

# UTC Spotlight

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This month: Utah State University



Utah Department of Transportation

## Unique Construction Techniques Require Unique Testing

The adoption of Accelerated Bridge Construction (ABC) techniques in Utah has raised questions regarding how well ABC bridge spans handle unique stresses placed on them during construction as well as how well they might handle stresses posed by natural hazards, such as earthquakes. The Utah Transportation Center (at Utah State University) has partnered with the Utah Department of Transportation (UDOT) in undertaking research projects aimed at answering questions that may arise from the application of ABC methods.

The ABC concept is a core component of UDOT's bridge replacement and rehabilitation program. Since 2002, UDOT has utilized some form of ABC method on over 19 projects—including 77 bridges. These construction

projects have ranged from bridge deck replacements, using pre-cast deck panels on existing girders, to the complete replacement of a bridge, using self-propelled modular transports (SPMTs) capable of moving entire bridge spans into place over a weekend.



Utah Department of Transportation

Bridge span being moved into place using a Self-Propelled Modular Transport (SPMT)

replacement, in Salt Lake City, saved an estimated 120 days of construction time and \$4.2 million to the traveling public by eliminating detours and traffic delays.

The initial Utah State-UDOT research project involved testing potential joint designs for connecting precast panels used to replace bridge decks. Deck panels are cast off site, brought to the location of the bridge under repair and, after demolition of the existing deck, placed on the existing girders in an overnight operation. Connections used to tie deck panels together are critical in the proper performance of the bridge, particularly

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under seismic excitation, and several designs were constructed and tested in a laboratory at the Utah Transportation Center.

Another research project examined the stresses placed on bridge spans as they are moved into place by SPMTs. During a series of weekend bridge replacements that took place in 2008, UDOT placed instruments in key locations to record the behavior of the spans during the move into position. Researchers at the Utah Transportation Center performed a data analysis of the data provided by the bridge instrumentation to assist in the development of a design specification for these moved-into-place bridge spans. That specification calls for a bridge design that can withstand the unusual stresses placed on the bridge during the movement by SPMTs.

A third research project by Utah Transportation Center researchers, scheduled for late 2009 and early 2010, will examine the composite behavior between steel bridge girders and precast ABC decks. A bridge in North Salt Lake City was redecked in 2007 utilizing precast deck panels over existing steel wide flange girders. These deck panels were cast with holes positioned to fit over studs welded to the steel girders; the holes were then filled with grout. This bridge is slated for demolition this fall and during that demoli-

tion four girder spans with the attached deck will be salvaged and shipped to the Systems Materials and Structural Health (SMASH) lab at Utah State University. There, tests will be conducted to determine the amount of composite action created by the girder studs and grouted holes in the deck panels.

As stewards of the state's transportation infrastructure, UDOT is determined to utilize designs and construction methodologies that are efficient in the use of materials, time of construction, and taxpayer dollars. Applying ABC methods to the state's bridges accomplishes all of these objectives. Although start-up costs for the initial ABC projects were high,

they have dropped as both UDOT and its contractors gained experience.

In fact, now the costs of some prefabricated elements are less than traditional cast-in-place bridge elements. In addition, the shortness of construction times has saved the traveling public tens of millions of dollars through reduced travel disruption and congestion.

The Utah Transportation Center is proud to be a partner with UDOT in advocating ABC methodologies and performing research that will make ABC components and procedures even more efficient and successful. ♻️



Bridge span nearing its final position

### About This Project

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