



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)

August 23, 2019

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 **TR202009** entitled, **“Optimizing Work Zone Zipper Merge Operations Using Driving Simulations.”** 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 the [Research Administrative Engineer](#) by **October 4, 2019 10:00 AM (CST)**. More information about project contracting in general can be found at <https://www.modot.org/research-requests-proposal>.

Sincerely,

Jennifer Harper
Research Administrative Engineer



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

www.modot.org

Background

Driving through work zones during a popular and busy travel season can create frustration and confusion amongst Missouri's traveling public. The seemingly simple act of merging from multiple lanes of traffic into fewer available lanes becomes not-so-simple when performed in real time at highway speeds. Learning to avoid the obstacles of lost time, road rage and accidents or collisions in these merging areas prior to work zones is an issue all DOTs are trying to address.

The zipper merge concept (also referred to as dynamic late merge) aims to make those aforementioned issues less common and less severe in applicable scenarios. Proper use of the zipper merge allows use of both lanes that are set to merge all the way up to the defined merging area, where vehicles then alternate taking turns to move forward into the open lane, effectively looking like a true-to-life "zipper". This in turn minimizes the jockeying for position at an indefinite number of conflict points prior to the work zone area and creates a single location where drivers must negotiate a straightforward turn-taking exercise.

The zipper merge concept can reduce time lost in the queue prior to a work zone, driver frustration and accidents that commonly occur when less efficient merging techniques are employed. Even with these benefits, the zipper merge is not always the most ideal merging operation for all scenarios. Travelways with higher speeds, irregular lane setups, large variations in observed traffic speeds, and other situations might not be prime zipper merge candidates. This project will utilize a driving simulator study to help to identify the most appropriate travelway situations for implementing the zipper merge along with the most effective signage and sign packages to help the traveling public properly navigate the closure of lanes prior to a work zone.

Objectives

The objectives of this project are as follows:

- Evaluate the following:
 - Optimal travelway scenarios for use of zipper merge;
 - Most effective sign types and configurations;
 - Driver response in various scenarios to signing configurations using driving simulations; and,
 - Effectiveness of educational material in driving simulations.
- Preparation of educational material and awareness strategies to aid MoDOT and the traveling public in utilizing and properly navigating zipper merges.

Project Requirements

Task 1: Project Management

The contractor will facilitate a kick-off 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 kick-off meeting.

Upon comments received during the meeting and/or in writing, the contractor will incorporate those comments into a Final Work Plan.

A Technical Advisory Committee (TAC) will be created prior to the kick-off meeting, comprised of MoDOT and FHWA personnel to aid in evaluation assessments and provide input prior to the design of simulator trials in an effort to increase focus on the most relevant conditions and to minimize unnecessary trial iterations.

The contractor will conduct a quarterly status meeting to review progress for the previous period and anticipated work for the next period. Contractor will also develop minutes for the kick-off meeting and each of the quarterly status meetings.

Task 2: Research/Literature Review

Perform a literature search of past research, including state DOT efforts to evaluate zipper merge operations and highly effective strategies in education of the traveling public.

Task 3: Evaluation of Applicable Zipper Merge Scenarios

The contractor will conduct evaluations of applicable zipper merge scenarios based on, but not necessarily limited to, the following conditions:

- Optimal travelway operating speeds;
- Volume-to-capacity ratio;
- Travelway geometries; and,
- Projected queue length and upstream conflict mitigation.

The evaluations will aim to highlight optimal conditions for the application of zipper merge deployment prior to work zones.

Task 4: Evaluation of Applicable Zipper Merge Sign Configurations

The contractor will conduct evaluations of signs, sign combinations and displayed messaging that adheres to MUTCD guidelines, along with sign placement prior to and within the merging area that provides safe and effective notification of zipper merge operations to the traveling public. Sign considerations should include, but are not limited to, the following:

- Static signs;
- Static signs with MUTCD-approved improvements (flags, lighting/flashers, dynamic lighting, etc.); and,
- CMS boards.

The evaluations will aim to highlight the most effective sign configurations and types of signs to communicate zipper merge operations to the traveling public.

Task 5: Educational Material Literature Review and Package Creation

The contractor will perform a literature review of currently available educational material and/or promotional material employed by MoDOT, other state DOTs, and FHWA/USDOT related to zipper merge operations. The contractor will produce a package of educational materials that emphasizes the most relevant and effective educational concepts from the literature review.

Task 6: Design and Conduct Driving Simulator Trials

Based on the evaluation results attained in Task 3 and 4, along with input from the TAC, the contractor will create simulator trials for various combinations of zipper merge scenarios and zipper merge sign configurations. A maximum of eight combinations zipper merge scenarios and sign configurations shall be designated for the driving simulator trials by the TAC.

The contractor will conduct driving simulator trials with a minimum of 50 participants, across a broad scope of demographics. Participants' behavioral responses to the different zipper merge sign configurations will be collected and analyzed. The participants' response prior to introduction to and after engagement with educational material will also be compared and studied.

Task 7: Analysis of Driving Simulator Trials

The contractor will analyze the effectiveness of various sign configurations combinations in combination with the ability of the created zipper merge educational materials to improve participant response, based on the results from the driving simulator trials.

Task 8: Develop Report, Research Summary and Presentation

The contractor will develop a final report detailing the tasks completed during the project including any and all findings generated during the project's duration. The contractor will provide a 1-2 page research summary that states the project objectives and includes information on trial results and project conclusions. The zipper merge educational material created for the project shall be included with the report. A presentation for MoDOT staff, summarizing important or significant details of the project, may also be required.

Project Deliverables

For report and plan templates and forms, 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 should 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 Draft Research Summary

These drafts should 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 template and **Publication Guidelines** 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 should be submitted as Word documents (unless otherwise instructed). Please refer to **Publication Guidelines** and summary template on the website.

Final Presentation

May be required. The contractor will present the results, recommendations, and implementation ideas to MoDOT and other stakeholders. The contractor will 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. Formation of Technical Advisory Committee (TAC). Quarterly project status meetings.
2	Literature review results.
3	List of candidate scenarios for implementing zipper merge operations prior to a work zone, with examples using MoDOT-maintained travelways.
4	List of candidate signs, messages and combinations that promote effective zipper merge operations.
5	Crafted zipper merge educational material package based on the findings of similar materials distributed by state and federal entities.
6	Driving simulator trial scenarios for TAC consideration. Design of chosen scenarios and carrying out of driving simulations.
7	Evaluation of driving simulator participant responses.
8	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 **November 20, 2019**. 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.

The Offeror will provide a proposed schedule to complete the work including the following items: quarterly progress meetings, draft final report, and final report.

The draft final report shall be completed and provided to MoDOT within 10 months of the Notice to Proceed. All work shall be completed and the final report provided to MoDOT within 12 months of the Notice to Proceed.

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

Date	Milestone
On or before 12/4/2019	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.
12/31/2019	Quarterly report due.
3/29/2019	Quarterly report due.
6/30/2020	Quarterly report due.
9/30/2020	Draft final report and draft research summary are due. The draft documents shall be submitted to MoDOT approximately two months prior to the final report.
11/30/2020	Final report, research summary and presentation are due. The final documents shall be due approximately one month before the end of the contract. This is to allow all billing to be completed prior to the end of the project.
12/31/2020	Final invoice due.
12/31/2020	Contract ends.

Special Notes

Project budget is not to exceed **\$90,000**. 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>.

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 should 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:** Please 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 should indicate the name, title, and telephone number of at least three clients within the past three years.

- Proposals must be no more than 8 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 should **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.

RFP Schedule

This document constitutes an RFP from qualified organizations to conduct the TR202009 Optimizing Work Zone Zipper Merge Operations Using Driving Simulations 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
8/23/2019	MoDOT posts RFP to the website at https://www.modot.org/research-requests-proposal .
9/10/2019 4:00 PM (CST)	Written comments or questions must be submitted to Research Administrative Engineer .
9/17/2019	MoDOT will post written responses publicly on the website at https://www.modot.org/research-requests-proposal .
10/4/2019 10:00 AM (CST)	Written proposals must be submitted to Research Administrative Engineer .
10/22/2019	MoDOT will notify submitters about project selection, or if needed about interviews to finalize selection.

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 [Research Administrative Engineer](#) or the website at <https://www.modot.org/information-researchers>.

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 Administrative Engineer's attention at: 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 **12:00 PM (Central Standard Time)** on the day of the deadline, please contact us at MoDOTResearchRFP@modot.mo.gov as soon as possible. Your submission should not be considered received until you have received your email confirmation.