

Executive Summary, Research Readiness Level Assessment, and Technology Transfer

Accelerated Bridge Construction (ABC) Decision Tool

Research Objectives

The main objective of the study is to develop a decision-making framework to help inform NDOT on the applicability of ABC methods on the various bridges within the transportation network in Nebraska. The study will obtain data specific to Nebraska and develop a decision model to compare the use of ABC as compared to traditional methods using factors weighted on importance to achieving agency objectives. Weighted factors may include direct costs, user impacts, average daily traffic, site conditions, safety, and other pertinent factors impacting construction methodology. The specific factors and weighting will be determined in coordination with NDOT during the research study. The project will result in development of an ABC Decision Tool that will serve as a framework to allow NDOT to rigorously determine and prioritize the use of ABC on candidate bridges in need of replacement or new construction which will provide the agency with the most value. The decision tool is intended to be used early in the preliminary project development phase to evaluate design and construction methodology alternatives.

Research Benefits

The results of this study can be used to help NDOT determine the best candidate bridges to utilize ABC early in the design and construction methodology decision making process. The decision tool can serve as a preliminary screening process to identify bridges with attributes that benefit most from the use of ABC. Early identification of good candidate bridges allows the NDOT to better implement ABC methods to maximize the benefits and minimize the costs of ABC in a budget constrained environment.

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Background

A challenge transportation asset managers face is the need to cost effectively prioritize the repair and replacement of the large inventory of deteriorating bridges while considering the increasing budgetary constraints. Accelerated bridge construction (ABC) is defined by the FHWA as bridge construction that uses innovative planning, design, materials, and construction methods in a safe and cost-effective manner to reduce the onsite construction time that occurs when building new bridges or replacing and rehabilitating existing bridges. ABC techniques have a great potential to minimize the traffic disruptions during bridge replacements and construction, promote traffic and worker safety, and improve the overall quality of the built bridges. Despite the major advances in design and construction of ABC techniques, some agencies are hesitant about using ABC techniques due to risks during construction and perceived higher initial costs. In addition, oftentimes the current decision process used to determine and prioritize the candidate bridges for this type of construction can be based solely on average annual daily traffic (AADT), where this may be prudent to evaluate based on several factors. A decision-making framework incorporating important factors in determining the suitability of ABC in Nebraska will allow NDOT to find the best fit candidate bridges to maximize the benefits of Accelerated Bridge Construction.

Conclusion

This report investigates the creation and assessment of a decision-making tool developed to aid the Nebraska Department of Transportation (NDOT) in determining the suitability of the Accelerated Bridge Construction (ABC) method for bridge replacement projects. The tool utilizes the Analytic Hierarchy Process (AHP) to integrate different criteria, including Average Daily Traffic (ADT), Average Daily Truck Traffic (ADTT), detour time, railroad impact, economy of scale, and the use of typical details, which were found to be paramount in the decision-making process across the state. A sensitivity analysis was conducted to evaluate the tool's performance and identify the most significant factors influencing the implementation of ABC for average Nebraska bridges. After testing the tool on a dataset of 123 local bridges needing replacement, it identified 10 confirmed candidates for ABC, 38 requiring further evaluation, and 75 more suitable for traditional construction methods. Additionally, the developed tool was compared with two existing decision-making tools from other states, showing similar results in 80% of the bridge replacement cases.

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Final report is available:
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NDOT Recommendations Based Off Research Project

This research did not provide the results desired by the NDOT. The study did not obtain data specific to Nebraska and develop a decision model to compare the use of ABC as compared to traditional methods using factors weighted. There was little verification of the ABC Decision Tool, only a comparison to existing ABC models from other states. NDOT is not looking into accelerated construction tools until FHWA creates their own ABC model, which NDOT will consider before revision or verification of the ABC Tool provided by this research.

- *As provided by Jaber Fouad, Lead TAC Member*

Research Readiness Level (RRL) Assessment

Level 1: Basic Research

Concept; develop/improve tools for design, data collection.

RRL 1

Technology Transfer

Principal Investigator did not have any technology transfer for this research project.

**This brief summarizes Project SPR-FY22(009)
“Accelerated Bridge Construction (ABC) Decision Tool”
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