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MASH-16 Compliance Assessment

Sponsor Information

Date:	September 23, 2019
Name:	Roadside Safety Pooled Fund
Company:	N/A
Address:	N/A
City, ST Zip:	N/A
Country:	United States of America

Texas A&M Transportation Institute (TTI) evaluated the product described below and found it to meet the appropriate evaluation criteria in MASH-16.

Device & Testing Criterion

System Type	Device Name/Variant	Testing Criterion	Test Level
Longitudinal Barriers	32-inch F-Shape Cast-In-Place (CIP) Barrier	MASH-16	TL3

Disclosure of Financial Interest

☒ TTI has no financial interest beyond payment for services for design and/or evaluation of this product.

☐ Other (describe):

Product Description

○ New Hardware ○ Significant Modification to Existing Hardware ◉ Non-significant Modification to Existing Hardware

The 32-inch F-Shape CIP Barrier is a solid concrete parapet bridge rail system. The barrier has a total height of 32 inches. There are different designs for the 32-inch F-Shape CIP Barrier, but each design typically has the same profile angle.

Evaluation Results

Any full-scale crash testing performed by TTI as part of this evaluation was done in compliance with MASH-16.

MASH Test Number	Description/Justification	Evaluation Results
3-10 (1100C)	Rail geometry has a direct influence on MASH occupant risk criteria. For concrete barriers, rail geometry is defined by the barrier shape or profile. MASH Test 3-10 has not been conducted on a Cast-In-Place (CIP) F-Shape barrier. However, MASH Test 3-10 was successfully performed on the New Jersey Safety Shape (NJSS) barrier under NCHRP Project 22-14(2) "Performance Evaluation of the Permanent New Jersey Safety Shape Barrier – Update to NCHRP 350 Test No. 3-10 (2214NJ-1)." The cross-sectional profile of the NJSS barrier is similar to the F-Shape barrier but is considered more critical in terms of vehicle stability. In addition, MASH Test 5-10 was successfully performed on the T224 bridge rail and is documented in Research Report FHWA/TX-15/9-1002-15-5 "Crash Test and Evaluation of the T224 Bridge Rail." The T224 barrier has a vertical traffic face with openings between posts and is considered more critical in terms of vehicle decelerations. Since the NJSS barrier and T224 barrier have been found to meet MASH TL-3 occupant risk criteria, the 32-inch F-Shape CIP Barrier is considered satisfactory according to MASH Test 3-10 evaluation criteria.	Non-critical, not performed
3-11 (2270P)	Rail geometry has a direct influence on MASH occupant risk criteria. For concrete barriers, rail geometry is defined by the barrier shape or profile. MASH Test 3-11 has not been conducted on a CIP F-Shape barrier. However, MASH Test 3-11 was successfully performed on the New Jersey Safety Shape (NJSS) barrier under NCHRP Project 22-14(3) "Evaluation of Existing Roadside Safety Hardware Using Manual for Assessing Safety Hardware (MASH)." The cross-sectional profile of the NJSS barrier is similar to the F-Shape barrier but is considered more critical in terms of vehicle stability. In addition, MASH Test 5-11 was successfully performed on the T224 bridge rail and is documented in Research Report FHWA/TX-	Non-critical, not performed

	15/9-1002-15-5 "Crash Test and Evaluation of the T224 Bridge Rail." The T224 barrier has a vertical traffic face with openings between posts and is considered more critical in terms of vehicle decelerations. Since the NJSS barrier and T224 barrier have been found to meet MASH TL-3 occupant risk criteria, the 32-inch F-Shape CIP Barrier is considered satisfactory according to the occupant risk evaluation criteria specified in MASH. To evaluate the structural adequacy of a 32-inch F-Shape CIP Barrier without performing MASH Test 3-11 or Finite Element (FE) impact simulations, a strength analysis must be conducted using the procedure described in AASHTO LRFD Bridge Design Specifications, Section 13. The calculated resistance of a barrier must be compared to the MASH TL-3 design impact load. The MASH TL-3 design impact load is 71 kips located at an effective height of 19 inches above the roadway surface, as determined in NCHRP Project No. 20-07/Task 395, "MASH Equivalency of NCHRP 350-Approved Bridge Railings". The barrier is considered satisfactory for the MASH TL-3 structural adequacy criteria if the calculated resistance of the 32-inch F-Shape CIP Barrier is greater than or equal to the MASH TL-3 design impact load. For a bridge rail system to be considered a MASH acceptable barrier, a minimum height must be met to ensure stability of the vehicle and to prevent override of the barrier. The MASH TL-3 minimum rail height is 29 inches, as determined in NCHRP Project No. 20-07/Task 395, “MASH Equivalency of NCHRP 350-Approved Bridge Railings.” The 32-inch F-Shape CIP Barrier has a height of 32 inches and, therefore, the 32-inch F-Shape CIP Barrier meets the MASH TL-3 minimum height stability criterion.	

Signature(s)

☐ *New Hardware or Significant Change to Existing Hardware:* By signature below, the researcher has determined that the critical crash test(s) for this device was (were) conducted in accordance with MASH-16 criteria. The researcher has determined that no additional crash tests are necessary to determine MASH-16 compliance.

☒ *Non-significant Change to Existing Hardware:* By signature below, the researcher has determined that the modification to existing hardware is deemed non-significant.

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Country:	USA

TTI Crash Testing Performed: ☐ Yes (lab signature required) ☒ No (lab signature not required)

Laboratory Name:	
Laboratory Signature:	
Address:	
City, ST Zip:	
Country:	
Accreditation Certificate Number and Dates of Current Accreditation Period:	