

CASE STUDY

Raising the Bar for Highway Bridge Renovation

The Kansas Turnpike Authority (KTA) was losing a significant volume of truck traffic due to dozens of bridges that were too low to accommodate oversized loads. Now, thanks to an innovative bridge raising program that kicked off in 2016, most of the KTA bridges that needed to be addressed first have now been raised to the needed clearance heights and toll revenue from trucking is on the upswing.



Challenge

Since 1956, the KTA has provided safe and economical travel for passenger vehicles and trucks on 236 miles of toll highway stretching from the Kansas City metro to the Oklahoma border. When the turnpike first went into service in the early years of the national interstate highway system, vertical bridge clearances were designed at much lower levels than those needed today. Over time, however, an increasing number of trucks, including many carrying large oversized loads, were being rerouted off the turnpike system to avoid bridge collision hazards.

A study launched by the KTA on how to best address this issue identified an initial group of bridges located south of Wichita that were priorities to be raised.

Project Stats

Client

Kansas Turnpike Authority

Project Cost

\$3.7 million

46

**BRIDGES RAISED
THROUGH FIVE
ROUNDS**

\$34M

**TOTAL DESIGN &
CONSTRUCTION COST
THROUGH 2022**

\$1.3M

**TOTAL COST
SAVINGS**

50%

**LESS TIME THAN
CONVENTIONAL
METHODS**

After deciding that the pace of the program needed to increase, the KTA turned to Burns & McDonnell and asked for a faster and more cost-effective way to raise bridges. The KTA also requested that the program be structured to increase freight traffic, streamline maintenance and improve safety.

Solution

In 2015, Burns & McDonnell proposed an innovative bridge raising program that utilized a progressive design-build (PDB) approach to improve efficiency and speed up the schedule for raising low-clearance bridges spanning the Kansas turnpike.

Upon receiving notice to proceed, Burns & McDonnell served as a turnkey design-build contractor and developed a bridge raising plan that could safely and efficiently raise the bridges over interstate traffic while minimizing disruptions to regular traffic on the turnpike.

Under this plan, construction teams deploy up to 10 hydraulic pumps on each bridge project, carefully pushing as much as 500,000 pounds of steel girders and concrete deck upward 1 inch at a time. After about a day of pumping, shimming, inspecting and repeating, the bridges are raised to the specified height, where they are placed on new bearings and secured with steel anchor bolts.

While the bridges are raised, the construction team also inspects and performs a range of routine maintenance, ranging from substructure concrete repairs to expansion joints, slab repairs and deck overlays. This value-added feature to the program has resulted in significant cost savings, while minimizing further disruptions to highway traffic. Significant safety improvements also are performed during the raisings, including median barrier improvements, bridge pier protection, guardrail and end terminal upgrades, and drainage and erosion improvements.

These value-added project elements have addressed and mitigated risks through contingencies to the project budget that cover any additional costs as needed. With the design-build method, these costs have typically been negligible because crews already mobilized to the site can complete tasks quickly and without change orders. In most cases, unspent contingency funds are returned to the KTA as overall budget savings that have helped improve program economics.

The program utilizes an assembly-line approach, where one crew executes the same or similar project tasks before moving on to another project underway at another site to tackle the same tasks. The method allows the overall program to move forward steadily with no downtime in the schedule.

As an additional efficiency, the program sources the new steel bolsters needed on the raised bridge decks from AZCO, a Burns & McDonnell construction division specializing in fabrication of structural steel components. With AZCO fabricating these long-lead components to precise specifications well before they are needed on the project site, additional schedule risk is mitigated.

Thanks to this schedule optimization and sourcing efficiency, six to seven projects have been started and completed on average each year since the program began.

Results

In 2016, Burns & McDonnell completed the first phase of the program bridge raisings, with 11 bridges raised over the I-35 portion of the turnpike system. This first round validated the overall program approach, resulting in significant savings and reducing schedule by approximately 50% over the time that would typically be required under a conventional design-bid-build contract.

With completion of five rounds of the program through 2023, 46 of the lowest and most critical bridge structures have been raised to the specified height of at least 15 feet, 9 inches of clearance.

Total design and construction costs through the commencement of Round 5 were \$34 million, a savings of \$1.3 million over the costs anticipated for bridge rehabilitations using conventional design-bid-build delivery methods. Just as important, the program has experienced no OSHA recordable safety incidents. This is a significant achievement on a program that has made substantial improvements in the safety and efficiency of freight transport on the turnpike.

About Burns & McDonnell



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