

REQUEST FOR PROPOSALS LTRC 24-1ST / SIO DOTLT1000503

ULTRA HIGH PERFORMANCE CONCRETE (UHPC) APPLICATION IN LINK SLABS FOR CRACK MITIGATION

PROBLEM STATEMENT

Connecting adjacent spans by jointless decks that provide continuity only through a link slab is gaining acceptance as a better alternative than establishing full continuity by means of positive moment reinforcement embedded in continuity diaphragms. In addition to eliminating the cost of joints and their associated maintenance costs, jointless decks also eliminate the deterioration of girder ends, and bent caps by draining road wash and debris away from these areas.

The performance of link slabs under different scenarios was investigated in a field study of the Ouachita River Bridge through LTRC Project 14-1ST https://www.ltrc.lsu.edu/pdf/2020/FR_626.pdf.

Research showed that link slabs perform well in a floating span configuration up to a segment length of 540 ft. Due to the tension experienced by these link slabs, transverse deck cracking along the gap between adjacent spans developed. It also showed that notches in the deck did not arrest cracks as was hypothesized. Therefore, a new crack mitigation strategy is still needed. Ultra-High Performance Concrete is a new class of cementitious composites that offers high compressive strength, relatively high tensile strength, and superior resistance to liquid ingress. Furthermore, it can sustain its tensile strength post cracking due to the mix's discontinuous internal fiber reinforcement. Using UHPC for link slab portions of bridge decks can help in mitigating link slab cracking.

OBJECTIVE

The purpose of this research project is to investigate the feasibility of using UHPC in link slab regions of bridge decks. This may be achieved by undertaking the tasks in the proposed research section below.

PROPOSED RESEARCH:

The proposal shall address at a minimum, the following tasks:

- Task 1.** Conduct literature review of research on UHPC applications in bridge construction. The PI will submit a summary report documenting his findings.
- Task 2.** Design of an UHPC mix suitable for link slab applications. This can be achieved through laboratory mixes and testing. The PI will submit a write-up documenting his work and final mix design.
- Task 3.** LDOTD will provide the PI a candidate bridge for the application of the link slab. The PI will develop a new detail for the link slab. This detail must be approved by the PRC. The existing detail and the new one will be constructed on the selected bridge for the purpose of performance monitoring and data collection and analysis.

- Task 4.** The PI will design an instrumentation plan for the identified bridge with UHPC link slab. **A PRC approval of the instrumentation plan is required before the PI proceeds to Task 5.**
- Task 5.** Install and collect data from the monitoring system and conduct site visits to track crack propagation over time.
- Task 6.** Deliver a draft technical summary and draft final report documenting all work done in the study. The PI shall submit the technical summary and final report to the Project Manager three (3) months before the end of the study.
- Task 7.** PI shall give a final presentation documenting all work done in the study 2 weeks after completing Task 6.
- Task 8.** PI shall address all technical comments and update both technical summary and final report. PI will resubmit his updated technical summary and final report to the Project Manager.

DELIVERABLES

- Interim report for work done in (Task 1).
- A UHPC finalized mix (Task 2).
- An instrumentation plan for the selected bridge (Task 4).
- Final Report documenting all work done throughout the study (Task 6).
- A presentation of findings to the PRC (Task 7).
- Updated technical summary and final report (Task 8).

SPECIAL NOTES

- A.** LTRC research projects will be conducted in accordance with the LTRC Manual of Research Procedures, 2019 edition.
https://www.ltrc.lsu.edu/downloads.html#pub_forms
- B.** Any work that is anticipated to be required from LTRC or DOTD forces shall be specifically detailed in the proposal.
- C.** Any surveys or questionnaires developed by the research team shall be reviewed and approved by the PRC prior to distribution.
- D.** 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.
- E.** To assist in the implementation process, the investigators of this research shall present the 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.
- F.** 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.

- G. 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.
 - H. Graduate assistance stipends are allowed. Tuition reimbursement or tuition remission rates applied to stipends are not allowed.
 - I. To equitably answer any questions regarding this Request for Proposals, the Louisiana Department of Transportation and Development (LA 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.
- J. 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>
 - K. If Sub-Consultants/Entities are used, the Prime Consultant/Entity must perform a minimum of 51% of the work for the overall project.
 - L. LTRC reserves the right to withhold invoice payments for delinquent deliverables as defined in the proposal.

ESTIMATED COST OF RESEARCH

\$250,000

ESTIMATED COMPLETION TIME

24 Months (*includes 3 months for review and approval of final report - i.e. final report due 21months*)

LTRC PRIMARY CONTACT

Walid Alaywan, Ph.D., P.E.
Sr. Structures Research Engineer
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Email: walid.alaywan@la.gov

AUTHORIZATION TO BEGIN WORK:

November 1, 2023 (estimated)

PROPOSAL FORMAT

All proposals are required to be formatted according to LTRC Manual of Research Procedures. Chapter 3 provides guidance on proposal development. A copy of the Manual may be downloaded from our website
(http://www.ltrc.lsu.edu/pdf/2016/LTRC_RESEARCH_MANUAL_FINAL.pdf).

PROPOSAL SELECTION

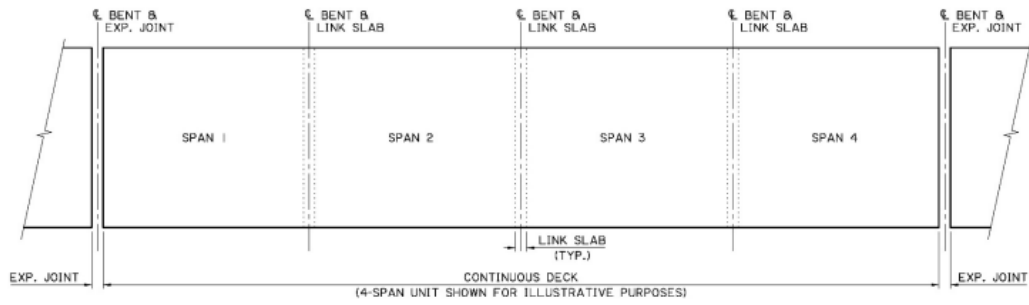
The Project Review Committee selected for this project will review, evaluate and rank all proposals received using the criteria established on the attached proposal review form.

DEADLINE FOR RECEIPT OF PROPOSALS

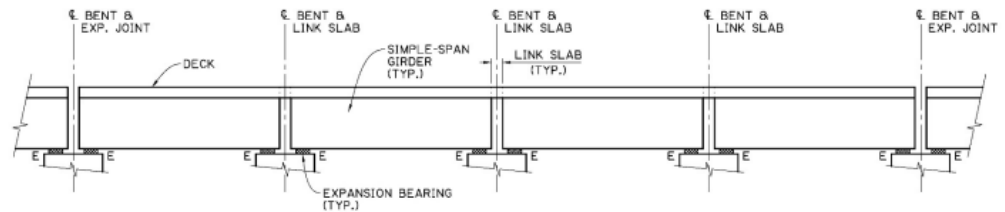
The proposal must be received by LTRC by **noon** on September 29, 2023. An electronic copy shall be submitted to Sheri Hughes via Sheri.Hughes@la.gov copying Samuel.Cooper@la.gov before the due date.

Proposals should be submitted to:

Samuel B. Cooper, Jr., Ph.D., P.E.
Director
Louisiana Transportation Research Center
4101 Gourrier Ave.
Baton Rouge, LA 70808



PLAN



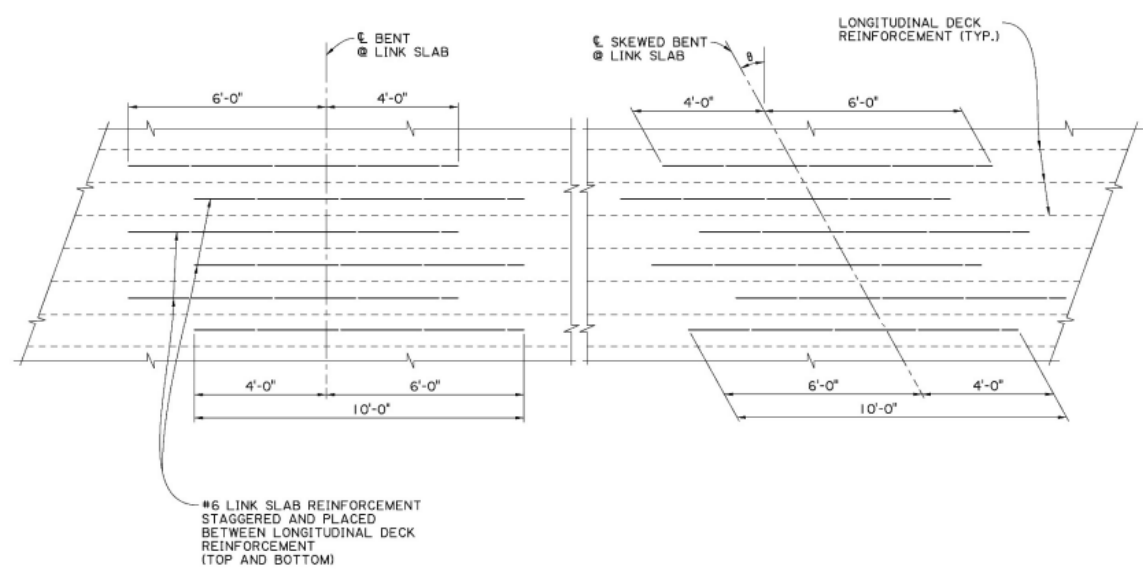
ELEVATION

INSTRUCTIONS FOR DESIGNERS:

1. A TYPICAL FLOATING SPAN IS SHOWN FOR ILLUSTRATIVE PURPOSES. REFER TO BDEM PART II VOL. 1 CHAPTER 5 FOR MORE INFORMATION ON FLOATING SPAN AND LINK SLAB.
2. INCORPORATE STANDARD LINK SLAB REINFORCEMENT (SHT. 2 OF 2) INTO PROJECT PLAN.

Figure 1.3.2-4: Typical Simple Span Made Continuous Deck Unit with Link Slab

(1 of 2)



LINK SLAB REINFORCEMENT

Figure 1.3.2-4: Typical Simple Span Made Continuous Unit with Link Slab

(2 of 2)