



U.S. Department
of Transportation
**Federal Highway
Administration**

June 9, 2022

1200 New Jersey Ave., SE
Washington, D.C. 20590

In Reply Refer To:
HSST-1/B-365

William P. Longstreet
Northern Infrastructure Products
21 Fortecon Drive Stouffville
ON. L4A 2GB
Canada

Dear Mr. Longstreet:

This letter is in response to your November 4, 2021 request for the Federal Highway Administration (FHWA) to review a roadside safety device, hardware, or system for eligibility for reimbursement under the Federal-aid highway program. This FHWA letter of eligibility is assigned FHWA control number B-365 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

Decision

The following device is eligible for reimbursement with details provided in the form which is attached as an integral part of this letter:

- Pinned Cross-Bolt F-Shape Precast Concrete Traffic Barrier

Scope of this Letter

To be found eligible for Federal-aid funding, new roadside safety devices should meet the crash test and evaluation criteria contained in the American Association of State Highway and Transportation Officials' (AASHTO) Manual for Assessing Safety Hardware (MASH). However, the FHWA, the Department of Transportation, and the United States Government do not regulate the manufacture of roadside safety devices. Eligibility for reimbursement under the Federal-aid highway program does not establish approval, certification or endorsement of the device for any particular purpose or use.

This letter is not a determination by the FHWA, the Department of Transportation, or the United States Government that a vehicle crash involving the device will result in any particular outcome, nor is it a guarantee of the in-service performance of this device. Proper manufacturing, installation, and maintenance are required in order for this device to function as tested.

This finding of eligibility is limited to the crashworthiness of the system and does not cover other structural features, nor conformity with the Manual on Uniform Traffic Control Devices.

Eligibility for Reimbursement

Based solely on a review of crash test results and certifications submitted by the manufacturer, and the crash test laboratory, FHWA agrees that the device described herein meets the crash test and evaluation criteria of the AASHTO's MASH. Therefore, the device is eligible for reimbursement under the Federal-aid highway program if installed under the range of tested conditions.

- Name of system: Pinned Cross-Bolt F-Shape Precast Concrete Traffic Barrier
Type of system: Barrier
Test Level: Test Level 3
Testing conducted by: Calspan Corporation
Date of request: November 4, 2021

FHWA concurs with the recommendation of the accredited crash testing laboratory on the attached form.

Full Description of the Eligible Device

The device and supporting documentation, including reports of the crash tests or other testing done, videos of any crash testing, and/or drawings of the device, are described in the attached form.

Notice

This eligibility letter is issued for the subject device as tested. Modifications made to the device are not covered by this letter. Any modifications to this device should be submitted to the user (i.e., state DOT) as per their requirements.

You are expected to supply potential users with sufficient information on design, installation and maintenance requirements to ensure proper performance.

You are expected to certify to potential users that the hardware furnished has the same chemistry, mechanical properties, and geometry as that submitted for review, and that it will meet the test and evaluation criteria of AASHTO's MASH.

Issuance of this letter does not convey property rights of any sort or any exclusive privilege. This letter is based on the premise that information and reports submitted by you are accurate and correct. We reserve the right to modify or revoke this letter if: (1) there are any inaccuracies in the information submitted in support of your request for this letter, (2) the qualification testing was flawed, (3) in-service performance or other information reveals safety problems, (4) the system is significantly different from the version that was crash tested, or (5) any other information indicates that the letter was issued in error or otherwise does not reflect full and complete information about the crashworthiness of the system.

Standard Provisions

- To prevent misunderstanding by others, this letter of eligibility designated as FHWA control number B-365 shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed upon request.
- This letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder.
- This FHWA eligibility letter is not an expression of any Agency view, position, or determination of validity, scope, or ownership of any intellectual property rights to a specific device or design. Further, this letter does not impute any distribution or licensing rights to the requester. This FHWA eligibility letter determination is made based solely on the crash-testing information submitted by the requester. The FHWA reserves the right to review and revoke an earlier eligibility determination after receipt of subsequent information related to crash testing.

Sincerely,

Michael S. Griffith

Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	November 04, 2021	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	William P. Longstreet	
	Company:	Northern Infrastructure Products	
	Address:	21 Fortecon Drive Stouffville ON. L4A 2G8	
	Country:	Canada	
	To:	Michael S. Griffith, Director FHWA, Office of Safety Technologies	

I request the following devices be considered eligible for reimbursement under the Federal-aid highway program.

Device & Testing Criterion - Enter from right to left starting with Test Level

!-!-!

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'B': Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	Pinned Cross-Bolt F-Shape Precast Concrete Traffic Barrier	AASHTO MASH	TL3

By submitting this request for review and evaluation by the Federal Highway Administration, I certify that the product(s) was (were) tested in conformity with the AASHTO Manual for Assessing Safety Hardware and that the evaluation results meet the appropriate evaluation criteria in the MASH.

Individual or Organization responsible for the product:

Contact Name:	Benjamin Powell	Same as Submitter <input type="checkbox"/>
Company Name:	Northern Infrastructure Products	Same as Submitter <input checked="" type="checkbox"/>
Address:	21 Fortecon Drive Stouffville ON. L4A 2G8	Same as Submitter <input checked="" type="checkbox"/>
Country:	Canada	Same as Submitter <input checked="" type="checkbox"/>
Enter below all disclosures of financial interests as required by the FHWA 'Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.		
<p>Cal Span was contracted by Northern Infrastructure Products to perform full scale crash testing of the Pinned Cross-Bolt, F-Shape Precast Concrete Traffic Barrier. There are no shared financial interests in the Traffic Barrier by Cal Span, or between Northern Infrastructure Products and Cal Span, other than costs involved in the actual crash tests of the Traffic Barrier to existing MASH protocols and reports for this submission to the FHWA.</p>		

PRODUCT DESCRIPTION

- New Hardware or Significant Modification
 Modification to Existing Hardware

The Pinned Cross-Bolt, F-Shape Precast Concrete Traffic Barrier (Barrier) test installation consisted of 13 standard F-Shape profile reinforced concrete barriers, each nominally 4meter (13feet 1½inches) in length face-to-face, 815millimeters (32-inch) tall, and 600millimeters (23-5/8-inch) wide at the base, tapering to 235millimeter (9-¼-inch) wide at the top, for a total installation length of 52meters (170feet 7¼inches) . Two (2) 25millimeter (1-inch) cross bolt holes precast in each end of concrete barrier segments.

The cross-bolts are fabricated from 7/8-inch (22 mm) diameter, SAE Grade 5 threaded rod. The lengths of the upper and lower cross bolts were 25-1/4 inches (641 mm) and 29 inches (737 mm), respectively. The barriers segments are placed end to end and the cross bolts are inserted through aligning guide pipes between adjacent barrier segments.

The total length of the Pinned Cross-Bolt, F-Shape Precast Concrete Traffic Barrier is approximately 52meters (171feet) including a 0-inch gap between the ends of the adjacent barrier segments, placed on a 102millimeter (4-inch) thick layer of asphalt pavement.

Each Pinned Cross-Bolt, F-Shape Precast Concrete Traffic Barrier was laterally restrained on asphalt pavement on traffic side only with three (3) threaded bolts 19-millimeter (¾-inch) diameter, 305-millimeter (12-inch) in length, using a 19-millimeter (¾-inch) nut and a 22-millimeter (7/8-inch) plate washer with ReDD™ (Reduced Deflection Device) of which is a fabricated plastic insert for the 19MM (¾-inch) diameter anchor bolt. Each anchor was installed in vertically drilled holes, 7 inches deep X 3/8IN diameter into the asphalt pavement and subbase then secured with an epoxy system as per the manufacturer's instructions. The threaded rod is epoxied 6 in. into the asphalt and subbase.

Typical soil at Calspan test site under asphalt deemed to meeting AASHTO standards of crushed stone compacted to more than 90% of its maximum dry density; in accordance with Test Methods D1556 and D6938 and AASHTO Method of Test T099.

CRASH TESTING

By signature below, the Engineer affiliated with the testing laboratory, agrees in support of this submission that all of the critical and relevant crash tests for this device listed above were conducted to meet the MASH test criteria. The Engineer has determined that no other crash tests are necessary to determine the device meets the MASH criteria.

Engineer Name:	Mark J Parisi	
Engineer Signature:	Mark J. Parisi	Digitally signed by Mark J. Parisi Date: 2021.11.09 11:32:24 -05'00'
Address:	4455 Genesee Street, Cheektwaga, NY 14225	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	<p>Test 3-10 involves an 1100C test vehicle impacting the Pinned Cross-Bolt F-Shape Precast Concrete Traffic Barrier (Barrier) test article at a target impact speed of 62 mph at 25 degrees. The target CIP for the right corner of the front bumper was 4ft downstream of the joint between barrier nos. 4 and 5.</p> <p>The results of the MASH 1100C test conducted on August 19 2021 are found in Cal Span Crash Test Report, Number MASH BR0076/BR0084, dated October 26, 2021. The 1100C test vehicle was traveling at an actual speed of 62.05 mi/h as it contacted the Barrier at 4ft downstream of joint connection between segments 4 and 5, at an impact angle of 26°.</p> <p>After loss of contact with the Barrier, the vehicle came to rest 325feet downstream of the impact point and 15.75feet toward the traffic side. The Barrier contained and redirected the 1100C vehicle. The vehicle did not penetrate, under ride, or override the installation. The vehicle exited within the exit box criteria defined in MASH. Maximum dynamic deflection of the Barrier during the test was 1 inch. . There was no measurable permanent deformation. No detached elements, fragments, or other debris were present to penetrate, or to show potential for penetrating, the occupant compartment, or to present undue hazard for others in the area. The 1100C vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 14.4° and -10.3°, respectively. Longitudinal OIV was 19.2 feet/second and lateral OIV was 30.2 feet/second. Maximum longitudinal occupant ride down acceleration was 5.3g, and maximum lateral occupant ride down acceleration was 17.4g. Occupant risk factors were within the preferred limits specified in MASH Section 5. Maximum exterior deformation to the vehicle was 7 inches in the side plane in the front plane at the right front corner at bumper height. Maximum occupant compartment deformation was 2 inches in the right front floor pan area. There was no damage to the vehicle's fuel tank or oil pan due to crash test.</p> <p>The Barrier performed acceptably for MASH Test 3-10.</p>	PASS

Required Test Number	Narrative Description	Evaluation Results
3-11 (2270P)	<p>Test 3-11 involves an 2270P test vehicle impacting the Pinned Cross-Bolt, F-Shape Precast Concrete Traffic Barrier (Barrier) test article at a target impact speed of 62 mph at 25 degrees. The target CIP for the right corner of the front bumper was 4ft downstream of the joint between Barrier nos. 4 and 5.</p> <p>The results of the MASH 2270P test conducted on June 4, 2021 are found in Cal Span Crash Test Report, Number MASH BR0076/BR0084, dated October 26, 2021. The 2270P test vehicle was traveling at an actual speed of 62.4 mi/h as it contacted the Barrier at 4ft downstream of joint connection between segments 4 and 5, at an impact angle of 26°.</p> <p>After loss of contact with the Barrier, the vehicle came to rest 230feet downstream of the impact point and 0ft toward the traffic side. The Barrier contained and redirected the 2270P vehicle. The vehicle did not penetrate, under ride, or override the installation. The vehicle exited within the exit box criteria defined in MASH Section 5. Maximum dynamic deflection of the Barrier during the test was 2inches. There was no measurable permanent deformation. No detached elements, fragments, or other debris were present to penetrate, or to show potential for penetrating, the occupant compartment, or to present undue hazard for others in the area. The 2270P vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 14.9° and 17.7°, respectively. Longitudinal OIV was 15.1ft/s and lateral OIV was 25.7ft/s. Maximum longitudinal occupant ride down acceleration was 9.1g, and maximum lateral occupant ride down acceleration was 14.6g. Occupant risk factors were within the preferred limits specified in MASH Section 5. Maximum exterior deformation to the vehicle was 7.61 inches in side plane in the front plane at the right front corner at bumper height. Maximum occupant compartment deformation was 0.5inches in the right front floor pan area. There was no damage to the vehicle's fuel tank or oil pan due to crash test.</p> <p>The Barrier performed acceptably for MASH Test 3-11.</p>	PASS
3-20 (1100C)	Device is not a Transition.	Non-Relevant Test, not conducted
3-21 (2270P)	Device is not a Transition	Non-Relevant Test, not conducted

Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test laboratory (cite the laboratory's accreditation status as noted in the crash test reports.):

Laboratory Name:	Calspan Corporation	
Laboratory Signature:	Mark J. Parisi	Digitally signed by Mark J. Parisi Date: 2021.11.09 11:33:10 -05'00'
Address:	4455 Genesee Street, Cheektowaga, NY 14225	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	L20-602 December 31, 2022	

Submitter Signature*: **WILLIAM P. LONGSTREET**
Digitally signed by WILLIAM P. LONGSTREET
Date: 2022.03.30 14:13:18 -07'00'

Submit Form

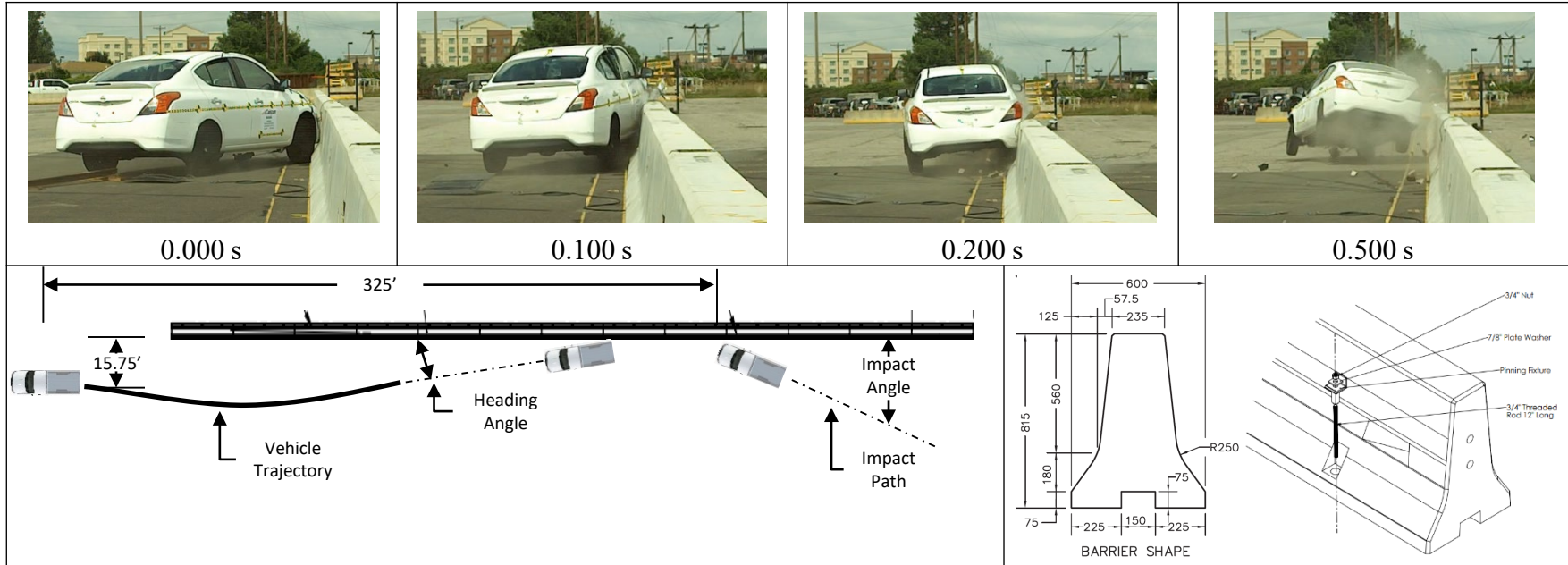
ATTACHMENTS

Attach to this form:

- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[Hardware Guide Drawing Standards](#)]. For proprietary products, a single isometric line drawing is usually acceptable to illustrate the product, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are relevant to understanding the dimensions and performance of the device should also be submitted to facilitate our review.

FHWA Official Business Only:

Eligibility Letter		
Number	Date	Key Words



General Information

Test Agency Calspan Corporation
 Test Standard Test No. MASH Test 3-10
 Calspan Test No. BR0084
 Test Date..... 2021-08-19

Test Article

Type Longitudinal Barrier – Pinned
 Name..... Pinned Cross-Bolt F-Shape Precast Concrete Traffic Barrier

Installation Length..... 170.6 ft (52.0 m)
 Material or Key Elements... Thirteen 13.12 ft (4 m) long sections of concrete barrier, 2.69 ft (0.82 m) above pavement x 1.96 ft (0.60 m) wide at the base x 1.25 ft (0.38 m) at top, with three 1ft bolts anchored 6 in (152.4 mm) into the asphalt and granular subbase, at 9 degrees from plumb vertical into the 3.5 in (88.9 mm) thick asphalt pavement with Epoxy and a washer and nut on top to secure barrier to ground

Soil Type and Condition

..... AASHTO M147-65 material added above subgrade and below the asphalt was #2 (2inch) crushed stone compacted to above 90% of its dry density

Test Vehicle

Type/Designation 1100C
 Make and Model..... 2017 Nissan Versa
 Curb 2,326 lb (1,054.6 kg)
 Test Inertial 2,372 lb (1,076 kg)
 Dummy..... NA
 Gross Static..... 2,372 lb (1,076 kg)

Impact Conditions

Speed 62.05 mi/h(100.4km/h)
 Angle..... 26.0°
 Location/Orientation..... 4.0 ft (1.2 m) Downstream of joint 4-5

Impact Severity

..... 304 kip-ft (413.26 kJ)
Exit Conditions
 Speed 53.5 mi/h (76.6 km/h)
 Trajectory/Heading Angle ... 10.3

Occupant Risk Values

Longitudinal OIV 19.2 ft/s (5.8 m/s)
 Lateral OIV..... 30.2 ft/s (9.2 m/s)
 Longitudinal Ridedown 5.3 g
 Lateral Ridedown..... 17.4 g
 THIV..... 10.4 m/s
 ASI..... 2.41

Max. 0.050-s Average

Longitudinal -10.3 g
 Lateral..... -17.6 g
 Vertical..... -4.2 g

Post-Impact Trajectory

Stopping Distance..... 325 ft (99.1 m) downstream
 15.75 ft (4.8m) left of barrier

Vehicle Stability

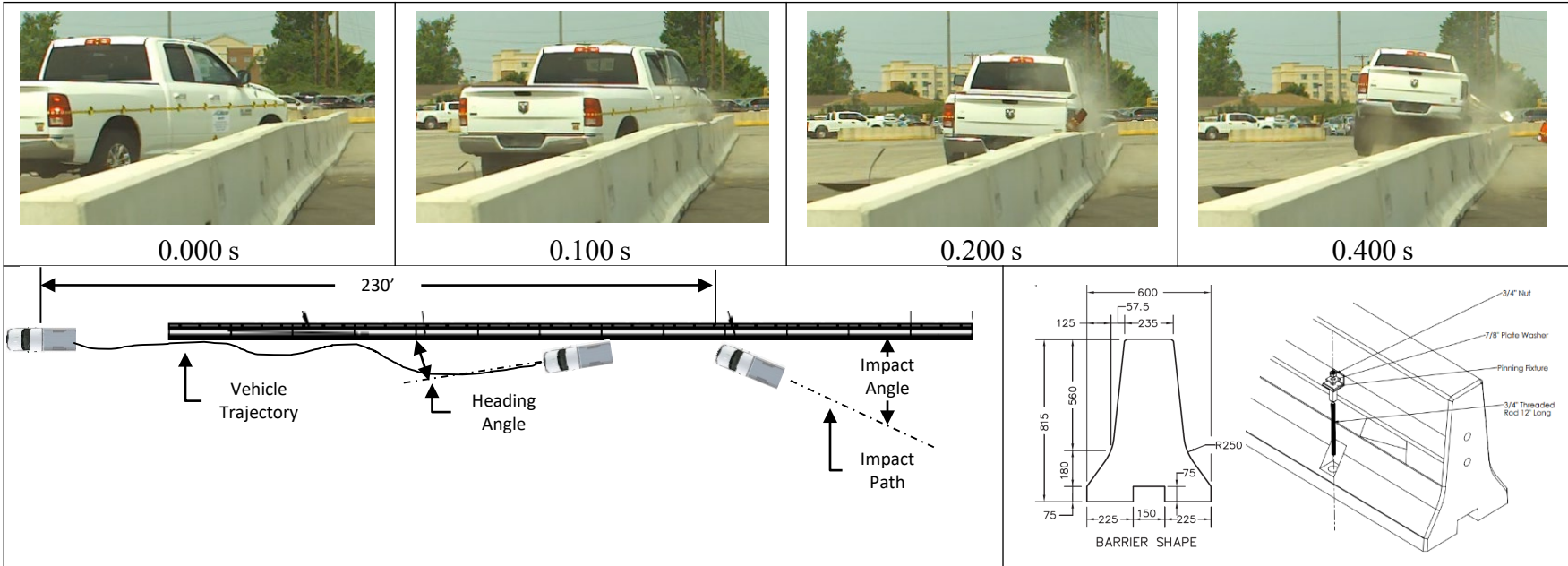
Maximum Yaw Angle 58.4°
 Maximum Pitch Angle -10.3°
 Maximum Roll Angle..... 14.4°
 Vehicle Snagging..... No
 Vehicle Pocketing No

Test Article Deflections

Dynamic..... 1in(25.4 mm)
 Permanent 0.5in(12.7 mm)
 Working Width 25 in (635 mm)

Vehicle Damage

VDS 01RFQ5
 CDC 01FREW4
 Max. Exterior Deformation 7 inches (191 mm)
 OCDI..... RF0020000
 Max. Occupant Comp.
 Deformation..... 2.69 in (68.33mm)



General Information

Test Agency Calspan Corporation
 Test Standard Test No. MASH Test 3-11
 Calspan Test No. BR0076
 Test Date..... 2021-06-04

Test Article

Type Longitudinal Barrier – Pinned
 Name..... Pinned Cross-Bolt F-Shape Precast Concrete Traffic Barrier
 Installation Length 170.6 ft (52.0 m)
 Material or Key Elements... Thirteen 13.12 ft (4 m) long sections of concrete barrier, 2.69 ft (0.82 m) above pavement x 1.96 ft (0.60 m) wide at the base x1.25 ft (0.38 m) at top, with three 1ft bolts anchored 6 in (152.4 mm) into the asphalt and granular subbase, at 9 degrees from plumb vertical into the 3.5 in (88.9 mm) thick asphalt pavement with Epoxy and a washer and nut on top to secure barrier to ground

Soil Type and Condition AASHTO M147-65 material added above subgrade and below the asphalt was #2 (2inch) crushed stone compacted to above 90% of its dry density

Test Vehicle

Type/Designation 2270P
 Make and Model..... 2013 RAM 1500
 Pickup Truck Curb..... 4,525 lb (2052.51 kg)
 Test Inertial 4,931.7 lb (2,237 kg)
 Dummy..... NA
 Gross Static..... 4,931.7 lb (2,237 kg)

Impact Conditions

Speed 62.4 mi/h(100.4km/h)
 Angle 26.0°
 Location/Orientation..... 4.0 ft (1.2 m) downstream of joint 4-5

Impact Severity 1927 kip-ft (2,613 kJ)

Exit Conditions

Speed 52.5 mi/h (84.5 km/h)

Occupant Risk Values

Longitudinal OIV 15.1 ft/s (4.6 m/s)
 Lateral OIV..... 25.7 ft/s (7.8 m/s)
 Longitudinal Ridedown 9.1 g
 Lateral Ridedown..... 14.6 g
 THIV..... 8.6 m/s
 ASI..... 1.65
 Max. 0.050-s Average
 Longitudinal-6.5 g
 Lateral.....-13.3 g
 Vertical.....-3.7 g

Post-Impact Trajectory

Stopping Distance..... 230 ft (70 m) downstream
 In line with barrier

Vehicle Stability

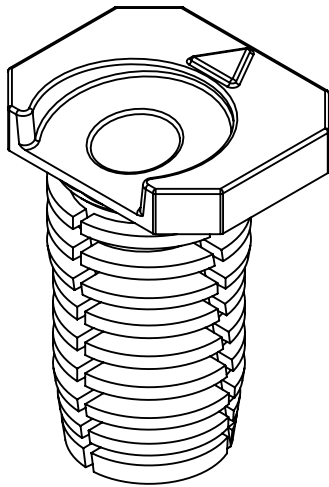
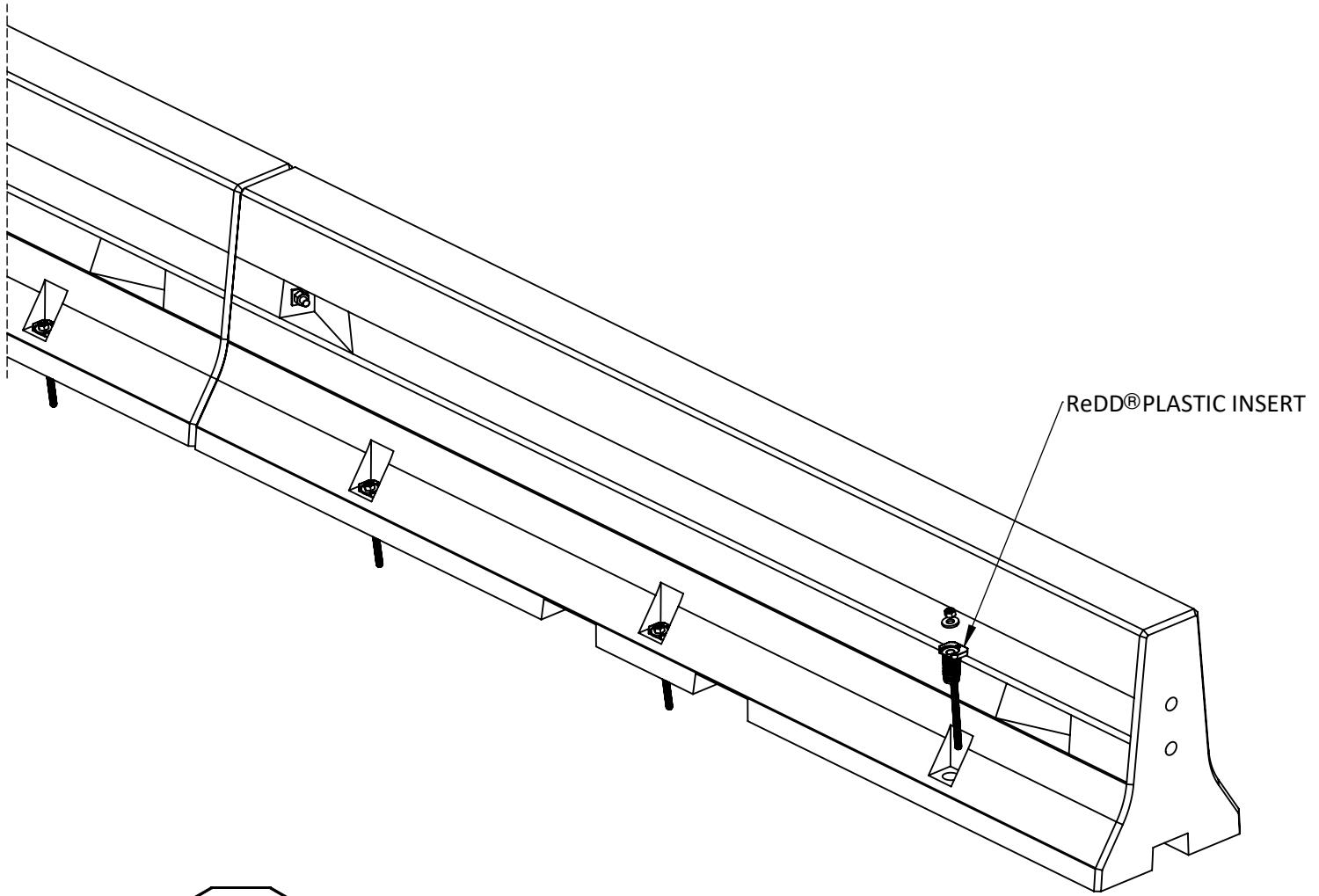
Maximum Yaw Angle 48.2°
 Maximum Pitch Angle -17.7°
 Maximum Roll Angle..... 14.9°
 Vehicle Snagging..... No
 Vehicle Pocketing No

Test Article Deflections

Dynamic..... 2 in (50.8 mm)
 Permanent 2 in (50.8 mm)
 Working Width 26 in (660 mm)

Vehicle Damage

VDS 01RFQ5
 CDC..... 01FREW4
 Max. Exterior Deformation 7.61 inches(197.13 mm)
 OCDI..... RF0020000
 Max. Occupant Comp. Deformation..... 7.61in (197.13mm)



ReDD® PLASTIC INSERT FOR ANCHOR RODS

PINNED CROSS-BOLT F-SHAPED CONCRETE TRAFFIC BARRIER – MASH TEST LEVEL 3

Northern Infrastructure Products

SGR74a



SHEET NO.

DATE:

1 of 2

11/04/21

INTENDED USE

The Pinned Cross-Bolt F-Shape Concrete Traffic Barrier is a MASH TL-3 system intended for installation along roadsides where a traffic barrier system is required, either permanent or temporary. The system consists of 13-ft 1½-in (4-m) long precast concrete f-shape traffic barriers, for a total installation length of 170-ft 7¼-in (52-m). The precast concrete traffic barrier sections are 32-in (813-mm) high and 23.5-in (597-mm) wide at the base. The Barrier was pinned (anchored) to pavement via precast anchor pockets for lateral restraint on asphalt pavement, traffic side only, with three (3) threaded bolts ¾-in (19-mm) diameter, 12-in (305-mm) in length, using a ¾-in (19-mm) nut and a 7/8-in (22-mm) plate washer with a plastic insert (ReDD®) for the ¾-in (19-mm) diameter anchor rods. Each anchor was installed in holes drilled 9 degrees from plumb (vertical), 7-in (178-mm) deep X 3/8-in (10-mm) diameter into 3.5-in (89-mm) thick asphalt pavement and subbase, then secured with an epoxy system as per the manufacturer's instructions. The threaded rod is epoxied 6-in into the asphalt and subbase. Test article dynamic deflection is 1-in (25-mm) for 1100C and 2-in (50.8-mm) for 2270P.

Test article exhibited concrete spalling at barrier joints and at toe of barrier, and, scuffing on the traffic face of the precast concrete traffic barrier at the impact site, including spalling of anchor pockets. There was no observed damage to the anchor bolts individually from both MASH crash tests 3-10 or 3-11.

APPROVALS

The Pinned Cross-Bolt F-Shape Concrete Traffic Barrier has been fully tested in compliance with MASH, 2016 Test Level 3 and is determined eligible for reimbursement by the FHWA. FHWA Eligibility Letter: TBD

CONTACT INFORMATION

Northern Infrastructure Products
21 Fortecon Drive
Stouffville, ON Canada L4A 268
Phone: (905)727-4198

Website: WWW.NORTHERN-IP.COM

PINNED CROSS-BOLT F-SHAPED CONCRETE TRAFFIC BARRIER – MASH TEST LEVEL 3



Northern Infrastructure Products

SGR74a

SHEET NO.

2 of 2

DATE:

11/04/21