Indiana Accelerated Bridge Construction Case Study

tech transfer summary

The construction on this ABC slide-in bridge project on SR 121 over I-70 in east central Indiana was procured using a cost-plus-time method called A+B bidding; this summary includes key take-aways from the project.

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RESEARCH PROJECT TITLE
Bidding of ABC Projects: Case Studies and Consensus Building

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The Accelerated Bridge Construction University Transportation Center (ABC-UTC) has assembled an experienced, knowledgeable, and engaged group of bridge academics and engineers who collectively provide the transportation industry with the tools needed to effectively and economically utilize the principles of ABC to enhance mobility and safety and produce safe, environmentally friendly, long-lasting bridges.

FLORIDA INTERNATIONAL UNIVERSITY

Project Description

The project summarized in this technology transfer summary is an accelerated bridge construction (ABC) project for twin bridges over State Road (SR) 121, carrying both east and westbound I-70 in Wayne County, Indiana. The project was originally slated to be constructed using conventional means of project delivery, and the Indiana Department of Transportation (INDOT) initially procured a designer for the conventional design. However, once a field visit was conducted, it became apparent that this project was a candidate for accelerated bridge construction.

The agency began developing plans for two types of ABC: slide-in and self-propelled modular transport (SPMT). The plan for construction was to maintain traffic on the existing bridge while the substructure was created for the replacement bridge. Once the substructure was competed, traffic over the existing bridge was closed, and the contractor had eight days to move in the new bridge superstructure and reopen the roadway to traffic. The project delivery system was design-bid-build utilizing the A+B bid method.

Why ABC

The project was identified as an ABC candidate primarily because of the presence of an available staging area next to the bridge site. The staging area allowed for either SPMT or slide-in construction. In addition, INDOT designated the project as an ABC candidate in order to develop experience with this type of construction within the agency.

I-70 over SR 121 in Wayne County, Indiana

Design and Cost Estimating

The schedule for the project was developed using the critical path method and discussions with INDOT construction staff. The cost estimate for the project was developed using the ABC-UTC webpage, which at the time of planning was up to date with bid tabs that allowed INDOT staff to evaluate and compare projects that were relevant to the INDOT project. The risk that was included in the estimate was included in the slide-in unit bid.

Input provided by INDOT's Traffic Section stated that closures on Fridays should be avoided due to the high traffic volumes during the afternoon peak. The Traffic Section also recommended avoiding closures during the summer months.

ABC Procurement

In Indiana, most projects are design-bid-build and are procured using low-bid procurement, although some projects are design-build.

The design consultant for the project was procured via a request for qualifications (RFQ). The contractor was procured using A+B bidding. A+B bidding is a cost-plus-time bidding procedure.

The A component of the bid is similar to low-bid, representing the unit prices for the contract. The B component is the number of days that the contractor expects the work to take. The A component is then added to the B component to generate the contractor's final bid. The bidder with the lowest final bid (both components) is awarded the contract, for the amount specified in the A component of the bid.

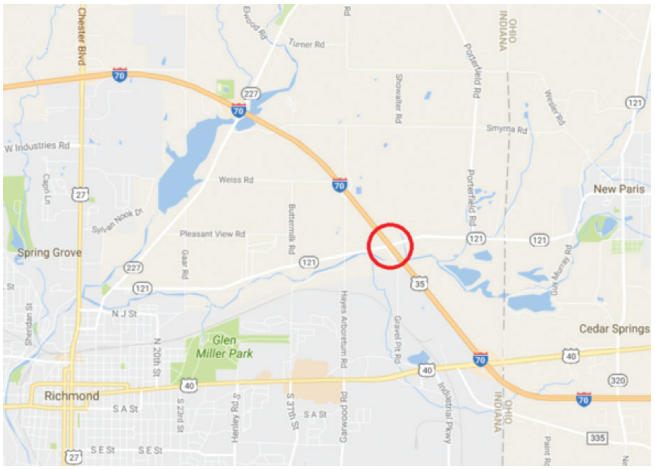
In this case, the A component included the typical low-bid unit prices used for state construction projects, such as concrete per cubic yard and reinforcing steel bar per pound. The B component included an estimation of the cost to road users of construction on the roadway. The A+B bidding method was used to allow for closure time to be considered, instead of only the low-bid procurement amount.

INDOT took the unusual step of developing two plan sets for this project, one for slide-in bridge construction and the other for SPMT. INDOT requested the two plan sets to gauge contractors' interest in both types of ABC. Contractors had to select one option in their bid. Bids were only received for the slide-in plan set. The SPMT option was not bid due to the high cost of the equipment, along with contractor concerns of constructability due to the small stroke of the SPMT equipment.

Contracting

The contract included incentives and disincentives based on the cost to road users of construction. The road user costs used to develop the incentives and disincentives were developed and adjusted by INDOT construction staff.

The incentives were capped at $170,000 for both the eastbound and westbound lanes of the bridge, and the incentives on SR 121 were capped at an additional $50,000. The contract also provided incentives to encourage the contractor to avoid construction on Fridays. The disincentives kicked in if the closures for the new bridge exceeded the eight days specified in the contract.



Location of the I-70 bridge over SR 121 in east central Indiana

ABC Construction

The project was constructed using the slide-in technique, with both replacement bridges constructed next to the original bridges. The original bridges were then demolished, and the new bridges were slid into place. During construction, a tolerance system was used by the contractor to ensure the final bridge location would be correct. During the slide-in, the tolerances were found to be too strict. A more relaxed tolerance system was needed to facilitate the slide-in.

Key Takeaways

- With a slide-in bridge, the most focus is typically placed on the slide itself. For this project, the slide went well, but in hindsight, the design of the substructure could have been of greater focus. During this process, the initial substructure design was not feasible; thus, the design work had to be repeated. A cost-effective solution to the substructure design was difficult to find.

- A mock-up was performed to ensure all equipment worked and that personnel were trained prior to the official slide. This ensured there were no surprises during the slide, and worked well for the contractor.

- The slide-in engineering that had to be done by the contractor was subcontracted out and was stamped by the engineer only after the engineer of record (EOR) for the bridge approved the plans.

- In terms of the bidding, the sliding component of the project was less expensive than expected.

Acknowledgments

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