

DRISI

CALTRANS DIVISION OF RESEARCH,
INNOVATION AND SYSTEM INFORMATION

Research Results

Maintenance

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Project Title:

Improved Maintenance Methods for Bridge Drains and Expansion Joints

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Task Manager:

Eemon Amini
Transportation Engineer
Eemon.Amini@dot.ca.gov

Improved Maintenance Methods for Bridge Drains and Expansion Joints

This research studied select maintenance methods for bridge joints and deck drains cleaning to determine their suitability to Caltrans' maintenance operations.

WHAT WAS THE NEED?

Bridge deck joints and drains have specialized maintenance needs. They are subject to higher debris loads due to bridge barriers containing debris on the structure instead of the debris being able to move naturally off the road.

Maintenance efforts are more constrained because shoulders are frequently narrower than the adjacent roadway, and there is no access to the area outside the shoulder to work from or retreat to in an emergency event. Clogged drains and packed joints can lead to bridge damage and costly repairs. These problems and challenges have led California Department of Transportation (Caltrans) to seek improved maintenance methods for bridge joints and deck drains.

WHAT WAS OUR GOAL?

The goal of this research was to identify and implement improved maintenance methods on the State's bridges to reduce damage from debris and increase the efficiency of maintenance operations.

WHAT DID WE DO?

The task manager and researchers from the Advanced Highway Maintenance and Construction Technology (AHMCT) Research Center reviewed existing research and practices of other states and considered existing commercial equipment and new concepts to identify better practices and equipment for adoption into Caltrans' operations.



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Discussions with Districts 4 and 11 staff provided insight of their experience with bridge cleaning processes and equipment, which led to identifying the obstacles and challenges experienced. The research team further met with vendors of commercially available equipment systems and performed in-house testing and evaluation of a regenerative vacuum sweeper as well as a common trailer-based vacuum excavator.

Through ongoing discussions and research, AHMCT met with District 11 staff in the field to observe current maintenance methods and problems. District 11 staff field tested a rented Ditch Witch vacuum trailer to determine its functionality. Lessons learned from the rental allowed researchers to identify a more appropriate and better suited Vermeer vacuum trailer, which was purchased through the research task and delivered to the district in February 2023.

WHAT WAS THE OUTCOME?

This research successfully completed a literature review that focused on commercially available equipment and processes to improve debris removal operations in joints, drains and scuppers. Research also successfully completed field evaluations of rented and purchased cleaning equipment, including regenerative sweepers and trailer vacuum systems. Through these efforts, the research concluded that:

- Common high-flow vacuum equipment alone will potentially draw loose incompressible debris for not more than one inch deep in expansion joints.
- No novel commercially available equipment solutions are available to improve present day cleaning operations for expansion joints.
- Demonstrations of a regenerative sweeper on a simulated expansion joint cleaning concluded that the sweeper could remove fine debris; however, items larger than three-quarters of an inch are not effectively removed.

- Through assessments of various vacuum systems used in debris removal operations on bridges, a Vermeer trailer unit, with a four-inch hose and 1,000 cfm flow rate, was purchased and tested in District 11 and initial results indicates successful operations. Systems with smaller hoses and flow rates were not successful and should be avoided.
- Having found value in the unit, District 11 continues to use the Vermeer vacuum in its routine bridge drain inlet cleaning operations.

WHAT IS THE BENEFIT?

Benefits of appropriate bridge expansion joint and drainage inlet maintenance include less damage to bridge structures, a reduction in associated repair costs, and lower maintenance costs through less maintenance efforts. Additional benefits are increased safety for maintenance workers due to less exposure to highway traffic. Implementation of the Vermeer trailer vacuum system reduces the labor-intensive exertion and removes debris more completely than systems with lower flow rates. Because of its usefulness in operations, District 11 is using the Vermeer unit in its regular bridge maintenance operations.

LEARN MORE

To view the evaluations, contact the task manager: Eemon.Amini@dot.ca.gov

IMAGES



Image 1: Example of drain cleaning in District 11



Image 2: Cleaning with a Ditch Witch 3-inch nozzle



Image 3: Vermeer LP573SGT trailer unit purchased for District 11 testing

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