

Geotechnical/ Structures

October 2025

Project Title: MASH 2016
Compliance of Roadside Safety
Features

Task Number: 3030

Start Date: January 1, 2017

Completion Date: Pending

Task Manager:

Vue Her
Senior Transportation Engineer
vue.her@dot.ca.gov



DRISI provides solutions and
knowledge that improves
California's transportation system.

Type 15-FBS Breakaway Pole Replacement Development and Testing

A modified version of the Type 15-FBS is being developed and will be crash tested to the current crash test guidelines.

WHAT IS THE NEED?

The Type 15-Flashing Beacon System (FBS) is a slip-base pole in the California Department of Transportation's (Caltrans) Standard Plan but has not been tested to the current crash test guidelines, the American Association of State Highway and Transportation Officials' (AASHTO) Manual for Assessing Safety Hardware (MASH) 2016. The Type 15-FBS is one of many roadside safety hardware and appurtenances that will need to meet the Federal Aid Eligibility requirements for new installations per the implementation agreement for MASH 2016.

This will require research, design, crash testing, various reviews, and publication of revised standards. The design will also need to meet Caltrans design standards and stakeholder priorities.

WHAT ARE WE DOING?

The objective of this project is to test and evaluate the crash performance of the Type 15-FBS slip base pole system under the MASH 2016 Test Level 3 criteria. This work includes a redesign of the existing Type 15-FBS system. MASH 2016 Test Level 3 criteria for "Support Structures" comprise of the following tests:

1. 3-60, 1100C (small car), 19 mph, right or left quarter point of impacting vehicle, 30 degree angle impact
2. 3-61, 1100C (small car), 62 mph, right or left quarter point of impacting vehicle, 30 degree angle impact
3. 3-62, 2270P (pickup), 62 mph, right or left quarter point of impacting vehicle, 30 degree angle impact

Redesign and retesting of the Type 15-FBS may be necessary if any of the tests are not successful. When testing is completed,

the research team will prepare a final report. If the testing shows that the product meets the MASH 2016 evaluation criteria, the slip base pole system will be adopted into Caltrans standards for use.

WHAT IS OUR GOAL?

Our goal is to produce a replacement for the Type 15-FBS that is compliant with Caltrans design standards and meet the Federal Aid Eligibility requirements for new installations per the implementation agreement for MASH 2016.

WHAT IS THE BENEFIT?

The Type 15-FBS has been a Caltrans standard plan for many years and has not been tested to current federal crash test guidelines. The benefit of this research is a MASH-compliant version of the Type 15-FBS that will meet federal safety guidelines and remain eligible for federal fund reimbursement.

WHAT IS THE PROGRESS TO DATE?

Eight Type 15-FBS light standards were ordered for this project. The installation of two modified Type 15-FBS light standards was completed at the Caltrans Dynamic Testing Facility in West Sacramento, CA. One MASH 2016 test was conducted on March 7, 2018. The second test, MASH 2016 Test 3-60 (TEST 410MASH3C20-01) was conducted on February 26, 2020. Test data results indicate that this test failed the MASH 2019 Test 3-60 evaluation criteria due to the breakaway feature of the test article not activating and the occupant impact velocity exceeding the maximum recommended value. A draft evaluation summary of the results was sent to the customer (Structures) on March 25, 2020. Four additional Type 15-FBS light standards were acquired for additional testing (total of 8 Type 15-FBS light standards for the project).

The research team met with Structures to determine the direction of this project. The decision was to modify the Type 15-FBS by widening the slip base notch angles from 60° to 90°. This is version 2 of the

Type 15-FBS.

The modified Type 15-FBS was installed on August 30, 2022 by Caltrans District 3 Special Crew, Sign Crew. The updated clamping bolts were torqued to Caltrans specifications of 150 ft-lb. The third test, MASH 2016 Test 3-60 (Test 410MASH3C22-01) was conducted on September 14, 2022. During this test, the vehicle successfully activated the breakaway feature but one of the beacons on the test article penetrated the rear window thus failing MASH evaluation criteria D (Detached elements, fragments, or other debris from the test article should not penetrate or show potential for penetrating the occupant compartment, or present undue hazard to other traffic, pedestrians, or personnel in a work zone.)

Due to test 410MASH3C22-01 failing, the research team and Structures have decided to modify the Type 15-FBS (version 3) again by only using one beacon and moving it to the top of the pole as well as moving the sign up. A slip-fitter and adapter will be used in this version to install the beacon.

Version 3 of the Type 15-FBS was tested on August 9, 2023. This test also failed due to the roof and windshield deformations exceeding the maximum allowable per MASH 2016 evaluation criteria. The research team and Structures is reevaluating the project scope as testing of this device has proven to be difficult.

Through research and communication with other testing laboratories, testing of this category of devices has been challenging. The research team and Structures may redesign the Type 15-FBS or explore other alternatives as a replacement for the Type 15-FBS.

Due to the retirement of the Structures customer rep, the research team will need to meet with Structures to discuss the direction of this project. The research team has reached out to Structures and is awaiting a response.

IMAGES



Image 1: Modified Type 15-FBS at the Caltrans Dynamic Test Facility



Image 2: Type 15-FBS Slip Base



Image 3: Test 430MASH3C17-01 Small Car 31 MPH Impact
(March 7, 2018)

The contents of this document reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the California Department of Transportation, the State of California, or the Federal Highway Administration. This document does not constitute a standard, specification, or regulation. No part of this publication should be construed as an endorsement for a commercial product, manufacturer, contractor, or consultant. Any trade names or photos of commercial products appearing in this document are for clarity only.



Image 4: TEST 410MASH3C20-01 Small Car 19 MPH Impact (February 26, 2020)



Image 6: TEST 410MASH3C22-01 Small Car 19 MPH Impact (September 14, 2022)



Image 5: TYPE 15-FBS SLIPBASE MODIFICATIONS – INCREASE NOTCH ANGLE FROM 60° TO 90°

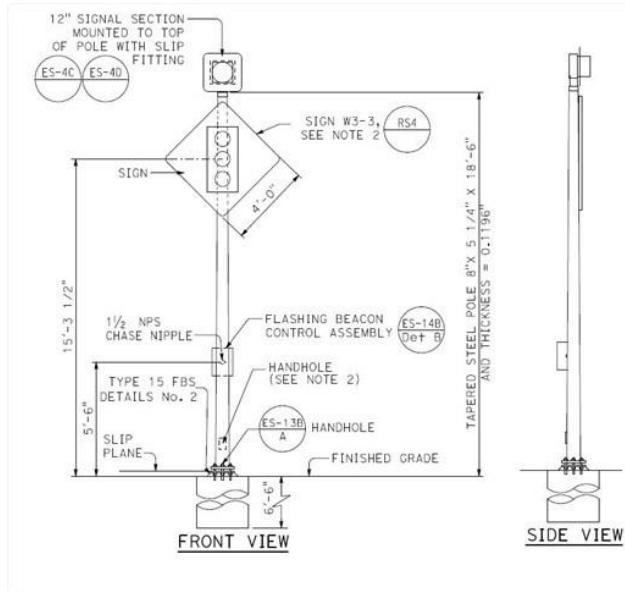


Image 7: Type 15-FBS Version 3

The contents of this document reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the California Department of Transportation, the State of California, or the Federal Highway Administration. This document does not constitute a standard, specification, or regulation. No part of this publication should be construed as an endorsement for a commercial product, manufacturer, contractor, or consultant. Any trade names or photos of commercial products appearing in this document are for clarity only.