

REQUEST FOR PROPOSALS

Improving the Use of Crack Sealing to Asphalt Pavement in Louisiana

LTRC No. 17-1P, SIO No. DOTLT1000145

PROBLEM STATEMENT

Surface cracking is one of the major surface distresses in asphalt concrete (AC) pavement, allowing water infiltration through the cracks, causing stripping in asphalt pavement layers, and weakening and deteriorating the base and/or subgrade. Its treatment, therefore, is one of the major activities in pavement preservation for many state DOTs. Among the various treatment methods currently available to preserve AC pavement with existing surface cracking are various forms of crack sealing. Crack sealing is not a common practice to Louisiana highways since the benefit of such treatment appears to be affected by the elevation of the ground water table. Studies completed in the 1960s for Louisiana showed that sealing roads in an area with a high ground water table accelerated AC stripping. The explanation was that crack sealing in such a situation prevented moisture from escaping upwards through the cracks of the AC pavements.

Since both asphalt mix design and crack sealing materials have been tremendously improved with the use of anti-strip and polymer materials, there is a need to re-evaluate the situation to determine if the 1960s research findings have been mitigated. We need to quantify where, when, and how various crack sealing solutions can be used for the benefit of pavement preservation on Louisiana highways. All these questions should be addressed and answered through a research investigation.

The main objective of the proposed research is to quantify the benefits of using crack sealing and other impermeable surface treatments with respect to their ability to provide service life extensions as well as to identify cost-benefits analyses for each method. With respect to determining any potential service life extensions, this will involve studying existing published research since the timeline for this project will not provide enough quantitative data for that determination. In addition, the study should identify the specific conditions that either confirms the 1960's findings with respect to potential pavement damage due to high water table with pavement sealing operations, mitigates those findings if that is appropriate, or revokes those findings if that is appropriate. Would surface cracking that originated from base failures which may include bottom up cracking, or surface cracking that extends to the base, result in different findings with respect to the 1960s results? This would include investigation of all impermeable surface treatments, including overlays, in areas with high water tables.

In Louisiana, most crack sealing and seal coat activities are currently intermittent and generally performed by DOTD district forces and contractors, respectively. Chip seals are sometimes performed under one of the Pavement Preservation programs with contract forces. The crack sealing activities are captured via the Maintenance Management System's work orders. Unfortunately, work orders only identify the control section and not the exact location and extent of the crack sealing activities on the control section. The research will entail investigating these work orders and determine if any can be used as potential candidates for the study. The chip seal projects will also be identified and investigated.

DOTD has a wealth of information for pavement construction history and pavement inventory data. Other information such as material types, layer thicknesses (base, subbase, and HMA or PCC surface), roadway geometry, traffic volume, and other maintenance information is available. DOTD's Pavement Management System has been in place since 1991 and has had historical pavement condition data, captured on bi-annual cycles, since its inception. Currently when crack sealing efforts can be identified, the manager of the Pavement Management Systems adjusts the cracking measures and the resulting cracking indexes reflect those changes. Essentially, a sealed crack is not counted as a crack in the system. It is expected that the PMS condition data will be useful in this investigation.

In addition to selecting candidates from existing work orders, new field test sections should be designed and established for various crack sealing treatments and monitored to determine the effectiveness of each treatment. This would allow for the selection of pavements that might best fit the high ground water table criteria as well as for pavements that aren't affected by the water table for comparison purposes. First, laboratory evaluation should be employed for recommending the best crack sealant materials to use in Louisiana. Second, optimum timing for application of crack sealants can be investigated through test sections and survey of neighboring states. The results of the research will be utilized to establish guidelines and specifications for direct and indirect crack sealing as well as assist in better asset allocation in the pavement preservation program.

OBJECTIVES

The main objective of the proposed research is to quantify the benefits of using crack sealing and other impermeable surface treatments under various ground water conditions and develop a user guideline for applying them to Louisiana highways. The final product should include the protocol for selecting proper roadways, which would include defining if any specific timeline windows exist for the various treatment opportunities or identify the pavement cracking condition boundary limits, for the various crack sealing treatments.

RESEARCH APPROACH

The Louisiana Transportation Research Center (LTRC) is seeking the insight of proposers on how best to achieve the research objectives. Proposers are expected to describe research plans that can be realistically accomplished within the constraints of available funds and contract time as allowed in this RFP. Proposals must present the candidate's current thinking in sufficient detail to demonstrate their understanding of the problem and the soundness of their approach. Task descriptions are intended to provide a framework for conducting the research. The proposal shall address at a minimum, the following tasks:

Task 1 – Review of Literature and State-of-the-Practice

Conduct a comprehensive examination and review of existing literature regarding the state-of-the-practice in the USA for the design, construction, and quality control of crack sealing and other impermeable surface treatments. Previous and ongoing research projects and case studies will thoroughly be reviewed and summarized. This will be accomplished by reviewing National Cooperative Highway Research Program (NCHRP) synthesis reports, Federal Highway

Administration (FHWA) research studies, National Highway Institute (NHI) courses, and journal and conference publications.

Task 2 – Review of DOTD State-of-the-Practice

Conduct a comprehensive survey of the state-of-the-practice of each district within DOTD. The results of the survey will determine the decision processes which are utilized to determine when crack sealing and other impermeable surface treatments have historically been used as well as identify which projects they have been used on. The survey should include but not be limited to project scoping, costs, anticipated benefits, and pavement conditions. The survey will be submitted to the PRC for approval prior to distribution. LTRC will assist in the distribution of the survey. An interim report summarizing the findings of Tasks 1 and 2 and providing a detailed field testing plan should be submitted to the project review committee (PRC) for review and approval three months after the beginning of this research work.

Task 3 – Collection of Historical Louisiana Performance Data

Identify roadways with cracked AC pavements with and without crack sealing and other impermeable surface treatments from DOTD database. Researchers are expected to interview local district personnel for data collection and identify appropriate methods and data sources to be utilized in the research to develop an appropriate statistical analysis. PRC will assist in data collection.

Task 4 – Laboratory Evaluation of Crack Sealant and Seal Coat Materials

Conduct laboratory evaluation on various crack sealant materials and select the best ones that fit with Louisiana’s hot and humid climate and should be used in Louisiana highways.

Task 5 – Analysis of Louisiana Historical Data Collected

Develop performance curves for all appropriate distresses with and without crack sealing and other impermeable surface treatments. The performance curves will be plotted with age versus the distress parameters typically used. DOTD defines the remaining service life (RSL) of a pavement section as the estimated/predicted number of years of service from any given date (usually from the last distress survey date) to the time when the pavement section is expected to accumulate distress points equal to the threshold value. The service life (SL) of a pavement section is the actual number of years that the pavement is expected to serve the traveling public between construction and rehabilitation or between two consequent rehabilitation activities. As available data permits, the researchers will be required to compute the RSL and SL for each parameter investigated. Examples of how to perform these computations may be found in *LTRC Report Number 460 “Development of Index Based Pavement Performance Models for Pavement Management System (PMS) of LADOTD”* located at http://www.ltrc.lsu.edu/pubs_final_reports_5.html.

Other analytical methods can also be used, and if so, should be well explained in the proposal.

Task 6- Analysis of the Effect of High Water Tables on Impermeable Surface Treatments

Identify the analysis methodology and findings of the investigation of the potential impact of high water tables on all impermeable surface treatments and overlays, including the effects of pavement drainage features and drainage maintenance on impermeable surface treatments and overlays with high water tables.

Task 7 – Cost benefits analysis (CBA)

Conduct a cost-benefit analysis on the use of crack sealing and other impermeable surface treatments. The CBA ratios will be tabulated as appropriate for each parameter.

Task 8 – Guideline Document

Develop a guideline document detailing the appropriate use of crack sealing and other impermeable surface treatments on future projects based on indicators such as the remaining service life, service life, and cost benefits analysis. The guideline should include a future implementation plan with a data collection protocol.

Task 9 – Final Report, Recommendations, and Implementation Plan

The research team will prepare a final report to document the entire research effort. The final report should include all the data, results, and recommendations generated by this study. The implementation plan is a separate document that describes how the department should enact the recommendations within the specifications, and policies of the DOTD.

DELIVERABLES

The proposal shall include project deliverables for appropriate tasks. Deliverables shall be due as defined in the proposal. The proposal shall include at a minimum the following deliverables:

- Review of literature and state-of-practice and field testing plan (Task 1)
- Review of DOTD state-of-practice, an interim report that summarizes the findings of Tasks 1 and 2 (Task 2)
- Roadway identification for project selection (Task 3)
- Crack sealant materials recommendation (Task 4)
- Remaining Service Life and Service Life computations or equivalent (Task 5)
- Findings of the analysis of the effect of high water tables on impermeable surface treatments (Task 6)
- Cost benefits analysis (Task 7)
- Guideline Document (Task 8)
- Final Report, Recommendations, and Implementation Plan (Task 9)

SPECIAL NOTES

- A. LTRC research projects will be conducted in accordance with the LTRC Manual of Research Procedures, 2016 edition.
(http://www.ltrc.lsu.edu/pdf/2016/LTRC_RESEARCH_MANUAL_FINAL.pdf)
- B. Any work that is anticipated to be required from LTRC or DOTD forces shall be specifically detailed in the proposal.
- C. LTRC projects are intended to produce results that will be applied in practice. It is expected that the implementation of the results of this research into practice will evolve as a concerted effort during this project. The final report must contain an implementation plan to include, as a minimum, the following:
 - a. The “product” expected from the research;
 - b. A realistic assessment of impediments to successful implementation;
 - c. The activities necessary for successful implementation; and
 - d. The criteria for judging the progress and consequences of implementation.

- D. To assist in the implementation process, the investigators of this research shall present the final results to LA DOTD officials in an oral presentation to be held in Baton Rouge, Louisiana at LA DOTD Headquarters after acceptance of the final report.
- E. The proposal should include travel to meet with the Project Review Committee for a “kick off” meeting, presentation of interim report, and presentation of the final report at a minimum. Funds budgeted for travel shall be limited to what is necessary for the conduct of the research. Funds shall not be budgeted for conference travel. Funding for technology transfer of research results are available upon request subject to LTRC approval and available funds.
- F. LTRC’s mission includes the support of higher education in Louisiana. Consultant and out-of-state institutions submitting proposals are encouraged to cooperate and collaborate with Louisiana universities for the purpose of sharing of knowledge and increasing transportation expertise in the academic community.
- G. Graduate assistance stipends are allowed. Tuition reimbursement or tuition remission rates applied to stipends are not allowed.
- H. To equitably answer any questions regarding this Request for Proposals, the Louisiana Department of Transportation and Development (DOTD) website will be updated with questions and answers and related documents regarding the project.
<http://webmail.dotd.louisiana.gov/agrestat.nsf/WebAdvertisements?OpenPage>
LA DOTD makes these documents available for informational purposes only to aid in the efficient dissemination of information to interested parties. LA DOTD does not warrant the documents against deficiencies of any kind. The data contained within this web site will be periodically updated. Interested parties are responsible to be aware of any updates. Questions regarding this RFP should be submitted in writing to the LTRC contact person. Questions must be received by close of business seven calendar days prior to deadline date.
- I. Consultants and business entities shall be registered with the Secretary of State in order to be able to work in Louisiana prior to award of contract. <http://www.sos.la.gov/tabid/1011/Default.aspx>
- J. If Sub-Consultants/Entities are used, the Prime Consultant/Entity must perform a minimum of 51% of the work for the overall project.
- K. LTRC reserves the right to withhold invoice payments for delinquent deliverables as defined in the proposal.

ESTIMATED COST OF RESEARCH

The estimated cost of this research is \$250,000, which includes the satisfactory completion of the recommended tasks outlined herein and any additional tasks added by the researcher to meet the research objectives. Itemized project costs shall be sufficiently justified as required in the LTRC Manual of Research Procedures.

ESTIMATED COMPLETION TIME

27 Months (*includes 3 months for review and approval of final report - i.e., draft final report due in 24 months*)

LTRC PRIMARY CONTACT

Doc Zhang, P.E., Ph.D.
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AUTHORIZATION TO BEGIN WORK

October, 2016 (Estimated)

PROPOSAL FORMAT

All proposals are required to be formatted according to *LTRC Manual of Research Procedures* available on the web site: <http://www.ltrc.lsu.edu/research.html>. Chapter 2 of that manual provides guidance on proposal development.

PROPOSAL SELECTION

The Project Review Committee selected for this project will review, evaluate, and rank all proposals received using the criteria established on the attached proposal review form.

DEADLINE FOR RECEIPT OF PROPOSALS

Ten copies of the proposal must be received by LTRC by the close of business **August 12, 2016.** Proposals to be submitted to:

Samuel Cooper, Jr., Ph.D., P.E.
Director
Louisiana Transportation Research Center
4101 Gourrier Ave.
Baton Rouge, LA 7080