

JOINT TRANSPORTATION RESEARCH PROGRAM

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SPR-4843

2025

Advancing Accelerated Bridge Construction and Fabrication in Indiana

Introduction

The aim of this research was to increase the use of accelerated bridge construction (ABC) and accelerated bridge fabrication (ABF) in Indiana. Specific research objectives included: (1) understand barriers to implementing ABC and evaluate ABF capabilities in Indiana, (2) investigate the benefits and limits of various ABC/ABF strategies specific to Indiana, and (3) develop guidelines and recommendations for implementing ABC/ABF in Indiana.

The focus was on the scoping stage with the goal of triggering early in the process which projects are potential candidates for ABC or ABF. Early triggering of projects is particularly important for a traditional design-bid-build (DBB) contract where the development of an ABC design would likely require extra time. The intent was not to create a tool with a binary answer for whether a project should use ABC or not. Rather, the intent was to identify potential ABC projects earlier and provide tools to those involved throughout the process to make site-specific decisions. This is particularly important given that the higher initial cost of ABC is a major barrier to its broader use in Indiana. The tools developed in this research can help identify projects where the benefits of ABC can justify that added cost.

Research tasks included: (1) reviewing and synthesizing existing guidelines and recommendations for the use of ABC from the Federal Highway Administration (FHWA) and other Departments of Transportation (DOTs), (2) interviewing key

stakeholders in Indiana to understand existing challenges to using ABC/ABF and potential opportunities, and (3) investigating and developing methods for evaluating bridges at a system level and a site-specific level for the potential use of ABC.

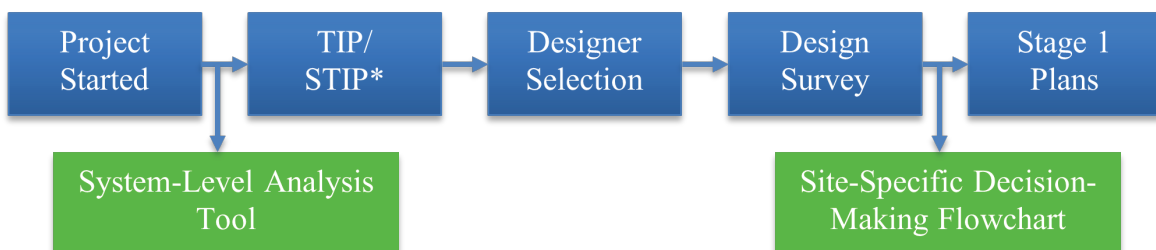
Findings

Findings from synthesizing existing guidelines and recommendations:

- Existing documents on ABC from the FHWA and DOTs across the country were reviewed and categorized as (1) manuals, (2) decision-making tools, or (3) other resources.
- Utah DOT's and Connecticut DOT's decision-making tools, while state specific, offered starting points for the system-level analysis developed in this research.
- For prestressed concrete girder bridges, ABF documentation included design manuals from the Precast/Prestressed Concrete Institute (PCI) and standardized girder sections. For steel girder bridges, ABF practices focused on press-brake formed tub girders and precast decks on steel beams.

Findings from interviewing key stakeholders in Indiana:

- A total of 24 stakeholders were interviewed, including designers, fabricators, contractors, asset managers, district directors, construction inspectors, load raters, and others.



*Transportation Improvement Program/State Transportation Improvement Program

Figure 1. Steps of the Existing Progress Development Process With Developed Methods Shown in Green

- Major recommendations from the interviews included:
 - Clarify INDOT expectations and goals for ABC/ABF;
 - Focus on prefabricated bridge elements and systems as method for ABC;
 - Improve communication between designers, fabricators, and contractors at the scoping stage;
 - Enhance early engagement with the fabricators and contractors during Stage 2 of design by providing detailed designs and information;
 - Standardize components to improve efficiency and reduce costs;
 - Provide clear project definitions and decision-making processes;
 - Incentivize stakeholders to be trained/educated and to participate in ABC/ABF projects.
- Additionally, communication gaps during traditional Design-Bid-Build (DBB) contracts were cited by contractors and fabricators. INDOT may benefit from enhancing the Stage 2 review process to specifically flag ABC-identified projects, improving early contractor awareness and collaboration.
- As prestressed concrete girders dominate the bridge market in Indiana and there are existing PCI design manuals for their use, the remainder of the project focused only on ABC as opposed to ABF.

Findings from investigating and developing methods for evaluating bridges for ABC:

- Based on discussions with the Study Advisory Committee (SAC), a two-stage approach for evaluating which bridges should be prioritized for ABC was developed, including (1) a system-level analysis tool that scores all bridges in the Indiana Department of Transportation (INDOT) inventory and (2) a site-specific decision-making flowchart to be used at an early stage of design for a specific bridge (see further discussion in Implementation).

Implementation

This research has led to two products for INDOT to use to determine if a project should be considered for ABC:

- *System-Level Analysis Tool*: A Python-based computer code has been developed that uses

existing data and automatically scores all bridges in the Indiana bridge inventory according to their potential for ABC. The scores are calculated based on available data in the Indiana Total Assets Management Systems (iTAMS) for the following criteria: (1) average daily traffic (ADT), (2) facility carried, (3) geometry, (4) clear roadway, and (5) detour length. The computer code is included in Appendix B. A user manual, included in Appendix C, has been written to facilitate use by INDOT. The computer code will be stored and used internally by INDOT.

- *Site-Specific Decision-Making Flowchart for ABC*: Based on the findings of this research, a set of guidelines and recommendations for using ABC have been developed to further evaluate if ABC should be used for a specific bridge. This flowchart is intended to be used at an early stage in the design process. The flowchart will be made available on the INDOT Bridge Design website.

The intention is that the system-analysis tool could be used periodically (e.g., once per year) to score all bridges in the inventory. Then, during the scoping stage of a bridge project, an INDOT asset manager could consult the scores to determine if a bridge is a strong candidate for ABC early in the process. The site-specific decision-making flowchart for ABC would be used later in the project by the designer (e.g., during early design development).

This research was disseminated through a poster at the Joint Transportation Research Program Poster Session and a Master's thesis.

Recommended Citation for Report

Duarte, C. N., & Thrall, A. P. (2025). *Advancing accelerated bridge construction and fabrication in Indiana* (Joint Transportation Research Program Publication No. FHWA/IN/JTRP-2025/12). West Lafayette, IN: Purdue University. <https://doi.org/10.5703/1288284317858>

View the full text of this technical report here: <https://doi.org/10.5703/1288284317858>

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