

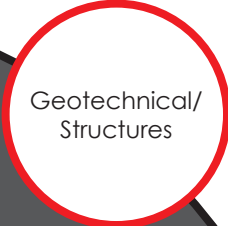


Caltrans Division of Research,  
Innovation and System Information

# Research



# Notes



Geotechnical/  
Structures

NOVEMBER 2022

Project Title:  
MASH 2016 Compliance of  
Roadside Safety Features

Task Number: 3170

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Completion Date: August 31, 2023

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## Develop MASH Bridge Railing that Satisfies State and Federal Historical Preservation Requirements [Type 86H Concrete Barrier Rail]

Develop a MASH 2016 compliant TL-4 bridge railing to replace existing concrete baluster bridge railings on rehabilitation and replacement projects for California bridges on the State and National Historic Registers.

### WHAT IS THE NEED?

There are many bridges within the State of California and National Historic Register that were built with the aesthetically pleasing concrete baluster rail. This bridge rail does not meet the Manual for Assessing Safety Hardware (MASH) 2016 standards. There is a need to design and develop an alternative historic appearing rail (Type 86H Concrete Barrier Rail) that is capable of supporting MASH 2016 TL-4 impact loads and meet current MASH crash testing guidelines.

This new design is needed to replace existing concrete baluster bridge railings on rehabilitation and replacement projects for California bridges on the State and National Historic Registers. This will likely require preliminary investigation, review of state and federal requirements for historic structures (State Historic Preservation Office and Federal Secretary of the Interior), analysis, design, crash testing, stakeholder review, and publication of revised standards.

### WHAT ARE WE DOING?

The Division of Engineering Services has completed the design of an alternative historic appearing and aesthetically pleasing concrete barrier rail, that is structurally capable of supporting MASH 2016 TL-4 impact loads. A Minor B contract was executed for construction of the Type 86H Concrete Barrier Rail at the Caltrans Dynamic Test Facility. Construction was overseen by our staff. The test article will be crash tested to MASH 2016. The test results will be presented to Division of Engineering Services to determine if the Type 86H Concrete Barrier Rail can be adopted as an alternative barrier rail for use by Caltrans.



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## WHAT IS OUR GOAL?

Our goal is to design, construct, crash test and obtain approval for a MASH TL-4 compliant bridge rail that supports environmental and cultural requirements for historic structures.

## WHAT IS THE BENEFIT?

This project will provide a bridge rail that meets federal safety requirements for use on state historic bridges and will be eligible for Federal-aid reimbursement. In addition, it will reduce delays of project delivery for upgrade and repair of state historic bridges.

## WHAT IS THE PROGRESS TO DATE?

The Type 86H Concrete Barrier Rail has been designed by Structures. A minor B contract package for construction of the test article has been awarded and executed by Caltrans Division of Procurement and Contracts. Work began at the Caltrans Dynamic Test Facility on November 2, 2020 and was completed on January 11th, 2021. Project test vehicles were purchased meeting MASH 2016 guidelines. The 1100C (Passenger Car), the 2270P (pickup) and the 10000S (Single-Unit Truck) tests were completed on May 26th, 2021 and August 25th, 2021, and December 8, 2021 respectively. Results have been processed and it has been confirmed that all three met the requirements set forth by MASH 2016. An updated set of Draft (standard detail) XS-Sheets for the Type 86H Concrete Barrier Rail was submitted by the Division of Engineering Services. Another review of these details was made by our office and additional comments were submitted to DES. The Type 86H Barrier was presented to the Highway Safety Features New Products Committee on February 17th, 2022 and was approved for use in California's Highway System. A draft report describing the results of the crash testing has been completed and is ready for an inhouse review.

## IMAGES

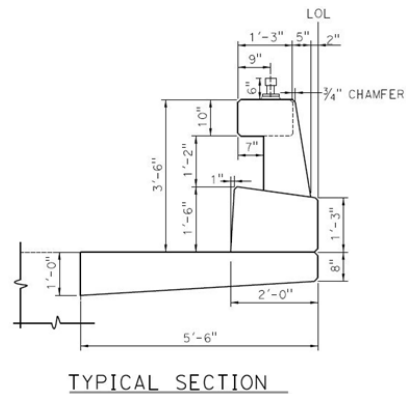


Image 1: Type 86H Cross Section Detail



Image 2: Type 86H Concrete Barrier looking North East



Image 3: Type 86H Concrete Barrier looking North West



Image 4: Type 86H Concrete Barrier looking North



Image 5: 1100C (Passenger Car) test on Type 86H Concrete Barrier Rail Looking South



Image 6: 2270P (pickup) test on Type 86H Concrete Barrier Rail Looking South



Image 7: 10000S (Single-Unit Truck) test on Type 86H Concrete Barrier Rail Looking East

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