Accelerated Bridge Construction Decision Making Process 2010

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. A spreadsheet has been developed to assist project planners in the implementation of this new process.

Approach

ABC is standard practice for project delivery, efficiency and fast construction. The Department has recently adopted themes that are now used as the basis of all projects in Utah. The themes are as follows:

- Accelerate Delivery – Design and Construction
- Decrease and Minimize MOT (Reduce user costs associated with delays)
- Encourage Innovation
- Get a good price

ABC can be used as a tool for the incorporation of these themes. In an effort to make the ABC decision making process more in line with these themes, the Department has developed a new process. The previous chart was based on a series of go/no-go decisions. In reality, many of these decisions are more measured. A definitive answer on whether or not to use ABC based on individual factors is not always appropriate.

In the past, one project factor out of the eleven selected factors could drive the decision process. The new approach involves measured responses to each factor. The individual factors are weighted in order to be consistent with the Department themes. The weighted factors are then used to calculate an ABC rating, which is used to provide direction on the use of ABC for the project. If the Department policies and direction change in the future, the weighting factors can be adjusted to coincide with the changes.

The result of this new approach is that a bridge with one significant control factor may actually rate lower than a bridge with several moderate control factors.

This approach will not change the decision-making process outcomes for projects that are on the outlying boundaries of the controls. Bridges where ABC was an

obvious choice before will remain as such. Conversely, bridges where ABC was not appropriate before will also remain as such. This new process will be helpful for bridges between these extremes where the use of ABC is in question.

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 to the current Department themes:

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 the Department theme of **Decrease and Minimize MOT**.

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 the Department theme of **Decrease and Minimize MOT**.

Bridge classification:

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 such as a major earthquake. Accelerated bridge construction can be used to minimize time of impact for these important roadways. This measure addresses the Department themes of **Decrease and Minimize MOT and Accelerate Delivery**.

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 Structures Division Project Manager and the TOC and determine the total project cost for each construction option that is being evaluated (SPMT bridge move, prefabricated elements, conventional construction, etc.). This measure addresses the Department themes of **Decrease and Minimize MOT, Get a Good Price and Encourage 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 the Department theme of **Get a Good Price**.

Use of typical details:

This is a measure of the potential to make use of Department typical details that have been developed for ABC. Most bridges can be successfully built using ABC; however there are instances where the complexity of the bridge geometry makes use of typical details impractical and costly. Contact the Structures Division Project Manager to evaluate the bridge site and determine the level of complexity as it relates to various ABC techniques. The use of typical details will lead to more repetition of elements, faster construction times, higher quality, and reduced prices. This measure addresses the Department themes of **Get a Good Price and Accelerate Delivery**.

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 the Department themes of **Decrease and Minimize MOT and Accelerate Delivery.**

Environmental issues:

This is a measure of the project's impact to the surrounding environment. 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 department theme and is not a weighted factor; rather, it is included in the ABC Decision Flowchart to evaluate if ABC can provide appropriate mitigation to an environmental commitment or requirement.

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 the Department themes of **Decrease and Minimize MOT and Accelerate Delivery**.

The ABC measures described above have been incorporated into an 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 Department themes and project goals.

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 the current Department themes. 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.

Utah Department of Transportation 4501 South 2700 West Salt Lake City, UT 84114	Project:	Hypothetical Bridge Project		
	By:	JJS	Checked:	CELS
	Date:	8/30/2010		8/30/2010
	Sheet No.	1	of	3

ABC Rating Procedure **June 2010**

Enter values for each aspect of the project. Attach applicable supporting data.

Average Daily Traffic	5	0	No traffic impacts
Combined on and under		1	Less than 5000
Enter 5 for Interstate Highways		2	5000 to 10000
		3	10000 to 15000
		4	15000 to 20000
		5	More than 20000
Delay/Detour Time	2	0	No delays
		1	Less than 5 minutes
		2	5-10 minutes
		3	10-15 minutes
		4	15-20 minutes
		5	More than 20 minutes
Bridge Classification	1	1	Normal Bridge
		3	Essential Bridge
		5	Critical Bridge
User Costs	4	0	No user costs
		1	Less than $10,000
		2	$10,000 to $50,000
		3	$50,000 to $75,000
		4	$75,000 to $100,000
		5	More than $100,000
Economy of Scale	2	0	1 span
(total number of spans)		1	2 to 3 spans
		2	4 to 5 spans
		3	More than 5 spans
Use of Typical Details	1	1	Complex geometry or unfavorable site conditions
		3	Some complexity, but favorable site conditions
		5	Simple geometry and favorable site conditions
Safety	5	1	Short duration impact with simple MOT scheme
		2	Short duration impact with multiple traffic shifts
		3	Normal duration impact with multiple traffic shifts
		4	Extended duration impact with multiple traffic shifts
		5	Extended duration impact with complex MOT scheme
Railroad Impacts	0	0	No railroad or minor railroad spur
		3	One mainline railroad track
		5	Multiple mainline railroad tracks

Note: Do not adjust weight factors without prior consultation with UDOT Structures Division Project Manager

ABC RATING SCORE FACTORS AND WEIGHTS					
	Score	Weight Factor	Adjusted Score	Maximum Score	Adjusted Score
Average Daily Traffic	5	10	50	5	50
Delay/Detour Time	2	10	20	5	50
Bridge Classification	1	5	5	5	25
User Costs	4	10	40	5	50
Economy of Scale	2	3	6	3	9
Use of Typical Details	1	3	3	5	15
Safety	5	10	50	5	50
Railroad Impacts	0	5	0	5	25
		Total Score	174	Max. Score	274

ABC Rating Score: 64

The ABC Rating Score is driven by the four most heavily weighted factors: Average Daily Traffic, Delay/Detour Time, User Costs and Safety. For a detailed explanation, review the narrative on page 4 of the ABC Decision Making Process.

Cost Considerations:

Calculate the following costs for use in determining the lowest total project cost

TOTAL PROJECT COST EVALUATION		
	Alternative #1	Alternative #2
Construction Costs	$2,500,000	$3,000,000
User Costs	$1,000,000	$250,000
Total Project Cost	**$3,500,000**	**$3,250,000**

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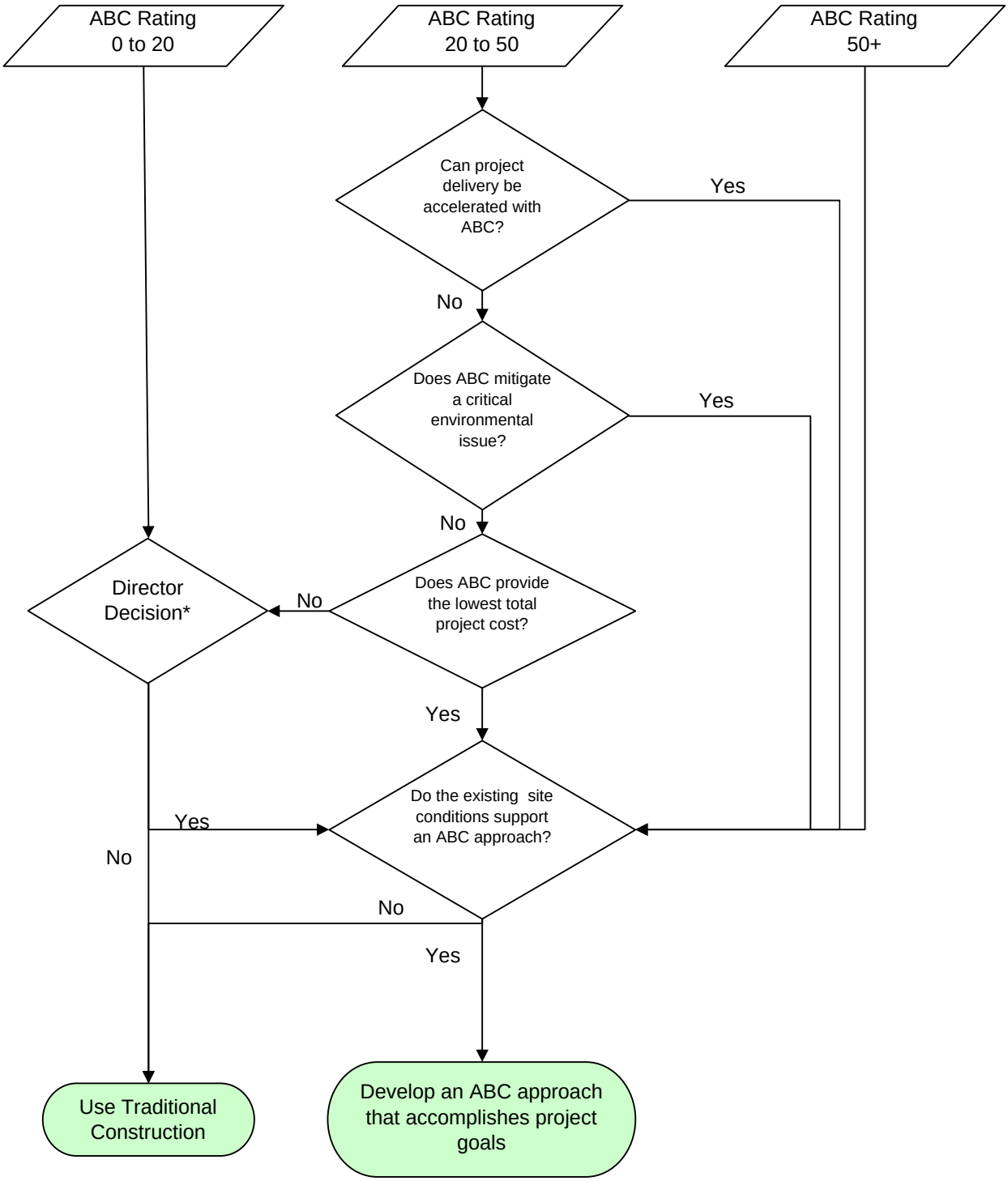
ABC Decision Flowchart **June 2010**

* Region Director or Project Development Director to evaluate possible indirect benefits