



Caltrans Division of Research,
Innovation and System Information

Research



Results



Maintenance

SEPTEMBER 2021

Project Title:
Managing Scour Potential and
Impacts

Task Number: 2403

Start Date: October 19, 2011

Completion Date: December 31,
2014

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Transportation Pooled Fund (TPF) Project TPF-5(211), “Bridge Pier Scour Research”

This study combined abutment flume experiments with numerical modeling to investigate flow fields and scour at vertical-wall abutments.

WHAT WAS THE NEED?

Scour at the base of bridge abutments during floods is a common cause of bridge failure. Shallow Abutment foundations are considered more vulnerable to scour because they are closer to the streambed and can significantly constrict flood flows. To protect abutments built on shallow foundations from scour damage, methods for countermeasure design are needed that are integrated components of the bridge.

WHAT WAS OUR GOAL?

To provide a more complete picture of the flow field and riverbed shear stresses near bridges and to specify appropriate application of riprap (rock) aprons for vertical-wall abutments based on the guidance of Hydraulic Engineering Circular (HEC-18) used for shallow abutment foundations.

WHAT DID WE DO?

Developed a conceptual model for the increased shear in the middle of the contracted channel at a bridge section. Based on the model, conducted physical and numerical modeling of water flows, and used the results of the modeling and calculations to develop design guidance for the installation of riprap aprons near bridges.



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WHAT WAS THE OUTCOME?

The physical model was designed to validate the hypothesis of increased shear stress with riprap aprons and provide feedback on riprap apron failure modes. The physical experiments also provided a basis for designing the numerical modeling. The experiments demonstrated that full width of channel riprap aprons could be effective at protecting against abutment and contraction scour, a cause of bridge foundation instability.

WHAT IS THE BENEFIT?

The development of guidance on the design of riprap aprons which are integrated as a component of the bridge structure. The integration of the design of the riprap can be effective in mitigating the detrimental effects of scour on bridge abutments thus preserving the integrity of the bridge foundation and its functionality.

LEARN MORE

Final Report:
<https://www.pooledfund.org/Details/Study/439>

To view the evaluations:

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