

## Iowa DOT Research Request for Proposal (RFP)

It is the intent of Iowa DOT Research to enter into agreement with the responsible bidder whose submitted proposal is the most advantageous, cost and other factors considered. Other factors include but are not limited to meeting or exceeding mandatory requirements, proposed staffing, and meeting required time schedule.

- Original RFP is posted at <https://iowadot.gov/research/Requests-for-Proposal>
- Questions should be submitted to the project manager, identified below.
  - Questions are due no later than 14 calendar days prior to the proposal due date. Questions and responses will be posted on <https://iowadot.gov/research/Requests-for-Proposal> no later than 7 calendar days prior to the proposal due date.
- Responses must be submitted in pdf form to [Proposal.Research@iowadot.us](mailto:Proposal.Research@iowadot.us)
  - Use the following naming convention for the PDF submission:
    - ResearchProposalNumber\_Agency\_PrincipallInvestigatorLastName.pdf
- Responses must comply with the proposal guidelines in “Required Format for Iowa DOT Research Proposals.”
  - <https://iowadot.gov/research/Research-Process/Proposal-Deliverable-Guidelines>

**RFP #: IHRB-3633**

**RFP Title: Bridge Deck Strategy: Materials and Reinforcement**

**Idea Page: <https://ideas.iowadot.gov/subdomain/ideas-main/end/node/3633?qmzn=iKFrYf>**

**RFP Posted:** September 15, 2024

**Proposals Due:** On or Before November 1, 2024 at 12:00 Noon Central Standard Time.

**Project Manager:** Vanessa Goetz, [vanessa.goetz@iowadot.us](mailto:vanessa.goetz@iowadot.us), (515)-239-1382

### Budget

- Funding limitations have been established. Proposed budgets shall not exceed \$\_\_\_\_\_.
- Proposed budgets are not limited. They will be considered during the evaluation process.

### Timeline

- Timing limitations have been established. Proposed timelines shall not extend beyond \_\_\_\_\_.
- Proposed timelines are not limited. They will be considered during the evaluation process.

### Literature Review

- A Literature Review has been performed as part of project development and should not be included as a task in the proposal. The Literature Review is available for download here:
- A Literature Review has not been performed and may be included as a task in the proposal.

## Problem Statement

Cracking of bridge decks shortly after initial construction is recognized as an ongoing concern, regionally and nationally. The severity, distribution and onset of cracking can vary, but it's not uncommon for widespread cracking to be observed within the first few weeks after concrete placement. The cracking presents a durability concern, and an economic burden to bridge owners. If left unrepaired, the cracking can lead to significant reductions in bridge deck service life.

Multiple research projects have been conducted on this topic. Information has been amassed on factors which can contribute to deck cracking, along with strategies to repair cracking after it occurs. However, effective strategies to prevent deck cracking remain elusive. Though knowledge of the potential/theoretical causes of cracking is well understood, assessment of the actual causes of cracking on Iowa bridges requires further study. To that end, Iowa DOT has reviewed the previous research on potential contributing factors to determine where knowledge gaps exist.

One knowledge gap is the extent which the physical properties of bridge deck construction materials influence the observed cracking problem. It is known that certain concrete mix designs, and certain reinforcing configurations, are more susceptible to cracking than others. Research is needed to determine whether, and to what extent, the bridge deck construction materials used in Iowa are contributing to the observed cracking problem.

## Objectives

The purpose of this research effort is to evaluate the influence of, and develop effective strategies for, selection of concrete and reinforcing materials for bridge deck construction, with respect to bridge deck cracking risk.

## Minimum Project Tasks

1. Conduct a literature review to collect relevant information on the impacts of bridge deck construction material selection with respect to cracking risk. Also review agency and industry guidance/specifications for bridge deck construction materials with respect to cracking risk and cracking control.
2. Bridge Deck Concrete:
  - Collect data on representative samples of bridge deck concrete mix designs used in Iowa, including constituent ingredient sources and chemical admixtures.
  - Batch samples of representative concrete mix in the lab and evaluate, at minimum, the material properties included in "Additional Information - Elements to Analyze", below. Compare representative Iowa mixes against mixes optimized for reduced cracking potential.
3. Bridge Deck Reinforcing:
  - Collect data on representative samples of bridge deck reinforcing configurations used in Iowa, including bar type, size, spacing, clearance, termination location, coating system, etc.
  - Investigate representative reinforcing configurations by laboratory testing, modeling and/or other methods to evaluate cracking risk. Compare representative Iowa configurations against configurations optimized for reduced cracking potential.
4. Develop recommendations, strategies, and proposed policy improvements for design/selection of bridge deck concrete and reinforcing materials for reduced cracking potential.
5. Conduct large scale test placement(s) using the recommended strategy(s) for concrete material and reinforcing configuration to validate effectiveness. Compare against a control specimen representative of current, typical practice in Iowa.

## Deliverables

1. Quarterly progress reports to the TAC
2. Draft Final Report
3. Final Report
4. Section 508 Compliant Technology Transfer Technical Brief
5. Draft Documents for proposed Policy, Design, and Specification Recommendations.

## Additional Information

### Bridge Deck Concrete:

Iowa DOT specifies parameters for concrete strength, workability, basic mix proportions, and source/product pre-approval. However, within these parameters, the concrete supplier is afforded broad discretion on choice/combination of constituent mix ingredients, material sources, and chemical admixtures. The research effort shall evaluate a representative sample of bridge deck mix designs used in Iowa to assess whether concrete mix design and/or constituent mix ingredients correlate with cracking risk. The research effort shall focus on short-term and long-term shrinkage potential, creep potential, thermal response, maturity profile, strength, elasticity, and other variables deemed of potential relevance to cracking risk. The research effort shall identify trends, recommend mix design/ingredient strategies to reduce cracking potential, and develop/test one or more optimized mix designs using constituent ingredients readily attainable in Iowa.

### Bridge Deck Reinforcing:

Iowa DOT requires design of bridge deck reinforcement steel to generally follow established protocol for total area of reinforcing per unit area of concrete, and minimum/maximum bar spacing/clearance. Although certain aspects of the reinforcing design can be left to designer discretion (ex. individual size/spacing of reinforcing bars within the permissible range), Iowa DOT offers standardized design layouts, and most projects adopt a standardized layout. The research effort shall evaluate a range of reasonable, code-compliant reinforcing layouts, to evaluate whether reinforcing layout correlates with cracking risk. The research effort shall focus primarily on the size, spacing, quantity, strength, and layout of steel reinforcing bars, but shall also investigate whether supplemental reinforcing strategies, such as inclusion of fiber reinforcement within the concrete mix, affect cracking risk. The research effort shall identify trends and recommend bridge deck reinforcement strategies to reduce cracking potential.

## Non-Discrimination Statement

Iowa DOT ensures non-discrimination in all programs and activities in accordance with Title VI of the Civil Rights Act of 1964. Any person who believes that they are being denied participation in a project, being denied benefits of a program, or otherwise being discriminated against because of race, color, national origin, gender, age, or disability, low income and limited English proficiency, or needs more information or special assistance for persons with disabilities or limited English proficiency, please contact Iowa DOT Civil Rights at 515-239-7970 or by email at [civil.rights@iowadot.us](mailto:civil.rights@iowadot.us).