Back to the RIVER

BY BRAD A. STORK, P.E.

All photos this spread (except where noted): Paul Crosby

A contemporary pavilion in Des Moines is part of a greater plan to reunite residents with the riverfront.

THE PRINCIPAL RIVERWALK PAVILION occupies a prominent site along the Des Moines River in downtown Des Moines, Iowa. The building is a key part of the new Principal Riverwalk, whose purpose is to revitalize the riverfront and draw Des Moines' residents back to the river. The 2,200-sq.-ft, triangular-shaped building's highly visible site at street level is located adjacent to a new recreational trail and riverfront promenade that anchors the west end of the city's historic Court Avenue Bridge.

The building was conceived by Substance Architecture as a crystalline space resting at the prow of a gently sloping, boat-shaped plaza formed by the adjacent trails, streets and promenades. This "crystal" is, in turn, shrouded by a steel-supported folded black zinc skin that appears to float above the building structure. This skin is selectively unfolded to provide panoramic views out of the upper level café, and the resulting roof overhangs provide solar protection to the buildings east and south façades while the west façade is louvered to allow for views upriver to the north while blocking the setting sun.

The interior of the café is a single glass dining space with a solid concrete "chimney" to the south and a wood and steel kitchen block to the west. The placement of these two elements allows the east riverfront façade to be completely unobstructed, and the café appears to hover above a set of services spaces excavated out of and located below the plaza.

In order to achieve the visual effect, an exposed steel frame was used to support the steel skin wall and roof systems. The main challenge for the steel structure was to accommodate the desired cantilevers that spanned in multiple directions, all the while remaining small enough to reduce the desired apparent thickness of the folded plane and appear to float above the main building structure.

Propped Up

The engineers at Charles Saul Engineering designed a "propped" moment frame system to support the gravity loads and resist the lateral loads imposed on the building. A row of W14×30 columns along the west side of the building

◀ The building was conceived as a crystalline space resting at the prow of a gently sloping, boat-shaped plaza.

▲ ▼ The 2,200-sq.-ft, triangular-shaped pavilion uses a "propped" moment frame system to support gravity loads and resist lateral loads. A row of W14×30 columns along the west side of the building, spaced at 16 ft on center, supports one end of the W14×30 roof beams spaced at the same dimension.

▼ ➤ The building's highly visible site at street level is located adjacent to a new recreational trail and riverfront promenade that anchors the west end of the Court Avenue Bridge.

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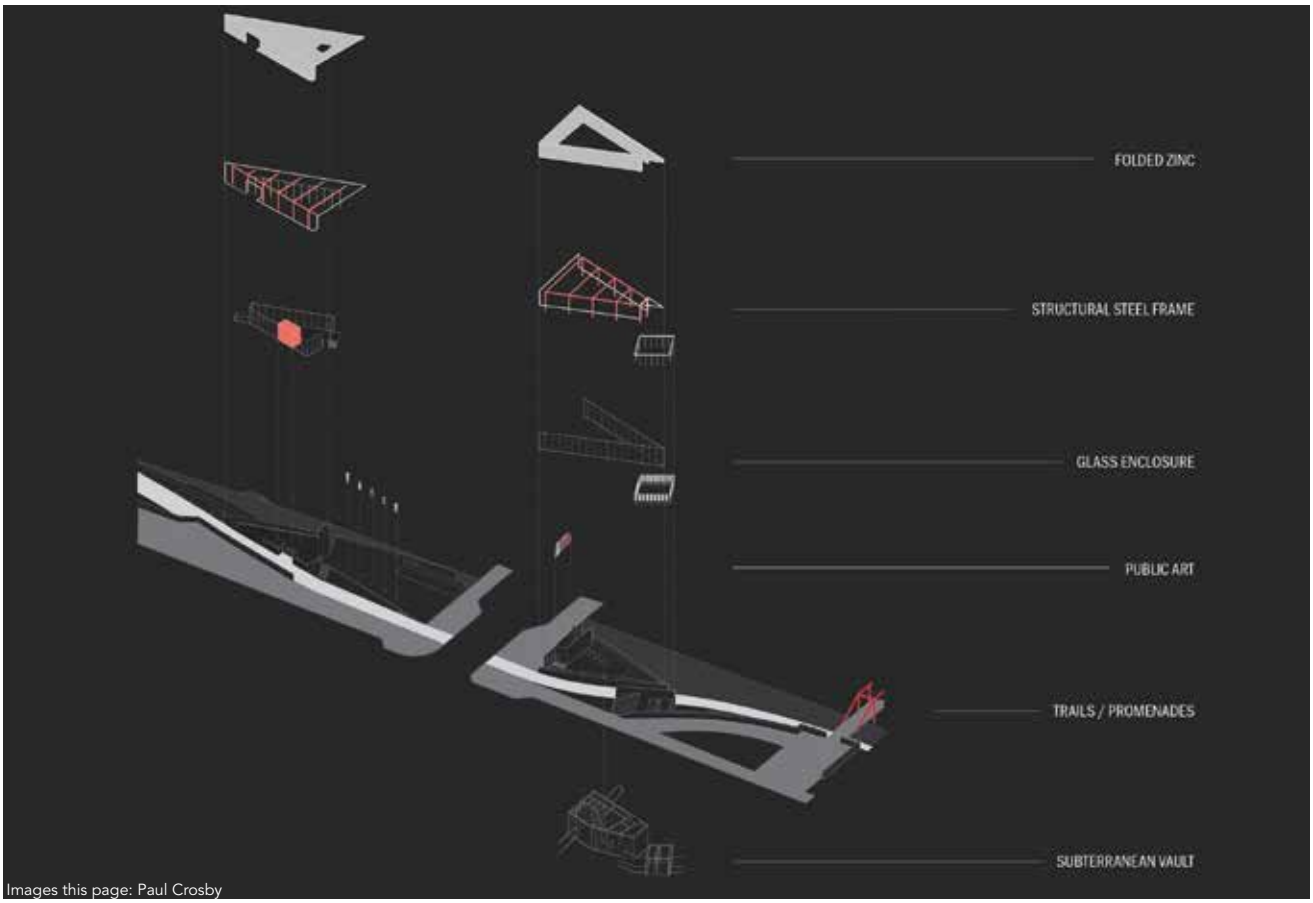

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▲ ▼ The steel framing system facilitated the architect's vision of a floating, folding roof and wall plane.

▼ Lateral loads were designed to be resisted by a combination of the W14×30 columns and the concrete "chimney."

spaced at 16 ft on center support one end of the W14×30 roof beams spaced at the same dimension, and a welded moment connection was used at the top of the column-and-beam intersections.

The W14×30 beams were cantilevered on the east side of the building over the top of a series of built-up column sections that acted as the prop. These welded built-up column sections consisted of back-to-back C6×13 channels with a ½-in. steel plate sandwiched between them. The plate extended 2½ in. past the flanges of the channels to provide support and a place to fasten the window glazing system. This small profile and construction allowed the columns to appear as a part of the glazing system while still allowing it to be a continuous plane from the exterior; the profile also allowed for the desired unobstructed views of the river and riverwalk.

Appearing Thin

The roof cantilevers for the building presented another design challenge. Large cantilevers were desired on the east side of the building to help shade the glass façade, but the roof profile still need to appear thin. The main W14×30 beams cantilevered 9 ft, 6 in. past the east face of the building to form the desired overhang. The beams were tapered down to a dimension of 4 in. at their end and allow the zinc roof skin to float over the top. This structure discretely accommodates the cantilevers and reduces the apparent thickness of this folded plane.

The floating cantilevered roof along the south side of the building presented yet another challenge. A 10-ft overhang was desired, but no structure could be located below the roof system since the roof needed to appear as a single folded plane that spanned from the east overhang to the west wall.

This design challenge was achieved by locating a series of 12 gage "Z" purlins spaced at 2 ft, 7 in. on center that were located in the depth of the folded plane. These purlins spanned to each W14×30 roof beam and were held up off the beam by ¾-in. plate spacers to help further reinforce the idea that the folded roof plane was floating above the steel structure.

Lateral loads for the building presented yet another challenge in that shear walls and X-bracing were not ideal, since they would impact the transparency and views desired by the architects. Lateral loads were designed to be resisted by a combination of the W14×30 columns and the concrete chimney. The columns were designed as cantilevers in both the strong and weak axes with moment-resisting base plate connections, and were oriented with the strong axis perpendicular to the wide side of the building and the weak axis parallel to the column line and concrete chimney. The chimney also aided in resisting the eccentric moments that were produced from the building's geometry and the location of the lateral load resisting elements.

The project involved a complex owner group that included representatives from the City of Des Moines, the Polk County Board of Supervisors, the Army Corps of Engineers, myriad City Boards and Commissions and the Principal Financial Group. This team cooperated over a period of eight years to guide the design team, secure public and private funding and implement this small but ambitious work. The result is a building that activates the public plaza and provides a new identity for the riverfront. The steel framing system facilitated the architect's vision of a floating, folding roof and wall plane plus unobstructed views of the river and public recreation areas adjacent to the building. More importantly, the Principal River walk Pavilion provides a destination that has successfully drawn and will continue to draw Des Moines' citizens and visitors back to the river. ■

Owners
City of Des Moines
Polk County Board of Supervisors
Principal Financial Group
Army Corps of Engineers

General Contractor
Covenant Construction Services

Architect
Substance Architecture

Structural Engineer
Charles Saul Engineering