


# Green Again

by Rico Cedro, AIA



The renovation of an innovative 1970s building in Zeeland, MI, demonstrates a commitment to sustainable design with its Gold-level LEED™ rating.

**W**hen the C1 building at Herman Miller Inc.'s Main Site in Zeeland, MI began to show its age, the owners chose to renovate rather than rebuild it from scratch. The result is a modern, environmentally friendly space for the furniture design and manufacturing corporation's business offices.

Since the 1950s, Herman Miller has worked to lessen the impact of its products and processes on the environment. All major company construction must be LEED™ (Leadership in Energy and Environmental Design)-certified at a minimum Silver Level by the United States Green Building Council, of which Herman Miller is a founding member.

Part of the corporation's facilities strategy is making the most of existing buildings and sites. The original 700,000 sq.-ft Main Site building complex was built in the 1960s. Almost all of it is high-bay steel construction. The straightforward structure of columns and open-web

joists, generally on a 40' grid, allows easy building expansion and internal re-configuration. Over the years, manufacturing floors have become offices, warehousing has become manufacturing and a variety of business units have come and gone in a process of constant and fluid adaptation. The original architect, A. Quincy Jones, designed the C1 building in 1974 as a quiet essay in exposed steel construction and brick planes. Once home to the offices of the corporate leadership team, the building required a complete overhaul.

For the new C1 building, Herman Miller required a modern, flexible, and open office space for a mixture of business units. Other goals were to increase the building's usable area; reduce energy and water consumption; develop an image more consistent with the aesthetic of the Main Site; and respect the intentions of the original architect. The LEED rating system provided a framework to create a high-performance, sustainable building.

## Total Turnaround

The building's original core and shell offer a solid armature for renovation. The 100'-by-100' floor main plate is designed on a 20'-by-20' grid. The structure is a bolted steel frame of W8x24 columns and W16x31 and W21x55 beams, supporting a mezzanine of concrete-filled steel deck. Spanning the full 20' grid dimension, 7½"-deep steel decking carries the roof. Lateral loads in this two-story structure are taken by masonry shear walls, which infill the frame.

Because the building originally was home to the CEO and other top management, the existing interiors had a more-extensive level of finish than the rest of Main Site. An elaborate system of fascias, bulkheads and ceilings covered most steel members. Exposed steel is visible mostly on the north and south façades. M10x9 mullions on 5' centers, along with the primary structural columns, support a grid of 10-gauge bent steel blades, creating a simple and striking curtain wall.

Sun louvers were one of a number of sustainable features incorporated in the original building. Others include operable windows at the top and bottom of the curtain wall for natural ventilation, glazing concentrated on the north and south façades, a rooftop water-spray system for cooling, and a sturdy building shell. Such features were uncommon for buildings in the 1970s, and demonstrate integration of green principles long before the development of the LEED system.

Preservation and internal expansion of the building shell is central to the design and sustainability strategy. The existing steel structure was extended to deck over acoustically troublesome double-height spaces, creating additional office square footage. Steel's inherent flexibility, lightness, quick erection, and ability to be erected in tight spaces allowed this phase of construction to remain on schedule. The steel members did not require a fire-protective coating, but sprinklers and an integrated alarm system were added to the building.

To reveal the beauty of the original structure, years of interior finishes were stripped away and eliminated. New finishes, especially in the ceilings, were applied sparingly. Planes of acoustical tile and gypsum board were suspended away from the structure to allow the steel framework and the texture of the decking to be an integral part of the interior design. By limiting the amount of new absorptive material, indoor air quality is improved and maintenance costs are reduced.

The team chose to further emphasize the steel frame by painting it the same color used on all Main Site exterior steel. Floor decking received a gray color to distinguish between the primary and secondary steel elements. One of the challenges the construction team overcame was the field-application of low-VOC (volatile organic compounds) paints on steel. A solution involving additional surface preparation and priming was developed to insure proper adhesion.

New mezzanine balustrades of folded, perforated steel panels replaced the bulky fascias in the building's original interiors. The visual and physical lightness of these new steel elements helps dissolve the separation between the mezzanine and the main floor.

Improvement to the exterior required the design and construction of an entry vestibule on the east façade for convenient access to a new parking lot. Krueck & Sexton designed a minimal pavilion to



*Above:* Recycled materials are specified throughout, including acoustical ceiling tiles, gypsum board, and steel products such as framing studs, reinforcing bar, structural shapes and sheet metal.

*Below:* New mezzanine balustrades of folded, perforated steel panels replaced the bulky fascias of the building's original interiors.







The new entry vestibule features an exposed welded frame of W6x15 columns and C15x33.9 beams in-filled with glass.

link the new parking lot to the original building. Set in a grove of existing birch trees, this exposed steel structure consists of a welded frame of W6x15 columns and C15x33.9 beams in-filled with glass. The channel beams bear directly onto the masonry walls of the original building.

In addition to interior finishes, Building C1's entire infrastructure of MEP systems were removed and replaced. Careful dismantling of the interiors took place in accordance with LEED principles. During construction, steel studs, piping, ductwork, equipment, concrete, gypsum board and other materials were separated for recycling. At the conclusion of the project, more than 75% of the total construction waste was recovered.

### Going Greener

A combination of strategies helped achieve a 30% reduction in total energy performance. Glass replacement substantially improved the performance of the building envelope. High-efficiency lighting reduced electrical consumption and improved the quality of the workplace. A multi-zoned VAV (Variable Air Volume) system with humidification was integrated into the Main Site building-energy management system. CO<sub>2</sub> is monitored to optimize fresh air. Perimeter-water hot radiators improve comfort at the north

and south steel curtain walls, which, while originally insulated, are not completely thermally broken.

More than 70% of Building C1's total energy load—chilled water, steam and electricity—comes from an on-site renewable source at the Main Site Energy Center. Herman Miller built this biomass-powered central plant in 1981. Fueled by sawdust and other wood by-products, it has saved the company in both energy and landfill costs.

Recycled materials are specified throughout, including acoustical ceiling tiles, gypsum board, and steel products such as framing studs, reinforcing bar, structural shapes and sheet metal. More than 50% of the building materials were manufactured within 500 miles of Zeeland, which both reduced transportation energy and supported the regional economy. Herman Miller manufactured most of C1's furniture. All furnishings contain a high proportion of recycled content. The project was recognized for environmental design innovation in this area.

Domestic water use was cut by one third by installing waterless urinals and efficient fixtures with automatic controls. Site storm-water quality and quantity management is accomplished by a series of bio-swales and sedimentation forebays planted with native vegetation, helping

minimize the environmental impact of the new parking lot. Trees provide shading for exterior hard surfaces, lessening heat-island effects.

Krueck & Sexton Architects worked with the active involvement of Herman Miller's facilities group to carefully balance environmental goals with high expectations of design quality and a fairly stringent budget. In November 2002, the United States Green Building Council awarded Building C1 Gold LEED Certification under Version 2.0—one the first eight buildings in North America to achieve this level of sustainable design. For more information about structural steel's contributions towards LEED ratings, visit [www.aisc.org/sustainability](http://www.aisc.org/sustainability).

When originally constructed, Building C1 pioneered for Herman Miller the idea of a flexible, environmentally responsive building that was capable of expressing corporate culture. True to its heritage, the building is now a restored and enhanced showcase for Herman Miller's decades-long commitment to corporate responsibility and environmental stewardship. ★

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#### Architect

Krueck & Sexton Architects, Chicago

#### Structural Design and MEP Engineering

GMB Architects-Engineers, Holland, MI

#### Structural Design

DAJ Engineering, Muskegon, MI

#### Structural Design Software

ENERCALC

#### General Contractor

Triangle Associates, Grand Rapids, MI

#### Structural Steel Fabricator

Steel Supply & Engineering, Grand Rapids, MI (AISC member)



Old bulkheads at the balconies (left) were replaced with new, semi-transparent railings (right).