



Caltrans Division of Research,
Innovation and System Information

Research

Notes

Seismic /
Structures

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Project Title:
Accelerated Bridge Maintenance to
Reduce Time/Traffic Impacts

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Post-Tension Box-Girder Deck Replacement Method

Develop and optimize the design and construction of ABC bridges that can demonstrate seismic resilience and serviceability.

WHAT IS THE NEED?

A significant percentage of state owned bridges (over 7,000) in California are post-tensioned box-girder designs. Post-tensioned box-girder construction in California expanded rapidly in the mid 70's and continues to be the structure of choice for typical bridge overcrossings. As the post-tensioned box-girder bridges age, the bridge decks need ongoing preservation and in some cases replacement.

Removal of the deck from a bridge in-service will result in significant stress reversals that the existing girders are not designed to handle. What is needed is an efficient way to handle the significant changes in girder stress during replacement of the deck of a post-tensioned box-girder bridge in-service.

WHAT ARE WE DOING?

This project has two phases:

In phase 1 of the project, 3D finite element models of post-tensioned box-girder bridges will be developed to evaluate permissible span deflection limits and stress for different sequences of deck removal/replacement. Analysis will be performed on various bridge configurations. These will include single and multi-span box-girders, continuous up to three spans; deck widths from two or three lanes up to six lanes. Additionally, a survey of the old post-tensioned box-girder bridges slated for deck replacement will be made as part of this study. The survey would provide guidance on the parameter range, such as span length, deck width, girder depth, number of cells, radius of plan curvature.



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Phase 2 of the project will involve field instrumentation of an actual bridge. Prior to instrumentation, a finite element model will be developed using dimensions and details of the bridge. Optimum sequence for deck removal without over-stressing the girder will be developed. Results from Phase 1 of the study will also be used to guide the sequence of deck removal and replacement, and field results will be used to verify the proposed deck replacement strategy.

WHAT IS OUR GOAL?

This research will support the following strategic objectives of the Division of Engineering Services:

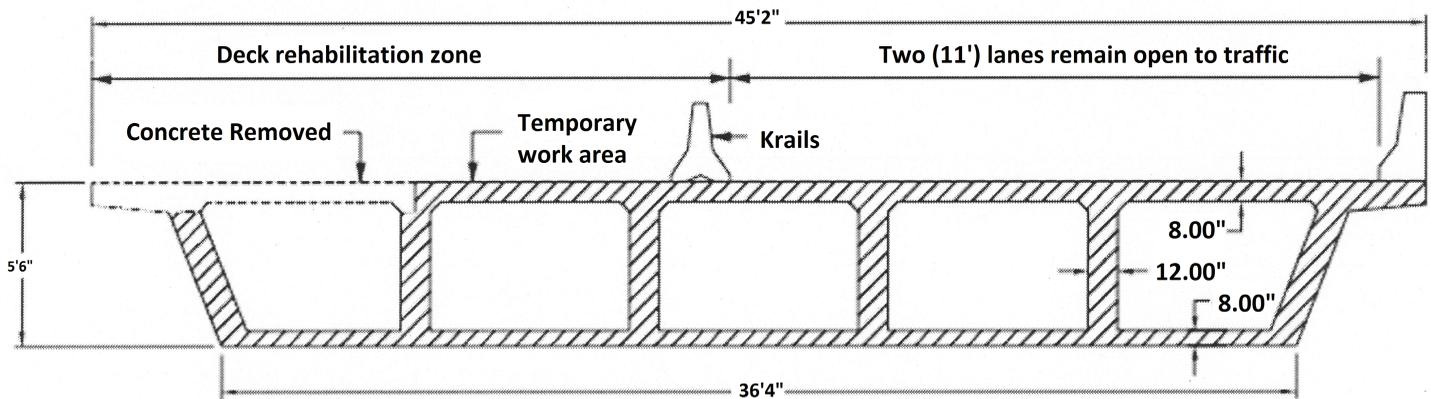
- To ensure reliability and structural integrity
- To balance performance, cost and time
- To optimize total value

WHAT IS THE BENEFIT?

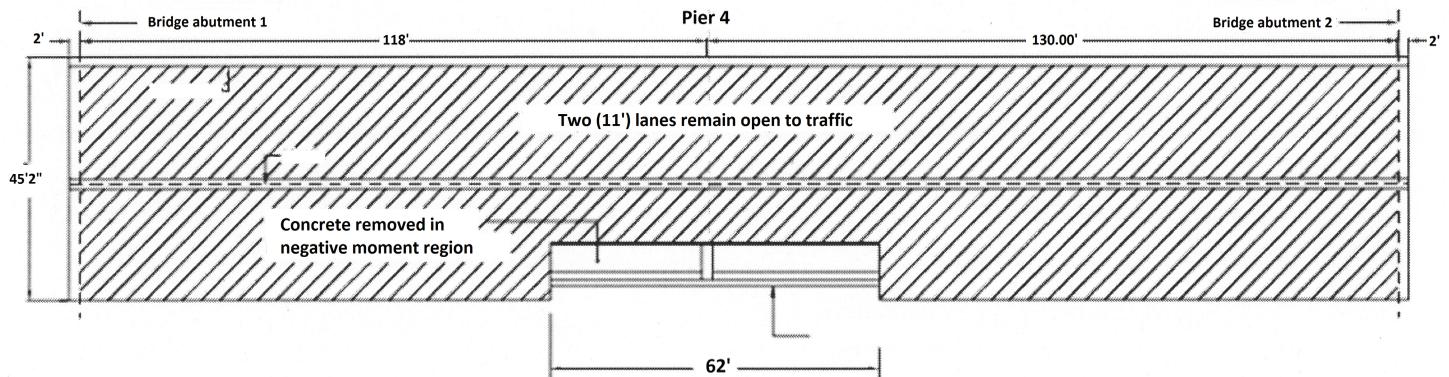
A final report will be provided to present the key aspects and procedures of the study, along with recommendations to facilitate the adoption of the new design and construction guidance material for post-tensioned box-girder deck replacement methods by Caltrans engineers.

WHAT IS THE PROGRESS TO DATE?

Begin work as described in the scope.



Cross-section showing partial deck removal of post-tensioned box-girders.



Plan view showing concrete removal in negative moment region.

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