



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

August 15, 2023

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

In Reply Refer To:  
HSST-1/B-371

Mark Ayton  
Northern Infrastructure Products  
21 Fortecon Drive  
Stouffville ON  
Canada

Dear Mr. Ayton:

We received your correspondence of March 23, 2022 requesting issuance of a reimbursement eligibility letter under the Federal-aid highway program for the roadside safety system, device, design, product, or hardware (collectively “device”) described below. This letter is assigned Federal Highway Administration (FHWA) control number B-371.

#### **ELIGIBILITY LETTERS**

The FHWA issues Federal-aid reimbursement eligibility letters for new roadside safety devices that are crash tested in accordance with the industry standard of the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH).

FHWA, the Department of Transportation, and the United States (government) do not regulate roadside safety devices, crash test facilities, or the manufacturing industry. Issuance of eligibility letters is discretionary and provided only as a service to the states. FHWA may, at its discretion, decline to issue, revise, or rescind an eligibility letter. Eligibility letters are only issued by the FHWA headquarters Office of Safety.

Eligibility letters are issued only as notice to the states that a device is eligible for reimbursement under the Federal-aid highway program. They do not establish approval or certification for any other purpose. Issuance of an eligibility letter is not a prerequisite or requirement for state transportation agencies seeking to use Federal-aid funds for roadside safety devices. State agencies may use a device for which an eligibility letter has not been issued and seek Federal-aid reimbursement.

#### **FEDERAL-AID REIMBURSEMENT**

The request for issuance of this letter certified the device was crash tested in accordance with the industry standard of AASHTO’s MASH. This eligibility letter is based on that certification and the material offered in support of its issuance. The device described below is eligible for reimbursement under the Federal-aid highway program.

Name of system: Traffic Barrier with Inertial Crash Panel and Soundwall System  
Type of system: Longitudinal Barrier  
Test Level: Test Level 4  
Testing conducted by: Texas A&M Transportation Institute (TTI)  
Date of request: March 23, 2022

Information about the device, including material such as the eligibility request, crash test reports, drawings, or images are included in one or more attachment(s) to this letter.

Eligibility letter B-371 is inapplicable to devices, optional equipment, alternate materials, or other features that were not crash tested in accordance with AASHTO's MASH.

This letter is issued only for the subject device as crash tested under AASHTO's MASH. Later modification(s) of the device are not eligible for Federal-aid reimbursement under this letter. Notice of later modification(s) should be given to transportation agencies, facility owners, and operators (collectively "agencies").

Agencies should be provided appropriate information about the device's design, installation, maintenance, materials, and mechanical properties.

Issuance of this letter is discretionary, and it may be revised or rescinded at FHWA's discretion. This letter is not a determination of compliance with the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) or ownership of any intellectual property rights.

This eligibility letter is not a determination by the government that a crash involving the subject device will result in any particular outcome. It is limited to only the device's eligibility for Federal-aid reimbursement.

### **INTELLECTUAL PROPERTY**

Issuance of this eligibility letter does not convey property rights of any sort nor any exclusive privilege. This letter is not authorization or consent by the government for the use, manufacture, or sale of any patented or proprietary system, device, design, product, or hardware for which the requester is not the patent owner. Eligibility letters are not an expression of any view, position, or determination by the government as to the validity, scope, or ownership of any intellectual property rights to a specific device. These letters do not grant, impute, suggest, or otherwise establish any ownership, distribution, or licensing rights to the requester. The government expresses no opinion about the intellectual property rights relating to any device for which this or any other eligibility letter is issued.

### **PUBLIC DISCLOSURE**

To prevent any misunderstanding, and as discussed above, this eligibility letter is assigned FHWA control number B-371. It should only be reproduced in full with its attachment(s). This letter and the material offered by the requester supporting its issuance is public information. All eligibility letters and supporting material are subject to public disclosure under the Freedom of

Information Act (FOIA). Eligibility letters are available to the public at [https://safety.fhwa.dot.gov/roadway\\_dept/countermeasures/reduce\\_crash\\_severity/](https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/).

If you have any questions please contact Aimee Zhang at [Aimee.Zhang@dot.gov](mailto:Aimee.Zhang@dot.gov).

Sincerely,

A handwritten signature in black ink that reads "Robert Ritter". The signature is written in a cursive style with a large initial "R".

Robert Ritter  
Director, Office of Safety Technologies  
Office of Safety

Enclosures

## Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

<b>Submitter</b>	Date of Request:	March 23, 2022	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Mark Ayton	
	Company:	Northern Infrastructure Products	
	Address:	21 Fortecon Drive, Stouffville ON	
	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	Traffic Barrier with Inertial Crash Panel and Soundwall System	AASHTO MASH	TL4

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:	Mark Ayton	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Northern Infrastructure Products	Same as Submitter <input checked="" type="checkbox"/>
Address:	21 Fortecon Drive, Stouffville ON	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.

Texas A&M Transportation Institute (TTI) was contracted by Northern Infrastructure Products to perform full-scale crash testing of the Traffic Barrier with Inertial Crash Panel and Soundwall System. There are no shared financial interests in the Traffic Barrier with Inertial Crash Panel and Soundwall System by TTI, or between Northern Infrastructure Products and TTI, other than costs involved in the actual crash tests and reports for this submission to FHWA.

PCL -8 -9 -10

## PRODUCT DESCRIPTION

- New Hardware or Significant Modification
  Modification to Existing Hardware

The installation consisted of five 15-ft (4.562 m) long sections of solid concrete single slope traffic barriers with five 15-ft (4.562 m) long solid concrete inertial crash panels installed at a height of 10.8-ft (3.289 m) above the pavement with Durisol® noise barrier panels mounted on top of the traffic barriers for a total length of 75 ft (22.86 m).

The concrete sections of the precast concrete traffic barrier were 3.6 ft (1.1 m) high (of which 3.3 ft (1.0 m) was projecting above the pavement) and 2.1 ft (0.648 m) wide at the base, sloping up on the traffic side towards the field side for a width of 1.5 ft (0.46 m) at the top. Mounted on top of each precast concrete traffic barrier unit between the flanges of set-back vertical steel posts installed at 15 ft (4.572 m) centers are stacked noise barrier panels that were manufactured by Durisol Ltd. There were five rows of noise barrier panels stacked on top of each other plus the concrete inertial crash panel between the third and fourth row of noise barrier panels as follows starting from the bottom: 1.5 ft (457 mm) noise barrier panel, 3 ft (917 mm) noise barrier panel, 2 ft (610 mm) noise barrier panel, 1 ft (305 mm) inertial crash panel, and two 3 ft (917 mm) noise barrier panels. There was no backfill on the field side of the traffic barrier, and there was a 4-inch space between the traffic face of the barrier and the runway aprons which was filled with gravel.

The five inertial crash panels were each 15-ft (4.562 m) long by 1-ft high (305 mm) by 16.5-in (419 mm) deep. The inertial crash panels were set on top of the third row of noise barrier panels and secured to each other around the back side of each steel post by a steel strap in a similar manner to how the traffic barriers are secured to each other. The inertial crash panels were also secured to each other on the traffic side at each steel post with a front steel strap. Two rows of noise barrier panels were set on top of the inertial crash panels to complete the installation.

NOTE: The original installation without the inertial crash panels was constructed and crash tested under a previous contract on March 31, 2020 and April 1, 2020 in accordance with MASH Tests 3-11 and 3-10, respectively (Test Report No. 690902-PCL8&9). No modifications to the existing traffic barriers, steel posts, concrete piers, or grading were made to the original installation after the MASH TL-3 crash tests. In advance of the MASH Test 4-12 crash test, inertial crash panels were installed at a height of 10.8-ft (3.289 m) above the pavement, requiring replacement of the bottom row of 2 ft (610 mm) high noise barrier panels with 1.5 ft (457 mm) high noise barrier panels, and replacement of the third row of 3 ft (917 mm) high noise wall panels with the 2 ft (610 mm) high noise barrier panels removed from the bottom row. Total height of complete installation above pavement was 16.8 ft (5.123 m).

## 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:	Nathan D. Schulz	
Engineer Signature:	<b>Nathan D. Schulz</b>	Digitally signed by Nathan D. Schulz Date: 2022.03.02 13:39:19 -06'00'
Address:	1254 Avenue A, Bldg 7091, Bryan, Texas 77807	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
4-10 (1100C)	<p>MASH Test 3-10, which is equivalent to MASH Test 4-10, was successfully performed under a previous contract as Crash Test No. 690902-PCL8 prior to addition of the inertial crash panels at a height of 10.8-ft (3.289 m) above the pavement for MASH Test 4-12. The results of the test are provided below.</p> <p>TTI Crash Test Report No. 690902-PCL8&amp;9 contains the results of this test that was conducted on April 1, 2020. The target CIP was 3.6 ft (1.1 m) upstream of the center of the joint between barriers 2 and 3.</p> <p>The impact speed and angle were 62.7 mi/h (100.9 km/h) and 24.8°. The actual impact point was 3.4 ft (1.0 m) upstream of the center of the joint between barriers 2 and 3. After loss of contact with the barrier, the vehicle came to rest 195 ft (60 m) downstream of the impact point and 94 ft (29 m) toward the traffic side.</p> <p>The barrier system contained and redirected the 1100C vehicle. The vehicle did not penetrate, underride, or override the installation. Maximum dynamic deflection during the test was 1.1 inches (29 mm). No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or present hazard to others in the area. Maximum occupant compartment deformation was 2.0 inches (51 mm) in the left front fire wall area.</p> <p>The 1100C vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 18° and 5°. Occupant risk factors were within the preferred limits of MASH. Longitudinal OIV was 21.3 ft/s (6.5 m/s), and lateral OIV was 28.2 ft/s (8.6 m/s). Maximum longitudinal occupant ridedown acceleration was 5.3 g, and maximum lateral occupant ridedown acceleration was 9.9 g.</p> <p>The Traffic Barrier with Inertial Crash Panel and Soundwall System performed acceptably for MASH Test 4-10.</p>	PASS


Required Test Number	Narrative Description	Evaluation Results
4-11 (2270P)	<p>MASH Test 3-11, which is equivalent to MASH Test 4-11, was successfully performed under a previous contract as Crash Test No. 690902-PCL9 prior to addition of the inertial crash panels at a height of 10.8-ft (3.289 m) above the pavement for MASH Test 4-12. The results of the test are provided below.</p> <p>TTI Crash Test Report No. 690902-PCL8&amp;9 contains the results of this test that was conducted on March 31, 2020. The target CIP was 4.3 ft (1.3 m) upstream of the center of the joint between barriers 2 and 3.</p> <p>The impact speed and angle were 61.0 mi/h (98.2 km/h) and 24.7°. The actual impact point was 4.3 ft (1.3 m) upstream of the center of the joint between barriers 2 and 3. After loss of contact with the barrier, the vehicle came to rest 180 ft (55 m) downstream of the impact point and 6 ft (1.8 m) toward the field side.</p> <p>The barrier system contained and redirected the 2270P vehicle. The vehicle did not penetrate, underride, or override the installation. Maximum dynamic deflection during the test was 5.3 inches (135 mm). No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or present hazard to others in the area. Maximum occupant compartment deformation was 5.0 inches (127 mm) in the right front fire wall area.</p> <p>The 2270P vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 30° and 7°. Occupant risk factors were within the preferred limits of MASH. Longitudinal OIV was 20.3 ft/s (6.2 m/s), and lateral OIV was 25.6 ft/s (7.8 m/s). Maximum longitudinal occupant ridedown acceleration was 5.7 g, and lateral occupant ridedown acceleration was 12.0 g.</p> <p>The Traffic Barrier with Inertial Crash Panel and Soundwall System performed acceptably for MASH Test 4-11.</p>	PASS

4-12 (10000S)	<p>TTI Crash Test Report No. 690902-PCL10 contains the results of MASH Test 4-12 that was conducted on July 15, 2020. The target CIP for the left corner of the front bumper was 5.0 ft (1.5 m) upstream of the center of the joint between barriers 2 and 3.</p> <p>The actual impact speed and angle were 57.8 mi/h (93.0 km/h) and 14.9°. The actual impact point was 5.5 ft (1.7 m) upstream of the center of the joint between barriers 2 and 3. After loss of contact with the barrier, the vehicle came to rest 280 ft (85.4 m) downstream of the impact point and 58 ft (17.7 m) toward the field side.</p> <p>The Traffic Barrier with Internal Crash Panel and Soundwall System contained and redirected the 10000S vehicle. The vehicle did not penetrate, underide, or override the installation. The vehicle exited within the exit box criteria defined in MASH.</p> <p>Maximum dynamic deflection during the test was 6.6 inches (167 mm). Maximum permanent deformation was 1.0 inch (25 mm). Working width was 32.1 inches (815 mm).</p> <p>No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or present hazard to others in the area. Maximum occupant compartment deformation was 6.5 inches (165 mm) in the left kick panel / floor pan area. Maximum exterior crush to the vehicle was 14.0 inches (356 mm) in the front plane at the left front corner at bumper height. The 10000S vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 12° and 5°.</p> <p>Occupant risk factors were within the preferred limits of MASH. Longitudinal OIV was 6.6 ft/s (2.0 m/s), and lateral OIV was 11.5 ft/s (3.5 m/s). Maximum longitudinal occupant ridedown acceleration was 3.5 g, and lateral occupant ridedown acceleration was 8.7 g.</p> <p>The Traffic Barrier with Inertial Crash Panel and Soundwall System performed acceptably for MASH Test 4-12.</p>	PASS
4-20 (1100C)	Test for transition is not applicable for this longitudinal barrier system.	Non-Relevant Test, not conducted



4-21 (2270P)	Test for transition is not applicable for this longitudinal barrier system.	Non-Relevant Test, not conducted
4-22 (10000S)	Test for transition is not applicable for this longitudinal barrier system.	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:	Texas AM Transportation Institute	
Laboratory Signature:	Digitally signed by Darrell L. Kuhn 'Date: 2022.03.23 16:53:28 -05'00' 	
Address:	1254 Avenue A, Bldg 7091, Bryan, Texas 77807	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	ISO 17025-2017 Laboratory A2LA Certificate Number: 2821.01 Valid To: April 30, 2023	

Submitter Signature\*: **Mark Ayton**   
Digitally signed by Mark Ayton  
Date: 2022.04.11 10:55:53  
-04'00'

Submit Form

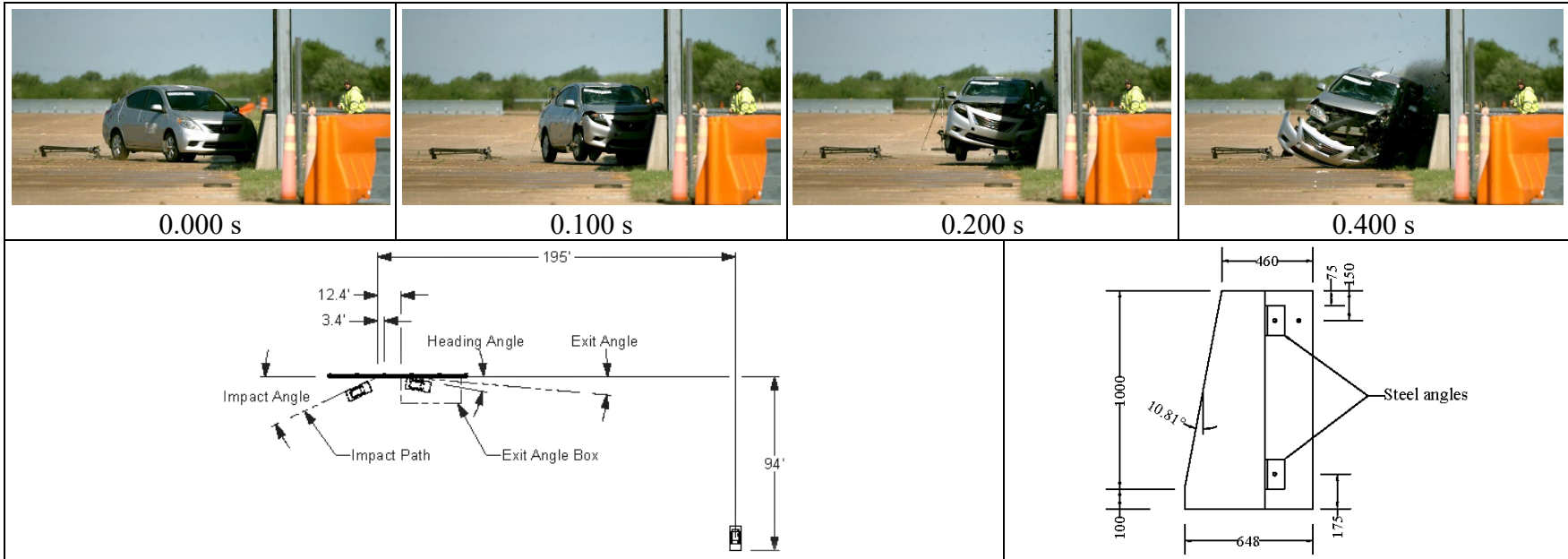
## ATTACHMENTS

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		Key Words
Number	Date	



**General Information**

Test Agency ..... Texas A&M Transportation Institute (TTI)  
 Test Standard Test No. .... MASH Test 3-10  
 TTI Test No. .... 690902-PCL8  
 Test Date ..... 2020-04-01

**Test Article**

Type ..... Longitudinal Barrier – Soundwall  
 Name ..... Proprietary Traffic Barrier with Soundwall  
 Installation Length ..... 75 ft (22.86 m)  
 Material or Key Elements .... Five 15 ft (4.562 m) long sections of concrete barrier, 3.3 ft (1 m) above pavement x 2.1 ft (0.648 m) wide at the base x 1.5 ft (0.46 m) at top, with Durisol® soundwall panels. Six W10x33 (W250x49) x 24.8 ft (7.56 m) steel posts at 15 ft (4.57 m)

**Soil Type and Condition** ..... Concrete footers (2 ft (610 mm) diam. x 8 ft (2438 mm) deep) in native clay soil

**Test Vehicle**

Type/Designation ..... 1100C  
 Make and Model ..... 2014 Nissan Versa  
 Curb ..... 2390 lb (1084 kg)  
 Test Inertial ..... 2423 lb (1099 kg)  
 Dummy ..... 165 lb (75 kg)  
 Gross Static ..... 2588 lb (1174 kg)

**Impact Conditions**

Speed ..... 62.7 mi/h (100.9 km/h)  
 Angle ..... 24.8°  
 Location/Orientation ..... 3.4 ft (1.0 m) upstream of joint 2-3

**Impact Severity** ..... 56 kip-ft (75.9 kJ)

**Exit Conditions**

Speed ..... 48.9 mi/h (78.7 km/h)  
 Trajectory/Heading Angle ..... 0.9° / 5.4°

**Occupant Risk Values**

Longitudinal OIV ..... 21.3 ft/s (6.5 m/s)  
 Lateral OIV ..... 28.2 ft/s (8.6 m/s)  
 Longitudinal Ridedown ..... 5.3 g  
 Lateral Ridedown ..... 9.9 g  
 THIV ..... 11.0 m/s  
 ASI ..... 2.4

**Max. 0.050-s Average**

Longitudinal ..... -11.8 g  
 Lateral ..... 18.3 g  
 Vertical ..... -4.2 g

**Post-Impact Trajectory**

Stopping Distance ..... 195 ft (60 m) ds  
 94 ft (29 m) twd traffic

**Vehicle Stability**

Maximum Yaw Angle ..... 46°  
 Maximum Pitch Angle ..... 5°  
 Maximum Roll Angle ..... 18°  
 Vehicle Snagging ..... No  
 Vehicle Pocketing ..... No

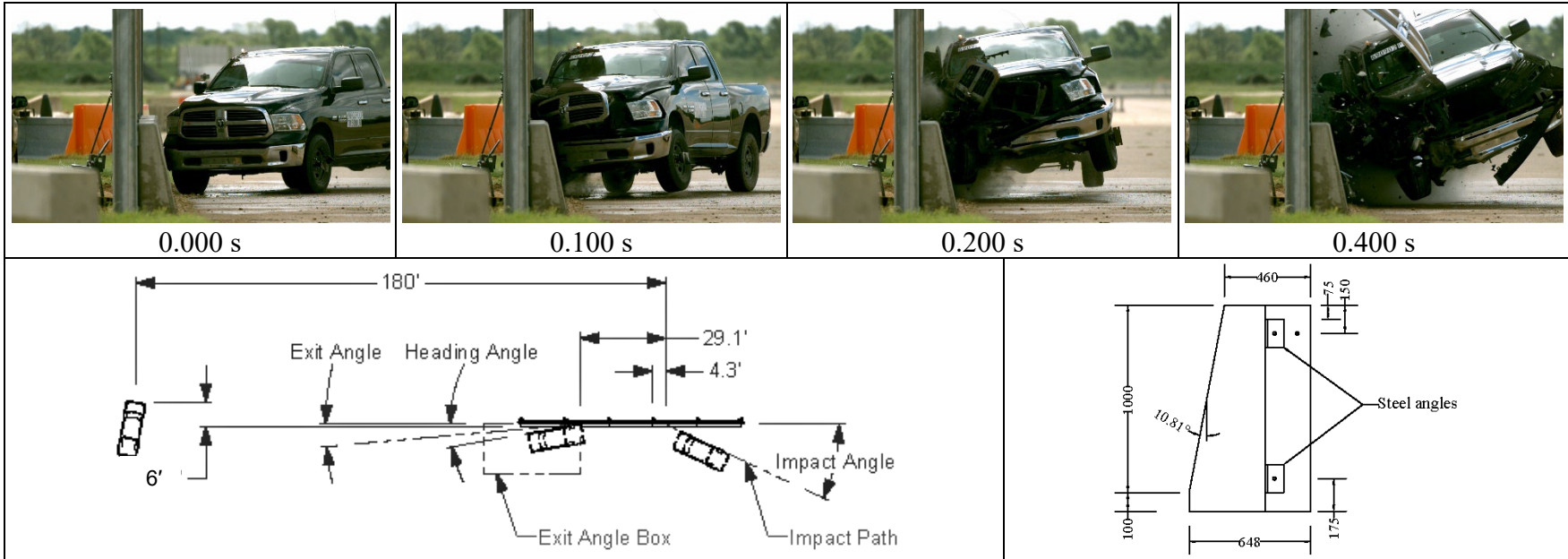
**Test Article Deflections**

Dynamic ..... 1.1 inches (29 mm)  
 Permanent ..... None  
 Working Width ..... 26.6 inches (676 mm)  
 Height of Working Width ..... 207.6 inches (5278 mm)

**Vehicle Damage**

VDS ..... 11LFQ6  
 CDC ..... 11FLEW5  
 Max. Exterior Deformation ..... 11.0 inches (279 mm)  
 OCDI ..... LF0020000  
 Max. Occupant Compartment Deformation ..... 2.0 inches (51 mm) in the left front fire wall area

**Figure 5.7. Summary of Results for MASH Test 3-10 on Traffic Barrier with Soundwall System.**



**General Information**

Test Agency ..... Texas A&M Transportation Institute (TTI)  
 Test Standard Test No. .... MASH Test 3-11  
 TTI Test No. .... 690902-PCL9  
 Test Date..... 2020-03-31

**Test Article**

Type ..... Longitudinal Barrier – Soundwall  
 Name ..... Proprietary Traffic Barrier with Soundwall  
 Installation Length ..... 75 ft (22.86 m)  
 Material or Key Elements ... Five 15 ft (4.562 m) long sections of concrete barrier, 3.3 ft (1 m) above pavement x 2.1 ft (0.648 m) wide at the base x 1.5 ft (0.46 m) at top, with Durisol® soundwall panels. Six W10x33 (W250x49) x 24.8 ft (7.56 m) steel posts at 15 ft (4.57 m)

**Soil Type and Condition**

Concrete footers (2ft (610 mm) diam. x 8 ft (2438 mm) deep) in native clay soil

**Test Vehicle**

Type/Designation ..... 2270P  
 Make and Model..... 2015 RAM 1500 Pickup Truck  
 Curb ..... 5019 lb (2277 kg)  
 Test Inertial ..... 5051 lb (2291 kg)  
 Dummy ..... 165 lb (75 kg)  
 Gross Static..... 5216 lb (2366 kg)

**Impact Conditions**

Speed ..... 61.0 mi/h (98.2 km/h)  
 Angle..... 24.7°  
 Location/Orientation..... 4.3 ft (1.3 m) upstream of joint 3-4

**Impact Severity**

110 kip-ft (149 kJ)

**Exit Conditions**

Speed ..... 47.6 mi/h (76.6 km/h)  
 Trajectory/Heading Angle ... 1.1° / 6.1°

**Occupant Risk Values**

Longitudinal OIV ..... 20.3 ft/s (6.2 m/s)  
 Lateral OIV ..... 25.6 ft/s (7.8 m/s)  
 Longitudinal Ridedown ..... 5.7 g  
 Lateral Ridedown ..... 12.0 g  
 THIV..... 10.1 m/s  
 ASI ..... 1.7

**Max. 0.050-s Average**

Longitudinal ..... -10.2 g  
 Lateral..... -13.4 g  
 Vertical..... -2.9 g

**Post-Impact Trajectory**

Stopping Distance..... 180 ft (55 m) downstream  
 6 ft (1.9 m) twd field side

**Vehicle Stability**

Maximum Yaw Angle ..... 39°  
 Maximum Pitch Angle ..... 7°  
 Maximum Roll Angle ..... 30°  
 Vehicle Snagging..... No  
 Vehicle Pocketing ..... No

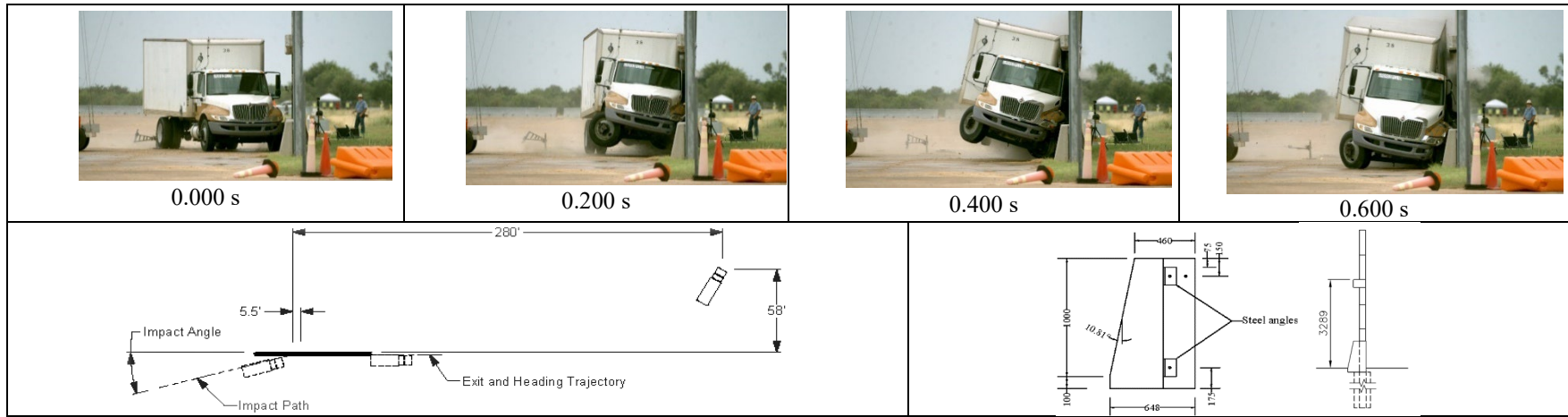
**Test Article Deflections**

Dynamic..... 5.3 inches (135 mm)  
 Permanent ..... None  
 Working Width ..... 30.8 inches (782 mm)  
 Height of Working Width ..... 207.6 inches (5278 mm)

**Vehicle Damage**

VDS ..... 01RFQ5  
 CDC ..... 01FREW4  
 Max. Exterior Deformation ..... 16.0 inches (406 mm)  
 OCDI..... RF0020000  
 Max. Occupant Comp. Deformation ..... 5.0 inches (127 mm) in the right front fire wall area

**Figure 6.6. Summary of Results for MASH Test 3-11 on Traffic Barrier with Soundwall System.**



**General Information**

Test Agency ..... Texas A&M Transportation Institute (TTI)  
 Test Standard Test No. .... MASH Test 4-12  
 TTI Test No. .... 690902-PCL10  
 Test Date..... 2020-07-15

**Test Article**

Type ..... Longitudinal Barrier – Soundwall  
 Name..... Proprietary Traffic Barrier with Inertial Crash Panel and Soundwall  
 Installation Length ..... 75 ft (22.86 m)  
 Material or Key Elements ..... Five 15 ft (4.562 m) long sections of concrete barrier, 3.3 ft (1 m) above pavement x 2.1 ft (0.648 m) wide at the base x 1.5 ft (0.46 m) at top, with Durisol® soundwall panels. Five 15 ft (4.562 m) long sections of concrete inertial crash panels 129.5 in (3289 mm) above pavement. Six W10x33 (W250x49) x 24.8 ft (7.56 m) steel posts at 15 ft (4.57 m).

**Soil Type and Condition** ..... Concrete footers in native clay soil

**Test Vehicle**

Type/Designation ..... 10000S  
 Make and Model..... 2012 International 4300 SUT  
 Curb..... 13,490 lb (6119 kg)  
 Test Inertial..... 22,420 lb (10170 kg)  
 Dummy ..... No dummy  
 Gross Static..... 22,420 lb (10170 kg)

**Impact Conditions**

Speed ..... 57.8 mi/h (93.0 km/h)  
 Angle..... 14.9 degrees  
 Location/Orientation..... 5.5 ft (1.7 m) upstream

**Impact Severity** ..... 166 kip-ft (224 kJ)

**Exit Conditions**

Speed ..... Remained in contact to  
 Trajectory/Heading Angle ..... end of barrier

**Occupant Risk Values**

Longitudinal OIV ..... 6.6 ft/s (2.0 m/s)  
 Lateral OIV..... 11.5 ft/s (3.5 m/s)  
 Longitudinal Ridedown ..... 3.5 g  
 Lateral Ridedown ..... 8.7 g  
 THIV..... 4.1 m/s  
 ASI ..... 0.7

**Max. 0.050-s Average**

Longitudinal ..... -1.9 g  
 Lateral..... 6.0 g  
 Vertical..... -2.3 g

**Post-Impact Trajectory**

Stopping Distance ..... 280 ft downstream  
 58 ft twd field side

**Vehicle Stability**

Maximum Yaw Angle..... 14 degrees  
 Maximum Pitch Angle..... 5 degrees  
 Maximum Roll Angle ..... 12 degrees  
 Vehicle Snagging ..... No  
 Vehicle Pocketing..... No

**Test Article Deflections**

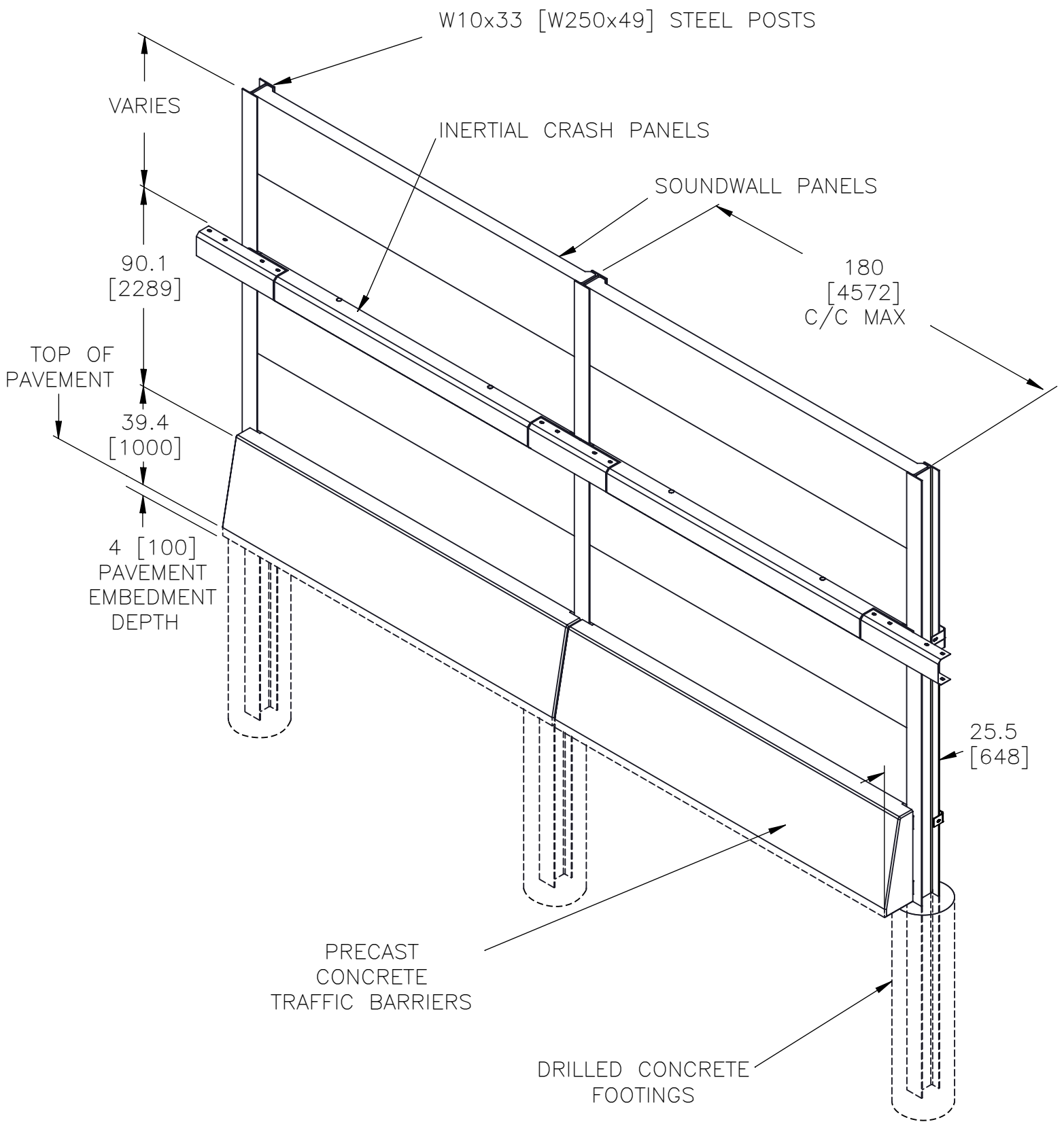
Dynamic ..... 6.6 inches (167 mm)  
 Permanent..... 1.0 inch (25 mm)  
 Working Width ..... 32.1 inches (815 mm)  
 Height of Working Width..... 201.7 inches  
 (5123 mm)

**Vehicle Damage**

VDS ..... NA  
 CDC..... NA  
 Max. Exterior Deformation..... 14.0 inches (356 mm)  
 OCDI ..... NA  
 Max. Occupant Compartment  
 Deformation..... 6.5 inches (165 mm)  
 the left kick panel/floor  
 pan area

Note: OIV = Occupant Impact Velocity; THIV = Theoretical Head Impact Velocity; ASI = Acceleration Severity Index; NA = Not Applicable.

**Figure 5.6. Summary of Results for MASH Test 4-12 on Proprietary Traffic Barrier with Inertial Crash Panel and Soundwall System.**



TRAFFIC BARRIER WITH INERTIAL CRASH PANEL AND SOUNDWALL SYSTEM, MASH TL-4

Northern Infrastructure Products

SGR73a



SHEET NO.

DATE:

1 of 2

03/24/22