



# WHRP

## Wisconsin Department of Transportation Wisconsin Highway Research Program

Request for Proposals

### ***Investigate Removing Existing Abutment Expansion Joints***

Questions submitted to [research@dot.wi.gov](mailto:research@dot.wi.gov) regarding the content of this RFP are due no later than 04:30 PM (CDT) on January 4, 2024

Responses to questions will be posted to the WisDOT Research and Library website <http://wisdotresearch.wi.gov/rfps-and-proposals> by 04:30 PM (CDT) on January 19, 2024

Proposers must submit a PDF version of their proposal by 4:30 PM (CDT) on February 9, 2024 to: [research@dot.wi.gov](mailto:research@dot.wi.gov).

Proposal Preparation Guidelines can be found at [Proposal Preparation Guidelines](#).

Proposers will be notified by April 26, 2024

For more information regarding this RFP, contact the WisDOT Research Program at: [research@dot.wi.gov](mailto:research@dot.wi.gov).

This RFP has been posted at: <http://wisdotresearch.wi.gov/rfps-and-proposals>

**Wisconsin Highway Research Program (WHRP)  
Structural Technical Oversight Committee (TOC)  
Request for Proposals**

***Investigate Removing Existing Abutment Expansion Joints***

**I. Background and Problem Statement**

This study aims to assess WisDOT’s past approach and considers alternative solutions for eliminating existing abutment expansion joints (abutment and pier fixity conversions). Removing these joints streamlines substructure rehabilitation details, mitigates substructure degradation, and decreases construction and maintenance expenses. Nevertheless, this elimination may alter the overall structure loads and movements. In particular, abutments will likely experience an increase in both lateral loads and movements associated with superstructure fixity, substructure stiffness, thermal requirements, bridge skew, and other factors. As such, not all existing abutment or pier locations may be suitable for removing expansion joints.

Current WisDOT practice calls for replacing existing expansion joints for deck-girder superstructures supported by abutments with fixed bearings. This practice is generally accepted due to the minimal changes to structure fixity and stiffness. However, replacing existing joints with expansion bearings has been limited due to structure fixity and stiffness changes. As such, concerns have risen with the ability to accommodate the structure response due to the thermal requirements.

The outcome of this study would enhance WisDOT’s understanding of substructure conversions and provide design considerations for identifying suitable candidates and their refined details. Eliminating expansion joints would greatly benefit WisDOT by reducing construction and maintenance expenses. Nonetheless, WisDOT would like to investigate the acceptance of these modifications through analytical scrutiny and is interested in developing design criteria for future applications.

**II. Research Objectives**

This research aims to examine WisDOT’s practice of removing existing expansion joints at substructures. The research team must examine if and when the existing expansion joints can be removed. More specifically, researchers will provide WisDOT with guidance for identifying suitable candidates and any supporting details. During the completion of this study, the research team will document the analysis process used for substructure conversions and provide recommendations and supporting information for potential implementation. These objectives will be achieved by:

- A. Identify bridge elements vulnerable to substructure conversions due to temperature related deformations and forces.
- B. Examine the forces and movements that develop in the structure.

- C. Define the changes in forces that are transmitted to foundations as a result of substructure conversions and any detail modifications to better accommodate these forces.
- D. Define practical limits of substructure conversions.
- E. Prepare recommendations for converting substructures.

### **III. Scope of Work**

#### **Task 1: Literature Review**

Conduct a comprehensive literature review and assessment of current practices across States' Departments of Transportation (DOTs), Canada's Ministries of Transportation, the Federal Highway Administration (FHWA), industries, and manufacturers. WHRP has completed an initial literature search that will be provided to the research team. In addition, the research team should include a collection of relevant DOTs' policies and practices. Provide a summary draft report of the reviewed information.

#### **Task 2: Review Past WisDOT Substructure Conversions and Alternative Conversions**

Review of WisDOT in-service structures with substructure conversions to gather information and identify performance issues. Researchers must also document observed distress associated with past conversions through inspection reports. Review alternative conversions identified in Task 1. This should include similar substructure conversion details used by other state DOTs and alternative conversion strategies such as a semi-integral abutment conversion (no expansion joint, girders supported by bearings, and use of a stationary substructure foundation).

#### **Task 3: Analysis of Substructure Conversions**

Evaluate existing structures with substructure conversions. The Project Oversight Committee (POC) will provide the research team with a list of past WisDOT substructure conversions. In consultation with POC members, the research team will select at least two different structures for a detailed evaluation. The selected structures may include structures already converted or structure conversion candidates. This evaluation will include structural analysis of the force and movement changes in the structure from the pre- to the post-substructure conversion, the criteria used for the performance evaluation of the substructure conversion, and the criteria used to consider local and global aspects of stability, strength, and cracking.

#### **Task 4: Develop Usage and Limitations**

Develop strategies for substructure conversions. Determine the viability of substructure conversions through a parametric study based on foundation configurations, pile type, pile orientation, thermal movements, skew, and other significant parameters identified in Tasks 2 and 3. Substructure conversion usage recommendations should be similar to WisDOT's Substructure type selection guide, as shown in Figure 12.7-1 of the WisDOT Bridge Manual. Additionally, provide use and limitations of alternative conversions identified in Task 2.

### **Task 5: Final Report**

The research team will prepare and submit a draft final report including background, best practices, recommendations, and interpretation developed during the project. As part of this report, develop recommendations and guidelines in a format consistent with WisDOT contract specifications and the Bridge Manual. Please refer to the Implementation section for further details.

### **Task 6: Data Management Plan**

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/ntl/public-access/creating-data-management-plans-extramural-research> ). The DMP will include the following items:

- The final research data produced during the project.
- The standards to be used for data and metadata format and content.
- Policies for accessing 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 preserving access to them.

## **IV. Required Testing/Equipment**

None anticipated.

## **V. WisDOT/TOC Contribution**

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

- A. The POC will work with the research team on WisDOT's current practices and identify past substructure conversion projects.
- 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 commitment letter must be included in the proposal.
- C. WisDOT staff/POC members can be expected to contribute a maximum of 40 hours over the project's duration.
- D. If fieldwork on or around in-service facilities is anticipated, the proposal will describe the nature and extent of traffic control and support assistance required. The research team will coordinate with WisDOT regional personnel and possibly the county personnel conducting project fieldwork. For WisDOT planning purposes, the research team shall specify in the proposal, as practical, traffic control measures for this project, including traffic flagging, signage, barricades, etc., and the duration (hours/day/location). WisDOT will not fund the traffic control apart from the research project budget.

## VI. Required Travel to Fulfill TOC Obligations

None anticipated. WHRP prefers a virtual Close-Out presentation; however, the researcher has the option to present the research results in person, paid by contract funds.

## VII. Deliverables

- A. Quarterly Progress Reports (QPRs)
  - a. WHRP contracts require quarterly technical progress reports for technical and administrative functions.
  - b. Detailed information regarding the content of the progress report can be found in [Quarterly Progress Reports Guidelines](#).
- B. Invoices
  - a. Invoices shall be submitted quarterly for partial payments on the project for authorized services completed to date. Four invoices per year are expected, one partial invoice for each specified quarter.
  - b. Detailed information regarding invoicing can be found in [Invoicing Requirements](#).
- C. Interim Reports
  - a. Literature Review.
  - b. Summary of past substructure conversions (a minimum of two is required).
  - c. Guidance and procedures to evaluate existing structures for substructure conversions.
- D. Before Close-Out Presentation (BCOP) Report
  - a. A 50-page long BCOP report summarizing the development and results of the project must be submitted three months before the contract end date to allow time to review and revise the BCOP before the presentation.
  - b. Reports are expected to have quality technical writing and proper grammar. It is acceptable to dedicate funds in the project budget for the services of a technical editor to ensure these requirements are met.
  - c. The required elements of the BCOP report can be found at: [Before Closeout Presentation Requirements](#).
- E. Project Closeout Presentation (COP)
  - a. The Principal Investigator on the research team is required to give a presentation to the TOC.
  - b. Presentation and formatting requirements can be found at [Closeout Presentation Requirements](#).
- F. After Closeout Presentation (ACOP) Report
  - a. The ACOP report, addressing comments made on the BCOP report and during the COP, is due within three weeks of the COP 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 completing revision(s) and TOC 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 \$180,000.
- B. Proposed project duration is 24 months, starting around 10/01/2024.

**IX. Implementation**

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

- A. Develop guidance and procedures to evaluate existing structures for substructure conversions. This should include commentary/documentation on the substructure conversions.
- B. Guidance on practical limits of substructure conversions for eliminating existing expansion joints. This guidance needs to outline the specific short comings of the substructure conversions and offer recommendations to mitigate performance concerns.
- C. The final research report and presentation will be used to develop training materials for industry professionals and WisDOT engineers.