ABC UTC
ACCELERATED BRIDGE CONSTRUCTION
UNIVERSITY TRANSPORTATION CENTER

ABC-UTC GUIDE FOR:

DEVELOPMENT OF GUIDELINES TO ESTABLISH EFFECTIVE AND EFFICIENT TIMELINES AND INCENTIVES FOR ABC

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ABSTRACT

These guidelines summarize the process to establish effective and efficient timelines and incentives for accelerated bridge construction (ABC) projects. The information will be of interest to highway officials; bridge construction, safety, design, and research engineers; and others concerned with the implementation of ABC projects.

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1. INTRODUCTION

Accelerated bridge construction (ABC) techniques are rapidly gaining acceptance as an alternative to conventional construction methods to reduce construction duration and minimize the impact of closures at the network level. There are different types of ABC, and each technique has its limitations and its own speed of completion. The choice of using ABC depends on a host of different factors, including the availability of capital funds for its implementation, its impact on the traveling public, and socio-economic considerations.

While many states have implemented a multitude of different ABC techniques, the decision making process for choosing ABC over conventional construction, the costs of ABC, the type of ABC techniques used, and the associated timelines and incentives for faster completion are not clear.

The guidelines presented in this document aim to address this lack of clarity. The guidelines can be used in states where ABC techniques have not yet been implemented to inform decision making regarding the adoption of ABC techniques and to justify investment in the higher direct costs of ABC.

The guidelines were developed through a review of the available literature and interviews with a few states that have implemented ABC at different levels. It was found that the major factors impacting the timelines for ABC projects are the impacts the closures might have on the socio-economic aspects of the community. While most states acknowledge the importance of indirect costs, there is no mathematical formulation to account for these costs in the final decision making process. Most decisions are made based on qualitative input from the districts and discussions with the public. For the establishment of incentives, most states suggest using a procedure similar to that followed for conventional construction and that follows the Federal Highway Administration (FHWA) guidelines.

The guidelines resulting from this research include the following steps:

1. Define a process: Identify the offices and individuals that will take part in the decision making process.

2. Define the appropriate performance measures: Set performance measures and develop a rating scheme for assessing the applicability of ABC to the bridge project.

3. Score the ABC project: Score the applicability of ABC techniques to the bridge project based on the rating scheme developed for each selected performance measure.

4. Set a threshold for ABC to be considered: Set a threshold for determining whether ABC will be considered for the project. Bridges falling below the threshold will be built using conventional construction techniques.

5. Second stage of decision making: The oversight group (identified in step 1) evaluates the feasibility of the ABC techniques to be implemented. This may result in the bridge being built using conventional construction.

2. DEFINE A PROCESS

The typical approach to defining a decision making process in most states is to develop a multi-level team that includes a concept team and an oversight team to make decisions on the selection of the bridge candidates for ABC.

The concept team can include individuals from offices that manage bridges, design, and environmental concerns who conduct the preliminary studies. A multi-stage or single-stage process can be used to investigate the feasibility of ABC techniques for bridges and develop a scoring or rating system using identified performance measures. Different states may decide to conduct this analysis in a coarse manner using a scoring or rating scheme or use more sophisticated techniques such as analytical hierarchy process (AHP) decision making software.

It is expected that the results will then be communicated to the oversight team that will take part in the prioritization of bridge candidates for ABC techniques. While the focus of the concept team is generally to rate the feasibility of ABC techniques for candidate bridges, the role of the oversight team is to ensure the availability of resources and funding for prioritizing the candidate bridges for ABC.

In an ABC rating process, a set of performance measures is defined and a rating scheme is developed to assess the applicability of ABC to a bridge project. This allows the preliminary design team to justify the need for ABC at a specific site.

Most of the available decision making guidelines use a scoring system that is then integrated with a modified version of an AHP tool. At this stage, the concept team initially assesses the applicability of ABC to the bridge construction process. The resulting score technically acts as a filter by ranking the suitability of bridge replacement candidates for ABC based on a set of measures. Table 1 in the research report for this project provides a list of the available measures and a list of the states that use them to score the suitability of ABC techniques versus conventional construction methods for bridge projects.

3. SCORE THE ABC PROJECT

The scoring of the suitability of ABC techniques is largely carried out by the concept team. At this stage, based on the identified performance measures and the rating score, which falls within a set range of values (normally between 0 and 100 or 0 and 10), the viability of ABC techniques for the candidate bridge is considered. Bridges that receive a higher score are more suitable for ABC.

4. SET A THRESHOLD FOR ABC TO BE CONSIDERED

Based on their priorities, previous scoring, previous experience with ABC, and a suite of other factors, departments of transportation (DOTs) define a threshold score to determine the viability of ABC for a project. A review of the available state ABC guidelines shows that most use the mean value of their scoring criteria (for example, 5 for 0 to 10 and 50 for 0 to 100) as the

threshold that allows a bridge to progress to the next stage of evaluation. In this case, bridges that have a score higher than the threshold automatically move on to a more detailed evaluation and further consideration.

All of the states that were studied in this research had a mechanism for districts to request further analysis of bridges that receive a score lower than the threshold. The additional analysis is based on factors such as long detours, environmental issues, safety issues, lost local business revenue, and critical infrastructure for emergency routes.

5. SECOND STAGE OF DECISION MAKING

For the second stage of decision making, the approach accepted by most states is to use ABC AHP tools to qualitatively analyze various construction alternatives. ABC AHP uses pairwise comparisons to evaluate the importance of defined factors relative to other factors using either a numerical or verbal scale. AHP consists of three components: the overall goal of the decision, a hierarchy of criteria by which the alternatives will be evaluated, and the available alternatives.

AHP considers five major criteria for decision making: direct costs, indirect costs, scheduling constraints, site constraints, and customer service.

The concept team members perform the ABC AHP analysis as a group to take advantage of the members' diverse experience. District staff can also offer intimate knowledge of local site constraints, community concerns, and other relevant information that may not be available to concept team members.

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