

# Research Spotlight

## Project Information

**REPORT NAMES:** Research on Evaluation and Standardization of Accelerated Bridge Construction (Parts A and C), Michigan Department of Transportation Bridge Slide Showcase (Part B)

**START DATE:** October 2013

**REPORT DATES:** September 2015 (Part A), August 2014 (Part B), September 2017 (Part C)

**RESEARCH REPORT NUMBERS:**

SPR-1618A, SPR-1618B, SPR-1618C

**TOTAL COST:** \$494,178 for all projects

**COST SHARING:** \$474,857 (Projects A and C) – 20% MDOT, 80% FHWA through the SPR, Part II, Program; \$19,321 (Project B) – Bridge Funding

## MDOT Project Managers

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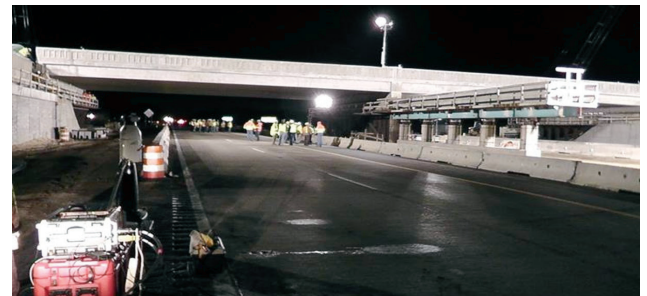
## Choosing accelerated bridge construction techniques: MDOT's improved tool

MDOT has implemented accelerated bridge construction (ABC) techniques since 2008 to save time and reduce highway closures. Earlier research developed a Michigan-specific accelerated bridge construction decision tool – Mi-ABCD – to facilitate comparing conventional construction (CC) to a single ABC technique. Now, an expanded software decision tool developed through follow-up research enables comparison of CC with additional ABC techniques and provides methodologies for quantifying the benefit-cost advantages of ABC.

### Problem

Repair and construction on Michigan's roadways and bridges can create traffic delays and long-term local burdens. One strategy MDOT has used to reduce traffic disruption caused by bridge replacement is accelerated bridge construction in which bridge elements or entire bridges are constructed off-site or off-alignment and then moved into place.

Costs for ABC are higher than for conventional construction methods, so a software decision tool was developed as part of a 2013 [research project](#) to help MDOT engineers make informed choices between CC and common ABC techniques, such as use of prefabricated bridge elements. Newer ABC techniques now needed to be added to the decision tool.



During Michigan's M-50 bridge slide project over I-96, the new bridge superstructure was supported on a temporary structure before being moved into place.

These techniques include slide-in bridge construction (SIBC) and self-propelled modular transporters (SPMT) as means to move the new bridge from its off-site location into final alignment once the old bridge is demolished.

Researchers were also asked to create guidelines for new foundation construction while an existing bridge is in service, to develop cost-benefit analysis methodologies, and to develop protocols for standardizing SIBC techniques.

*“There is a growing demand for completing transportation projects more quickly, reducing economic impacts on motorists and businesses. The work done under this research will help engineers quantify these benefits and select the most appropriate construction techniques.”*

**Michael Halloran, P.E.**  
Project Manager

## Research

Researchers gathered data for this investigation through a comprehensive review of 123 ABC projects described in Federal Highway Administration (FHWA) and state DOT records. This information included design details, construction activities, scheduling, resource needs, cost calculations, photos and videos. To develop SIBC protocols, researchers studied installation records of completed SIBC projects.

The need to replace or improve the bridge foundation can significantly increase construction duration. Researchers examined methods of constructing new foundations while an existing bridge is in use. They reviewed construction records of completed ABC projects, summaries of highway agency foundation policies, and summaries of foundation projects that used methods other than ABC, including successes and difficulties.

Although every project is different, ABC typically costs between 6 percent and 21 percent more than a conventional construction alternative. Researchers worked to develop cost-benefit analysis methodologies to allow engineers to

calculate the benefits of each ABC technique. In addition, they gathered economic data about community and business costs associated with highway detours and closures.

## Results

Through this research, the Mi-ABCD tool was expanded and refined to help engineers determine whether ABC is the best approach for a specific construction project. Researchers incorporated quantitative parameters, including site and structure considerations, work zone mobility, technical feasibility and risk, environmental aspects, seasonal constraints, project schedules, and costs. Researchers also addressed qualitative parameters, allowing engineers to make preference-based decisions. Further, researchers identified activities that could be standardized across SIBC projects.

Researchers synthesized state-of-the-practice data related to foundation construction while an existing bridge is in use. They found that disturbing the surrounding soil could affect foundations' stability, and they developed a flowchart to facilitate users' decision-making processes for foundation reuse, retrofit or replacement.

Researchers developed cost-benefit analysis methodologies to guide users' decisions among types of ABC. They also worked to quantify what are often intangible costs of highway closure and detours to communities and businesses. Using data for a specific SIBC project and a conventional construction alternative, they found that the community cost of CC was 7.2 times greater than that of SIBC and the cost to businesses was 16 times greater with CC than with SIBC. However, each project is unique, and the benefits of ABC over CC will vary from one site to the next.

Finally, researchers produced a [showcase report](#) of Michigan ABC projects and presented it at an August 2014 conference.

## Value

This project enhanced the value of the Mi-ABCD software tool by incorporating extensive decision-making parameters for additional ABC techniques, including means to match the suitability of a technique to site characteristics. Researchers' work toward standardization of SIBC activities will minimize future difficulties. Further, researchers' guidance about new foundation construction while an existing bridge is in service will decrease delays and traffic disruption. Finally, findings regarding ABC costs and benefits revealed that accelerated projects may yield great economic benefits for surrounding communities and businesses.

## Research Administration

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### These final reports are available online at

- [Part A](#)
- [Part B](#) (slide showcase)
- [Part C](#)

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