Artistic Achievement

BY MARIO ELCID, P.E., AND BOB VARGA, AIA, LEED AP

The arts campus at Western Michigan University finds the "missing link" with a dynamic new building that complements and enhances its neighbors.

SOMETIMES, IT TAKES JUST THE RIGHT PIECE OF FURNITURE—OR PERHAPS THE RIGHT RUG—TO "TIE THE ROOM TOGETHER."

Entire buildings can also play this role—on a grander scale, of course—as illustrated on the Western Michigan University campus in Kalamazoo.

The Richmond Center for Visual Arts (RCVA) completes the campus' Miller Plaza Quad and adds a new, striking element to WMU's School of Visual Arts. RCVA physically connects the Miller Parking Deck to the Dalton Center (which houses the music and dance departments) and provides a link to the south wing of Kohrman Hall, the future location for the School of Art. Conceptually, the completed Miller Plaza Quad imbues these connections, which will be used by students and visitors alike, with a broad visual art experience. And RCVA becomes a physical connector with the equally important function of allowing visitors to view and experience visual art at various scales and locations.

Designer Needs

The building uses form to express and delineate functions that the public at large will attend, such as student exhibits, main exhibits, and lectures. Although RCVA is a relatively small building, it had to meet rather high standards. One of the design challenges was to provide a high-quality and well-designed space on a budget considered tight for buildings achieving American Association of Museums (AAM) standards. To meet the budget, the design visually expresses typically concealed construction materials such as the structural steel system, which forms an integral part of the design and helps reveal the notion of "construction" to the art students inhabiting the space. All the structural elements become architectural finishes and work together to serve a specific visual purpose.

The exhibit areas are wrapped in a dynamic bent copper plane forming both the roof and south wall, allowing light to bleed in via north-facing clerestory glazing. The south exterior tilted wall in the exhibit hall seamlessly and gradually curves and transforms into a roof structure. Along that wall two rows of columns are placed to provide two structural functions and convey one visual intent. The outer sloped column line, with thinner columns spaced at 6 ft-8 in., supports the exterior copper wall, while the inner column line has larger columns and girders that are spaced at 20 ft on center and serve as roof support and are part of the moment frame lateral system. Horizontal angles are provided in the hidden cavity between the outer and inner columns to appropriately transfer the wind loads from the wall into the moment frames.

We guided the structural design to achieve a specific contrast between the thin planar, more rhythmic character of the exterior wall and the heavier inner columns and girders. This approach turned out to be very beneficial from an economics standpoint, as the larger columns had to be designed to resist the wind loads as well as the seismic loads in the north-south direction due to the unique geometry of the building.

Not-So-Basic Structural Design

RAM Steel was used to design the basic gravity framing elements of the building. Its ability to take into consideration the size restrictions of limiting physical factors and visual design intent also proved useful. For example, in the east-west direction the column spacing is kept consistent at 20 ft on center for the majority of the building. In the north-south direction the columns' spacing varies and ranges between 20 ft and 40 ft, which creates several framing scenarios where each bay has to be checked individually to meet the vibration criteria. W-Shapes are used to support the first floor slab above the partial basement, and the

Hedrich Blessing Photography

Laszlo Regos Photography

The south exterior tilted wall in the exhibit hall seamlessly and gradually curves and transforms into a roof structure.

second floor. Lightweight concrete was used for the second floor composite slab, while normal-weight concrete was used for the first floor composite slab to match the color and appearance of the slab-on-grade concrete around that location.

The complex geometry of the building's large second floor openings into the gallery area, sloped lecture halls, double-story entry space, and a tilted exterior wall and roof prompted a careful approach to designing the lateral system. RISA 2D and RISA 3D models were created to calculate the frames' stiffness, while a few specially designed spreadsheets were generated to ensure an appropriate and efficient distribution of the lateral forces while minimizing the effect of torsion. The lateral resisting system consists of moment frames in the north-east direction and vertical braces in the east-west direction. Horizontal braces were added within the floors, around openings, to help transfer the lateral seismic loads to the appropriate braces. Transfer vertical kickers were strategically placed between the exterior tilted wall and the moment frame columns to transfer wind loads from the building's skin to the main lateral force resisting system. The seemingly simplistic and partially exposed lateral system appears minimal and fits well with the overall design expression, but it conceals many more complex components within the architectural finishes.

Special Features

In addition to the basic structural steel members, the steel used in this building is heavily influenced by architectural requirements. Steel pieces are used to construct glass and steel display cases that showcase specially displayed pieces of art by the main donors. These boxes give the illusion that they are part of the building's main structural system, but in reality they complement the design and are purely architectural features.

WMU desired a very transparent front face for the building in order to draw the attention of students passing by on the plaza to what was happening inside the building. To that end, a very specific rhythm of expressed and concealed structure was set up to create larger "windows" into the building. For example, one of the main building columns on the east (front) building face is wrapped in an asymmetric metal panel skin that projected beyond the glass curtain wall. The lower part of the metal enclosure was widened to emphasize the asymmetry of the front entrance. Other columns on the same column line were left visibly exposed behind the glass to enhance the notion of "skin." In addition, the columns provide a visual frame for a large projection screen that descends from the ceiling into the lobby and can be viewed from outside the building.

The larger of RCVA's two lecture halls, located on the second floor, has a curved exterior that cantilevers outside of the first-floor borders. The open-space, cantilevered structure and curved exterior required for both lecture halls combined to provide additional challenges in keeping the steel framing as shallow as possible, as the allowable number of columns to be used in this space was limited. Several framing schemes were developed using RAM Steel, paying careful attention to the structural depth variations due to subtle framing changes. Continuous girders run over columns and are spliced at the zero moment transition point, helping to keep a shallow framing in the space, while filler beams are added within each bay helping to meet the required vibration criteria.

The new bridges that connect the building to the adjacent structures are another indicator of the level of detail and collaboration that makes the structural steel enhance the appearance of the project, and proves that design considerations were not limited to the interior of the building. For example, the bridge on the south side of the building connecting RCVA to the parking garage is supported by extremely narrow exposed galvanized wide-flange columns that are offset by deep side girders to draw the viewer's attention and focus to the bridge.

RCVA is a great example of what happens when art, design and structure come together to form an aesthetically appealing and extremely functional space. And steel plays a leading role in punctuating this design purpose, creating a bold, modern addition to a campus area that focuses on the arts. MSC

Mario Elcid is a structural engineer and a project manager, and Bob Varga is an architect and designer, both with SmithGroup.

Owner
Western Michigan University, Kalamazoo, Mich.

Architect and Structural Engineer
SmithGroup, Detroit

General Contractor
CSM Group, Galesburg, Mich.