



VIEWPOINTS | 2019

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Innovative strategies help address decaying bridges

Bridge owners explore new approaches to bridge funding, repair and replacement

While bridge owners held out great hope for the resources promised by the Fixing America's Surface Transportation Act of 2015, long-term infrastructure funding has continued to lag. Spirits were buoyed by President Trump's February 2018 Legislative Outline for Rebuilding Infrastructure in America and fiscal year 2019 Budget request, which points out the need for a permanent resolution to the Highway Trust Fund's fiscal instability. It stops short of proposing meaningful fixes, however. Meanwhile, White House and congressional leaders continue to identify public-private partnerships and other non-governmental sources to help pay for infrastructure needs.

The problem is larger than it looks

About 54,000 of the nation's bridges are rated as structurally deficient, according to a 2018 report from the American Road and Transportation Builders Association. Representing nearly 9 percent of the country's spans, these bridges are in desperate need of repair. Americans are crossing them 174 million times daily.

What's more concerning, however, is the number of bridges – and commuters – facing unseen dangers, like the one found unexpectedly on the Delaware River Turnpike Bridge. While conducting routine painting in January 2017, workers discovered a snapped fracture-critical member. The 61-year-old bridge, co-owned by the New Jersey Turnpike Authority and the Pennsylvania Turnpike Commission, carries more than 40,000 vehicles daily between New Jersey and Pennsylvania. It was closed immediately, along with two local roads and a state route below.

The irony? Although it experienced a critical failure and could have collapsed, the Delaware River Turnpike Bridge was not on the list of the 54,000 structurally deficient bridges.

Thanks to a precedent-setting partnership among the two state tolling authorities and HNTB, the repair was made and traffic restored in just two months. But these kinds of emergency repairs are expensive, and the bridge still needs to be replaced. New long-term funding plans are needed if we are to avoid repeats of that scenario. Can we afford this level of risk and expense?

Bridge owners face a dilemma

Bridge owners have long had to grapple with complex practical, political and financial factors when deciding how best to maintain, repair and replace bridges. What's more, they've been constrained by federal transportation rules that linked bridge funding to highly prescriptive contracting, engineering and construction processes. The FAST Act loosened many of those constraints in an effort to accelerate innovation and reduce unnecessary costs. While the act's funding hasn't been fully realized, its other provisions have taken hold.

Specifically, the FAST Act increased the availability of two key strategies that can help states proactively address deteriorating and dangerous bridges while achieving an optimal blend of efficiency, creativity and technical excellence.

Bridge bundling – the power of scale

The first example is bridge bundling. States are now encouraged to bundle multiple bridge projects into one larger project, which can then be awarded as a single contract. This authorization may be used to aggregate a specific set of projects or to undertake a statewide bridge improvement program.

With bundling, bridge owners can gain several advantages:

- **Simplicity:** They negotiate and manage one large contract for a collection of bridge projects, rather than dozens – or even hundreds – of contracts focused on individual projects.

- **Savings:** Large projects attract greater attention from major contractors, who compete aggressively to formulate a winning bid at an attractive price.
- **Efficiency:** When bridge projects are bundled, engineers can analyze their characteristics and design standard elements to be mass-produced, while builders can deliver economies of scale relating to materials, equipment and know-how.
- **Speed:** Winning contractors can hire a range of subcontractors – ready to begin work in communities where the bridges are located – to quickly ramp up construction while benefitting from standardized bridge elements and knowledge from other projects.

One example of the power of bridge bundling is found in Missouri, which in the fall of 2008 launched an ambitious \$685 million program to improve or replace 802 bridges statewide within five years. The 554 bridges slated for replacement were bundled into a mega design-build contract – the first of its kind in the nation – with a joint-venture contractor comprising national industry players. The contractor tackled the project by engaging, among other firms, more than 100 Missouri contractors and subcontractors, which lowered costs and boosted local knowhow. Such efficient sourcing, combined with collaboration and economies of scale unprecedented in bridge rehabilitation programs, contributed to the 554 bridges being replaced a full year early – and under budget.

Bundling doesn't have to be huge to work well, however. Over the past five years, the New York State Department of Transportation has created regional bundles of smaller projects to maximize the use of local contractors and make the projects more efficient from a location perspective. Nearly all projects in the state's first bundle were critical bridges over water. Most also included concerns about potential social erosion around their foundations, so they were funded in part by the Federal Emergency Management Agency. The original bundle – a mix of replacements and rehabs – was the state's first experience with using a design-build methodology, and the practice has continued. We see this grouping of smaller bundles based on region or other location-based criteria as a model for other states.

Accelerated bridge construction – harnessing creativity

The FAST Act also included reforms for accelerating bridge project delivery, thus reducing costs of bridge replacement projects, among other benefits. Specifically, it makes a way for the second of our two key strategies, called accelerated bridge construction, a relatively recent development in how cities and states plan and execute bridge replacements.

At the core of ABC is the acknowledgement that traditional processes for bridge replacement can take a significant amount of time and adversely impact social and economic wellbeing in nearby communities. Replacing a heavily used span over a river, for example, might traditionally demand the closing and removal of the existing bridge, followed by the building of a new one – a process taking years. Meanwhile, commuters would have to log many thousands of extra miles and endure delays due to detours and congestion. Commercial transportation efficiency would suffer and emergency services could be hamstrung. On the job site, workers would spend more months exposed to construction and vehicular risk, and opportunities for labor and material cost overruns would increase.

ABC can bypass many of these issues. Instead of adhering to a traditional, sequential approach, ABC allows bridge owners

to perform a range of activities concurrently and in controlled environments so they can more efficiently design, procure, prefabricate and erect replacement bridge systems. In most cases, they create the replacement bridge offsite, then transport it to the final location and secure it in place. Construction is faster, and the replacement activity itself can happen in as little as a few days, or even hours.

Every year, we see larger penetration of ABC – whether it's used on the entire project or selected elements. Owners are more and more schedule-sensitive. Rather than looking at construction costs alone, they are considering the costs of traffic and tolling disruptions. This is especially true in congested urban areas and with tolling agencies, where reliable travel times are important.

Time for analysis and action

Rather than continue waiting for increased infrastructure funding, bridge owners are taking action. They are focusing more on state-level funding and P3s. We also are seeing a greater use of availability payment options, where the public entity makes pre-established maximum periodic payments over time for the design, building, financing, operation and maintenance of the infrastructure. In addition, owners are embracing new, innovative delivery strategies to make headway with long-delayed bridge improvements and replacements.

As a first step, owners should work with partners to analyze existing at-risk bridges and prioritize those that can offer the most immediate returns on investment. Like any form of asset management, this requires a process that is thorough, objective and driven by the most comprehensive data available.

Analysis looks beyond the simple answers to uncover the most important priorities. For example, a structurally deficient bridge that carries 50,000 vehicles daily might initially seem a more urgent priority than one carrying just 5,000. Yet, perhaps the second bridge is a critical crossing for school bus traffic, ferrying a hundred buses filled with children every day. Factoring such differences into the asset management process enables more clear-eyed decision-making and eases the process of explaining priorities to a broad range of stakeholders.

The mandate for improving America's bridges is strong. This is no time for delay – our bridges aren't getting any younger.

About the Author

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