Innovative Design and Excellence in Architecture with Steel

National Winner

Lake Superior College

As part of the merger of the community and technical colleges in Minnesota, the state embarked on an ambitious plan to enlarge and modernize an existing facility in Duluth. The first phase included 69,900 sq. ft. of new space and 11,220 sq. ft. renovation.

The existing facility is located on a steeply sloped site overlooking Lake Superior. Years of uncoordinated renovations and additions had resulted in circuitous and disorienting circulation patterns. In addition, the building lacked a clearly identified main entrance from the primary parking

area. "We knew that the addition and renovation had to provide a sense of organization to the facility," explained Gary Mahaffey, FAIA, a principal with The Leonard Parker Associates, Architects, Inc., in Minneapolis.

The heart of the $10.8 million first phase is a two-story high concourse connecting the existing space to the new addition. Remarkably, the space actually begins outside the building with an anodized aluminum-clad wall. This two-story-high serpentine wall picks up the shape of an

A sinuous aluminum wall below is matched by a curved line of trusses above. Photography by George Heinrich

One of the keys to the excitement in this project was the visual continuation of the main entry road into the building through the design of an undulating anadozed aluminum-clad wall.

approaching roadway and continues its twists and turns into the building. "It's a manifestation of natural forces, an intrusion of nature into the building," explained Charles Orten, project architect with The Leonard Parker Associates. In addition to creating visual interest, the wall leads to a clearly delineated main entrance.

The space through the main entrance is both organizationally and stylistically brilliant. Organizationally, the two-story-high space provides ground floor access to all of the previously disconnected wings of the existing structure and access to the new addition.

Stylistically, the space is marvelous to see. The sinuous curves of the exterior wall are continued and further accented by a curving steel trusses on the ceiling. "The steel truss geometry is a function of the serpentine wall geometry below," explained Orten. Each of the 35 separate truss shapes, located 9'-4" on center, spans the 32' between the pipe columns on the north and south walls of the concourse. The ridge and lower chord of the system follow the curve of the wall below. A constant roof pitch of 22.5 degrees is maintained as is the vertical distance of the eave and an undulating ridge and north eave. Up lights illuminate the warm wood roof deck, the bowed shape of which is reminiscent of the wood hulls of sailing ships on the nearby Great Lake.

"Each truss is different dimensionally," explained John Meyer, P.E., project structural engineer with Meyer Borgman Johnson in Minneapolis. "The truss system is self-supporting for wind action. The trusses sit below the roof of the new structure and are supported on both the old and new structures."

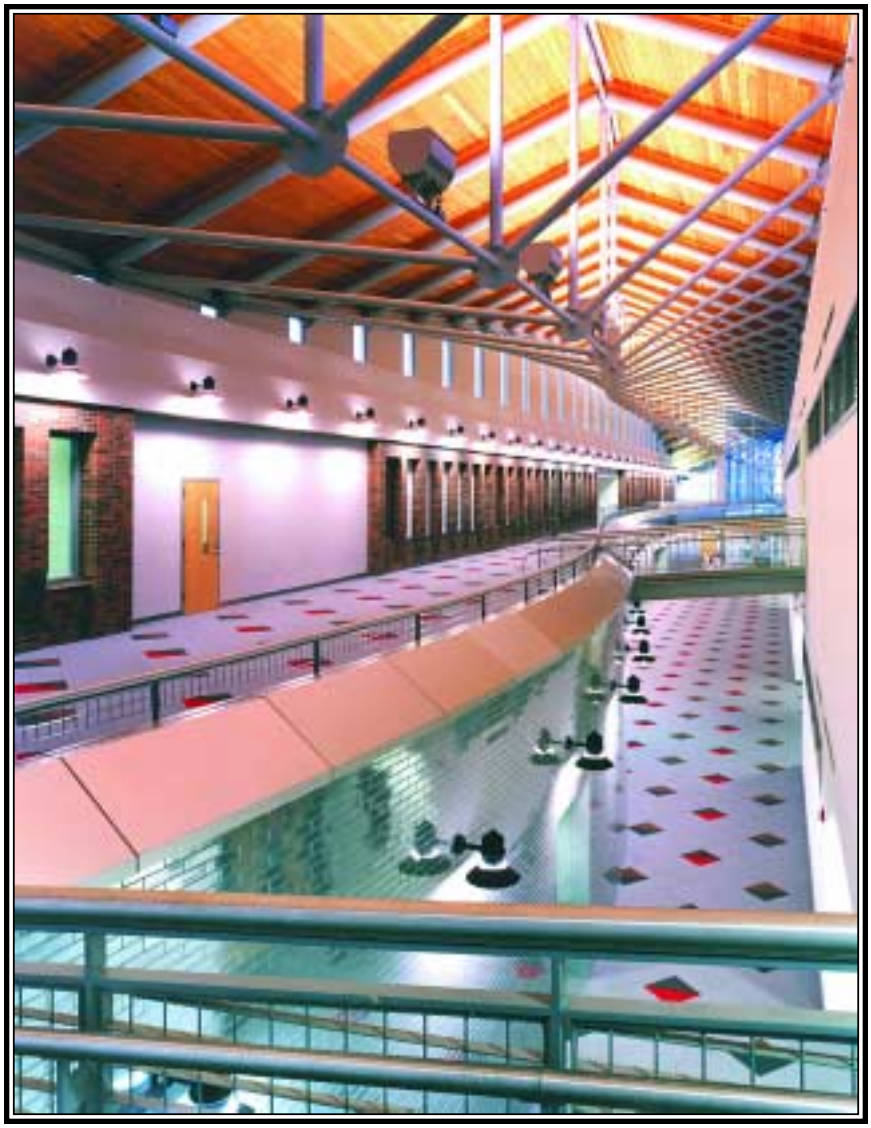
Steel tubes were used for torsional stiffness. "We used two lines of tube to transfer torsion to the steel columns," Meyer added. "The architect layed out the curvature and elevation and we mutually worked on the types of members and connection plates, and on how many web members would be allowed." The round truss members are joined by round, ½"-thick, steel gusset plates. STAAD-III, as well as an older, no-longer-available program, PFrame, were used for the structural design.

Subtle references to ships also are recalled in the sloping, gang-plank-like bridges spanning bwetween the serpentine wall and the new addition. Two 12"-deep steel channels support each bridge and the protective steel grid of the guard rail.

In addition to the main concourse, the new construction included a two-story structure housing additional classroom

space. The ground floor of the addition is concrete slab on grade, while the walls of the first story are reinforced concrete. Steel columns frame the second story and the roof consists of structural steel girders and steel joists.

Another interesting architectural feature is a white-clad aluminum tower housing the main stairwell for the new addition. The stand-alone welded steel frame is almost 70' high, with the top used to conceal mechanical equipment. The structure is a braced frame with a combination of Virendeel and diagonal bracing, according to Meyer. The four corners of the square tower consist of 35" square tubes while the bracing is primarily 16" square tubes with some W16, W18 and W21 beams to handle lateral buckling.



Project Team

Project: Lake Superior College, Duluth, MN

Architect: The Leonard Parker Associates, Architects, Inc., Minneapolis

Owner: Minnesota State Colleges and Universities

Structural Engineer: Meyer Borgman Johnson, Minneapolis

General Contractor: General Contractor: Max Gray Construction, Hibbing, MN