DEPARTMENT OF TRANSPORTATION

Internal Memo

January 13, 2017

To: All Managers

From: Nancy Daubenberger, Assistant Commissioner
Engineering Services Division

Mike Barnes, Assistant Commissioner
Operations Division

Subject: Implementation of Accelerated Bridge Construction

Over the past several years the Department has successfully implemented a number of accelerated bridge construction (ABC) techniques including placement of new bridge superstructures on the Maryland Avenue Bridge in St. Paul and the Hastings Bridge, both using self-propelled modular transporters (SPMTs). Other efforts have included a lateral bridge slide on Larpenteur Avenue over I-35E and installation of prefabricated components including full-depth precast concrete deck panels on bridges in D1 and Metro, and prefabricated abutment, wing wall, and superstructure components on bridges in D6 and Metro.

Use of ABC techniques can result in a significant reduction in on-site construction time as well as providing improvements in product quality, worker safety, and traveler safety.

To help Districts better identify which bridges are best suited for ABC, the Bridge Office has developed a three stage process with several simple tools as described at recent Pre-Construction Managers and Construction Managers meetings. Before finalizing the selection process and associated tools, they were tested and refined by conducting successful pilot projects in Districts 3, 6 and Metro and are now ready for statewide implementation. Use of the three stage process ensures that MnDOT uses a rational, consistent, objective, and defensible method of selecting appropriate ABC projects. More information regarding the three stage process and associated tools is included in the attached document and is also available on the Bridge Office website.

As District staff begin to scope projects that include a bridge, they should use the three stage process & tools to determine if accelerated bridge construction is a viable option. Early identification of ABC projects is critical, as it allows those involved with the project to complete the second and third stage ABC review and to identify potential ABC techniques and solutions early in the project development process. ABC alternatives should be considered very early in the scoping process (concurrent with the Bridge Scoping Worksheet) to allow for adjustments in letting date, project schedule, budget, design duration and other resource needs, including potential time needed for pre-fabrication of bridge elements.

The Bridge Office is currently working with several districts to target new ABC projects for bridges that are currently in the STIP (letting dates between now and June of 2020). Since scoping should be completed on projects in the STIP they worked with districts to utilize the tools and identify projects if appropriate.
For bridge projects scheduled for letting on or after 07/01/2020, District project managers should incorporate the three stage ABC process if the project includes a bridge deck replacement, superstructure replacement, or new bridge. Before a bridge project is entered in the STIP, the entire Stage 2 process should be finalized and the completed Stage 2 form sent to the Bridge Office for any bridges that show a "Yes" outcome in Stage 1 or where the District thinks that ABC would be advisable for the project.

Please refer to the attached "Selecting Projects for Accelerated Bridge Construction" for additional information.

Attachment

Selecting Projects for Accelerated Bridge Construction

In January of 2017, the Engineering Services and Operations Division Directors issued a memo instructing Districts to consider accelerated bridge construction (ABC) methodologies. To assist in determining which bridges are best suited for ABC a three stage process has been developed to provide a rational, consistent, objective, and defensible method of selecting appropriate projects. The three stage process should be used as a tool to evaluate the suitability of ABC but should not be viewed as an absolute control in decision making. Other considerations not incorporated in the process may be significant in decision making for any individual project at the discretion of the district.

Complete details for each of the 3 stages is included on the Bridge Office ABC website at:
http://www.mndot.gov/bridge/abc/

A brief summary of each of the three stages is provided below including a process flowchart:

Stage 1

Stage 1 includes an initial screening and ABC rating based on a set of quantifiable, objective measures which includes;

- User costs (in the form of daily vehicle operating costs)
- Average annual daily traffic (on and under the bridge)
- Heavy commercial average annual daily traffic (on and under the bridge)
- Detour length
- Traffic density, measured as (vehicles per day) divided by roadway width on the bridge

Each trunk highway bridge in the state (excluding culverts, railroad, and pedestrian bridges) has been evaluated, and scores for each of the above criteria were summed to form an overall weighted score, which was normalized to a recommendation of “Yes” or “No” regarding further consideration of ABC. Bridges with a “Yes” outcome should be evaluated in Stage 2 for further consideration of ABC. Bridges with an outcome of “No” are only evaluated in Stage 2 if requested by the District, who may be aware of unique circumstances that may make ABC a viable alternative.

When beginning to scope new bridges, bridge replacements, or major bridge rehabilitation projects the results of the Stage 1 analysis should be considered and the results of the Stage 1 analysis should be included on the bridge page of the MnDOT Project Scoping Worksheets and the Bridge Office Form A (available at http://ihub/bridge/design/pdf/planning-section-scoping-worksheet-form-a.docx) submitted to the Bridge Preliminary Plans Unit (for new or replacement bridges).

The result of the Stage 1 analysis for each bridge in each district (excluding culverts, railroad, and pedestrian bridges) is available on the Bridge Office website.

The Stage 1 results are also included in the BRIM spreadsheet and on the "Structure Inventory" sheet (see last page for example) for each bridge.

Stage 2

Stage 2 of the ABC selection process allows the Project Manager to consider issues that are much more subjective and site specific than those identified in Stage 1. Also, since accelerated construction techniques and methodologies often involve traffic detours, lane or road closures and extended work hours, there are compromises and trade-offs inherent in such projects. Therefore, close coordination with the District Traffic Engineer, Construction Resident Engineer and District Bridge Engineer is required to complete the Stage 2 assessment.

The Stage 2 assessment form can be downloaded from the Bridge Office website.

The District Project Manager (with input from appropriate subject experts) is responsible for completing the Stage 2 assessment before the project goes into the State Transportation Investment Plan (STIP).

A sampling of the questions in the Stage 2 tool include:

- Is it likely that this project will include complex traffic control schemes, long detours, extended duration, or significant user impacts due to bridge construction?
- Is bridge construction on the critical path of this project?
- Could additional width be needed on culverts, bridges, or shoulders to maintain traffic on the existing route or the detour route?

For each of the questions, a response of "Yes", "No", "Possibly", or "Not Applicable (N/A)" is recorded. The more questions that are answered with "Yes" or "Possibly", the more likely that accelerated bridge construction techniques may provide a viable solution. The responses in the second stage assessment also help in beginning to identify which ABC techniques and/or alternative contracting methods may be most appropriate.

After thoroughly reviewing the responses to the Stage 2 questions, the District Project Manager, with assistance from other appropriate experts and the Bridge Office will make a final determination regarding whether or not further consideration of ABC is warranted. The District has complete discretion in making the final decision regarding whether or not ABC techniques are included in a bridge project *(if a bridge project is to be funded with Statewide Performance Program bridge (SPPB) funds, the SPPB Program Manager needs to be included in the final decision of whether or not to use ABC techniques)*, and is also responsible for documenting final decisions in Stages 2 and 3 and for sending copies of the completed Stage 2 form to the Bridge Office Preliminary Plans Unit with the original document retained by the Project Manager. **The entire Stage 2 process should be finalized and the completed Stage 2 form sent to the Bridge Office before a bridge project is entered into the STIP.**

Stage 3

If the conclusion of the Stage 2 assessment indicates that further consideration of ABC is warranted, the Project Manager will work with the Bridge Office Preliminary Plans Unit, Bridge Final Design Unit, Regional Bridge Construction Engineer, and other specialty disciplines (District Traffic, Resident Construction Engineer, and Office of Construction and Innovative Contracting) to discuss project specific details and move forward in selecting appropriate ABC alternatives and techniques. This stage also considers alternative contracting methods that may help accelerate construction or reduce work zone impacts, including: A+B, lane rental, no excuse bonuses, incentives/disincentives, design build, and construction manager general contractor (CMGC). The goal of the Stage 3 process is to identify a final construction method, technique or contract administration method, or a combination of these methods.

Information regarding the Stage 3 assessment can be downloaded from the Bridge Office website. The Bridge Office website also includes an extensive list of links and other information regarding potential ABC options.

Additional Information

All of the tools described above are available on the Bridge Office website, along with additional background information, and a list of bridges for each district that have a Stage 1 outcome of "Yes" and are scheduled to be let in the next 5-10 years.

ABC Roles & Responsibilities

The following is a guide to the roles and responsibilities for successful scoping and implementation of ABC projects:

District Project Manager (PM): As the primary leader of project development the PM is responsible for reviewing the Stage 1 ABC outcome ("Yes," "No," or "N/A") as soon as a bridge project is identified for scoping. If the Stage 1 result is "Yes," the PM should immediately begin completing the Stage 2 assessment, involving the necessary experts as required. If the Stage 2 assessment recommends further development of ABC alternatives, the PM is responsible for scheduling and facilitating meetings to compare ABC alternatives (Stage 3) and making final recommendations. The PM is also responsible for finalizing the Stage 2 form and sending the completed form to the Bridge Office prior to adding a bridge project to the STIP.

District Bridge Engineer: Provide support to the PM throughout the scoping phase including assistance with the Stage 2 and 3 assessments. Consider the use of ABC during the scoping phase (site visits, existing bridge assessment, etc.)

District Traffic and Resident Construction Engineer: Provide support to the PM throughout the scoping phase including assistance with the Stage 2 and 3 assessments.

Bridge Office Regional Bridge Engineer: Consider the use of ABC during the scoping phase (site visits, existing bridge assessment, etc.). Provide support and expertise to the Bridge Office Preliminary and Scoping Engineer positions for Stages 2 and 3. During final design through construction, provide support and expertise to designers and construction staff.

Bridge Office Scoping Engineers: Prior to the project entering the STIP, help PM and District Bridge Engineer scope the bridge needs and identify options, costs, traffic staging, construction scheduling for bridge rehabilitation and replacement work. If requested by the District Bridge Engineer or PM, provide support with the Stage 2 assessment.

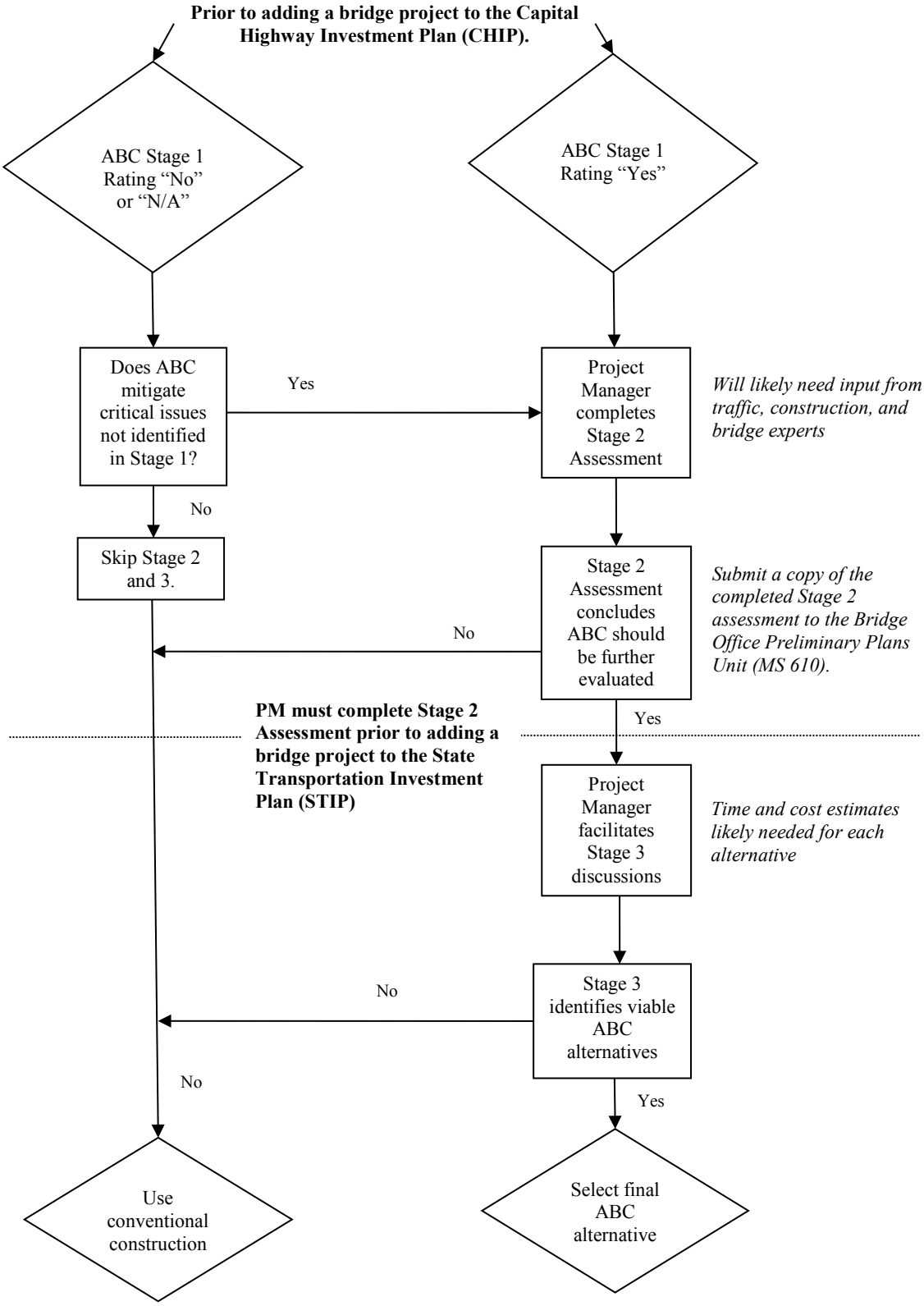
Bridge Scoping Coordinator: Provide support to PM and District Bridge Engineer throughout scoping phase and provide guidance on Stage 2 & 3. Develop and maintain ABC resource information. Aid in scheduling & facilitating meetings with the Bridge Office and the PM/District.

Bridge Office Preliminary Plans Unit: Provide support to the PM throughout the scoping and preliminary design phase including assistance with the Stage 2 & 3 assessments. Consider the use of ABC during the scoping phase (site visits, existing bridge assessment, etc.)

Bridge Office Final Design Unit: Provide support to the PM throughout Stage 3 and final plan preparation.

Bridge Office Estimating Unit: Provide preliminary and final cost estimates during Stages 2 and 3. Should be aware of the Stage 1 outcome prior to preparing the first preliminary cost estimate.

Accelerated Bridge Construction Decision Process Flowchart



EXAMPLE

MINNESOTA STRUCTURE INVENTORY REPORT

Bridge ID: 62847 **I 94 over FAIRVIEW AVENUE**

Date: 01/10/2017

ABC Stage 1 Conclusion

+ GENERAL +

Agency Br. No.	Crew 7639
District	METRO Maint. Area
County	62 - RAMSEY
City	ST PAUL
Township	
Desc. Loc.	0.4 MI W OF JCT TH 51
Sect., Twp., Range	33 - 029N - 23W
Latitude	44d 57m 06.37s
Longitude	93d 10m 36.36s
Custodian	STATE HWY
Owner	STATE HWY
Inspection By	METRO D
Year Built	1967
MN Year Remodeled	
FHWA Year Reconstructed	
Bridge Plan Location	CENTRAL
Potential ABC	YES

+ STRUCTURE +

Service On	HIGHWAY
Service Under	HIGHWAY
Main Span Type	CCONC SLAB SPAN
Main Span Detail	
Appr. Span Type	
Appr. Span Detail	
Skew	
Culvert Type	
Barrel Length	

Number of Spans

MAIN: 4 APPR: 0 TOTAL: 4

Main Span Length	40.0 ft
Structure Length	144.5 ft
Deck Width	137.3 ft
Deck Material	C-I-P CONCRETE
Wear Surf Type	LOW SLUMP CONC
Wear Surf Install Year	1993
Wear Course/Fill Depth	0.21 ft
Deck Membrane	NONE
Deck Rebars	NONE
Deck Rebars Install Year	
Structure Area	19,840 sq ft
Roadway Area	17,976 sq ft
Sidewalk Width - L/R	
Curb Height - L/R	
Rail Codes - L/R	22 22

+ ROADWAY +

Bridge Match ID (TIS)	1
Roadway O/U Key	1-ON
Route Sys/Nbr	ISTH 94

Roadway Name or Description

I 94

Roadway Function	MAINLINE
Roadway Type	2 WAY TRAF
Control Section (TH Only)	6282
Ref. Point	237+00.974
Date Opened to Traffic	12-01-1968
gth	1 mi.
Lanes ON Bridge	
t)	165,000 (2004)
HCADT	6,600
Functional Class.	URB/PR ART ISTH

+ RDWY DIMENSIONS +

If Divided	NB-EB	SB-WB
Roadway Width	62.2 ft	62.2 ft
Vertical Clearance		
Max. Vert. Clear.		
Horizontal Clear.	62.1 ft	62.1 ft
Lateral Clr. - Lt/Rt		
Appr. Surface Width	140.0 ft	
Bridge Roadway Width	124.4 ft	
Median Width on Bridge	3.0 ft	

+ MISC. BRIDGE DATA +

Structure Flared	NO
Parallel Structure	NONE
Field Conn. ID	
Cantilever ID	

Foundations

Abut.	CONC - FTG PILE
Pier	CONC - SPRD SOIL
Historic Status	NOT ELIGIBLE
On - Off System	ON

+ PAINT +

Year Painted	Pct. Unsound
Painted Area	
Primer Type	
Finish Type	

+ BRIDGE SIGNS +

Posted Load	NOT REQUIRED
Traffic	NOT REQUIRED
Horizontal	NOT REQUIRED
Vertical	NOT REQUIRED

+ INSPECTION +

Deficient Status	ADEQ
Sufficiency Rating	78.0
Last Inspection Date	08-22-2016
Inspection Frequency	24
Inspector Name	METRO DISTRICT
Status	A-OPEN

+ NBI CONDITION RATINGS +

Deck	6
Superstructure	6
Substructure	6
Channel	N
Culvert	N

+ NBI APPRAISAL RATINGS +

Structure Evaluation	6
Deck Geometry	9
Underclearances	4
Waterway Adequacy	N
Approach Alignment	8

+ SAFETY FEATURES +

Bridge Railing	1-MEETS STANDARDS
GR Transition	1-MEETS STANDARDS
Appr. Guardrail	1-MEETS STANDARDS
GR Termini	1-MEETS STANDARDS

+ IN DEPTH INSP. +

Frac. Critical	N
Underwater	N
Pinned Asbly.	N
Spec. Feat.	

+ WATERWAY +

Drainage Area	
Waterway Opening	
Navigation Control	NOT APPL
Pier Protection	
Nav. Vert./Horz. Clr.	
Nav. Vert. Lift Bridge Clear.	
MN Scour Code	A-NON WATERWAY
Scour Evaluation Year	

+ CAPACITY RATINGS +

Design Load	HS 20+MOD
Operating Rating	HS 42.60
Inventory Rating	HS 25.50
Posting	
Rating Date	09-15-2003

Overweight Permit Codes

A: 1 B: 1 C: 1