BA in Sociology (Honors) and a Certificate in Environmental Studies. Aaron can be contacted via email at aaronmh@umich.edu.

Allyson Pumphrey

Allyson graduated from the School of Natural Resources & Environment with a Master's degree in Landscape Architecture in April 2005. Prior to attending the University of Michigan, she received her BS in Landscape Horticulture & Design from Purdue University in West Lafayette, Indiana. Allyson has experience in residential site design and urban redevelopment projects. Her professional interests include urban trails and greenways, brownfield redevelopment, and urban design. Allyson is employed by InSite Design Studio, Inc. in Ann Arbor, Michigan. Allyson can be contacted via email at apumphrey@insite-studio.com.

Larissa Larsen

Larissa Larsen, Ph.D., is an assistant professor with positions in both the School of Natural Resources and Environment and the Urban Planning Program at the University of Michigan. Larissa has a Master's in Landscape Architecture degree from the University of Guelph in Canada and a Ph.D. in regional planning from the University of Illinois at Urbana-Champaign. Prior to becoming a professor, Larissa practiced landscape architecture and urban planning in Chicago. Her current research investigates the ecological and social impacts of urban settlement patterns. Larissa can be contacted via email at larissal@umich.edu.