Research Notes

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Decision Tool for Accelerated Bridge Construction

Accelerated Bridge Construction (ABC) is recognized as an important method to design and rehabilitate highway structures. ABC uses new technology and innovative project management techniques to reduce overall bridge costs and minimize the impact of construction on the public. In particular, ABC can substantially lower user delays, reduce traffic congestion, increase work zone safety, and provide more durable bridges. Accelerated Bridge Construction often employs prefabricated elements and systems (PBES), and transportation professionals agree that PBES last longer and perform better because of higher quality materials and shop-controlled fabrication. However, like any new technology, direct construction costs for ABC are generally higher than for conventional construction. Various DOTs have used ABC when there has been a perceived benefit, but transportation personnel did not have an established protocol to quantify the benefit of using ABC over traditional construction for specific bridge replacement or rehabilitation projects. Consequently, this research, conducted by Oregon State University and funded by multiple states, developed a project-level tool for engineers and decision-makers to quantitatively assess the utility of using AB

After a comprehensive literature review, the research team recommended that a decision-making method called Analytical Hierarchy Process (AHP) be used as the basis for the decision tool. AHP is a framework to compare and prioritize decision alternatives with respect to multiple criteria. The power of AHP is that it takes a complex decision situation with many considerations, breaks it down into a series of comparisons that are tenable, and then assembles the results into a rational decision outcome. For the bridge construction decision tool, the alternatives were ABC and conventional construction. The project's technical advisory committee and the research team established the criteria hierarchy consisting of five criteria: schedule constraints, indirect costs, direct costs, site constraints, and customer service. Each criterion was further expanded into two to nine subcriteria. For example, Indirect Costs was divided into user delay, freight mobility, revenue loss, livability during construction, road-users exposure, and construction personnel exposure. For Customer Service, the subcriteria were public relations and public perception. Though the criteria hierarchy was established to cover all factors pertinent to deciding the type of bridge construction to deploy, the decision tool user determines the importance of each criterion relative to the other criteria. The user also has the option to include a criterion that is not currently in the hierarchy to account for unusual situations.

The research team created the decision tool as a stand-alone computer application, tested and refined the application by applying it to actual bridge projects, and modified the user interface based on feedback from the beta testing. The results have shown that the decision tool is a powerful aid in providing a rational basis for construction decisions. The application will be available to all transportation agencies through the FHWA Web site.

ABC in action: an old bridge is moved to the side and a new bridge is slid into place.

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The final report for this project was published in December 2011 on the Research Section's web page:
http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/2011/ABC.pdf