



I-70 Bridge Replacement Notches a Number of Firsts

New Pecos Street Bridge incorporates several innovations for CDOT's project team and greatly improves neighborhood access **BY MARK SHAW**

Replacing the Pecos Street Bridge over Interstate 70 in central Denver this year encompassed several firsts for the project owner—the Colorado Dept. of Transportation—the project team and the industrial neighborhoods on either side of the interstate that depend heavily upon the busy interchange.

The project began “as just a standard bridge replacement,” says Tamara Hunter-Maurer, the design and construction engineer for CDOT. The 1965 bridge had outlived its functional life and needed to go, but replacing it would be difficult because the interchange is just west of Denver’s infamous “Mousetrap,” where I-70 and I-25 intersect, creating big traffic loads.

More than 130,000 vehicles a day pass under the bridge along I-70, with heavy trucks traveling the service roads on either side of the freeway to access manufacturing and warehouse sites. “The norm for a freeway intersection would be about 4% heavy-truck traffic. At Pecos, it’s more like 7%,” Hunter-Maurer says.

Furthermore, traffic alignments on the old Pecos Street Bridge and along 48th Street, which runs parallel to the freeway, were awkward. They created a pinch

at the exit ramps and along the bridge, where big trucks had to swing wide and cross into other lanes to get on and off the freeway. The interchange was cramped, even though the old bridge was seven lanes wide.

“It was too wide and not wide enough,” Hunter-Maurer says. “We needed an out-of-the-box solution.”

So CDOT worked with its design engineer, Wilson & Co., and contractor Kiewit Infrastructure Group, both of Denver, to study 15 different alternatives for the interchange. The team decided to design roundabouts at either end of the bridge to better control freeway access and traffic flow. It is CDOT’s first use of roundabouts at a high-volume, urban interchange.

The decision to place the roundabouts on either end of the bridge drove other decisions, including design and construction of the bridge itself. “The roundabouts came first, the bridge later. We were seeking innovation here, bigger improvements than a straightforward bridge swap could achieve,” Hunter-Maurer says.

Because of the potential for big public impacts from traffic disruption in the area, CDOT sought a delivery method that gave the agency more control over traffic flow. CDOT chose to pilot a CM/GC project delivery

ROUND AND ROUND The roundabouts built on either end of the bridge improve traffic flow through the interchange and into the neighborhood.



**INCHING
ALONG** The full
constructed
bridge was safely
moved and put
in place over one
weekend in July.

approach—its first such contract on a major highway project—that would also help meet the tight schedule imposed by funding deadlines.

The \$18.2-million project was funded by the Colorado Bridge Enterprise and the Federal Highway Administration. All funds had to be spent by Oct. 1, 2013. CDOT also received a \$4.7-million Highways for Life grant for innovation.

Hunter-Maurer says it was actually the FHWA that suggested another of the project's firsts: to use accelerated bridge construction (ABC). The new structure was built in CDOT's first-ever bridge farm, located a

block from the site and rolled into place intact.

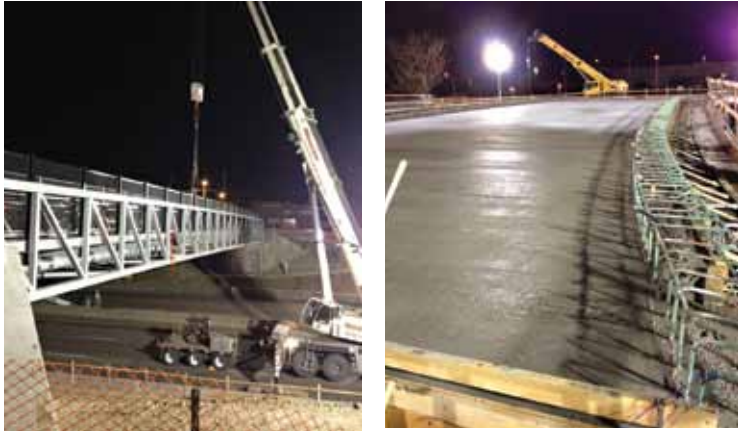
"From the beginning, we saw this project as a candidate for ABC," Hunter-Maurer says. "One of the biggest factors was the cost to users of numerous delays on I-70 from multiple closures for onsite bridge construction, and the impact on the neighborhood."

"The other option was a full closure of the freeway over one weekend, about 50 hours, to roll the new bridge into place," says Dave Paris, project manager for Kiewit.

The team opted for ABC and the single full closure. The new bridge would be designed as a cast-in-place, post-tensioned box structure with a curved, bow-tie shape, another first in the state. A more typical girder-bridge construction would have made it more difficult to achieve the bow-tie curves, which allow more room for the roundabouts on either end, Paris says.

"If the roundabouts were farther apart, we could have built a straighter bridge, but we didn't have the right-of-way space for that," Hunter-Maurer says. The roundabout on the south side actually extends about 10 ft onto the bridge itself, the first time CDOT has opted for such an alignment. "We got more strength by post-tensioning the bridge," says Tom Melton, structural director for Wilson & Co.'s West region.

After a year of preparation, it took the team 90 days to



AMENITIES

The project also included a separate pedestrian bridge (above). The new vehicle bridge (right) features a unique bow-tie shape to allow room for the roundabouts

plan the details of the bridge move. Demolition of the old bridge began Friday night, July 19, and at noon on Saturday, Netherlands-based heavy-cargo transportation specialist Mammoet started moving the 4.8-million-lb replacement bridge onto I-70. A series of grouped trailers worked like a hydraulic tripod to hold the bridge in “exactly the same plane” throughout the move, Paris says. “It was almost an automated procedure.”

“But engineering involvement during the bridge move was critical because some of our original assumptions [about the move] were not valid,” Hunter-Maurer says. “We had to shift some of the support points around.”

Kiewit had more than 100 people working 2,500 man-hours around the clock to ensure the bridge was set safely. The move required 2,000 tons of imported dirt and 600 steel plates to line the travel pad. They ensured that the bridge stayed level and the freeway surface was not damaged by the massive trailers. The team monitored distortions and deflections closely during the move. The bridge was not physically attached to the trailers. “It was all just gravity,” Paris says.

The new bridge had to be pivoted 180 degrees once it was on the freeway before it could be rolled into place in its final configuration around 1 a.m. on Sunday morning. The freeway opened on time for the Monday morning rush hour. The move went smoothly and safely, with minimal impacts, says Hunter-Maurer. The project was completed on schedule in the fall.

“We were blown away by the number of people who came out to the viewing area to see the move,” says James Brady, Wilson & Co. senior vice president. “There was a real sense of pride in the neighborhood about the project.”

The new bridge and Pecos Street interchange are a “night and day difference” from the previous alignments, Hunter-Maurer says. ■

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