Dynamic Workplace

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Photo by Jeff Dykehouse

Architecturally exposed structural steel, natural lighting and green elements combine to create a dynamic balance of community, collaborative and individual space at the Herman Miller Marketplace in Zeeland, MI.

The Herman Miller Marketplace Project, a 95,000-sq.-ft steel-framed office building in Zeeland, MI, was designed to create an innovative, adaptable workplace environment that would support progressive business-place thinking and become a model of sustainable design, corporate products and office efficiency.

"Sustainability was the driving force," said Mike Corby, AIA, Integrated Architecture executive vice president. The project achieved a Gold LEED™ rating and was named a 2003 AIA Top 10 Green Project.

"The expectation was that MarketPlace would be a green building, achieving at least a Silver LEED rating," Corby said. "The developer, Granger Group of Companies, offered a flexible, LEED-influenced building outline that supported the inclusion of tenant-specific goals, beginning with a fast-track project. Herman Miller's desire for a sustainable, Silver LEED-rated building was written into the lease agreement, effectively tying the green rating to the rent. If the project did not achieve the specified LEED rating, less rent would be charged. Language in the design documents included requirements that would exceed the LEED Silver rating."

Other project goals included consolidation of four leases, the alignment of nine business units, minimizing the initial cost, and reducing operating costs. The project also was to be complete in 10 months, from the signing of lease agreements through the design, construction and move-in processes.

"Initial planning directed sustainable strategies for site, natural light, fresh air, water use, energy use, building materials and finishes," Corby said. "The result is a 2.0 Gold LEED™ certification. Documented operational cost savings are coming in 41% lower than Herman Miller's traditional leased office space.

EXPOSED STEEL FRAME

Corby says a steel structural system was chosen for its recycled content, the project's aggressive time line, and the goal of minimizing initial cost. Steel also could meet the owner's requirements of an open floor plan and natural daylighting, and would work well with the building's precast concrete skin.

The two-story building was designed with a 16′ floor-to-floor elevation, and a 16′ floor-to-roof elevation. The typical bay spacing was 40′x40′, with perimeter columns spaced at 20′0″.

The floor was constructed for an open office space, with 3″ composite deck supporting 2.5″ concrete above, for a total slab thickness of 5.5″. The floor structure was typically 36″-deep special long-span joists at 10′-0″ on center, and W27x84 composite girders. To make the girders composite, an HSS shape was added between the joist seats, and shear studs were added to the HSS. The perimeter floor beams were W18x35's with end-plate moment connections for lateral stability. "Constructing the floor the way we did helped the vibration characteristics of the floor significantly," said Don Akhurst, Senior Structural Engineer at JDH Engineering.

The roof was constructed with 1.5″-wide rib roof deck sitting on 32LH06 joists at 6′-8″ on-center, supported by 32″-deep joist girders. Lateral-load resistance was achieved by creating perimeter moment frames with 20′ column spacing, a requirement for vertical-deflection control. End-plate moment connections were used at the floor, and cap-plate and angle connections at the roof. No fire protection was needed for the steel.

Photo by Hedrick Blessing

Exposed, steel-joist roof framing provides a fitting backdrop for colorful light fixtures.

The dramatic entry canopy presented a challenge to designers. Its columns are located outside of the building at several different angles, and are built from 8"-diameter pipes with tapered fins, approximately 30" out-to-out at the center and tapered to be flush with the column at the top and bottom. "The hard part structurally was attaching this canopy back to the main building to keep these sloped columns from falling over," Akhurst said. "So the lateral analysis done on the building had to include a horizontal component of the snow and dead loads from the canopy. When we first saw what the architect wanted to do with this canopy, we could not believe it, [but] after looking at this canopy now that it is built, I would have to say it sets this building off."

All steel in the building is considered architecturally exposed. Welding, painting and installation proceeded according to the Architecturally Exposed Structural Steel section in AISC's *Code of Standard Practice*. "Designing for architecturally exposed structural steel wasn't hard," Akherst said. "It's a little different when you perform the vibration analysis, and when you check the floors, because you don't have a lot of the dampening from architectural finishes as you normally do. And being exposed did lead to some structural coordination issues-the architect did not want the joist bridging located just anywhere, so we laid out the bridging and made the joist supplier work with our requirements."

DRAMATIC ENTRANCE

The building's most dramatic interior element, a two-story glass atrium framed in painted steel, introduces natural light to the building's central core while earning LEED points by insuring daylight and exterior views from at least 90% of regularly occupied spaces. Green plants, natural stone and flowing water combine to create an organic setting that offers natural humidification.

The atrium design required careful planning. "The tricky part was that the glass that surrounded the atrium was not straight vertical, but sloped at about a 15-degree angle, so coordinating the location of the floor steel and the roof steel was critical for this feature," Akhurst said.

Other sustainable design features include daylighting with an interior light well and open floor plan; operable windows and occupant thermal controls; carefully selected, high-efficiency light sources and direct task lights combined with natural light to minimize lighting-system energy demands; computerized building controls; low-water-use fixtures and waterless urinals; recycled and locally supplied building materials; indigenous, drought-resistant vegetation; addition of 100+ shade trees to create green space within the parking lot; reduced solar heat gain with an Energy Star® energy-efficient roof; efficient HVAC system that reduces energy costs by 40%; and alternative transportation supporting bicycle use, electric powered vehicles, and car/vanpooling.

OWNER/DEVELOPER
Granger Group of Companies, Lansing, MI

ARCHITECT
Integrated Architecture, Grand Rapids, MI

GENERAL CONTRACTOR
Triangle Associates, Grand Rapids, MI

STRUCTURAL ENGINEER
JDH Engineering, Grandville, MI

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

LANDSCAPE ARCHITECT
Michael Dul & Associates, Birmingham MI

ENGINEERING SOFTWARE
ENERCALC, RAM Structural System

STEEL JOIST SUPPLIER
Nucor Vulcraft, St. Joe, IN