



WHRP

Wisconsin Department of Transportation Wisconsin Highway Research Program

Request for Proposal

Textured Epoxy Coated and Galvanized Reinforcement to Reduce Cracking in Concrete Bridge Decks and Components

Questions submitted to research@dot.wi.gov regarding the
Content of this RFP are due no later than
4:30 PM (CST) on December 12, 2017

Responses to questions will be posted to the WisDOT Research and Library website
<http://wisdotresearch.wi.gov/rfps-and-proposals> by
4:30 PM (CST) by December 19, 2017

Researchers must submit a PDF version of their proposal by
4:30 PM (CST) by January 26, 2018
to: research@dot.wi.gov

Researchers will be notified of the proposal review decision by May 1, 2018

For more information regarding this RFP contact the WisDOT Research Program at:
research@dot.wi.gov. This RFP is posted to the Internet at:
<http://wisdotresearch.wi.gov/rfps-and-proposals>

**Wisconsin Highway Research Program
Request for Proposals
Structures Technical Oversight Committee**

***Textured Epoxy Coated and Galvanized Reinforcement to Reduce
Cracking in Concrete Bridge Decks***

I. Background and Problem Statement

Historically, bridge and structure owners have searched for ways to prevent cracking of concrete bridge decks and components to prevent and control deterioration. Structural components that are of concern include parapets, piers, and prestressed girder ends. However, bridge decks have been the primary concern for deterioration due to the wide, thin, and long pours used coupled with application of deicing chemicals. Designers have used code guidance on reinforcement placement in an attempt to control flexure cracking as well as providing reinforcement to resist temperature and shrinkage strains. Industry has provided products like epoxy coated, stainless steel, galvanized, and other reinforcements to help reduce deterioration that may occur to the reinforcement after the initiation of cracking. Some of the mitigating tools used to address deterioration of reinforcement may be expensive (e.g., stainless steel reinforcement).

Recently, new approaches have been proposed to help prevent cracking that may be the result of issues with the localized bond between epoxy coated reinforcement and the concrete. Specifically, the use of textured epoxy coated reinforcement has been introduced as a strategy to reduce or prevent cracking in concrete decks and components. For Textured Epoxy Coated Reinforcement, it had been reported that the epoxy receives a powder coating improving bond strength. One DOT reported reduced and/or tighter cracking than conventional epoxy coated rebar on three pilot deck projects. It had also been reported that the process is not patented and difference in cost is only few cents per unit weight.

Along the lines of textured epoxy coated reinforcement, it has been suspected that galvanized reinforcement may also provide improved bond between concrete and reinforcement as a byproduct of the corrosion protection benefits of galvanization. It is not known if this potential improved bond between galvanized reinforcement exists and provided benefits in controlling cracking in bridge decks and components. However, if this quality exists, it could provide benefit in bridge decks and components.

Overall, research is needed to assess if and how textured epoxy coated reinforcement and galvanized reinforcement help prevent cracking. If so, researchers should provide details that would speak to design considerations (development lengths, use in various structural elements), specifications, effectiveness in crack control, and cost.

II. Objectives

The objective of this research is to examine the use of textured epoxy coated and galvanized reinforcement in bridge decks and other bridge components, specifically Wisconsin deep prestressed girder ends. The research would need to examine if and why the textured and galvanized reinforcement provides better bond to concrete and how effective these types of reinforcements are in reducing cracking compared to standard epoxy coated reinforcement. This research will document the effectiveness of textured epoxy coated and galvanized reinforcement and provide recommendations and supporting information for potential implementation.

III. Scope of Work

- A. Conduct a comprehensive literature review and assessment of current practices at various other state DOTs, FHWA, industries, and manufacturers. WHRP has an initial Literature Search that will be provided to Researchers.
- B. Summarize information available related to current practices at various other state DOTs, industries, and manufacturers.
- C. Contact industry representatives who manufacture and supply textured and galvanized reinforcement to gather relevant information about characteristics, performance, cost, and availability.
- D. Identify bridges that have been constructed with textured and/or galvanized reinforcement to determine performance trends, cost information, specifications, and lessons learned.
- E. Design and conduct laboratory investigation and experiments that would provide insight to the performance of textured and galvanized reinforcement as a crack control mechanism. These laboratory tests and experiments would be focused at the properties of bond of the reinforcement to the concrete as well as the overall effectiveness in controlling cracking in bridge decks and other bridge elements.
- F. Work with the WHRP Structures Technical Oversight Committee (TOC) to identify a full-scale field application of textured or galvanized reinforcement. This would most likely be a bridge deck constructed in the 2019 construction season. Develop design guidance, specification recommendations, and field evaluation program to support successful piloting of the reinforcement and quantification of the performance. This could involve both observations and instrumentation. Construction related cost of reinforcement would be the responsibility of Wisconsin Department of Transportation.
- G. Develop recommendations and guidelines in a format consistent with WisDOT Bridge Manual, Standard Specifications, and associated presentation materials for WisDOT practitioners.

IV. WisDOT/TOC Contribution

WisDOT will provide the following support through the WHRP Project Oversight Committee and Regional Bridge Maintenance Engineers:

- A. Work will be conducted with project oversight by the WisDOT Bureau of Structures and WHRP Structures TOC. The TOC members will appoint a Project Oversight Committee (POC) to support the successful completion of the project.
- B. The research team will not assume the availability of WisDOT staff or equipment in the proposal. If WisDOT or another entity donates equipment or staff time, a letter of commitment must be included in the proposal.

- C. Expected level by staff/TOC members: Maximum of 40 hours over the duration of the project. The research team will consult with POC members in the selection of project sites.
- D. The TOC and POC will work with the research team to identify and implement inclusion of textured or galvanized reinforcement into a pilot project or bridge components for the 2019 construction season. The cost of production quantities of reinforcement (bridge deck) will be the responsibility of WisDOT. The research team will be responsible for the cost of quantities of reinforcement for laboratory efforts.
- E. WisDOT staff will assist research team in getting access to the FHWA Long Term Bridge Preservation Bridge Portal for collection of national bridge demographic and condition information.
- F. If field work on or around in-service facilities is anticipated by the research, the proposal will need to discuss the nature and extent of needed traffic control and support assistance that will be requested from WisDOT. The researcher will need to closely coordinate with WisDOT regional personnel and possibly the county personnel where project fieldwork is being conducted. For WisDOT planning purposes, the Principal Investigator shall specify in his or her proposal, as practical, what specific traffic control will be required for this project, such as traffic flagging, signage, barricades, etc., as well as the duration needed (hours/day/location). It should not be assumed that WisDOT would fund the traffic control apart from the research project budget.

V. **Required Travel**

This project may require travel to Madison, WI for a meeting to finalize the work plan with the POC as well as interim reporting during the project. There may also be travel required to fabrication facilities and construction sites for construction pilot projects. It is expected the PI will deliver the final presentation in person in Madison, WI.

VI. **Deliverables**

- A. Reporting Requirements: Six (6) hard copies and an electronic copy of the final report delivered to WisDOT by the contract end date. This includes the report, special provisions, and structural details. Please refer to the Implementation section for further details.
- B. Bridge manual, Construction Manual chapter text and Specification related to policy and construction support related to implementation of textured and galvanized reinforcement.
- C. Development of PowerPoint presentation to serve as a training tool for WisDOT Bridge design and construction staff. WisDOT staff will provide the associated training.
- D. Presentation Requirements: All projects require the PI to give a closeout presentation to the TOC after submittal of the draft final report.

VII. **Budget and Schedule**

- A. Project Budget shall not exceed **\$180,000**.
- B. Proposed project duration is **24 months** starting around **October 1, 2018**.
 - Deadline for submittal of draft final report is three months prior to contract end date to allow for report review activities.
 - Deadline for research close out presentation is 4-6 weeks prior to contract end date.
 - Deadline for submittal of the Final Report is the contract end date.

VIII. Implementation

Successful implementation of this research will be achieved through the development of the following items:

- Clear and concise commentary on the effectiveness of using textured epoxy coated and galvanized reinforcement in bridge decks and components.
- Updates to WisDOT Bridge and Construction Manuals chapters, and Specifications related to using textured and galvanized reinforcement in bridge decks and components.
- Information on cost and availability of textured Epoxy Coated and galvanized reinforcement.
- A PowerPoint presentation to serve as a training tool for WisDOT Bridge Maintenance, Bridge Asset Management, and Regional Planning staff.