

## CHECKLIST TO DESIGNATE AREAS OF EVALUATION FOR REQUESTS FOR PROPOSAL (RFP)

	REQUISITION NUMBER	DUE DATE	TIME DUE
MDOT PROJECT MANAGER	JOB NUMBER (JN)	CONTROL SECTION (CS)	

DESCRIPTION

**MDOT PROJECT MANAGER:** Check all items to be included in RFP  
 WHITE = REQUIRED  
 \*\* = OPTIONAL

**CONSULTANT:** Provide only checked items below in proposal  
 When applicable, Best Value scoring criteria is listed separately in the RFP.

Check the appropriate Tier in the box below

TIER I (\$50,000 - \$150,000)	TIER II (\$150,000-\$1,000,000)	TIER III (>\$1,000,000)	
N/A			Understanding of Service **
			<i>Innovations</i>
			Organizational Chart
			Qualifications of Team
N/A	N/A		Quality Assurance/Quality Control **
			<b>Location:</b> The percentage of work performed in Michigan will be used for all selections unless the project is for on-site inspection or survey activities, then location should be scored using the distance from the consultant office to the on-site inspection or survey activity.
N/A	N/A		Presentation **
N/A	N/A		Technical Proposal (if Presentation is required)
3 pages (MDOT Forms not counted) Resumes will only be accepted for Best Value Selections	7 pages (MDOT Forms not counted)	14 pages (MDOT forms not counted)	Total maximum pages for RFP <b>not including key personnel resumes.</b> Resumes limited to 2 pages per key staff personnel.

**PROPOSAL AND BID SHEET E-MAIL ADDRESS – [mdot-rfp-response@michigan.gov](mailto:mdot-rfp-response@michigan.gov)**

### GENERAL INFORMATION

Any questions relative to the scope of services must be submitted by e-mail to the MDOT Project Manager. Questions must be received by the Project Manager at least five (5) working days prior to the due date and time specified above. All questions and answers will be placed on the MDOT website as soon as possible after receipt of the questions, and at least three (3) days prior to the RFP due date deadline. The names of vendors submitting questions will not be disclosed.

MDOT is an equal opportunity employer and MDOT DBE firms are encouraged to apply. The participating DBE firm, as currently certified by MDOT's Office of Equal Opportunity, shall be listed in the Proposal.

### MDOT FORMS REQUIRED AS PART OF PROPOSAL SUBMISSION

**5100D** – Request for Proposal Cover Sheet

**5100J** – Consultant Data and Signature Sheet (Required for all firms performing non-prequalified services on this project.)

**(These forms are not included in the proposal maximum page count.)**

The Michigan Department of Transportation (MDOT) is seeking professional services for the project contained in the attached scope of services.

If your firm is interested in providing services, please indicate your interest by submitting a Proposal, Proposal/Bid Sheet or Bid Sheet as indicated below. The documents must be submitted in accordance with the latest (Consultant/Vendor Selection Guidelines for Services Contracts.”

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**RFP SPECIFIC INFORMATION**

ENGINEERING SERVICES	BUREAU OF TRANSPORTATION PLANNING	OTHER
THE SERVICE WAS POSTED ON THE ANTICIPATED QUARTERLY REQUESTS FOR PROPOSALS		
NO	YES	DATED _____ THROUGH _____
<b>Prequalified Services</b> – See the attached Scope of Services for required Prequalification Classifications.		<b>Non-Prequalified Services</b> – If selected, the vendor must make sure that current financial information, including labor rates, overhead computations, and financial statements, is on file with MDOT’s Office of Commission Audits. This information must be on file for the prime vendor and all sub vendors so that the contract will not be delayed. <b>Form 5100J is required with proposal for all firms performing non-prequalified services on this project.</b>

**Qualification Based Selection** - Use Consultant/Vendor Selection Guidelines.

**For all Qualifications Based Selections**, the selection team will review the information submitted and will select the firm considered most qualified to perform the services based on the proposals. The selected firm will be asked to prepare a priced proposal. Negotiations will be conducted with the firm selected.

**For a cost plus fixed fee contract**, the selected vendor must have a cost accounting system to support a cost plus fixed fee contract. This type of system has a job-order cost accounting system for the recording and accumulation of costs incurred under its contracts. Each project is assigned a job number so that costs may be segregated and accumulated in the vendor’s job-order accounting system.

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**Qualification Based Selection / Low Bid** – Use Consultant/Vendor Selection Guidelines. See Bid Sheet instructions for additional information.

For Qualification Review/Low Bid selections, the selection team will review the proposals submitted. The vendor that has met established qualification threshold and with the lowest bid will be selected.

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**Best Value** – Use Consultant/Vendor Selection Guidelines, See Bid Sheet Instructions below for additional information. The bid amount is a component of the total proposal score, not the determining factor of the selection.

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**Low Bid** (no qualifications review required – no proposal required.)

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**BID SHEET INSTRUCTIONS**

Bid Sheet(s) are located at the end of the Scope of Services. Submit bid sheet(s) with the proposal, to the email address: [mdot-rfp-response@michigan.gov](mailto:mdot-rfp-response@michigan.gov). Failure to comply with this procedure may result in your bid being rejected from consideration.

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**PARTNERSHIP CHARTER AGREEMENT**

MDOT and ACEC created a Partnership Charter Agreement which establishes guidelines to assist MDOT and Consultants in successful partnering. Both the Consultant and MDOT Project Manager are reminded to review the [ACEC-MDOT Partnership Charter Agreement](#) and are asked to follow all communications, issues resolution and other procedures and guidance’s contained therein.

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**2017 Insurance Update – MDOT  
3.9.17**

At a minimum, the insurance types and limits identified below, may be required from the selected consultant, prior to contract award.

Required Limits	Additional Requirements
<b>Commercial General Liability Insurance</b>	
<u>Minimal Limits:</u> \$1,000,000 Each Occurrence Limit \$1,000,000 Personal & Advertising Injury Limit \$2,000,000 General Aggregate Limit \$2,000,000 Products/Completed Operations	Consultants must have their policy endorsed to add “the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents” as additional insureds
<b>Automobile Liability Insurance</b>	
<u>Minimal Limits:</u> \$1,000,000 Per Occurrence	
<b>Workers' Compensation Insurance</b>	
<u>Minimal Limits:</u> Coverage according to applicable laws governing work activities.	Waiver of subrogation, except where waiver is prohibited by law.
<b>Employers Liability Insurance</b>	
<u>Minimal Limits:</u> \$500,000 Each Accident \$500,000 Each Employee by Disease \$500,000 Aggregate Disease	
<b>Professional Liability (Errors and Omissions) Insurance</b>	
<u>Minimal Limits:</u> \$1,000,000 <b>Per Claim</b>	

The Insurer shall provide at least thirty (30) days written notice of cancellation. The Prime Consultant will be responsible to verify subconsultant(s) compliance with MDOT’s insurance requirements.

**Proposals must be submitted for this project electronically. Proposal Submittal Requirements Can Be Found At the Following Link**  
[http://www.michigan.gov/documents/MDOT\\_Consultant-Vendor\\_Selection\\_Guidelines-0106\\_145222\\_7.pdf?20150707153457](http://www.michigan.gov/documents/MDOT_Consultant-Vendor_Selection_Guidelines-0106_145222_7.pdf?20150707153457)

**In PART IV – INSTRUCTION FOR SUBMITTING PROPOSALS**

**NOTIFICATION**

**E-VERIFY REQUIREMENTS**

E-Verify is an Internet based system that allows an employer, using information reported on an employee's Form I-9, Employment Eligibility Verification, to determine the eligibility of that employee to work in the United States. There is no charge to employers to use E-Verify. The E-Verify system is operated by the Department of Homeland Security (DHS) in partnership with the Social Security Administration. E-Verify is available in Spanish.

The State of Michigan is requiring, under Public Act 200 of 2012, Section 381, that as a condition of each contract or subcontract for construction, maintenance, or engineering services that the pre-qualified contractor or subcontractor agree to use the E-Verify system to verify that all persons hired during the contract term by the contractor or subcontractor are legally present and authorized to work in the United States.

Information on registration for and use of the E-Verify program can be obtained via the Internet at the DHS Web site: <http://www.dhs.gov/E-Verify>.

The documentation supporting the usage of the E-Verify system must be maintained by each consultant and be made available to MDOT upon request.

It is the responsibility of the prime consultant to include the E-Verify requirement documented in this NOTIFICATION in all tiers of subcontracts.

9/13/12

**Michigan Department of Transportation**

**SCOPE OF SERVICE  
FOR  
EARLY PRELIMINARY ENGINEERING DESIGN SERVICES  
“AS-NEEDED” SCOPING OR IN DEPTH BRIDGE INSPECTION**

**CONTROL SECTION:** REGIONWIDE

**JOB NUMBER:** 133118, 133119

**PROJECT LOCATION:**

The bridges are situated in various locations in Wayne County of the Metro Region.

**PROJECT DESCRIPTION:** DEVELOPING BRIDGE REPAIR ALTERNATIVES

The purpose of this service is to develop the scope of work and estimate for each bridge. To evaluate various repair alternatives for a prescribed set of bridges and recommend the most appropriate rehabilitation or preventive maintenance treatment based on current conditions, remaining structure life and sound engineering judgment.

Full-time service will not be required at all times. This scope is for “as-needed” engineering services, based on the intermittent needs of the department. MDOT staff will submit requests to the consultant’s point of contact. Every attempt will be made to submit requests at least one week prior to the need for personnel; however, it is expected that requests will be responded to within 48 hours.

**Up to 2 CONSULTANTS will be selected** for this “as-needed” scope. The number of projects assigned to each consultant will be determined by future workload.

**Project includes visiting the site for each structure and maintaining traffic to evaluate the bridges.**

**ANTICIPATED PROJECT START DATE:** November 9, 2017

**ANTICIPATED PROJECT COMPLETION DATE:** December 31, 2018

This selection is for a 13 month period.

**PRIMARY PREQUALIFICATION CLASSIFICATION:**

Design – Bridges: Scoping

**SECONDARY PREQUALIFICATION CLASSIFICATION:**

Design – Traffic: Work Zone Maintenance of Traffic

**DBE REQUIREMENT:** N/A

**MDOT PROJECT MANAGER (MDOT PM):**

JN 133118

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JN 133119

Christal J. Larkins, P.E.

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**GENERAL INFORMATION:**

The Bridge Management Section of the Metro Region, Michigan Department of Transportation (MDOT) is seeking a proposal from a “Pre-Qualified” Consulting Engineering Firm (CONSULTANT) to perform in-depth inspections of bridge structures on state trunkline roads in accordance with the most recent version of the National Highway Institute Bridge Inspection Reference Manual.

The deliverables will be the Scoping Report or Detailed Inspection for each bridge. The information contained in the Scoping Reports will be used by the Design Division to prepare rehabilitation plans or a preventive maintenance log project. The content of the reports will need to adequately convey the general physical condition of each structure, the specific areas in need of repair and identify surrounding appurtenances which may affect the project.

MDOT has determined the following preliminary maintaining traffic concepts, which may be assumed by the CONSULTANT in developing the scopes of work. All maintaining traffic concepts shall be consistent with the MDOT Work Zone Safety and Mobility Policy.

1. When possible, work on the bridges shall be performed at night or on weekends to keep daytime lane closures to a minimum.
2. When night work is not possible, temporary or permanent widening and traffic shifts on the roadway and bridge shoulders should be evaluated for feasibility, such that as many lanes of traffic can be maintained as possible.

3. The feasibility of incentive/disincentive provisions should be considered and cost estimates added to the scope of work for each bridge as applicable.

## **DURATION AND SCHEDULE**

The CONSULTANT must be prepared to begin the field inspection work within one week after receiving the notice to proceed.

### **A. PROJECT SCHEDULE**

The CONSULTANT must review the Scope of Service to develop a Work Plan that details the process of inspecting the specific elements for a typical bridge. The Work Plan will be submitted as part of the Priced Proposal. Changes to the Work Plan will be submitted to MDOT's Project Manager for approval.

### **B. MEETINGS**

#### **1. Project Initiation**

A mandatory Project Initiation Meeting will be held with the CONSULTANT prior to the start of the site review work. The CONSULTANT PM will be required to attend the meeting and it will be held at MDOT's Region Office unless an alternative site is mutually agreed to. This meeting will take place one week after the anticipated authorization, unless otherwise notified.

#### **2. Progress Meetings**

Progress Meetings will be held on an as needed basis.

The Project Initiation Meeting is intended to exchange information regarding the general procedures for communication, review the schedule, discuss emergency procedures and communication, and discuss any open questions that remain. Additional MDOT region and statewide staff may attend the meeting.

The CONSULTANT will keep notes of these meetings and provide minutes to the MDOT PM within one week after the meeting.

The CONSULTANT is to submit monthly progress reports indicating work completed, work in progress with estimated completion date, the amount of contract billed, future billings and any concerns.

## **GENERAL DESCRIPTION OF THE WORK**

The work for each bridge is broken down into three main components: A) Site Inspection B) Engineering Analysis, and C) Report Preparation.

### **A. SITE INSPECTION**

Each bridge and environs must be visited by the CONSULTANT PM and/or QTL. The purpose of this visit is to locate all areas of deterioration, determine feasible repair options, and to ascertain quantities. Where necessary, high-reach equipment or an under bridge inspection crane must be used to get close enough to evaluate the structural components (See Section EQUIPMENT AND SAFETY, below). The site review should be done during days without precipitation. MDOT will not accept photos with weather related obstructions, i.e. snow. Questions regarding scour are to be directed to Chris Potvin in Design, Hydraulics Unit at (517) 335-1919.

The information collected in the field must be sufficient to determine quantities and locations of repairs and improvements. This information must be detailed in the field notes and/or sketches and are to be included in the report. **Locations of all areas needing full depth patches must also be noted in the sketches and included in the report.**

All efforts shall be made by the CONSULTANT to perform a complete "In-Depth" inspection while on site.

#### **1. Steel Beam End Inspection**

For the structures requiring Steel Beam End Inspection, below are the minimum items to be completed.

- a. All dirt, debris, and rust scale must be removed from the ends of each of the steel beams under all joints at piers and abutments. Note any areas that are prone to trapping drainage or debris. Visually inspect for areas of section loss, heavily rusted areas or any web buckling due to excessive section loss. Areas where section measurements are to be taken shall be cleaned by means of hand tools to a SSPC SP3 degree of cleanliness. Thickness readings shall be taken at each beam end that exhibits section loss using an ultra-sonic thickness gage. Thickness readings on the web and the bottom flange are to be taken at the thinnest locations within 5 feet of the end of the beam. Do not remove paint on beam ends that exhibit no section loss. Mark the sheet as "No visible loss."

The thickness readings will be compared with the original thickness and the percentages of section loss will be calculated. This data will be tabulated in a specific format (as shown in Detailed Beam Survey Report) and sketches will be prepared of major components, showing the location, length and width of the deteriorated areas with dimensioning to reference point. Specifically, if beam end repairs are necessary, show the locations of beam ends in need of repair on the existing erection diagram from the as-built plans. This information will be presented in the appendix of the scoping report. These documents are used by Lansing Bridge Design to prepare rehabilitation plans, and Bridge Management Unit to perform load



rating analyses if requested, and Bridge Field Services to determine any necessary immediate repair plans.

- b. On structures with pin and hanger assemblies, the beam end shall be cleaned as described in section (a). Thickness readings on the web and the bottom flange are to be measured at the thinnest locations within 5 feet of the end of the beam. Thickness readings must also be measured at the pin plates and link plates. If these are areas of heavy flaking rust, the consultant will clean as necessary to measure for any section loss. Structures with riveted pin plates shall be inspected and measured for section loss. If this is not feasible with an ultrasonic thickness gage due to material build up or bulging between the plates, the CONSULTANT shall notify the MDOT PM, and note it in the report. Check pin and hanger assemblies for proper operation. The CONSULTANT shall note whether the pin and hanger assembly meets current standards. Note the condition of the pin plates, and if the beam ends are in contact due to pin and hanger closure.
- c. The CONSULTANT shall note the condition of all other steel superstructure elements including but not limited to stiffeners, intermediate diaphragms, end diaphragms, pier diaphragms, cross frames, other lateral bracing and bearings including sole plates and masonry plates. These elements shall be thoroughly inspected, and cleaning may be required. Note any areas that exhibit out of plane bending or distortion.
- d. The CONSULTANT shall visually check for fatigue cracking on fatigue prone details such as welded cover plates, diaphragm connections, or any welding in tension zones that are transverse to the plane of stress. Dye penetrant use is required if there is a crack or suspected crack. This must be clearly documented on paper with narrative and photographs. The CONSULTANT must inform the MDOT PM prior to the testing so that arrangement may be made to witness the process.
- e. All surfaces where paint has been removed to bare steel shall be coated with primer prior to leaving the site.
- f. Note the condition of all bearing devices. For steel bearings such as rocker bearings or pedestal bearings, inspect for pack rust, rocker alignment, section loss and paint condition. For elastomeric bearings, check for excessive bulging of the sides (greater than 15% of bearing thickness), shear deformation due to thermal movement, splitting and tearing, and discoloration from exposure to light.

## **2. Concrete Deck (Surface/Underside)**

For the structures requiring Concrete Deck (Surface/Underside) inspection, below are the minimum items to be completed.

- a. The concrete deck surface/underside will be inspected for wet areas, spalling, map cracking, delamination, and rust along beam edges or any other evidence of deterioration.
- b. The concrete deck surface/underside will be sounded with a hammer or chain drag. All delaminated, spalled, and cracked areas are to be marked with chalk, crayon, or keel that will be evident in the photographs. Paint may be used on deck surface with MDOT PM's approval. Photos of the area must be taken and a written description of the deterioration must be documented for inclusion into the report. Photos of the top surface of deck will be taken from a height no less than 10 feet.
- c. The percentage of each type of deck surface and soffit deficiencies will be noted in the report.
- d. If possible, note as to whether the deck has previously been overlaid and if so, when and what type of material.
- e. The width of the structure must be evaluated to determine whether it is functionally obsolete. If widening is necessary to upgrade the structure to current standards, or for maintaining traffic during construction, this must be stated in the report. Please refer to the MDOT Bridge Design Guides, Section 6.05 for acceptable bridge deck cross sections. This will include possible widening to meet current standards for radii. The CONSULTANT will describe how and where the widening is to take place and provide a plan view sketch showing the proposed widening. Specify if widening can be done within the deck overhang, or if additional beam lines and substructure width will be needed to accommodate the required deck cross section. Widening may also require additional approach work to transition between the roadway width and the new bridge width.
- f. Any work required for the approaches must be included in the report and these items accounted for on the Estimate Sheet.
- g. Sketches of the deck mapping the areas of delamination and cracking are to be included in the appendix of the scoping report. Percent of total surface area delamination shall be calculated and shown on the sketches.

### **3. Superstructures**

For inspections of superstructures, include the following items as applicable.

- a. For reinforced concrete and prestressed concrete superstructures, visually inspect for shear or flexure cracking, exposed or broken prestressing strands, crushing of beam end in bearing areas, discoloration of concrete caused by corroding mild reinforcement or prestressing strands, high load hit damage

and signs of previous repairs. Observe live loads crossing structure and note excessive deflections or working cracks. Inspect the concrete diaphragms for spalling or diagonal cracking from structure movement or excessive deflection, and any other concrete defects. Note the use of temporary supports, or if they may be needed for the structure to remain in service until proposed rehabilitation.

- b. For timber structures visually inspect for checks (separations of the wood fibers parallel to the grain direction) knots and splits which are natural defects that may provide openings for decay and begin to reduce the strength of the members. Inspect for fungus, insect damage or any other effects of nature. Inspect for in-service defects such as fire damage, vehicular collision, abrasion or mechanical wear, overload distress, excessive deflection of flexural members, weathering or warping and chemical damage. Perform a pick or penetration test at various locations, which involves lifting a small sliver of wood with a pick or pocket knife, and observing whether or not it splinters or breaks abruptly. Sound wood splinters, while decayed wood breaks abruptly. Inspect areas near the support to check for horizontal shear cracks along the grain of the member. Inspect bearing areas for crushing due to decay. Note the condition of fasteners and connections.
- c. The vertical clearance of the bridge must be field verified and noted in the executive summary and stated in the report. A picture of any vertical clearance sign attached to the bridge must be taken. See the MDOT Bridge Design Manual, section 7.01.08 for minimum vertical clearance requirements. For structures not meeting minimum vertical underclearance criteria, raising the structure to meet current standards must be considered in selecting the repair option. Any option including a deck replacement, superstructure replacement or bridge replacement must meet the minimum vertical underclearance requirement as it is very difficult to obtain design exception. The cost of raising the grade of the bridge to obtain acceptable underclearance must take into account additional approach work.

#### **4. Substructure / Railing**

- a. Sound all substructure and railing concrete elements (pier columns, caps, abutments, backwalls, etc.) for delamination and unsound areas. All delaminated areas are to be marked with paint that will be evident in the photographs. Sketches for each substructure and railing element mapping the areas of distress (cracks, delamination, spalls, etc.) are to be included in the appendix of the report. The percent of the total surface area distressed shall be calculated and shown on each sketch.
- b. Visually inspect all substructure and railing units for signs of settlement, lateral movement, cracking, spalling, exposed reinforcement and material

defects. Visually examine fractured concrete to determine if it contains slag aggregate. Note the condition of the backwalls, and check the bridge seat for undermining at bearing locations. For pier caps, check for flexural cracks and shear cracks. Note areas of previous repairs. Pictures of the substructure and railing elements must be taken and a written description of the deterioration and location must be documented for inclusion into the report.

- c. Note the type and condition of the bridge railing. Does the railing meet current standards? Is a thrie beam retrofit necessary, or a railing replacement? If pedestrian fencing is present, note its condition. Guardrail on the approaches should also be evaluated. Note the condition of brush blocks, raised shoulders and sidewalks, and how these elements transition from the approaches.

## **5. Non Destructive Testing**

The CONSULTANT may determine that other non-destructive testing beyond what is mentioned in the Scope of Service is needed to make a better judgment. However, such testing (ultrasonic, magnetic particle testing, acoustic emission, etc.) must be approved by MDOT's Project Manager. If the project manager approves the test, the CONSULTANT must submit a testing proposal. The testing proposal will show what tests are to be performed, what specific information is to be gained from testing, and how the information is to be used. Proposals submitted with insufficient information will be denied.

The results and analysis of any testing that is approved and performed will be discussed in the Site Review Findings section of the report and the actual test reports will be included in the Appendix.

## **6. Scour**

Stream and river bed scour has to be evaluated periodically to ensure that the foundation for the bridge has adequate support. The CONSULTANT will perform a scour check around all structural elements that are located in water up to six feet deep utilizing hands and probes. Substructure elements that are in water over six feet will be inspected by a diver under a separate contract.

Information on stream scour must be included in the report and, if there is any loss of bearing or undermining of a footing, this must be reported to the MDOT PM using a "Request For Action" (RFA) form. If the loss of bearing is sufficient to cause concern for the structural element to support the bridge, the CONSULTANT will notify the MDOT PM on an emergency basis.

In addition to scour, a new stream bed cross section must be included in the report. Any cross sections recorded in former year will be provided to the CONSULTANT by MDOT prior to the inspection. All years should be graphed

together so any changes in elevation will be evident.

## **7. Additional Items for Full Scoping**

- a. The area immediately around the structure must be closely evaluated to determine if there are any site issues or constraints that may have an impact during construction. Each quadrant of the structure is to be evaluated and photo-documented. These include items such as:
  - 1) Businesses or driveways close to the approaches.
  - 2) Utilities attached to or near the bridge.
  - 3) Signs or sign brackets attached to the bridge. Specify if the connections are bolted or welded.
  - 4) Dynamic Message Boards.
  - 5) Poor alignment or geometrics.
  - 6) Approach and departure guardrail terminals or the presence of impact attenuators.
  - 7) Bank erosion or scour. Unusual channel features.
  - 8) Railroad tracks that have been removed from over or under the bridge.
  - 9) Proximity of other bridge structures.
  - 10) Is drainage sufficient? Any evidence of ponding on the structure?
  - 11) Is the Right-of-Way limited and might additional ROW or easements be required?
  - 12) ITS components, such as cameras, changeable message signs, conduit, and other ITS elements.
  
- b. Additionally the following items are some of the items that, if apply, must be evaluated and costs considered:
  - 1) Is the bridge historical?
  - 2) Does this bridge have special structural design features which may affect the repair options (e.g non-redundant, fracture critical)?
  - 3) Is the minimum vertical underclearance deficient?
  - 4) If it is a turn-around structure, or has a turn around on it, do the radii meet current standards? Is widening of the bridge required to meet current radii standards?
  - 5) Are there environmental issues that may impact the project?
  - 6) If it is a pedestrian structure, do the geometrics meet current ADA criteria? If not, consider what repair options would be necessary to meet the minimum criteria set by the ADA.
  - 7) Are there sidewalks on the bridge? If so, do the geometrics meet current ADA standard? Are there sidewalk ramps within the limits of the bridge approach? If so, do the sidewalk ramps meet current ADA standard?
  - 8) Determine impacts of the proposed bridge treatment on the existing horizontal and vertical alignments, pavements, curb and gutter, drainage, right of way (ROW), etc. Every effort shall be made to

minimize ROW impacts within the limits of the projects. In areas of potential ROW impacts, the Consultant shall identify the potential need for additional ROW, by station or address, type of ROW required (grading permit, easement or fee), and roadside improvements proposed (i.e. fencing, turf establishment, landscaping, non-motorized, etc.).

- 9) Review and document the final scope for conformance to 3R/4R Guidelines for non-freeway jobs and 4R, AASHTO and Interstate Standards for freeway jobs. Documentation shall include existing condition, treatment as per design standards, and recommendation.
  - 10) Identify areas where bridge design standards cannot be met on the final proposed recommended treatment, give justification and documentation as to the reason, and prepare the design exception. The preparation of a Design Exception Request form for the recommended proposed treatment may be necessary to fulfill the Federal Highway Administration requirements for structures on National Highway System (NHS) routes.
  - 11) Review and document the roadside safety related items (i.e. guardrail, barriers, attenuators, etc.) which need to be modified or included in the project. Documentation will include location, existing type and condition, and the recommended treatment.
  - 12) Document and identify any possible utility conflicts and estimate the cost of relocation and/or adjustment.
  - 13) Document and identify locations of possible environmental issues which may impact the project, and estimate the cost of treatment.
  - 14) Develop Construction Zone Traffic Control Concepts in accordance with the Michigan Department of Transportation Mobility Policy.
  - 15) Structures where recommended repair is replacement, consultant shall explore the possibility of applying Accelerated Bridge Construction (ABC) Techniques for all of the bridge elements.
  - 16) All estimates and other project related items shall meet all MDOT requirements and detailing practices (i.e., format, materials, symbols, patterns, and layout) or as otherwise directed by MDOT.
- c. Photo log of the bridge and the surrounding areas must be included in the report. All of the pictures must be mounted on 8½" X 11" media and are to be captioned with a description of what the picture is intended to show. Each copy of the bridge report must have this series of pictures showing at least the following items and sequenced in the following order:
- 1) Elevation views of both sides of the bridge
  - 2) Deck surface (entire deck surface to be photographed, including joints). Photo shall be taken from a minimum height of 10 feet
  - 3) Railing, sidewalks, brush blocks, raised shoulders or any other feature of the deck surface
  - 4) Approaches

- 5) Underside of deck (to sufficiently document condition)
- 6) Typical superstructure elements (beams, diaphragms, cross bracing, lateral bracing, bearings, pin and hangers, etc.)
- 7) Abutments, including wingwalls and slope protection
- 8) Piers showing all faces
- 9) Waterways / railroad tracks
- 10) Areas of major deteriorated
- 11) Load posting signs
- 12) Vertical clearance signs
- 13) Signs or ITS attached to the bridge including connections
- 14) Utilities including connections
- 15) Quadrant photos, showing businesses or other items that could affect the cost of the construction, including ITS components
- 16) Quadrant photos, showing side slopes, downspouts or other items that could affect the cost of construction.
- 17) Traffic Signals / Pedestrian Signals with Construction Influence Area
- 18) Approach sidewalks

**If, during the site inspection, the CONSULTANT finds any structural condition that may cause the bridge to be load restricted (such as holes in beams, broken prestressing strands, etc.), or which may require other immediate action (such as lane closures or emergency repairs to holes in the deck, temporary supports, false decking due to spalled concrete, etc.), the CONSULTANT will notify the MDOT PM as soon as possible. The CONSULTANT will be provided with a list of contact information of key personnel within MDOT in the event that the MDOT PM is unavailable. In addition, The CONSULTANT will provide documentation of the condition (e.g. beam measurements, pictures taken) to MDOT as quickly as possible using form 1887- MDOT Request For Action.**

In addition, pictures must be taken which will support the CONSULTANT's recommendations. All pictures must be captioned to describe the general view (such as north elevation, etc.) and to describe the pertinent item or deterioration. The deck surface photos will be an "aerial view" taken from a height of at least 10 ft above the surface of the deck. These photos will be taken after the deck delamination survey and the areas of delamination are expected to show clearly in the photo.

## **B. ENGINEERING ANALYSIS**

The engineering analysis phase will include an evaluation of the site inspection findings, determination of the appropriate work type category. The types of repair options that are to be considered must be separated into two major work type categories: Capital Preventive Maintenance and Rehabilitation/ Replacement.

### **Capital Preventive Maintenance (CPM)**

- a. Joint Replacement
- b. Pin and Hanger Replacement
- c. Complete Painting
- d. Zone Painting
- e. Shallow Concrete Overlay
- f. Thin Epoxy Overlay (Floodcoating)
- g. Deck patching, Healer Sealer
- h. Scour Countermeasures
- i. Bituminous Overlay
- j. Substructure Patching

### **Rehabilitation / Replacement (R&R)**

- a. Deep Concrete Overlay
- b. Superstructure Repairs
- c. Substructure Repair (Substructures with an NBI rating of 4 or less)
- d. Substructure Replacement
- e. Deck Replacement
- f. Superstructure Replacement
- g. Structure Replacement

The Bridge Deck Preservation Repair Matrix must be consulted for reasonable deck repair options based on the condition of the deck surface and underside. This is to be used as a guide, and shall not substitute for sound engineering judgment. The degree of required analysis and required deliverables vary for the work categories. See below for more discussion about the option choices.

#### **1. Rehabilitation/Replacement Work Category**

For proposed R & R work proceed with the preparation of and evaluation of at least three repair strategies, including the estimate of cost of the repair strategies and the selection of the best repair option. This phase shall also consider the scope of road work and maintaining traffic concepts as outlined in the scope.

An initial repair option will have been determined during the site review in the field. The CONSULTANT is required to perform an engineering analysis of this option and on the options above and below it from the list in the section “Scoping Checklist and determining the most appropriate Repair Options”. For example, if deck



replacement is determined to be the most appropriate repair option, a cost estimate shall be prepared for the overlay and superstructure replacement options.

For the superstructure replacement and bridge replacement options, the CONSULTANT will also analyze eliminating or correcting undesirable or deficient design characteristics (e.g., structural capacity, widening, etc.). Analysis of the load carrying capacity of some components of the bridge may be required.

## **2. Estimating Various Repair Options**

Cost estimates for each of the Repair options will be prepared for each structure using the Bridge Repair Cost Estimate form with unit prices (provided by MDOT PM). The Estimate Sheet, provides spaces to show all of the repairs to be performed for that call for projects year. Calculations for the paint area will be prepared by the CONSULTANT and included in the appendix of the report.

The estimates required are “early preliminary estimates” and not the more detailed “engineering estimates.” The object is to determine the most economical method of treatment and to establish the budget. The unit prices on the attachment are averages of various types of repairs regardless of the type material (steel or concrete for instance). The more detailed estimates will be determined in the design phase (Not part of the authorization)

If additional information is necessary for a unit price not on the list, contact the MDOT PM.

## **3. Capital Preventive Maintenance**

For proposed Capital Preventive Maintenance work proceed with the preparation of a cost estimate using the Bridge Repair Cost Estimate. This phase shall also consider the scope of road work and maintaining traffic concepts as outlined in the scope. If additional information is necessary for a unit price not on the list, contact the MDOT PM.

# **C. DELIVERABLES**

## **1. Rehabilitation / Replacement Work Category**

Submitted draft reports shall be the report in its entirety unless instructed otherwise by the MDOT PM. The draft report shall be submitted as an electronic PDF file through a folder in ProjectWise, ftp site or other approved electronic delivery. The final deliverables for a Rehabilitation/Replacement work category for this scope of work will be the reports, photographs, estimate sheets, field notes and scoping checklist. One electronic PDF file of the report will be submitted for each bridge scope included in the work package list through a folder in ProjectWise, ftp site or other approved electronic delivery. When applicable, access to and the location of the folder on ProjectWise will be given prior to the draft report submittals.

The naming convention for the PDF file shall be as follows:

*Scope Struct ID Date: SCOPE B01-63123 9-9-2015*  
*Detail Struct ID Date: DETAIL B01-63123 9-9-2015*

The submitted report for each bridge shall be as described below. A summary sheet showing Structure Number, Bridge ID, bridge location, proposed work, and estimated cost per bridge shall serve as a cover sheet.

*a. Table of Contents:*

A table of contents will be provided for the complete document.

*b. General Site Review Procedures:*

This section will summarize the general procedures used during the site review. This information will include a table showing the site review dates for the bridge, equipment used, traffic control procedures, site review procedures, etc.

*c. Executive Summary:*

This is to include a statement of the recommended treatment for the bridge and the cost (in 2021 FY dollars as directed by the MDOT PM) of the initial repair. The executive summary will be a standalone section and will not refer to other sections of the report, nor will the main text refer to information in the executive summary. The information to be included in the executive summary shall be as stated follows:

- 1) Recommended repair option, and cost in 2021 dollars
- 2) Provide the Element Level Condition State assessment and quantity of defects for each element based on the scoping findings per the Michigan Bridge Element Inspection Manual (MIBEIM)
- 3) The general condition, and current NBI ratings for item 58A (deck surface), item 58 (deck), item 59 (superstructure), and item 60 (substructure) from the Bridge Safety Inspection Report (BSIR).
- 4) The percent deficiencies of the deck surface, deck underside and substructure units. State if recommended repair option is consistent with the Bridge Deck Preservation Repair Matrix and justification as to why or why not.
- 5) The measured existing vertical underclearance, and any utilities on the structure. State the Region or TSC contact personnel for utility and maintenance of traffic issues (MDOT PM to provide this information).

*d. Field Site Review Findings:*

This section will include, as a minimum, discussion of the following areas:

- 1) Overall assessment of the condition of the bridge including an evaluation of the beam end thicknesses (webs and bottom flanges) taken during the site review. Reference to current NBI ratings for items 58A, 58, 59, & 60. State percent deck surface and

underside deficiencies. Sketches of beam end repair areas, all substructure elements showing repair areas for all faces, and typical deck sections for widening options.

- 2) Site issues, i.e., geometrics, vertical clearance, maintenance of traffic, utilities, scour, etc. In case of the situation where no site issues that would impact the rehabilitation of the structure were identified, a statement will be made that all areas were investigated and no issues were found.
- 3) Testing results and implications to the repair options. If no testing was performed, this will be stated in the report.
- 4) The following outline may be used for a consistent presentation format for the body of this section of the report:
  - a. Approaches (approach slab and sleeper slab if applicable, guardrails)
  - b. Deck (surface, underside, joints, sidewalk, brush block, bridge railing)
  - c. Superstructure (beams, diaphragms, cross frames, paint system, bearings, pin and hangar)
  - d. Substructure (abutments, backwalls, wingwalls, piers, slope protection, scour)
  - e. Site Issues
    - I. Maintaining Traffic
    - II. Geometrics
    - III. Vertical Clearance
    - IV. Signs
    - V. Quadrants
    - VI. ADA/Standards Compliance, etc.
    - VII. Utilities
    - VIII. Channel condition
    - IX. ITS Components
    - X. Material Testing

e. *Rehabilitation Options:*

This section will include a discussion of the rehabilitation options considered. For each option evaluated, a discussion of the necessary improvements and the associated costs will be included. The report must discuss and state the reasoning and judgment for selection of the recommended option. This discussion will also include the reasoning for the elimination of all other options, as appropriate.

f. *Summary with Repair Recommendation:*

This section will state the recommended course of action for the bridge and the factors used in determining this recommendation. This section will also briefly discuss the effects of postponing the recommended improvements.

g. *Maintaining Traffic / Mobility Summary*

This section shall include an analysis of the traffic control plan in accordance

with the Michigan Department of Transportation's Mobility Policy. Various traffic control alternatives shall be evaluated.

*h. Bridge Repair Cost Estimate*

A cost estimate must be prepared for each repair option that was considered using the Bridge Repair Cost Estimate Sheet.

*i. Appendix:*

1. Index sheet with Photo Titles
2. Word document with photos and descriptions
3. Scoping Checklist(s)
4. Field notes and sketches
5. Paint Calculations – Paint Areas, Deck Areas, etc.
6. Table of beam end thickness readings (if applicable)
7. Lab test reports (if applicable)
8. Road Preliminary Estimate (separate spreadsheet)
9. Existing Plan Sheets (general plan of site and general plan of structure)
10. Current Bridge Inspection Reports
11. Revised Elements Report in accordance with the Michigan Bridge Element Inspection Manual  
[http://www.michigan.gov/documents/mdot/MiBEIM\\_2015-03-05\\_Final\\_486188\\_7.pdf](http://www.michigan.gov/documents/mdot/MiBEIM_2015-03-05_Final_486188_7.pdf)
12. Revised SI&A- Form 1717A (as necessary)

**2. Capital Preventive Maintenance Work Category**

The deliverables for CPM reports will be similar to that for R&R, with two main exceptions. The Summary with Repair Recommendations section will only include brief discussion and listing of the repairs being recommended. Discussion on other repair recommendations, comparing and contrasting the logical alternatives, will not be needed. Once agreed upon by the MDOT PM as a CPM category bridge, the repairs will be less involved and will not require additional analysis. The second difference will be reflected in the Cost Estimates. There will only be need for one estimate.

Formatting for the reports will include:

- Summary Sheet
- Table of Contents
- Executive Summary
- Field Review Findings
- Rehabilitation Options Considered
- Summary with Repair Recommendation
- Estimate Sheets
- Word Document with Photos and Descriptions
- Scoping Checklists

Field Notes and Sketches  
Calculations - Paint Areas, Deck Areas, etc.  
Table of Beam End Thickness Readings (if applicable)  
Maintaining Traffic Concepts  
Appendix materials will follow as prescribed for the R&R reports.

Submitted draft reports shall be the report in its entirety. Draft reports shall be submitted electronically. The final report will be one hard copy of each of the report in its entirety; and one electronic PDF file on a Memory Stick Drive. In addition to the PDF file, the CONSULTANT shall also submit the Microsoft Word and Excel format files of each bridge.

The naming convention for the PDF file shall be as follows:

*Scope Struct ID Date: SCOPE B01-63123 9-9-2015*

*Detail Struct ID Date: DETAIL B01-63123 9-9-2015*

Incomplete final reports or reports with errors will be returned to the CONSULTANT for revision. Failure to make the required changes will be considered a failure to meet the terms of the contract.

## **TRAFFIC CONTROL**

### **Traffic Control & Permits During Site Inspection**

The traffic control during the site inspection will be the responsibility of the CONSULTANT. Permits for the traffic control and for working in the MDOT right-of-way must be obtained from the appropriate MDOT Transportation Service Center prior the start of work. On the permit application, indicate the Control Section and Job Number. Allow ample time for permit issuance. The CONSULTANT must follow all requirements as issued with the Permit from the MDOT TSC.

Nighttime lane closures for deck inspection may be allowed at the discretion of the MDOT Operation Engineer at each respective TSC. Approval for nighttime work must be obtained prior to the start of work.

## **RAILROAD FLAGGING & PERMITS**

If it is necessary to work over an active railroad during the site inspection phase, the CONSULTANT will be responsible for obtaining the necessary permits and flagmen. Costs for this will be considered an expense and must be detailed in the traffic control section in the proposal and on the invoice.

## **SOFTWARE REQUIREMENTS**

The CONSULTANT is required to own and use Microsoft Excel and Microsoft Word for all spreadsheets and word processing. The requested electronic files (see DELIVERABLES) must be submitted in these applications. Electronic file templates for all of the attachments can be provided via E-mail, from the MDOT PM. Contact the MDOT PM with your E-mail address.

## **EQUIPMENT AND SAFETY**

The CONSULTANT will be responsible for obtaining and operating the high reach equipment for inspection under the bridge. However, MDOT will provide an under bridge inspection crane for the CONSULTANT's use in certain situations, for example, high river and railroad crossings. The CONSULTANT will still be responsible for traffic control and for scheduling. Contact the MDOT PM or DPM a minimum of 14 days in advance for scheduling use of the equipment.

During the inspection, the CONSULTANT is responsible for traffic control and all aspects of personal safety of his or her staff. Traffic control will follow standard MDOT procedures. The CONSULTANT will be responsible for obtaining all permits and notifying the Region Engineer in writing (with a copy to the MDOT PM) of the time and location of the work.

All other inspection equipment and personal safety equipment such as hard hat, steel toed shoes, reflective vest, and eye protection will be responsibility of the CONSULTANT.

## **DIVING REQUIREMENTS**

No diving of river crossings is expected as part of this work. However, if it does become necessary, it will be dealt with under a separate authorization.

## **CONSULTANT PAYMENT – Actual Cost Plus Fixed Fee: As-Needed**

Compensation for this project shall be on an **actual cost plus fixed fee** basis. This basis of payment typically includes an estimate of labor hours by classification or employee, hourly labor rates, applied overhead, other direct costs, subconsultant costs, and applied fixed fee. The fixed fee for profit allowed for this project is 11.0% of the cost of direct labor and overhead.

This scope is for “as needed” services. As such, the hours provided are only an estimate. The Consultant will be reimbursed a proportionate share of the fixed fee based on the portion of the authorized total hours in which services have been provided to the Department. Fixed fee on “as needed” projects is computed by taking the percent of actual labor hours invoiced to labor hours authorized, then applying that percentage to the total fixed fee authorized.

All billings for services must be directed to the Department and follow the current guidelines. Payment may be delayed or decreased if the instructions are not followed.

Payment to the Consultant for services rendered shall not exceed the maximum amount unless an increase is approved in accordance with the contract with the Consultant. Typically, billings must be submitted within 60 days after the completion of services for the current billing. The final billing must be received within 60 days of the completion of services. Refer to your contract for your specific contract terms.

Direct expenses, if applicable, will not be paid in excess of that allowed by the Department for its own employees in accordance with the State of Michigan’s Standardized Travel Regulations. Supporting documentation must be submitted with the billing for all eligible expenses on the project in accordance with the Reimbursement Guidelines. The only hours that will be considered allowable charges for this contract are those that are directly attributable to the activities of this project.

MDOT reserves the right to request services on other projects located in the Region/TSC area that are not listed above, under the conditions of this “as needed” scope of services.

Full time services may not be required on all projects at all times. This scope is for “as needed” services, based on the intermittent needs of MDOT. It must be noted that this is not a guarantee that MDOT will use the Consultant’s services.

MDOT will reimburse the consultant for vehicle expenses and the costs of travel to and from project sites in accordance with MDOT’s Travel and Vehicle Expense Reimbursement Guidelines, dated May 1, 2013. The guidelines can be found at [http://www.michigan.gov/documents/mdot/Final\\_Travel\\_Guidelines\\_05-01-13\\_420289\\_7.pdf?20130509082418](http://www.michigan.gov/documents/mdot/Final_Travel_Guidelines_05-01-13_420289_7.pdf?20130509082418). MDOT’s travel and vehicle expense reimbursement policies are intended primarily for construction engineering work. Reimbursement for travel to and from project sites and for vehicle expenses for all other types of work will be approved on a case by case basis.

MDOT will pay overtime in accordance with MDOT's Overtime Reimbursement Guidelines, dated May 1, 2013. The guidelines can be found at [http://www.michigan.gov/documents/mdot/Final\\_Overtime\\_Guidelines\\_05-01-13\\_420286\\_7.pdf?20130509081848](http://www.michigan.gov/documents/mdot/Final_Overtime_Guidelines_05-01-13_420286_7.pdf?20130509081848). MDOT's overtime reimbursement policies are intended primarily for construction engineering work. Overtime reimbursement for all other types of work will be approved on a case by case basis.

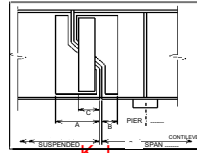




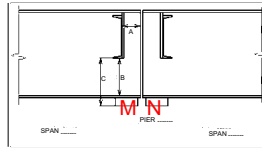
Form 0267-1 (03/02)

**DETAILED BEAM SURVEY REPORT**  
(WELDED GIRDER OR ROLLED BEAM)

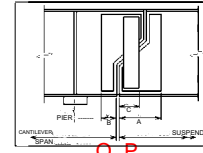
USE this form when TRAFFIC ON BRIDGE IS: WEST or EAST Bnd.



IF at .pin & hanger.. THIS Side of pier



IF at ... PIER ...



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FACILITY CARRIED: \_\_\_\_\_  
 INSPECTED BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
 STRUCTURE NO. \_\_\_\_\_ REGION \_\_\_\_\_

ALWAYS CIRCLE ABOVE TO NOTE APPLICABLE CASE USED IN FORM

DETAILS FOR FROM  
 span W  
 ex. span 1 w

INSPECTION AT FROM  
 PIER W  
 ex. PIER 1 w

DETAILS FOR FROM  
 span W  
 ex. span 2 w

COMMENTS & references to photos and sketches

COMMENTS & references to photos and sketches

BEAM LINE #	WEB LOSS MEASUREMENTS				FLANGE LOSS MEASUREMENTS				REPORT CASE			WEB LOSS MEASUREMENTS				FLANGE LOSS MEASUREMENTS				BEAM LINE #																				
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## Accelerated Bridge Construction Techniques

Accelerated Bridge Construction (ABC) is the construction that uses innovative planning, design, materials and construction methods in a safe and cost-effective manner to reduce the on-site construction time for new bridges or replacement and rehabilitation of existing bridges. ABC techniques, including Prefabricated Bridge Element Systems (PBES) and Slide-In Bridge Construction, are recognized by (MDOT) and (FHWA) as important and effective methods to construct or rehabilitate highway structures, while reducing the impact of bridge construction activities on mobility, the economy, and user delay. All major rehabilitation or reconstruction bridge projects should be evaluated to determine if ABC is suitable and provides a benefit taking into consideration safety, construction cost, site conditions, life cycle cost of the structure, MDOT's mobility policy and user delays, and economic impact to the community during construction.

When considering ABC, new technologies in the form of construction techniques, innovative project management, high performance materials, and pre-fabricated structural elements should be combined to achieve the overall goals of shortening the duration of construction impacts to the public, encouraging innovation, ensuring quality construction and expected serviceability of the completed structure. Prefabricated bridge elements can be built on-site away from traffic if site conditions warrant, or they can be fabricated off-site and shipped to the site. Both methods offer advantages in quality control compared to cast in place construction where schedule or staging dictate the work progression. Special attention will need to be paid to the erection of prefabricated elements and the connection details.

All proposed ABC candidate projects are subject to Statewide Alignment Team Bridge (Bridge Committee) approval. Candidate projects, during the scoping or structure study phases, are to be presented at the monthly Bridge Committee meeting. The Bridge Committee will review candidate projects for further evaluation, and grant approval to pursue ABC techniques and determine availability of Bridge Emerging Technology funding.

Strategic implementation of ABC is required to ensure the application is appropriate for the project location and objectives. The following criteria should be considered during the bridge project scoping process to determine if ABC is appropriate.

### Criteria Consideration

#### Site:

- Is the bridge located in a remote area?
- What are the existing structure characteristics and foundation type? Often, the existing substructures may be in the way of achieving full prefabricated or accelerated construction.
- Is the existing terrain difficult to traverse?

- Are there pre-casting and concrete readi-mix facilities in the area?
- Is there access for equipment and/or sufficient space for a pre-casting operation?
- Can the pre-casting site and subsequent structure move path be completed successfully without significant impacts to adjacent residents and businesses?
- Is there ROW available to build on site away from traffic then move into place?

Average Daily Traffic:

- Is the bridge located on a high ADTT route?
- Would delays have impacts to local economy and community services?

Delay or Detour Time:

- Does closure of the bridge require a long detour?
- Are large delays expected due to part-width construction?
- Are emergency services adversely impacted?
- How is the MDOT mobility policy impacted?

User Costs:

- What is the value of maintaining traffic on an interstate route?
- What is the duration of the impact for conventional construction vs. ABC?
- What is the user delay cost given the staging?
- What possible savings can be realized by shortening the construction duration?

Impact to the Local Economy During Construction:

- Will a detour or maintenance of traffic scheme result in serious impacts to the local economy and businesses?
- Will conventional construction impact any significant local/public events to where considering ABC options could avoid them?

Safety:

- Does staged construction on the interstate require working adjacent to traffic?
- What posted speed is proposed in the construction zone?
- Does complex staging expose the public and workers to unsafe conditions?

Environmental Issues:

- Are there seasonal issues limiting construction (i.e. bridges over waterways)?
- Are air quality, ambient noise, and other quality of life issues a factor?

Technical Feasibility:

- Is part width construction proposed on structure with spread footings?

- Is part width construction proposed on structure founded on sandy soils?
- Is the bridge on a river crossing with scour or hydraulic issues?
- Is the structural capacity of the existing substructure known?
- Will removal of portions of existing bridge during staged construction have an adverse impact on the remaining portions of the bridge?

#### Quality Concerns:

- Would part width construction affect the expected service life of the structure?
- Would the use of innovative materials increase the expected service life of the structure?
- If the initial cost of ABC construction is more than conventional construction, is there overall life cycle benefit?

The above criteria and questions must be carefully evaluated during project scoping and preliminary design to determine if ABC implementation will be of benefit. An ABC decision making tool is currently under development that will help evaluate the above criteria.

If the determination has been made that ABC will be implemented on a specific project, the next step is to choose the methods that are technically and economically feasible. ABC can be PBES or it can be full structural placement methods such as Self-Propelled Modular Transporter (SPMT) or building a bridge on temporary false work and sliding it into place.

PBES can be built on site away from traffic if site conditions warrant, or they can be fabricated off site and shipped to the site. Both methods offer advantages in quality control compared to cast in place construction where schedule or staging dictate the work progression. Erection of prefabricated elements and the connection details will require special attention being paid to the following:

#### Detailing Considerations

##### Dimensional Tolerances:

- Connections between elements must accommodate field erection
- Elements fabricated off site should be test fit or otherwise confirmed to be of the correct dimensions prior to shipping
- Templates should be used to ensure correct fit-up between prefabricated elements or between a prefabricated element and a cast in place element
- Connection details should be standardized

##### The Weight and Size of Precast Elements:

- Need to ensure elements can be erected with contractor's equipment
- Need to ensure elements can be shipped to the site

- Need to ensure elements can be erected without long term lane closures

The following prefabricated elements may be considered for use on MDOT bridge projects:

- Precast Full Depth Deck Panels
  - These may be transverse or longitudinally post tensioned
  - Panels are sensitive to skew and beam camber and haunches
  - May have long term maintenance concerns
  - Riding/wearing surface material to be used
  - Dimensional tolerances are very tight
- Decked Beam Elements
  - Two steel beams connected with deck (modular beams)
  - Decked bulb T beams
  - Decked prestressed spread box beams
  - Systems rely on full shear and moment capacity joints and closure pours
  - Camber control required
- Pier Elements
  - Precast pier caps
  - Precast columns
  - Precast pile caps
  - Systems rely on grouted or mechanical reinforcement splices to develop reinforcement sufficiently to transfer reactions from one element to the next
  - Multiple smaller caps spanning two columns as opposed to one large cap should be considered
  - Pier columns that directly support beams without pier caps may be considered
- Abutment and Other Elements
  - Precast abutment panels
  - Precast footings
  - Precast backwalls and wingwalls
  - Systems rely on grouted or mechanical reinforcement splices to develop reinforcement sufficiently to transfer reactions from one element to the next
  - Voids can be considered to reduce weight
- Precast Approach Slabs

Dimensional tolerances are very tight for all PBES. The tolerance sensitivity required when erecting prefabricated elements may require dual or independent survey contracts to ensure proper fit up, camber, deflections and finished grades.

The following full structural placement methods may be considered for use on MDOT bridge projects:

## Placement Methods

### Self Propelled Modular Transport (SPMT):

- Computer controlled platform vehicle with movement precision to within a fraction of an inch
- Capable of lifting 165 to 3,600 tons
- Vertical lift range of 36 to 60 inches
- Axle units can be rigidly coupled longitudinally and laterally
- Move costs range from \$50,000 to \$500,000 (mobilization costs are significant, so SPMTs should be considered on corridors where multiple bridges may be moved)
- Limited to use on sites with minimal grade changes
- During design, need to consider dynamic effects of move on structure
- If using multiple SPMT's, need to ensure proper bracing for overall stability during move

### Lateral Bridge Slide:

- Bridge section is built on temporary supports adjacent to existing substructure
- Bridge section bears on stainless steel, or other low friction surface such as Teflon
- Existing substructure units can be reused or new units constructed with minimal impact to traffic
- Bridge section is laterally jacked into place
- Cost to slide a bridge is approximately \$50,000 to \$80,000 depending upon size of the bridge
- Additional stiffeners and/or diaphragms may be required on beams at point of jacking force application
- Additional reinforcement in concrete elements may be required to control jacking stresses, or other ABC related construction loads

### Incremental Launching:

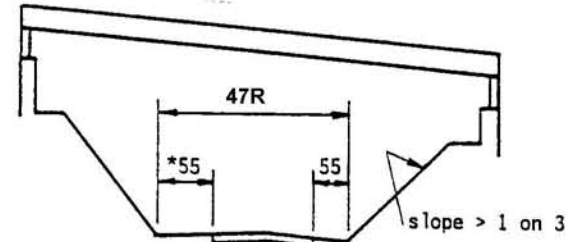
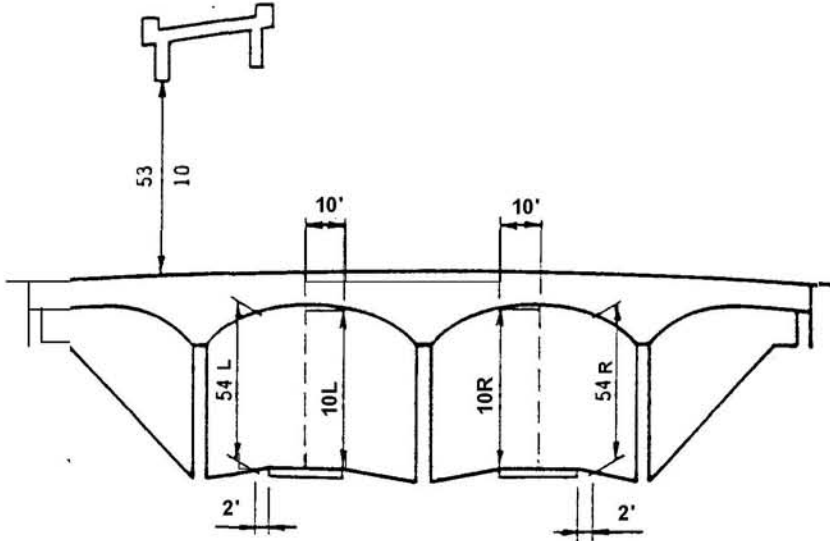
- Bridge section is built near approaches, and then longitudinally launched into place
- Prestressing may be required for concrete elements due to alternating bending moments generated during launch

Allowing the contractor to select methods of placement may also lead to additional innovations and acceleration to the project schedule. Depending on the complexity of the overall project, innovative contracting methods may also be used in conjunction with ABC/PBES techniques. Innovative contracting methods are approved on a project by project basis by the MDOT Innovative Contracting Committee and the MDOT Engineering Operations Committee.

The Federal Highway Administration provides additional information about ABC and PBES at the following website: <http://www.fhwa.dot.gov/bridge/abc/index.cfm>

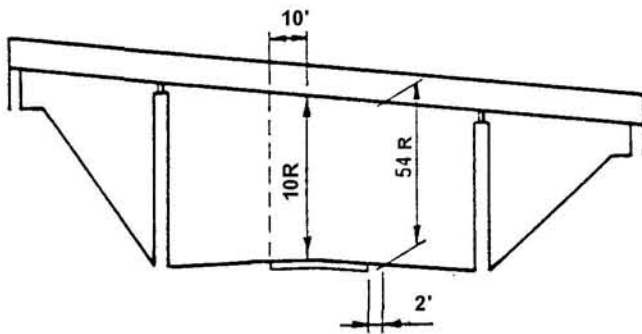






Item 55 - Minimum lateral clearance on right.

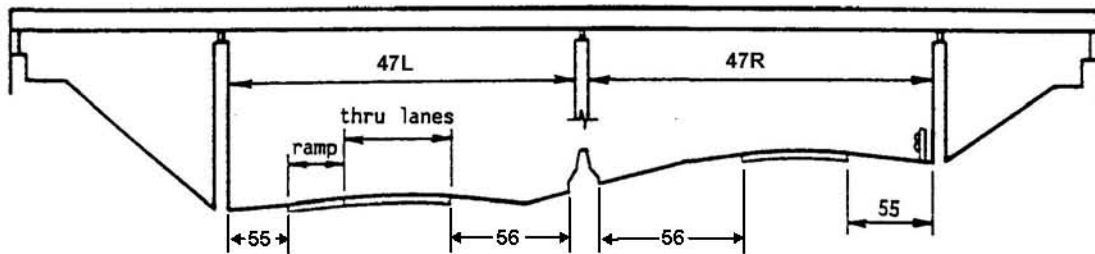
\* Item 56 - Minimum lateral clearance on left. Code left side for structure over one-way traffic.



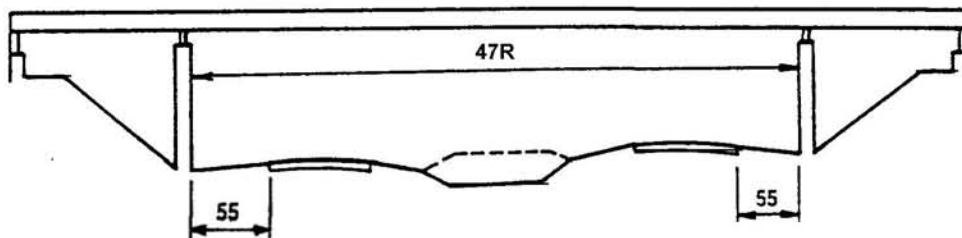
\* Take measurement 2ft off edge of pavement unless underclearance is less over pavement.

Item 10L and 10R - Minimum vertical clearance best 10'.

Item 54L and 54R - Minimum vertical underclearance. For divided highways, record both.\*



Items 55, 56 and 47 for divided highways. Measure both sides and record the minimum for items 55 and 56.



Item 56 - Minimum lateral clearance on left. Code as shown for divided highway with open median.