



105 West Capitol Avenue  
P.O. Box 270  
Jefferson City, Missouri 65102

Missouri Department of Transportation  
*Patrick K. McKenna, Director*

1.888.ASK MODOT (275.6636)

May 26, 2020

Dear Research Partner:

The Missouri Highways and Transportation Commission requests proposals from qualified organizations—namely private consultants, universities, and research organizations—to furnish professional services as described in the following request for proposal to be coordinated by the Research Unit of the Construction and Materials Division.

Please submit a proposal for project **TR202101** entitled, “**Enhanced Camber Calculations for Prestressed Concrete Bridge Girders.**” Your submittal must include a work plan, the proposed project team and its background, and any related projects now active or recently completed by your firm. The project team must be led by a licensed professional engineer in the state of Missouri and the final report must be sealed, in accordance with the provisions of Chapter 327 RSMo.

The selection committee will use Qualification Based Selection. A “not to exceed” budget amount is included in the RFP to assist with the required scope, but budgets are not to be included with the proposal submissions and will not be presented to the selection committee.

Please submit all proposals to [MoDOTResearchRFP@modot.mo.gov](mailto:MoDOTResearchRFP@modot.mo.gov) by **July 28, 2020 at 10:00 AM (CST)**. More information about project contracting in general can be found at <https://www.modot.org/information-researchers> under RFP documents.

Sincerely,

Jen Harper  
Research Director



*Our mission is to provide a world-class transportation system that is safe, innovative, reliable and dedicated to a prosperous Missouri.*

[www.modot.org](http://www.modot.org)

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## Background

Like many state's Department of Transportation, MoDOT has been utilizing prestressed concrete I, NU and Bulb-tee girders in bridge construction for quite some time. Similar to other DOTs, MoDOT has observed issues with increased occurrences of less than expected camber in completed prestressed concrete bridges. Bridge erection and construction methods have changed over the years along with more condensed timelines in almost all facets, from fabrication of prestressed members to loading of those same girders with panels, rebar and concrete for the deck. Shortened timeframes, longer span lengths, a variety of material properties and environmental conditions, among other factors are taking the known and understood girder camber calculations to their limit.

Accurate bridge camber in prestressed concrete girders is a critical design component in the ride, appearance, maintenance requirements and overall life of a concrete superstructure bridge. There are a variety of components that go into the final camber of the prestressed concrete girders, including the initial calculation, casting and release, shipping, timeline to deck pour and eventual loading with the deck components.

MoDOT is actively exploring ways to improve the accuracy, constructability and overall performance of new prestressed concrete girder bridges. Enhanced prestressed girder camber calculations, which take into account many different factors and lessons learned over the years, will be the primary deliverable for this project.

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## Objectives

The objectives for the project are as follows:

- Perform a literature review to collect and analyze recent girder camber research efforts completed by other state Departments of Transportation.
- Gather data on MoDOT bridges with less than expected camber in prestressed concrete I, NU and Bulb-tee girders.
- Develop and validate a computational model of representative prestressed concrete I, NU and Bulb-tee girder bridges.
- Identify the most plausible causes for less than expected camber from the currently utilized camber calculation and recommend a new or improved camber calculation equations.

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## Project Requirements

### Task 1: Project Management

The Contractor shall facilitate a kickoff meeting with MoDOT to review the work plan, scope, and schedule; and establish a protocol for regular ongoing communication and coordination with the team. This proposal will serve as the Draft Work Plan, to be discussed in the kickoff meeting. Upon comments received during the meeting and/or in writing, the Contractor shall incorporate those comments into a Final Work Plan.

The Contractor shall schedule and conduct a quarterly status meeting to review progress for the previous period and anticipated work for the next period. Contractor shall also develop minutes for the kickoff meeting and each of the quarterly status meetings.

## **Task 2: Literature Review**

The Contractor shall perform a literature review of recently completed research by other state DOTs related to camber predictions and calculations for prestressed concrete I, NU and Bulb-tee girders and camber calculations and procedures used by neighboring states. This review will aid in understanding potential issues or concerns experienced by other states along with additional concepts to consider during the subsequent tasks of this project. Additionally, relevant calculations or procedures from other states shall be compared to the new camber calculation and procedure generated in later tasks, to further substantiate the proposed method.

## **Task 3: Collect Field Data**

The Contractor, in collaboration with MoDOT's Bridge Division and Construction & Materials Division personnel, shall aggregate MoDOT bridge data records to identify a number of bridges that possess less than designed camber. The contractor will then collect any relevant additional data for those identified bridges with less than expected cambers in prestressed concrete I, NU and Bulb-tee girders. Data may include, but is not limited to:

- Girder geometries and support conditions;
- Environmental conditions and history at applicable sites; and,
- Material properties of individual girders.

Girder fabrication, documented bridge construction processes and timeline between girder pouring, erection, and slab pouring on selected bridges shall be investigated for potential impacts to camber geometry, along with the final condition of prestressing tendon anchorages.

The number of bridges identified in initial data gathering and field data collection shall be at the discretion of the Contractor, such that they have a sufficient number to successfully complete those items in Tasks 4 and 5.

## **Task 4: Develop and Validate Model**

The Contractor shall develop a computational model of representative prestressed concrete I, NU and Bulb-tee girder bridges, considering girder fabrication effects and the casting process of the bridge deck in terms of composite action with girders, and determine the model parameters by making the simulated camber into the actual camber. The model shall be validated by the Contractor.

## **Task 5: Formulate Revised Camber Calculation Equation**

After identifying the most plausible cause for less than expected camber in prestressed concrete girders, the Contractor shall analyze the currently utilized camber calculations for areas of improvement. Following this analysis, the Contractor shall recommend new or updated camber calculation equations and procedures to be utilized for new construction of prestressed concrete girder bridges. Literature review materials gathered in Task 1 shall be used to compare neighboring or similar climate states' camber calculations and procedures with the new or updated calculation(s) and procedures for this project, to further substantiate the proposed method.

The new or updated camber calculation(s) shall be coded such that it can be processed through an easily accessible program (i.e., Microsoft Excel) where persons using the equation only need to input specified parameters to attain the calculated camber value.

## **Task 6: Develop Report, Research Summary, EPG Revisions and Presentation**

The Contractor shall develop a final report detailing the tasks completed during the project, including any and all findings generated during the project's duration. The Contractor shall provide a 1-2 page research summary that states the project objectives, findings and conclusions. The Contractor shall also prepare updated language and the new calculations for entry into relevant sections of MoDOT's Engineering Policy Guide (EPG). A presentation for MoDOT staff, summarizing important or significant details of the project, shall also be provided.

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## Project Deliverables

For templates and forms for reports and plans, visit <https://www.modot.org/information-researchers>.

### Email Communications

E-mail and phone communications between the Principal Investigator(s) and MoDOT contacts as necessary are required to provide on-going updates of progress throughout the project

### Data Management Plan

The plan is a formal document that describes the data that is acquired, created or produced during the project, specifies who owns it and who can access it as well as information on how it will be described, managed, analyzed, stored, shared and preserved during and after the project is over. Please refer to templates on the [website](#).

### Quarterly Reports

Quarterly reports shall be submitted throughout the project on the last day of March, June, September and December. The quarterly reports are not intended to replace any additional correspondence between the research team and MoDOT needed to keep the project moving. Please refer to template on the [website](#).

### Draft Final Report and Research Summary

These drafts shall be final products except for revisions based on MoDOT's review. A final report must include a completed Technical Report Documentation page. Please refer to **Publication Guidelines** and summary template on the [website](#).

### Final Report and Final Research Summary

After MoDOT's review is complete and documents have been edited to MoDOT's satisfaction, final documents shall be submitted as a Word documents (unless otherwise instructed). Please refer to **Publication Guidelines** and summary template on the [website](#).

### Engineering Policy Guide Revisions

The Contractor, based on the results of the research and completion of Final Report, shall present revisions for MoDOT's Engineering Policy Guide (EPG) to MoDOT Bridge Division personnel for those sections related to girder camber calculations, including but not necessarily limited to [Category:705](#).

### Final Presentation

The Contractor shall present the results, recommendations, and implementation ideas to MoDOT and other stakeholders. The Contractor shall coordinate location, date, and meeting fees with MoDOT. For stakeholder and agency participants, any travel and lodging fees are to be covered by individual attendees or their firms. MoDOT and stakeholders will provide feedback to the Contractor, especially related to implementation.

## Task-Specific Deliverables

Task	Deliverables
1	Schedule and conduct kickoff meeting. Kickoff meeting minutes. Draft and final work plans. Quarterly project status meetings.
2	None
3	Collected field data (if requested by MoDOT).
4	None
5	Revised camber calculation equations and computational/programmed equation tool.
6	Final report and research summary. Presentation. Final project meeting.

## Project Schedule

The following is an estimate of the project timeline or information on key dates within the project, presuming the project starts **September 11, 2020**. Proposals need to include a work plan with a proposed timeline. For a sample of a work plan template, see link below. Changes to our estimated project timeline below will be considered, however, timeline extensions cannot be guaranteed. The project timeline will be discussed and finalized during the kickoff meeting.

For report templates and forms, visit <https://www.modot.org/information-researchers>.

Date	Milestone
On or before 10/1/2020	A kick off meeting with MoDOT will be scheduled to discuss project requirements and deliverables. The dates of key milestones and deliverables will be determined from this meeting.
12/31/2020	Quarterly Report
3/31/2021	Quarterly Report
6/30/2021	Quarterly Report
9/30/2021	Quarterly Report
9/16/2021	Draft report and draft research summary are due. The draft documents shall be submitted to MoDOT approximately two months prior to the final report.
11/17/2021	Final report, research summary and presentation are due. The final documents shall be due approximately one month before the end of the

Date	Milestone
	contract. This is to allow all billing to be completed prior to the end of the project.
12/21/2021	Final invoice due and contract ends.

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## Special Notes

Project budget is not to exceed **\$80,000**. A budget is not to be included in the proposal, but will be required for the contract and must be within this limit. For a sample Budget template, report templates and forms, see <https://www.modot.org/information-researchers>.

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## RFP Requirements

- “Contracting Documents” provide further details and links to the required forms. They are available at <https://www.modot.org/information-researchers>.
  - **Organization’s Project Experience:** The proposal must clearly identify the Organization’s experience in offering the services requested in this RFP during the past three (3) years. The description must include a list of the agencies which your organization has served during this time period or currently serves. Please highlight any work you have done with other state agencies or local governments.
  - **Team Member Experience:** Must list all team members (including Subcontractors) proposed to work on the project. Attach licenses, certifications and resumes for key personnel.
  - **Organization’s Client References:** Proposals must indicate the name, title, and telephone number of at least three clients within the past three years.
- Proposals must be no more than 10 pages in length with a font size no less than 11 points. This length limit **does not include** the Proposal Submission Form, Organization’s Project Experience, Team Member Experience, Organization’s Client References and optional cover letter (if included, one page maximum).
- Proposals must be submitted as one combined PDF document. The submission shall **only include the required documents** organized in the following order: 1) Proposal Submission Form; 2) Cover Letter (Optional; 1 page maximum); 3) Body of Proposal (including work plan); 4) Organization’s Project Experience; 5) Team Member Experience; and 6) Organization’s Client References.
- The Offeror must respond to this RFP by submitting all the information required herein for its proposal to be evaluated and considered for award. Failure to submit all the required information shall be deemed sufficient cause for disqualification of a proposal from consideration.
- Proposals will be evaluated by an agency and stakeholder team with knowledge and backgrounds in relevant areas for this project. Selection of the successful Offeror will be based on the Offeror’s demonstrated knowledge in the required areas, the merit of the proposed methods and approach in achieving the desired goals, the experience and qualifications of the team, the plan for ensuring implementation of results, and the adequacy and availability of team members to complete the work in a timely manner.

- Correct proposal submission is one of the evaluation criteria. If submission instructions in this section are not followed, the **Offeror risks an automatic 10 point deduction (out of 100 total points)** when points are awarded during the Proposal Evaluation Process.

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## RFP Schedule

This document constitutes an RFP from qualified organizations to conduct the **TR202101 - Enhanced Camber Calculations for Prestressed Concrete Bridge Girders** study for the MHTC and Missouri Department of Transportation (MoDOT). MHTC reserves the right to reject any and all proposals for any reason whatsoever.

The following RFP Schedule of Events represents MoDOT's best estimate of the schedule that shall be followed. The time of day for the following events shall be between 7:30 am and 4:00 pm, Central Standard Time unless otherwise noted. MoDOT reserves the right at its sole discretion to expand this schedule, as it deems necessary, without any notification except for the deadline date for submitting a proposal. Time is of the essence for responding to the RFP within the submission deadlines.

The following timeline must be met for a proposal to be accepted.

Date	Action
5/26/2020	MoDOT posts RFP to the website at <a href="https://www.modot.org/research-requests-proposal">https://www.modot.org/research-requests-proposal</a> .
6/19/2020 4:00 PM (CST)	Written comments or questions must be submitted to the <a href="#">Research Director</a> .
6/30/2020	MoDOT will post written responses publicly on the website at <a href="https://www.modot.org/research-requests-proposal">https://www.modot.org/research-requests-proposal</a> .
7/28/2020 10:00 AM (CST)	Written proposals must be submitted to <a href="#">Research Director</a> .
8/19/2020	MoDOT will notify submitters about project selection, or if needed about interviews to finalize selection.

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## Contracting Requirements

The successful team will be required to complete additional documentation and enter into a contract such as a "Standard Research Agreement" or "Task Order." Applicants should be aware of these additional needs so contracting can proceed in a timely manner.

As part of the eAgreements process, MoDOT uses an electronic signature tool, DocuSign, for signing agreements electronically. All parties of the agreement must agree to sign electronically in order to utilize the electronic signature option. If your proposal is selected, you will be informed about how to obtain your credentials for electronic signatures (including how to become a MoDOT vendor if you are not already).

Standard contracts, forms, attachment templates and additional information are available from the website at <https://www.modot.org/information-researchers>.

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## Proposal Submission

### Submission Deadline

Proposals must be emailed by **10:00 AM (Central Standard Time)** according to email time stamp by the submission date in the RFP Schedule to the Research Director's attention (Jen Harper) at: [MoDOTResearchRFP@modot.mo.gov](mailto:MoDOTResearchRFP@modot.mo.gov). Please reference the project title since more than one RFP may be due at one time. Electronic proposals are required.

### Submission Confirmation

You will receive an email confirmation after your proposal has been received. If you do not receive such a confirmation by **12 noon (Central Standard Time)** on the day of the deadline, please contact us at [MoDOTResearchRFP@modot.mo.gov](mailto:MoDOTResearchRFP@modot.mo.gov) as soon as possible. Your submission should not be considered received until you have received your email confirmation.