Wisconsin Department of Transportation
Wisconsin Highway Research Program

Request for Proposals

Underwater Concrete Pours and Non-Segregating Concrete

Questions submitted to research@dot.wi.gov regarding the content of this RFP are due no later than 4:30 PM (CST) on January 3, 2022

Responses to questions will be posted to the WisDOT Research and Library website https://wisconsindot.gov/Pages/about-wisdot/research/researchers.aspx by 4:30 PM (CST) on January 14, 2022

Proposers must submit a PDF version of their proposal by 4:30 PM (CST) on February 4, 2022 to research@dot.wi.gov.

Proposal Preparation Guidelines can be found at Proposal Preparation Guidelines

Proposers will be notified by April 29, 2022

For more information regarding this RFP contact the WisDOT Research Program at research@dot.wi.gov.

This RFP has been posted to the Internet at https://wisconsindot.gov/Pages/about-wisdot/research/researchers.aspx

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

Underwater Concrete Pours and Non-Segregating Concrete

I. Background and Problem Statement

Poor concrete quality is often of concern in concrete placed underwater for bridge substructures and aggregate segregation in deep drilled shafts. Furthermore, identifying and repairing these types of structures is difficult and expensive. With this in mind, WisDOT has recently restricted the usage of underwater concrete pours for pile-encased piers to avoid poor concrete quality and costly repairs. The WisDOT Bridge Manual Standard 13.09 (https://wisconsindot.gov/dtsdManuals/strct/manuals/bridge/std1309.pdf) describes these limitations. This manual also provides guidelines for when to include underwater inspection and when an underwater concrete pour for a pile encased pier application is not recommended.

WisDOT wants to study further the issues related to concrete placed underwater for bridge substructures and aggregate segregation in deep drilled shafts. So, this project aims to complete a research synthesis report to compile and evaluate placement methods, difficulties associated with pile encased piers and non-segregating concrete for sign bases, environmental and construction factors controlling the pouring of concrete, etc. In addition, this study should investigate how WisDOT's concrete mixes (including high-slump concrete with a non-segregating admixture or other mixes) behave in underwater pours and in deep drilled shafts. Finally, this research project should help evaluate the guidance provided by Standard 13.09 and provide any recommendations for the pile encased application or similar applications, such as abutments.

During the study, the researcher should consider environmental and construction factors associated with underwater and deep drilled shafts concrete pouring, including water velocities, depth of water, methods of confinement and placement, and concrete mix design. As these factors might lead to concrete that is compromised for strength and long-term performance. So, the research team should also consider addressing questions related to the type of inspection that would be desired to help ensure an appropriate level of quality. The potential recommendations may include the need or benefit for diving inspection after installation and other remote inspection technology.

The research report should aim at assessing WisDOT current policy, standards, and specifications, the policy and practices of other DOTs, and current industry practices (including other marine environment construction industries), and then provide guidance to be used in improving WisDOT policy, standards, and specifications related to underwater concrete placement. So, the research team would develop information that would be used

to update the current department Bridge Manual, and Construction and Materials Manuals policy on the placement of concrete underwater and applications prone to aggregate segregation. This project would also potentially impact specifications and standards used to construct concrete piers and abutments in water environments.

These updates would also potentially address:

- Limitations for depositing concrete underwater versus concrete placed in the dry through form dewatering.
- Specification recommendations to control aggregate segregation
- Techniques to excavate and form substructures in aquatic environments.

II. Objectives

A. Examine best practices for the placement of concrete underwater and deep drilled shafts.
B. Evaluate current guidance and specifications for improvements based on best practices
C. Prepare recommendations for changes to WisDOT Manuals, standards, specifications, and policy to promote higher quality concrete substructures.

III. Scope of Work

Task 1:

Conduct a comprehensive literature review and assessment of current practices at various other state Departments of Transportation (DOTs), Canada's Ministries of Transportation, FHWA, industries and manufacturers. WHRP has completed an initial Literature Search that will be provided to research team. In addition, the research team should include a collection of relevant DOT policies, practices, and standard specifications related to the placement of concrete underwater and in deep drilled shafts. Provide a summary of the reviewed information.

Task 2:

Document policies, practices, and standard specifications used at other state DOTs. Contact at least five other states in the upper Midwest regarding the placement of concrete underwater and deep drilled shafts. Summarize this information related to current practices and limitations.

Task 3:

Evaluate current WisDOT practices and past issues with the placement of concrete underwater and deep drilled shafts. The review should include a Bridge Manual and specification review on current WisDOT practices. This review should also document recent issues experience in Wisconsin that have been identified during construction or during regular inspections. For the issues identified, there should be discussion and correlation to reasons that may have led to poor performance. The use of the WisDOT's bridge management system (Highway Structures Information System, HSI) and interviews with regional construction and in-service inspection staff will be required.

Work with the Project Oversight Committee (POC) to collect and assess Wisconsin-specific

policy and specifications for the following applications:

- Stream crossings utilizing pile encased piers
- Stream crossings utilizing bridge abutments placed below the observed water elevation.
- Drilled shaft foundations for LRFD Standardized Overhead Sign Structures

Task 4:

Develop recommendations and guidelines in a format consistent with WisDOT contract specifications and Bridge Manual. Please refer to the Implementation section for further details.

Task 5:

The research team will include a Data Management Plan (DMP) documenting all field/laboratory data and analyses to ensure accessibility and transparency of research data as required by the USDOT per the Public Access Plan (https://ntl.bts.gov/public-access/creating-data-management-plans-extramural-research). The DMP will include the following items:

- The final research data to be produced during the project
- The standards to be used for data and metadata format and content
- Policies for access and sharing the final research data, including provisions for appropriate protection of privacy, confidentiality, security, intellectual property and other rights or requirements
- Policies and provisions for re-use, re-distribution and the production of derivatives
- Plans for archiving final research data and other research products, and for preservation of access to them

IV. Required Field Testing

None anticipated

V. WisDOT/TOC Contribution

WisDOT will provide the following support through the POC to support the successful completion of the project:

A. Work will be conducted with project oversight by the WisDOT Bureau of Structures and WHRP Structures Technical Oversight Committee (TOC).
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. WisDOT staff/TOC members can be expected to contribute a maximum of 40 hours over the duration of the project.
D. If field work on or around in-service facilities is anticipated to conduct this research then the researcher shall specify in the proposal the nature and extent of traffic control that will be required for this project including traffic flagging, signage, barricades, etc., as well as the duration needed (hours/day/location).
E. There also needs to be a discussion in the proposal of the specific traffic control support that is being requested from WisDOT. The researcher will need to coordinate the location of the project fieldwork with the POC chair, WisDOT regional personnel and possibly the

county personnel. The researcher should make accommodations in their proposal budget for traffic control and should not assume WisDOT will fund traffic control expenses.

F. Researchers should not assume availability of contractors for sampling and testing.

VI. Required Travel

A. This project requires meetings with the POC before the beginning of the project to finalize the work plan.

B. This project requires that the principal investigator delivers a technical Close-Out Presentation about two months before the end of the project.

VII. Deliverables

A. Quarterly Progress Reports
   a. WHRP contracts require quarterly technical progress reports that serve both technical and administrative functions.
   b. Detailed information regarding the content of the progress report can be found at Quarterly Progress Reports Guidelines

B. Invoices
   a. Invoices shall be submitted quarterly for partial payments on the project for authorized services completed to date. Invoices may be submitted four times per year, one partial invoice for each specified quarter.
   b. Detailed information regarding invoicing can be found at Invoicing Requirements

C. Before Close-Out Presentation Report
   a. A Before Close-Out Presentation report is required to be submitted three months before the contract end date to allow time for review, revision, and scheduling of the project Close-Out Presentation.
   b. Reports are expected to have quality technical writing and proper grammar. It is acceptable to dedicate resources from your project for the services of a technical editor to ensure these requirements are met.
   c. The required elements of the Before Close-Out Presentation report can be found at: Before Close-Out Presentation Requirements

D. Project Close-Out Presentation
   a. The Principal Investigator on the research team is required to give a presentation to the Technical Oversight Committee in-person.
   b. Presentation and formatting requirements can be found at: Close-Out Presentation Requirements

E. After Close-Out Presentation Report
   a. The After Close-Out Presentation Report is due within three weeks of the Close-Out Presentation for review and comments.
   b. This report details the results of the research project. The final report should be as concise as possible (e.g., a maximum of 50 pages plus supporting appendices) and follow the report guidelines and submission requirements: After Close-Out Presentation Report Requirements
   c. After revision(s) and oversight committee chair approval, an electronic copy of the Publication-Ready Report must be delivered to WisDOT by the contract end date.

VIII. Schedule and Budget

A. Project budget shall not exceed $75,000. Matching funds will not be considered in the proposal evaluation process.
B. Proposed project duration is 12 months starting around October 1, 2022.

IX. Implementation

A. This study will review and recommend guidance on specifications on non-segregating concrete and underwater concrete pours.
B. This study will review and recommend modifications to our policies, standards, and specifications to promote higher quality concrete.
C. Recommendations on inspection and repair techniques that promote placement of quality concrete.
D. The final research report and presentation will be used to develop training materials for industry professionals and WisDOT engineers.