



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-373

Mr. Ahmad Hammad  
WSP USA Inc.  
2200 Western Court, Suite 120  
Lisle, IL 60532  
USA

Dear Mr. Hammad:

We received your correspondence of May 11, 2021 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-373.

#### **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: Pinned Temporary Concrete Barrier  
Type of system: Temporary Concrete Barrier  
Test Level: Test Level 3  
Testing conducted by: Texas A&M Transportation Institute (TTI)  
Date of request: May 11, 2021

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-373 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-373. 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:	December 01, 2022	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Manar Nashif, P.E. Acting Chief Engineer	
	Company:	Illinois State Toll Highway Authority	
	Address:	2700 Ogden Avenue, Downers Grove, IL 60515	
	Country:	USA	
	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 Temporary Concrete 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:	Ahmad Hammad, PhD, PE, SE	Same as Submitter <input type="checkbox"/>
Company Name:	WSP USA Inc.	Same as Submitter <input type="checkbox"/>
Address:	2200 Western Court, Suite 120, Lisle, IL 60532	Same as Submitter <input type="checkbox"/>
Country:	USA	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 WSP USA Inc. (WSP) to perform full-scale crash testing of the Pinned Temporary Concrete Barrier. There are no shared financial interests in the Pinned Temporary Concrete Barrier by TTI, or between WSP and TTI, other than costs involved in the actual crash tests and reports for this submission to FHWA.

\*\*690900-WSP -3-4\*\*

[[ Rev 12-1-22: deleted "DRAFT" in top box ]]

## PRODUCT DESCRIPTION

- New Hardware or Significant Modification     
  Modification to Existing Hardware

The installation consisted of eight reinforced concrete barriers, each 12 ft-6 inches long, for a total installation length of 100 ft. Two 7/8-inch diameter 30-inch long threaded rods, with a plate washer, washer and heavy hex head nut on each end (tightened with impact wrench), connected adjoining barriers to each other in an "X pattern." The barriers were 9½ inches wide at the top, 24 inches wide at the bottom, and 32 inches tall. Each barrier had two 3-inch tall x 22 inch long openings at the bottom, and three vertical holes on each side to receive anchor pins. The barriers were secured to the working slab with one 1-inch diameter x 25-inch long anchor pin located on the traffic side, at each end of each barrier units. These pins anchored the barrier units completely through a 10-inch thick unreinforced concrete slab and into the subgrade below.

### 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:	D. Lance Bullard, Jr.	
Engineer Signature:	<b>D. Lance Bullard, Jr.</b>	Digitally signed by D. Lance Bullard, Jr. Date: 2022.12.07 15:59:48 -06'00'
Address:	1254 Avenue A, Bldg 7091, Bryan, Texas 77807	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input checked="" 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 (WSP-3) involves an 1100C vehicle impacting the test article at a target impact speed of 62 mi/h <math>\pm</math>2.5 mi/h and a target impact angle of 25° <math>\pm</math>1.5°. The target CIP was determined using the information provided in MASH Section 2.2.1, Section 2.3.2, and Table 2-7 and was for the right corner of the front bumper to impact at 3.6 ft upstream of the centerline of the joint between barriers 4 and 5.</p> <p>The results of the test conducted on September 14, 2020, are found in TTI Test Report number 690900-WSP -3-4. The test vehicle was traveling at an impact speed of 64.5 mi/h as it made contact with the barrier 3.2 ft upstream of the barrier joint between barriers 4 and 5 at an impact angle of 25.0°. After loss of contact with the barrier, the vehicle came to rest 220 ft downstream of the impact point and 43 ft towards the field side.</p> <p>The barrier contained and redirected the 1100C vehicle. The vehicle did not penetrate, underride, or override the installation. The 1100C vehicle exited within the exit box criteria.</p> <p>Working width was 28.0 inches at a height of 3.0 inches. Dynamic deflection of the barrier during the test was 8.0 inches, and permanent deflection was 4.0 inches. Although small pieces of concrete spalled off of the barrier, 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.</p> <p>Maximum exterior crush to the vehicle was 9.0 inches in the side plane at the right front corner at bumper height. Maximum occupant compartment deformation was 1.5 inches in the right kick panel area.</p> <p>The 1100C vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 9° and 17°, respectively. Longitudinal OIV was 20.0 ft/s, and lateral OIV was 26.9 ft/s. Longitudinal occupant ridedown acceleration was 3.4 g, and lateral occupant ridedown acceleration 7.9 g. The occupant risk factors were within the MASH preferred limits.</p> <p>The Pinned Temporary Concrete Barrier performed acceptably for MASH test 3-10.</p>	PASS

Required Test Number	Narrative Description	Evaluation Results
3-11 (2270P)	<p>Test 3-11 (WSP-4) involves a 2270P vehicle impacting the test article at a target impact speed of 62 mi/h <math>\pm</math>2.5 mi/h and a target impact angle of 25° <math>\pm</math>1.5°. The target CIP was determined using the information provided in MASH Section 2.2.1, Section 2.3.2, and Table 2-7 and was for the right corner of the front bumper to impact at 4.3 ft upstream of the centerline of the joint between barriers 4 and 5.</p> <p>The results of the test conducted on September 16, 2020 are found in TTI Test Report number 690900 WSP -3-4. The test vehicle was traveling at an impact speed of 63.9 mi/h as it made contact with the barrier 3.9 ft upstream of the barrier joint between barriers 4 and 5 at an angle of 25.2°. After loss of contact with the barrier, the vehicle came to rest 220 ft downstream of the impact point and 9 ft towards the field side. The barrier contained and redirected the 2270P vehicle. The vehicle did not penetrate, underride, or override the installation. The 2270P vehicle exited within the exit box criteria.</p> <p>Working width was 34.4 inches at a height of 3.0 inches. Dynamic deflection of the barrier during the test was 17.9 inches, and permanent deflection was 10.0 inches. Although small pieces of concrete spalled off of the barrier, 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.</p> <p>Maximum exterior crush to the vehicle was 12.0 inches in the front and side planes at the right front corner at bumper height. Maximum occupant compartment deformation was 1.0 inches in the right front firewall area.</p> <p>The 2270P vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 18° and 20°, respectively. Longitudinal OIV was 14.4 ft/s, and lateral OIV was 21.0 ft/s. Longitudinal occupant ridedown acceleration was 4.1 g, and lateral occupant ridedown acceleration 11.4 g. The occupant risk factors were within the MASH preferred limits.</p> <p>The Pinned Temporary Concrete Barrier performed acceptably for MASH test 3-11.</p>	PASS

3-20 (1100C)	This product is not a transition system.	Non-Relevant Test, not conducted
3-21 (2270P)	This product is not a transition 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 A&M Transportation Institute	
Laboratory Signature:	Digitally signed by Darrell L. Kuhn 'Date: 2022.12.07 14:40:46 -06'00 	
Address:	1254 Avenue A, Bldg 7091, Bryan, Texas 77807	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input checked="" 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\*:

Submit Form

## ATTACHMENTS

Attach to this form:

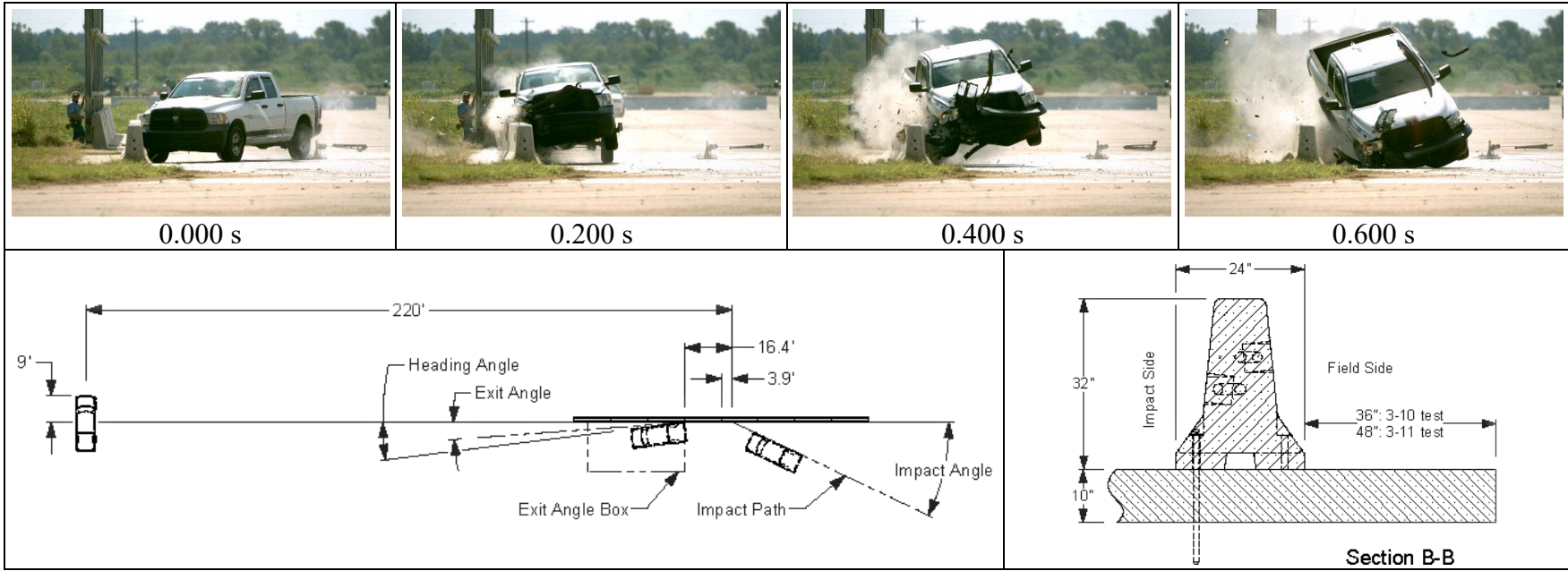
- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[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..... Texas A&M Transportation Institute (TTI)  
 Test Standard Test No. .... MASH Test 3-11  
 TTI Test No. .... 690900-WSP4  
 Test Date ..... 220-09-16

**Test Article**

Type ..... Longitudinal Barrier—Temporary Concrete Barrier  
 Name ..... Pinned Temporary Concrete Barrier  
 Installation Length..... 100 ft  
 Material or Key Elements ... 12 ft-6 inches long, 9½ inches wide at the top, 24 inches wide at the bottom, and 32 inches tall, X-connection; pinned to concrete slab

**Soil Type and Condition** .... Concrete Pavement, Dry

**Test Vehicle**

Type/Designation ..... 2270P  
 Make and Model ..... 2014 RAM 1500 Pickup  
 Curb ..... 4982 lb  
 Test Inertial ..... 5009 lb  
 Dummy ..... No dummy  
 Gross Static ..... 5009 lb

**Impact Conditions**

Speed ..... 63.9 mi/h  
 Angle ..... 25.2  
 Location/Orientation ..... 3.9 ft upstream of joint 4-5

**Impact Severity** ..... 124 kip-ft  
**Exit Conditions**

Speed ..... 54.9 mi/h  
 Trajectory/Heading Angle... 4.2°/7.1°

**Occupant Risk Values**

Longitudinal OIV ..... 14.4 ft/s  
 Lateral OIV ..... 21.0 ft/s  
 Longitudinal Ridedown ..... 4.1 g  
 Lateral Ridedown ..... 11.4 g  
 THIV ..... 7.9 m/s  
 ASI ..... 1.5

**Max. 0.050-s Average**

Longitudinal ..... -6.8 g  
 Lateral ..... -11.2 g  
 Vertical ..... -5.1 g

**Post-Impact Trajectory**

Stopping Distance ..... 220 ft downstream  
 9 ft twd field side

**Vehicle Stability**

Maximum Yaw Angle ..... 49°  
 Maximum Pitch Angle ..... 20°  
 Maximum Roll Angle ..... 18°  
 Vehicle Snagging ..... No  
 Vehicle Pocketing ..... No

**Test Article Deflections**

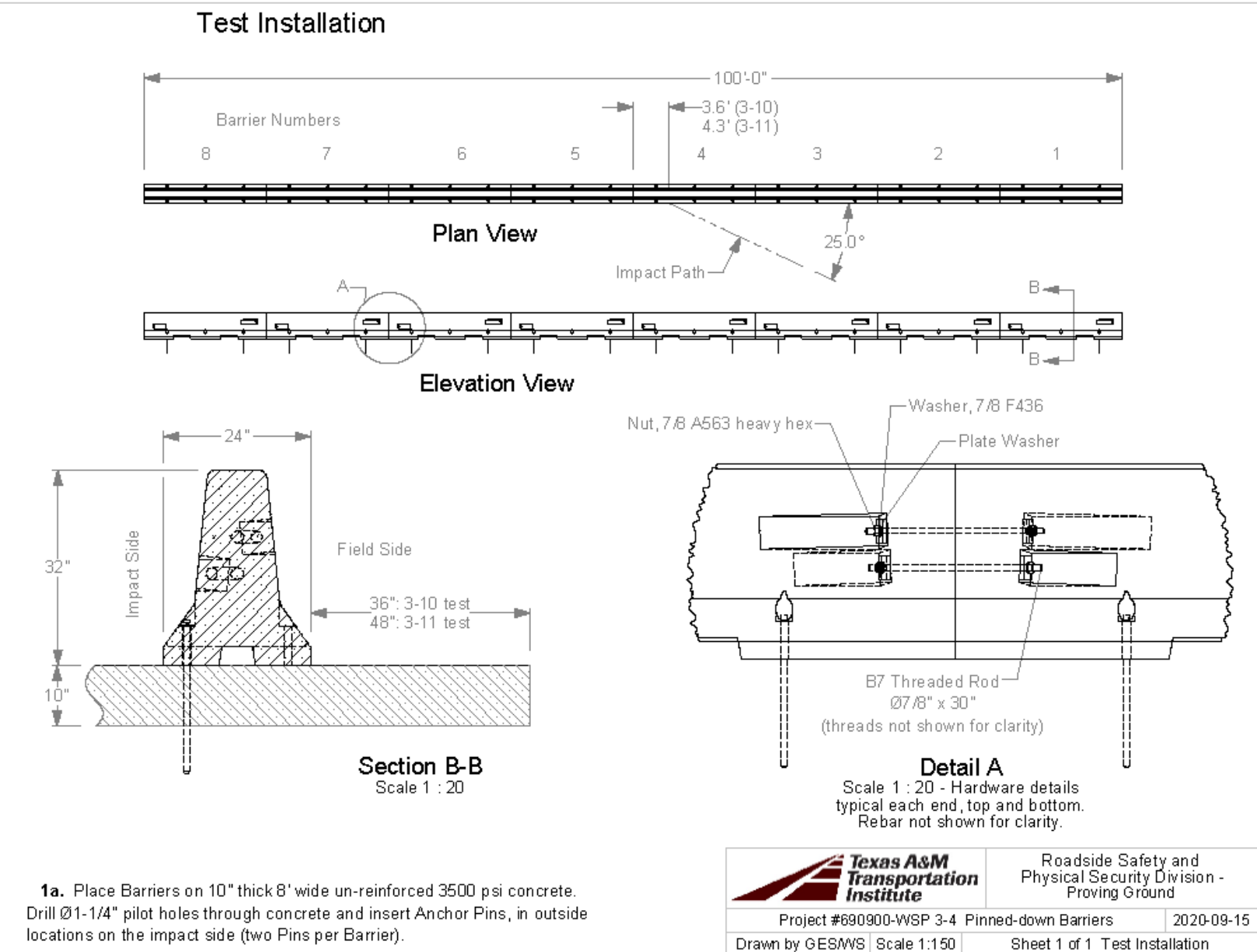
Dynamic ..... 17.9 inches  
 Permanent ..... 10.0 inches  
 Working Width ..... 34.4 inches  
 Height of Working Width ..... 3.0 inches

**Vehicle Damage**

VDS ..... 01RFQ5  
 CDC ..... 01FREW4  
 Max. Exterior Deformation ..... 12.0 inches  
 OCDI ..... RF0010000  
 Max. Occupant Compartment Deformation ..... 1.0 inches in the right front firewall

**Figure 6.14. Summary of Results for MASH Test 3-11 on Pinned TCB.**

APPENDIX A. DETAILS OF PINNED TCB



	Roadside Safety and Physical Security Division - Proving Ground	
	Project #690900-WSP 3-4 Pinned-down Barriers	2020-09-15
Drawn by GESWS	Scale 1:150	Sheet 1 of 1 Test Installation

G:\Accreditation-17025-2017\EIR-000 Project Files\690900\WSP WSP - TCB TL3 Testing - Akram\14\Drafting, WSP 1-4\690900-WSP 3-4 Drawing