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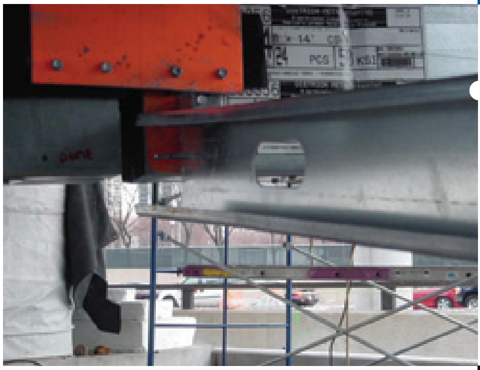
PROJECT PROFILE

THE BP BRIDGE AT MILLENNIUM PARK
CHICAGO, ILLINOIS

Building a structure designed by architect Frank Gehry can take many twists and turns. The BP Bridge in Chicago's Millennium Park was no exception.



This picture shows the intersection of the Radius Track curved stud (on the left) with the structural framing (center). The single stud (foreground) is a typical crossbeam that spans between the curved ribs.

This is the structural connection point at the control joint at the center of the bridge (the Zipper). Curved studs (shown on the left and right) are connected to the bridge's structural steel by the plates above. A crossbeam is behind the connection.

The serpentine BP Bridge, clad in stainless steel panels, has a gentle slope and a hardwood deck that carries pedestrians across Columbus Drive to parkland that abuts Lake Michigan. The 934-foot long bridge also buffers traffic noise from reaching the Gehry-designed Jay Pritkzer Pavilion, the new home for Chicago's Grant Park Symphony.

As with the Disney Concert Hall in Los Angeles in 2003, Radius Track Corporation teamed up with Permasteelisa Cladding Technologies on the BP Bridge Project. They were able to leverage the knowledge gained from the Disney project with stunning results.

Permasteelisa was the project subcontractor who provided 9,406 stainless steel panels used on the skirt, belly and walkway. Radius Track manufactured the 132 curved steel stud beams that formed the final shape of the belly structure.

"On jobs like that uniqueness is always a challenge," said Craig Harding, senior project manager for Permasteelisa. In typical high-rise construction, one floor is the same as another. With the BP Bridge project, every one of the stud components was a different shape and length and the holes on each stud had to be drilled in a different place.

In the past, that extreme customization would have been cost-prohibitive. Harding explained, "What really helps us out now is the programmability of the CATIA model. CATIA can model the studs with bends and throw out an NC file that goes right to Radius Track's machine that fabricates the studs."

CATIA was originally developed for the aerospace industry. With its adaptation for architects, data is easily shared with contractors so everyone works from the same base point.

"It does a real good job with curved surfaces," said Larry Elsen, Technical Coordinator for Permasteelisa, whereas other software doesn't do such a great job. CATIA is also very programmable. You can get information out of it a lot easier."

For the BP Bridge project, Permasteelisa gave Radius Track common delineated files of xyz coordinates that determined the shape of every stud and the location of each bend. Radius Track also received separate files indicating where the mounting holes had to be drilled for cross braces between the curved stud beams.

"We were able to merge those files for a layout of the part and do everything in one step," said Chuck Mears, President of Radius Track. "It was a pioneering step for us because it simplifies the amount of work that Permasteelisa has to do when they're dealing with these more complex shapes."

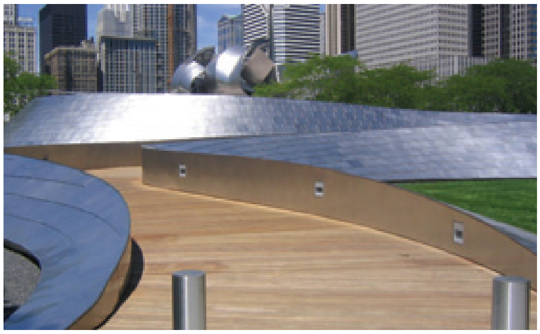
Elsen added that because of this file merge, he did not have to do a part drawing for every one of the curved studs. He made only a few sample part drawings and the CATIA model translated the information into 3D.

"The sample drawings also indicated an A, B, C or D end cut," said Mears. "So there were only four or five things we had to know when we made all 132 of the curved studs used on the belly." Each member was labeled to make it easy for the construction team to assemble the pieces.

According to Elsen, the BP Bridge project went smoothly in part because of the things they learned during the Disney Concert Hall project. The bridge was also smaller in size and involved less geometry. The key to building a structure designed by Gehry is to find a way to make it simple, despite the complex curves. "If you're going to make

A curved beam is being hoisted into place at the outer edge of the bridge. Connections made through the "U" shaped saddle plate allow the beam to be cantilevered out about 4 feet to the edge of the bridge.

This sloped side face of the bridge is a ruled surface that derives its curvature from straight studs. The ends of the belly's curved beams are visible below and between the side framing. The intersection of the belly surface and the side surface are seen on the final pictures.



something that's difficult, try to make only one part of it difficult," said Elsen. "You have to have a simple design if you're going to have a complex geometry. You don't want to have thousands of different configurations of parts and pieces."

Harding added that one of the challenges was in coming up with the scheme. "We played around with it a lot, trying to figure out what would work the best and how we could deal with all the variation."

The Permasteelisa team ended up putting all of the variation into the stud. The aluminum panels and clips were all standard items that were fastened to the studs to create the curved surface. "We took one highly specialized component and a bunch of standard pieces and stretched a skin on it," said Harding. "Basically the skeleton made the shape."

The studs in the skirt surface were flat, not curved. Clips that were attached to the studs took up the difference in the surface. With the simplified design, there were only eight different kinds of clips, each a different length, which were used for a dish in the surface.

If Gehry were to design another bridge, with a different shape and length, in a different location, Elsen said the process would be easier because of the things they learned on this project. "The thing is, we may never see it again."

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