CHAngemaker
Mike Culmo, PE

The Benefits of Accelerated Bridge Construction

In this blog, we take a deeper look at the ABC method for bridge construction and answer the question: "What are the benefits of Accelerated Bridge Construction?"

The transportation industry demands safe and adequate road connections as it continues to evolve to allow for the flexibility of traveling to serve a growing population and elevate highway congestion. Many of our nation's highway bridges were built over 60 years ago and are fast approaching the end of their anticipated service life. Efficient and cost-effective methods need to consider durability and constructability, maximizing investments for bridge repairs and replacements to maintain these aging bridges and roadways. Replacement of these bridges will become a mainstay of bridge engineering for the next 25 years.

Replacing a bridge with traffic on it has been compared to replacing the oil in your car while it is still running; it's challenging to shut off traffic to make room for reconstruction. It often requires costly and time-consuming staged or phased construction or temporary lane closures. One option is to build the bridge on a new alignment. In many cases, there is not sufficient right-of-way to do this and requires a costly realignment of approach roadways.

Bridge reconstruction causes significant impacts to traffic due to increased delays (costs) for travelers. It also results in work zones that can be dangerous to travelers and workers alike. Every year, hundreds of people are killed in work zones. As a bridge engineering community, we need to do better. Accelerated Bridge Construction (ABC) is an important tool in the engineer's toolbox to address the issues associated with infrastructure renewal.

ABC has become a widely accepted way to deliver rehabilitation and replacement projects across the country, where large portions of a bridge are constructed offsite or adjacent to a site and installed in as little as a weekend. ABC significantly reduces road and lane closures, traffic delays, and environmental impacts. ABC also improves work-zone safety by significantly limiting the amount of time that travelers and workers are exposed to work zones.

During the execution of early ABC projects, costs were higher than conventional construction due to several factors, including increased costs for handling large elements and contractor risk. Costs have reduced with increased use, better detailing, and contractors becoming more comfortable with the process. In some cases, ABC can be less expensive than conventional construction, but in many projects, a premium for ABC

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work is a reality. This premium can be justified by the goodwill the owner can gain with the traveling public. Still, many agencies have budgets to adhere to and many bridges to replace, leading to hesitation to use ABC on a wide scale.

Reduced costs for traffic management and staged construction can help mitigate the increased bid prices for ABC. Another option to mitigate cost increases is through a reduction in construction management and third-party costs. Construction management is a real cost that is borne by the bridge owner. These costs include inspectors, materials testing, field offices, and back-office contract management. If ABC can reduce the overall project schedule, the owner can reap savings on these costs that are tied to the duration of the project. Management of construction involving full-time inspection, contract management, and field offices is a high cost to bridge owners. Railroad flagging costs are another source that the owner must bear during construction. These costs are not included in the bid cost, but they are assumed by the owner. If an overall project schedule can be reduced, the owner can potentially save a significant portion of the overall project costs. The amount of savings can vary by project, but construction management cost reductions can approach 15% to 20% of the overall project costs. These savings can be used to offset the potential premium cost for ABC. In some cases, the overall project costs for ABC can be less than conventional construction.

The use of ABC methods can drastically improve an outcome for the client or community. A recent example of this is the Atlantic Street bridge in Stamford, CT, which carries five tracks of the Metro-North Commuter Railroad with an overhead catenary system to transmit electrical energy to the trains. This railroad is one of the busiest rail corridors in the country, carrying over 250 commuter trains per day, numerous AMTRAK trains, and occasional freight trains.

In most cases, only one railroad track can be replaced at a time, making the replacement of bridges very costly and time-consuming. The Atlantic Street bridge was scheduled to take five years to reconstruct. By using ABC, the bridge was replaced in just two years. The bridge superstructures were constructed offsite and away from the rails, which reduced railroad flagging costs. The superstructures were install using Self-Propelled Modular Transporters (SPMTs), which allowed the installation to be performed underneath the existing catenary system, thereby saving millions of dollars with little to no disruption to the railroad network.

The Connecticut Department of Transportation's (CTDOT) Accelerated Bridge Construction Decision Matrix Guide, developed in collaboration with CHA, provides the proper guidance to evaluate the suitability and application of ABC for all bridge rehabilitation and replacement projects. This approach factors in many aspects of the impact of a project while examining total project costs. CTDOT uses this approach for ABC decision making on all bridge projects. In some cases, the construction management cost savings can easily exceed the construction cost premium, making ABC an easy choice.

CHA's work with the Federal Highway Administration (FHWA), **American Association of State Highway Transportation Officials** (AASHTO), bridge owners, industry, fabricators, and contractors has yielded numerous improvements to existing designs. It has led to the creation of innovative, new materials, and technological advancements in ABC. The key to continued use of ABC is simplicity; the simpler the design, the easier it is to build, and the more cost-effective it will be.

Until recently, bridge engineers had to rely on engineering judgment and past research to develop ABC designs. In 2018, AASHTO published the LRFD Guide Specifications for Accelerated Bridge Construction. CHA's Chief Bridge Engineer, Michael P. Culmo, was the principal author of this document. Designers now have a national standard to follow for the design of ABC projects. With this specification, ABC has finally arrived. The experiment has ended, and ABC is now standard practice across the country.

About the Author: Michael P. Culmo is the Chief Bridge Engineer at CHA Consulting, Inc. He has 37 years of experience in structural engineering, including roadway and bridge design and a breadth of experience with Accelerated Bridge Construction (ABC). He has spent nearly two decades of his career researching, developing, and promoting ABC technologies worldwide and regularly collaborates with state Departments of Transportation, federal transportation agencies, and academia to develop practical guidelines and standards for ABC. You can reach Mike at **MCulmo@chacompanies.com**.