

Rapid Bridge Replacement in Utah

Built offsite and rolled into place.

Accelerated bridge construction (ABC) techniques cut road closures and detours from six months to a single weekend and saved \$4 million in road user costs during the Utah Department of Transportation's (UDOT) recent replacement of the 4500 South bridge over the I-215 East Loop in Salt Lake City.

After evaluating project costs and user costs, UDOT decided that an ABC strategy was the best way to go. Championing the use of the new strategy were Shana Lindsey, UDOT's Director of Research and Bridge Operations, and Jim McMinimee, UDOT Director of Project Development, as well as the staff of UDOT's Salt Lake Region 2 office. "This innovation let us accomplish the work that needed to be done and not impact the driving public," says Lindsey. The project was supported by \$1 million in funding from FHWA's Highways for LIFE program. "Highways for LIFE provided the seed money for the project, which enabled us to go ahead and use an accelerated strategy," says Lindsey.

Using prefabricated bridge elements, the superstructure of the new four-lane, 172-ft long, and three million pound concrete and steel bridge was constructed offsite in the gore zone of an existing ramp over a period of four months. In addition to reducing traffic disruption, prefabrication offers benefits such as greater work zone safety and less impact on the environment. Also, prefabricated bridge elements are made in a controlled environment, which enhances the quality of the bridge and results in a longer-lasting product. Meanwhile, the abutments for the new bridge were constructed underneath the existing bridge without impacting traffic.

The weekend installation process

began with closing I-215 to traffic at 9 p.m. on Friday, October 26, 2007. On Saturday morning, the old bridge was removed using self-propelled modular transporters (SPMTs). SPMTs are multi-axle, computer-controlled platform vehicles that can move bridge systems with precision to within a fraction of an inch. The vehicles can move in any horizontal direction, while maintaining their payload geometry and keeping equal axle loads. SPMTs also have vertical lift. Their use provides an efficient solution for bridge replacements on high-volume roads, reducing traffic disruptions and increasing worker safety. Because of the grade and slope of the site and terrain changes, UDOT's project was the most complex to use SPMTs to date in the United States.

Greatest Challenge

On Sunday morning, the SPMTs were used again to lift the new bridge into place. It was transported only about 400 ft, but the process involved moving it onto the interstate, turning it 90 degrees, and dealing with the elevation difference

between the lanes. The new overpass is on a 12-percent slope, while the roadway on which the bridge structures were transported is on a four-percent slope with a two-percent cross slope. In addition, the elevation between the north- and south-bound lanes of the interstate is five ft, and the new structure needed to be within four in. of its final placement at all times.

"Both the removal and the installation went very well," says McMinimee. The road reopened on Monday morning, nearly six hours ahead of schedule. What would normally require six months of road closures and detours was accomplished in a single weekend.

Before embarking on the I-215 project and using SPMTs for the first time, UDOT conducted a scanning tour to other states that have used ABC techniques or SPMTs, including Louisiana, New York, and Florida. The tour allowed UDOT to ask questions and learn from other states' experiences, laying the groundwork for its project.

As part of the Highways for LIFE program and to provide a similar boost to




The Utah Department of Transportation used self-propelled modular transporters to remove the old 4500 South Bridge.

others, UDOT invited neighboring Western States to come watch the bridge removal and installation and then stay for a three-hour workshop on ABC and the use of SPMTs. The workshop attracted 150 highway agency representatives, contractors, and consultants.

While using SPMTs was an additional cost of nearly \$800,000, for UDOT this was offset by the reduced user costs. "UDOT is championing the idea of looking at total project costs that include road user costs," says McMinimee. "We spent more on construction but we saved road users \$4 million. This project was also very important to gaining support in Utah for using innovative strategies," adds Lindsey. "It went exactly according to plan." From UDOT to area motorists and residents, the project was a success for the entire community.

The project's success has also brought momentum to planning accelerated bridge projects. For example, UDOT will use SPMTs to replace 13 bridges on I-80 in 2008. "The economy is tied directly to traffic flow," notes Lindsey. "We're using taxpayer dollars and everyone benefits when we use innovation to prevent lane closures and accomplish the work faster. It was a good thing to be able to bring the SPMT technology to Utah."

The Federal Highway Administration (FHWA) recently published the *Manual on Use of Self-Propelled Modular Transporters to Remove and Replace Bridges* (FHWA-HIF-07-022), which provides details from project conception to completion for using SPMTs to remove or install a bridge. The manual, available at www.fhwa.dot.gov/bridge/prefab, describes equipment, lists benefits and costs, and identifies criteria to determine when this technology is appropriate. It covers planning, design, and contracting issues and includes sample calculations, diagrams, specifications, and case studies.

For more information on the 4500 South bridge removal and replacement, contact Daniel Hsiao at UDOT, 801-965-4638 or dhsiao@utah.gov. 

The preceding is excerpted from the December 2007 issue of Focus, and Issue 4, December 2007 of Innovator, both of which are published by the U.S. Department of Transportation, FHWA.



UDOT used SPMTs to install the prefabricated superstructure of the 4500 South Bridge in Salt Lake City in October 2007.



The superstructure of the new bridge was constructed offsite over a period of four months.



Following installation of the new bridge, I-215 reopened to traffic after a single weekend of work.