



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)

April 10, 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 **TR202020** entitled, “**Evaluation of Recycled Components in Stone Matrix Asphalt Mixes.**” 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 **June 12, 2020 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

Stone matrix asphalt (SMA), also called stone mastic asphalt, is a durable, rut-resisting wearing course employing a gap-graded aggregate structure and thick modified asphalt binder, typically with higher asphalt content and fibers. Improved deformation resistance and durability are capable due to the stone-on-stone structure of the mix. Originally developed and used in Europe in the 1960s, SMA found a place in North American pavement design in the 1990s.

Recycled asphalt pavement (RAP), also called reclaimed asphalt pavement, is previously laid pavement that has been removed and reprocessed. When properly crushed and screened, RAP consists of high-quality, well-graded aggregates coated by asphalt cement. Recycled (or reclaimed) asphalt shingles (RAS) is the reprocessed byproduct of tear-off sheets of roofing shingles. These reclaimed products, along with other alternatives like select plastic wastes, processed tire rubber, and other viable recycled material sources can potentially provide a “win-win” in identifying an end-use for a waste stream and reducing material costs for pavement.

MoDOT has employed the use of RAP and RAS in conventional hot mix asphalt pavements for some time now, along with using the two in SMAs, albeit in limited quantity. This project aims to focus in on the optimal contents for various recyclable materials to be used in SMA mixes.

This project consists of two independent phases. Phase 1 identifies potentially viable recycled materials for inclusion in SMA mixes and optimum percentages of aggregate replacement through laboratory analysis. If the results from Phase 1 address Department needs and demonstrate intrinsic value, and if MoDOT agrees to further research the findings of this project, Phase 2 will further explore the findings of Phase 1 through construction and monitoring of chosen SMA mixes.

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## Objectives

The objectives of this project are as follows:

Phase 1:

- Identify viable recycled materials which may include rubber, plastics, recycled/reclaimed asphalt pavement (RAP) and recycled asphalt shingles (RAS) as a coarse aggregate replacement in SMA mixes. The project will confirm successful mix performance at low/medium and high percentages of recycled content.
- Identification and evaluation of reduced air void design targets for SMAs with RAP or RAS contents, to increase the crack durability of SMA mixes.
- Evaluate the potential for fractionated reclaimed asphalt pavement (FRAP) as a blending ingredient in SMA mixes to reduce cost and increase performance/longevity of pavement.
- Develop and evaluate a method to assess the quality of RAP product with regards aggregate quality and corresponding frictional properties, along with condition of asphalt binder to gauge potential for thermal cracking.

Phase 2 (upon successful completion of Phase 1 and decision to proceed from MoDOT):

- Collaborate with MoDOT TAC to outline and chose viable construction projects for field implementation and monitoring of chosen SMA mixes with recyclable materials.

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# Project Requirements

## Phase 1

### **Task 1: Project Management**

The Contractor will 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 will incorporate those comments into a Final Work Plan.

The Contractor will schedule and 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 kickoff meeting and each of the quarterly status meetings.

### **Task 2: Literature Review**

The Contractor will conduct a comprehensive literature review to identify viable recyclable materials for evaluation in the project. A list of potential recyclable materials, known or believed to work well in an SMA mix, will be created. The list must include details of how each potential material would likely be incorporated into a mix design, benefits and concerns with inclusion in a mix, and any other notable details, including but not limited to, associated costs, availability/reliability of source stream, and so on. Anticipated low/medium and high contents (% replacement) should be included, based on perceptions and past research identified during the literature review, as these will serve as index markers for the lab testing portion of the project.

The Contractor shall review established or potential methods to assess the quality of RAP sources, notably when they come from a source other than the existing surface of the roadway being overlaid. A proposed method based on literature search findings will be evaluated in Task 4.

The list of potential materials will be reviewed by the Technical Advisory Committee (TAC) for selection of recyclable materials to include in the evaluation. A maximum of five (5) materials from this list may be included in the project for evaluation.

### **Task 3: Mix Design**

The Contractor shall, in consultation with the MoDOT TAC, generate proposed SMA mix designs for each of the identified recycled materials chosen in Task 2. Each mix will utilize a type of recyclable material, aggregate and asphalt binder at a minimum, with potential additives such as fibers, as specified for SMA construction in the most recent MoDOT Standards and Specifications. For each recycled material chosen, mixes with low/mid-range percentages and high percentages of recycled material contents will be designed, based on results from Task 2 and/or sound theory.

Specific points to be addressed along with the above-referenced items:

- For SMA mixes with RAP or RAS as the recycled material, additional considerations will be taken to investigate the application of reduced air void design targets, in an effort to improve the mixes ability to meet cracking test requirements.
- Fractionated Reclaimed Asphalt Pavement (FRAP) will be evaluated for potential as a blending ingredient in SMA mixes to reduce cost and increase performance/longevity of pavement.

Selected aggregate and asphalt binder will be procured by the Contractor, along with the representative market-ready recycled materials in sufficient quantities as to create the necessary trial mixes.

The Offerer shall provide detail in their proposal as to their proposed methodology for designing SMA mixes with recycled content, and considerations for adapting mix designs to meet or exceed current performance standards.

#### **Task 4: Laboratory Performance Testing, Analysis and Refinement**

The Contractor shall evaluate and adapt an effective method to assess the quality of RAP products, based on findings from the literature search or other experience. The quality of RAP should revolve around aggregate properties such as shape, durability and friction characteristics, in addition to asphalt binder conditions and applicability for use in SMA considering thermal cracking potential and other relevant characteristics. This method should be performed prior to the creation and testing of samples containing RAP.

Testing methods to be considered for evaluating the quality of RAP include:

- Micro Deval
- British Pendulum

The Contractor shall then conduct laboratory testing for both low/mid and high contents of each recycled material, as proposed in the Task 3 mix designs. Mix designs shall be constructed using specified materials and simulate current methods and levels of constructability. Laboratory testing should evaluate the mixes, at a minimum, for stability/rutting resistance, fatigue resistance, low temperature cracking resistance, durability, skid resistance and workability during construction.

Testing methods to use in material and mix evaluations shall include, but are not limited to:

- Hamburg Wheel Tracking Test
- Indirect Tensile Asphalt (IDEAL) Cracking Test
- Illinois Flexibility Index Test (IFIT)

Mixes will be modified as necessary to realize the limits of acceptable replacement percentages for each material. At the conclusion of laboratory performance testing, the Contractor shall present Job Mix Formulas for each recycled-material SMA mix, with both the low/mid and high recycled contents (% replacement).

#### **Task 5: Develop Report 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. A presentation for MoDOT Staff, summarizing important or significant details of the project, will also be provided.

### **Phase 2**

Based upon results from Phase 1 and the benefits and costs associated, MoDOT will make a determination of whether or not to proceed with Phase 2 within 90 days following acceptance of the Phase 1 Final Report. If MoDOT decides to proceed with the next phase, a work plan and budget will be developed for Phase 2 with the awarded Contractor from Phase 1.

## **Field Performance Evaluation**

Dependent on the results of laboratory testing and analysis performed in Task 4 and the Final Report, recycled material SMA mixes may be selected for construction, to various volumes and scopes, in coordination with appropriate MoDOT projects. The Contractor, in collaboration with the TAC, shall develop a list of potential projects and/or locations in which to construct and field test the Job Mix Formulas developed in Task 4. The ultimate decision on scope/volume of construction, along with the number of mixes to construct and evaluate, resides with MoDOT and the TAC.

During the construction of the chosen recycled-content SMA pavement(s), the Contractor shall observe and document the workability/constructability of the designed mixes in field.

Following the construction of the chosen recycled-content SMA pavement(s), the Contractor will evaluate and monitor the field sections for, at a minimum, the stability/rutting resistance, fatigue resistance, low temperature cracking resistance, durability and skid resistance.

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

### Other Deliverables

Examples include construction reports, interim reports, annual reports, maps, brochures, Include descriptions, criteria, and frequency.

### 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    | <ul style="list-style-type: none"> <li>Schedule and conduct kickoff meeting</li> <li>Kickoff meeting minutes</li> <li>Draft and final work plans</li> <li>Quarterly project status meetings</li> </ul>                      |
| 2    | <ul style="list-style-type: none"> <li>List of viable recycled materials for incorporation into SMA mixes with details as outlined in Task 2.</li> <li>Considerations for evaluating the quality of RAP product.</li> </ul> |
| 3    | <ul style="list-style-type: none"> <li>Proposed mix designs for the recycled materials chosen (by TAC) from Task 2 list.</li> </ul>   |
| 4    | <ul style="list-style-type: none"> <li>Results from assessment of method to evaluate the quality of RAP product.</li> <li>Job Mix Formulas for each of the chosen recycled materials.</li> </ul>                            |
| 5    | <ul style="list-style-type: none"> <li>Final Report</li> <li>Final Project Meeting</li> <li>Presentation</li> </ul>   |

## Project Schedule

The following is an estimate of the project timeline or information on key dates within the project (Phase 1), presuming the project starts July 31, 2020. Proposals need to include a Phase 1 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 8/14/2020 | 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. |
| 9/30/2020              | Quarterly report due   |
| 12/31/2020             | Quarterly report due   |
| 3/31/2021              | Quarterly report due   |
| 6/30/2021              | Quarterly report due   |
| 9/30/2021              | Quarterly report due   |

| Date       | Milestone  |
|------------|--|
| 12/31/2021 | Quarterly report due   |
| 3/31/2022  | Quarterly report due   |
| 6/30/2022  | Quarterly report due   |
| 8/1/2022   | Draft final report and research summary are due. The draft documents shall be submitted to MoDOT approximately two months prior to the final report.   |
| 9/30/2022  | Final report, research summary report 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. |
| 11/1/2022  | Final invoice due and contract ends.   |

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## Special Notes

Project budget is not to exceed **\$320,000**. 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 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 12 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.

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## RFP Schedule

This document constitutes an RFP from qualified organizations to conduct the **TR202020 Evaluation of Recycled Components in Stone Matrix Asphalt Mixes** 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   |
|--------------------------------|--|
| 4/10/2020                      | MoDOT posts RFP to the website at <a href="https://www.modot.org/research-requests-proposal">https://www.modot.org/research-requests-proposal</a> .                            |
| 5/5/2020<br>4:00 PM<br>(CST)   | Written comments or questions must be submitted to <a href="#">Research Director</a> .   |
| 5/15/2020                      | 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> . |
| 6/12/2020<br>10:00 AM<br>(CST) | Written proposals must be submitted to <a href="#">Research Director</a> .   |
| 7/3/2020                       | 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 **12:00 PM [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.