

Geotechnical/
Structures

DECEMBER 2021

Project Title:
Seismic Design of Bridge Pier Walls

Task Number: 3984

Start Date: January 1, 2022

Completion Date: December 31,
2024

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Seismic Design of Bridge Pier Walls

Propose conducting an experimental research program aimed at developing seismic design requirements for bridge pier walls.

WHAT IS THE NEED?

To develop seismic design specifications and seismic detailing requirements for bridge pier walls. Caltrans Seismic Design Criteria (SDC-V1.7) discourages the use pier walls for bridge substructures and requires that a pier wall be designed to "remain essentially elastic." SDC-V2.0 eliminated any reference to pier walls. As a result, pier wall design requirements will be addressed in a new Structure Policy Document (STP 20.36). Due to lack of research data on the subject, the draft STP is largely based on engineering judgement and very conservative design assumptions. The result of using the proposed specification will be oversized bridge substructures which impacts the design of the whole bridge including the foundations and leads to uneconomical design. This research seeks to establish fact-based design specifications that will insure consistent, safe, and economical bridge designs for all bridges where the use of pier walls is required.

WHAT ARE WE DOING?

We propose conducting an experimental and analytical research program to develop seismic design requirements for bridge pier walls. The program aims to develop ductile details for bridge pier walls, characterize pre- and post-cracking stiffness, strength, and ductility of pier walls, which will ultimately lead to science-based design specifications to be incorporated into STP 20.36.



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WHAT IS OUR GOAL?

Following are the main objectives of this study:

- Evaluate the post-elastic performance in the strong direction of bridge pier walls designed by AASHTO design/detailing requirements.
 - Evaluate the effects of bi-directional loading on the post elastic behavior.
- Develop improved seismic details to enhance the post-elastic performance of bridge pier walls.
- Develop pier wall design specifications that will lead to safe and economical designs.

WHAT IS THE BENEFIT?

Efficiency, consistency, and economy. Currently there is little guidance on the subject, so engineers must either be overly conservative or find expensive workarounds when the bridge requires the use pier walls. This project seeks to develop seismic details along with design specifications that will simplify the design process and eliminate the need for excessive conservatism or expensive workarounds leading to efficient bridge designs and reduced project delivery costs. Efficient designs reduce bridge construction costs which frees up resources for use on other projects or other state transportation priorities.

WHAT IS THE PROGRESS TO DATE?

A final report will be provided to present the key aspects and procedures of the study, along with recommendations to facilitate the adoption of the new design recommendations into a Structure Technical Policy and Bridge Design Memo documents that will be available for designers to use on current and future projects.

Begin work as described in the scope