CDOT Department of Transportation

**Accelerated Bridge Construction**

**Decision Making Process**

**2012**

**Introduction**

In the past, the Department used an Accelerated Bridge Construction (ABC) Decision Chart during project scoping to determine if ABC was appropriate for the site. This chart was based on the Federal Highway Administration Manual entitled “Decision-Making Framework for Prefabricated Bridge Elements and Systems (PBES), May 2006”. This process was based on a set of questions regarding specific constraints of each project. If certain thresholds were met, ABC was recommended.

A new approach has been developed for the decision-making process for accelerated bridge construction. This guide outlines the approach to the new process and how it is used during project development. Attachment “A”, the ABC Evaluation and Decision Matrix workflow has been developed to assist project engineer and planners in the implementation of this new process.

**Definitions**

SME Subject Matter Expert

 ABC Accelerated Bridge Construction

 MOT Maintenance of Traffic

AHP Analytic Hierarchy Process is a structured technique for organizing and analyzing complex decisions.

ADT Average Daily Traffic

EDC Every Day Counts initiative is designed by FHWA to identify and deploy innovation aimed at shortening project delivery, enhancing the safety of our roadways and protecting the environment

**Approach**

ABC is standard practice for project delivery, efficiency and fast construction. The Department has committed to utilizing ABC as a tool to achieve the following goals:

* Embrace FHWA’s Every Day Counts (EDC) initiatives
* Decrease and minimize MOT (reduce user costs associated with delays)
* Encourage innovation
* Increase safety to the public and workers

In an effort to make the use of ABC more approachable a straight forward 2-step process has been developed:

1. The first step, shown in Attachment “B”, is completed at the pre-scoping level based upon ADT and basic understanding of the site constraints. If there is no benefit from ABC the evaluation process is completed and documented in the first step.
2. The second step, utilizes the FHWA AHP software, is a more in-depth evaluation to select the most appropriate ABC method (examples shown in Attachment “C”) to meet the project goals and constraints. The second step will take place after scoping but before FIR design is complete. It is an interactive process completed with the specialty groups and led by the project engineer and a CDOT subject matter expert. Summaries of each step of the process should be captured in the Structure Selection report prepared by Staff Bridge or the Bridge Design Consultant.

The intent of the selection process is to apply some form of ABC on most projects. The second step of the process provides suggestions on ABC methods that will determine the appropriate level of ABC. CDOT already commonly utilizes some form of ABC such as pre-cast adjacent girders. With a process in place CDOT’s goal is to have more projects utilize ABC methods of construction and EDC initiatives.

 **ABC Measures**

Eight measures of project constraints have been identified as being applicable to the ABC decision process. The following is a brief description of each measure and how they apply:

Average daily traffic:

This is a measure of the amount of traffic traversing the bridge site. Use a value equal to the total number of vehicles on the bridge and on the roadway under the bridge (if applicable). The value of maintaining the interstate highway network is accounted for in this measure by assigning the maximum score for this situation. This measure addresses minimizing impacts to the traveling public during construction.

Delay/Detour time:

This is a measure of the time impact that a project has on vehicles passing through the construction site. Account for the construction time delays due to detours and congestion caused by construction. If delays are anticipated for both the roadway on and under the bridge, enter the worst case scenario. This measure addresses minimizing impacts to the traveling public during construction.

Bridge importance:

This measure is used to account for bridges that are on or over a designated evacuation route or part of a critical lifeline route that will be used in an emergency. Accelerated bridge construction can be used to minimize time of impact for these important roadways. This measure addresses minimizing impacts to the traveling public during construction and accelerating replacement.

User costs:

This is a measure of the financial impact of a construction project on the traveling public. The major contributing factors in calculating user costs are the delay time and ADT, but the duration of the impact to users is the key component in measuring the encumbrance to the traveling public. The Department has instituted standard methods for calculating user costs. Calculate the user costs in coordination with the regional traffic engineer to determine the total project cost for each construction option that is being evaluated (SPMT bridge move, prefabricated elements, conventional construction, etc.). This measure addresses minimizing impacts to the traveling public during construction, reducing total project costs and encouraging innovation.

Economy of scale:

This measure accounts for the repetition of the elements and processes, and how they relate to the overall cost of a project, as well as the possible savings to future projects. The total number of spans is used in order to account for repetition of substructure elements as well as superstructure elements. This measure addresses reducing total project costs.

Safety:

This is a measure of the relative safety provided to the traveling public and the work force at the construction site. Accelerated bridge construction and the use of prefabricated elements will reduce the exposure time of travelers and workers to these dangerous environments. Project sites that require complex MOT schemes for extended periods of time are undesirable. The goal of ABC is to minimize this exposure to both the traveling public and the workers on site. This measure addresses increasing safety to workers and the traveling public during construction.

Railroad impacts:

This is a measure of the impact of the project on railroad traffic. The number of trains and type of train are used to measure this impact. This measure addresses total project cost, increasing safety to workers and minimizing impacts to commerce.

Site Conditions:

This is a measure of physical constraints that may inhibit the use of ABC. Vertical profile shifts over 1 foot greatly impact if not inhibit the ability to accelerate the construction. Also time sensitive utilities can dictate the construction window to undermine the ability to accelerate construction. This measure addresses physical fatal flaws to the ABC delivery process.

The ABC measures described above have been incorporated into a Pre-Scoping ABC Rating procedure to help determine where the use of ABC is appropriate. This procedure is described on the next page. The range of scores to be used with the ABC Decision flowchart has been set to ensure that accelerated construction will be commonplace when the measured benefit is more significant than the measured cost with respect to accomplishing FHWA everyday counts initiatives and CDOT’s goals.

 *Environmental issues:*

*The presence of endangered species or annual spawning seasons can lead to short construction windows. In other cases, projects may have limitations due to wetlands, air quality, extreme weather or noise. Accelerated bridge construction may be necessary to accomplish an acceptable level of impact on the surrounding environment. This measure does not specifically address a goal and is not a weighted factor; rather, it is included on page 3 of the Pre-scoping ABC Rating (Flowchart) to evaluate if ABC can provide appropriate mitigation to an environmental commitment or requirement.*

**Pre-Scoping ABC Rating – Attachment “B”**

**ABC Rating Procedure**

This procedure has been developed to calculate an ABC rating score that accounts for all of the project measures defined in the previous section (except environmental issues). Weighting factors have been assigned to each measure to coincide with FHWA’s everyday counts initiatives and CDOT’s goals. Do not change the weighting factors for individual projects.

The values assigned to each project decision measure are multiplied by the corresponding weight factor. The ABC Rating Score is the ratio of the weighted score to the maximum score shown as a percentage. The ABC Rating Score has been categorized into three ranges. The minimum score of 20 is intended to capture any project receiving a score of 5 in any one of the 4 most heavily weighted categories. The higher threshold score of 50 is intended to capture any project receiving an average score of 3.5 in the 4 most heavily weighted categories. Each of the three rating ranges lead to a different entry point on the corresponding ABC Decision Flowchart. Use the ABC Rating Score to enter the flowchart and work toward a conclusion.

**ABC Decision Flowchart**

The ABC Rating Procedure is the first step in the determination of whether accelerated bridge construction is appropriate for each project. The ABC Decision Flowchart uses the ABC rating score and then addresses yes/no factors that need to be considered prior to making a final decision on construction approach. These factors include project schedule, environmental issues, total project cost, site conditions and high-level indirect costs such as political capital, safety or possible impacts to stakeholders. Together, the ABC Rating Procedure and ABC Decision Flowchart can be used to make a final determination on the appropriate construction methods for each project. The following pages depict the ABC Rating Procedure and the ABC Decision Flowchart.

If ABC is determined to be beneficial to the project at the Pre-scoping level using this rating method and flowchart, then the design should proceed to a conceptual level to better identify site constraints and issues. Then follow the second step and complete the AHP with the specialty groups present to identify the best method of ABC to meet the project goals.

ABC Construction Matrix – Attachment “C”

The ABC Construction Matrix provides suggestions on accelerated methods that can be applied based on the complexity of the project. This is guidance on getting started and other innovative solutions are encouraged, especially if the project is delivered as a CM/GC or Design-Build.

Approval of ABC:

Approval of ABC is at the regions discretion and should be communicated at a level commensurate with the level of ABC. E.g. an SPMT bridge roll-in ABC method should receive approval by the RTD and Chief Engineer, whereas adjacent precast element ABC method can be determined at the program or resident engineer level.