



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

June 9, 2020

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

In Reply Refer To:  
HSST-1/B-343

Mr. Gary Lallo  
Hill & Smith, Inc.  
1000 Buckeye Park Road  
Columbus, OH 43207  
USA

Dear Mr. Lallo:

This letter is in response to your January 13, 2020 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-343 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

### **Decision**

The following device is eligible within the length-of-need, with details provided in the form which is attached as an integral part of this letter:

- Zoneguard® Portable 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: Zoneguard® Portable Barrier  
Type of system: Longitudinal Barrier  
Test Level: MASH Test Level 3 (TL3)  
Testing conducted by: Texas A&M Transportation Institute  
Date of request: January 13, 2020

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-343 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  
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:	January 13, 2020	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Gary Lallo	
	Company:	Hill &Smith, Inc.	
	Address:	1000 Buckeye Park Road, Columbus, OH 43207	
	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	Zoneguard®Portable 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:	Gary Lallo	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Hill &Smith, Inc.	Same as Submitter <input checked="" type="checkbox"/>
Address:	1000 Buckeye Park Road, Columbus, OH 43207	Same as Submitter <input checked="" 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 Hill &Smith, Inc. to perform full-scale crash testing of the Zoneguard®Portable Barrier. There are no shared financial interests in the Zoneguard®Portable Barrier by TTI, or between Hill &Smith, Inc. and TTI, other than costs involved in the actual crash tests and reports for this submission to FHWA.

## PRODUCT DESCRIPTION

Help

- New Hardware or Significant Modification
  Modification to Existing Hardware

The tested device was a proprietary temporary roadside safety barrier provided and manufactured by Hill & Smith, Inc. of Columbus, Ohio. The test installation consisted of five barrier units, each unit nominally 50 ft in length, for a total length of approximately 250 ft. Each 50 ft long barrier unit was comprised of three sections (a male end section, a central section, and a female end section). Each barrier section was 16 ft-8 inches long and 31½ inches tall (without rubber pads) with a 27-9/16-inch wide sloped base. Each section contained four anchor channel feet in the base located at 1 ft-7-11/16 inches and 6 ft-1¼ inches from each end. Each foot contained two 1½-inch wide x 5-inch long longitudinal slots for anchor pins, laterally spaced at 19-11/16 inches. Each male and female end section was fitted with four proprietary upper interlocking U-shaped channel speed joint connectors, with a sliding lock on one end.

The Zoneguard® barrier was installed on a 3-inch thick asphalt pad with the traffic side edge of the base 8 inches from, and parallel to, the edge of the existing concrete apron. The barrier was secured to the asphalt pad with 1¼-inch diameter x 20-inch long pins. Each barrier section had 8 slots for the anchor pins, 4 each on the traffic and field sides. These pin locations provided anchorage every 33 ft-4 inches on center, with exception at each end of the installation. Other than the pins, there were no additional bolts, clamps, or adhesives securing the barrier to the asphalt pad. Additional details and information can be found on the drawings.

### 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: 2020.01.12 09:17:01 -06'00'	
Address:	3100 SH 47, 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:

Help

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	<p>Test 3-10 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 left corner of the front bumper was 3.6 ft upstream of the joint between segments 9 and 10. The results of the test conducted on January 24, 2018 are found in TTI Test Report number 690900-HSI7. The test vehicle was traveling at an impact speed of 61.3 mi/h as it made contact with the Zoneguard® Barrier 2.7 ft upstream of the joint between segments 9 and 10 at an impact angle of 25.2°. After loss of contact with the barrier, the vehicle came to rest 146 ft downstream of the impact. Working width was 28.8 inches at the toe (ground level). Maximum dynamic deflection during the test was 3.4 inches at the toe, and 9.0 inches at the top of the barrier, which was 1.7 inches inside of the original position of the field side toe. Maximum permanent deformation was 1.0 inch at the joint between segments 9 and 10. The front bumper, hood, left front fender, left front rim, left front door, left rear door, left rear rim, left rear quarter panel, and rear bumper were damaged. The windshield was cracked in the lower center. The frontal damage was due to a secondary impact with another barrier. Maximum exterior crush to the vehicle was 6.0 inches in the side plane at the left front corner just above bumper height. Maximum occupant compartment deformation was 0.25 inch in the left floor pan area. The occupant risk factors were within the MASH preferred limits. The device performed acceptably for MASH test 3-10.</p>	PASS

Required Test Number	Narrative Description	Evaluation Results
3-11 (2270P)	<p>Test 3-11 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 impact point for the test, as provided by the sponsor, was the centerline of the vehicle aligned with a point 4.3 ft upstream of the critical point of the system, which was the midpoint between the traffic side anchors of barrier sections 6 and 7. The results of the test conducted on May 9, 2017 are found in TTI Test Report number 690900-HSI6. The test vehicle, traveling at an impact speed of 64.0 mi/h, contacted the Zoneguard® barrier where it correlated to the centerline of the vehicle aligned with a point 3.56 ft upstream of the midpoint between the traffic side anchors of barrier sections 6 and 7 at an angle of 25.2°. After loss of contact with the barrier, the vehicle traveled downstream of the point of impact along the existing runway of the test site. The vehicle then exited the runway and entered an existing ditch beyond the edge of the runway. This final resting location was 280 ft downstream of the point of impact and 30 ft toward the field side.</p> <p>Working width was 51.1 inches, and the vehicle was in contact with the barrier 24 ft. Maximum dynamic deflection during the test was 25.1 inches beyond the toe, and maximum permanent deformation was 9.0 inches. The front bumper, grill, left front tire and rim, left front fender, left front and rear doors, left rear cab corner, left rear exterior bed, left rear tire and rim, and rear bumper were damaged. The left upper and lower A-arms were deformed. Maximum exterior crush to the vehicle was 12.0 inches in the side plane at the left front corner at bumper height. Maximum occupant compartment deformation was 1.5 inches in the left front firewall area. The occupant risk factors were within the MASH preferred limits. The device performed acceptably for MASH test 3-11.</p>	PASS
3-20 (1100C)	The product is not a transition system.	Non-Relevant Test, not conducted
3-21 (2270P)	The 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: 2020.01.13 15:48:47 -06'00' 	
Address:	3100 SH 47, Bldg 7091, Bryan, Texas 77807 TTI, TAMU 3135, College Station, TX 77843-3135	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, 2021	

Submitter Signature\*: **Gary Lallo** Digitally signed by Gary Lallo  
Date: 2020.04.28 13:55:35  
-04'00'

**Submit Form**

### ATTACHMENTS

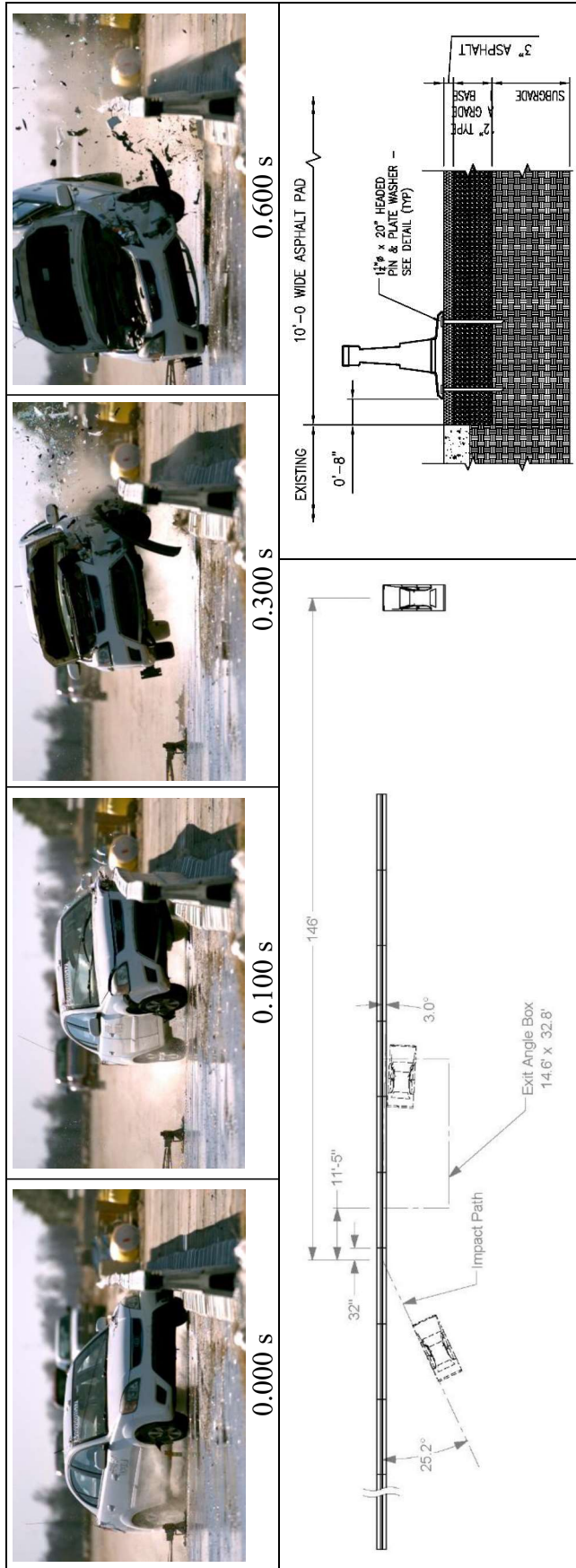
Attach to this form:

- 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		
Number	Date	Key Words





**General Information**

Test Agency..... Texas A&M Transportation Institute (TTI)  
 Test Standard Test No. .... MASH Test 3-10  
 TTI Test No. .... 690900-HSI7  
 Test Date ..... 2018-01-24

**Test Article**

Type ..... Portable Barrier  
 Name..... Zoneguard®  
 Installation Length..... 250 ft  
 Material or Key Elements ... 15 sections of 8 gauge (nominal) press-brake bent sheet steel, 16 ft-8 inches long, 32 inches tall with a 27<sup>9</sup>/<sub>16</sub>-inch wide sloped base anchored to asphalt with anchors laterally spaced at 19<sup>1</sup>/<sub>16</sub> inches. Placed on asphalt surface, damp

**Soil Type and Condition** ....

**Test Vehicle**  
 Type/Designation..... 1100C  
 Make and Model ..... 2010 Kia Rio  
 Curb ..... 2513 lb  
 Test Inertial ..... 2450 lb  
 Dummy ..... 165 lb  
 Gross Static ..... 2615 lb

**Impact Conditions**

Speed ..... 61.3 mi/h  
 Angle ..... 25.2°  
 Location/Orientation..... 2.7 ft upstream of joint 9-10

**Impact Severity**.....

**Exit Conditions**  
 Speed ..... 51.7 mi/h  
 Angle ..... 3.0°

**Occupant Risk Values**

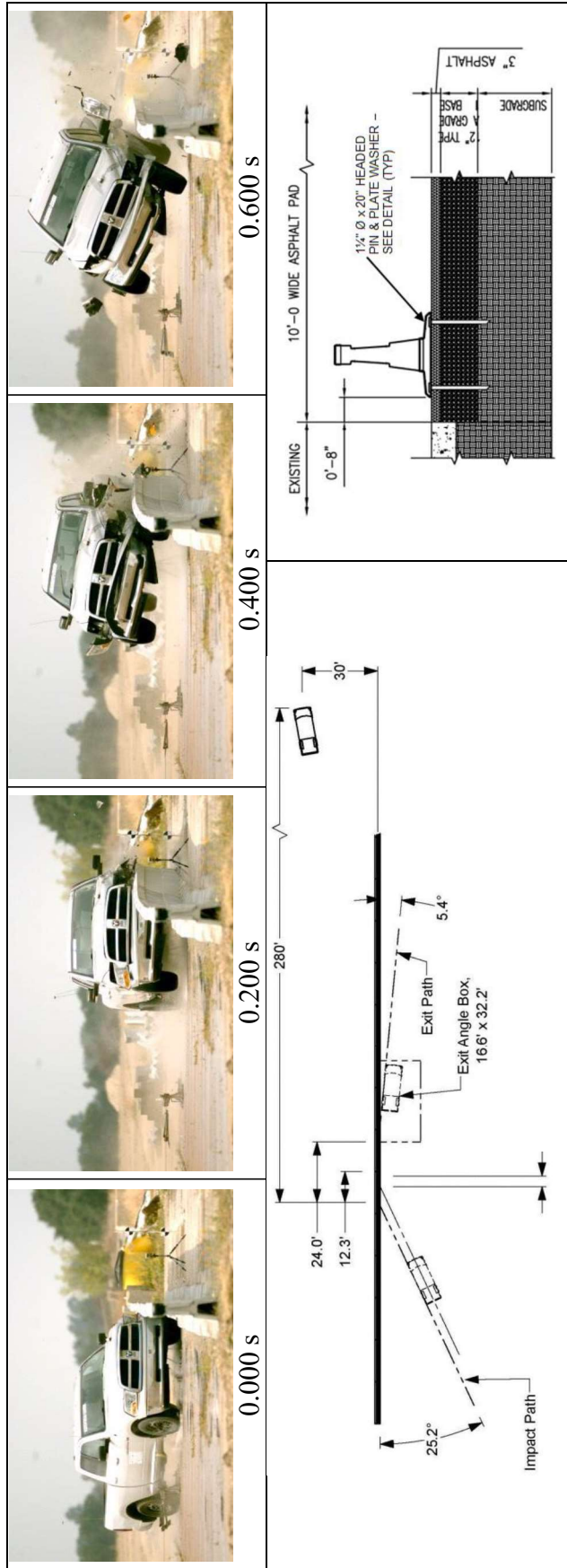
Longitudinal OIV ..... 18.7 ft/s  
 Lateral OIV ..... 24.9 ft/s  
 Longitudinal Ridedown ..... 2.9 g  
 Lateral Ridedown ..... 6.6 g  
 THIV ..... 33.8 km/h  
 PHD ..... 6.7 g  
 ASI ..... 1.91  
 Max. 0.050-s Average  
 Longitudinal ..... -9.4 g  
 Lateral ..... 13.3 g  
 Vertical ..... -4.4 g

**Post-Impact Trajectory**

Stopping Distance..... 146 ft downstream  
**Vehicle Stability**  
 Maximum Yaw Angle ..... 27°  
 Maximum Pitch Angle ..... 17°  
 Maximum Roll Angle ..... 11°  
 Vehicle Snagging ..... No  
 Vehicle Pocketing ..... No

**Test Article Deflections**

Dynamic, at top ..... 9.0 inches  
 Dynamic, at toe ..... 3.4 inches  
 Permanent, at toe ..... 1.0 inch  
 Working Width ..... 28.8 inches  
 Working Width Height ..... At grade  
**Vehicle Damage**  
 VDS ..... 11LFQ4  
 CDC ..... 11FLEW3  
 Max. Exterior Deformation..... 6.0 inches  
 OCDI ..... LF0000000  
 Max. Occupant Compartment Deformation ..... 0.25 inches



**General Information**

Test Agency..... Texas A&M Transportation Institute (TTI)  
 Test Standard Test No. .... MASH Test 3-11  
 TTI Test No. .... 690900-HS16  
 Test Date ..... 2017-05-09  
**Test Article**  
 Type ..... Anchored Portable Barrier  
 Name ..... Zoneguard®  
 Installation Length..... 250 ft  
 Material or Key Elements ... 15 units of 8 gauge (nominal) press-brake bent sheet steel, 16 ft-8 inches long, 32 inches tall with a 27<sup>9</sup>/<sub>16</sub>-inch wide sloped base anchored to asphalt  
 Anchored to Asphalt, Damp

**Soil Type and Condition**

**Test Vehicle**  
 Type/Designation ..... 2270P  
 Make and Model ..... 2011 Dodge RAM 1500 Pickup  
 Curb ..... 4979 lb  
 Test Inertial ..... 5032 lb  
 Dummy ..... No dummy  
 Gross Static ..... 5032 lb

**Impact Conditions**

Speed ..... 64.0 mi/h  
 Angle ..... 25.2 degrees  
 Location/Orientation..... CL 3.56 ft upstream of midpt btwn anchors of segments 6 & 7  
**Impact Severity**  
**Exit Conditions**  
 Speed ..... 52.6 mi/h  
 Angle ..... 5.4 degrees

**Occupant Risk Values**

Longitudinal OIV ..... 9.8 ft/s  
 Lateral OIV ..... 18.0 ft/s  
 Longitudinal Ridedown ..... 4.8 g  
 Lateral Ridedown ..... 10.9 g  
 THIV ..... 22.7 km/h  
 PHD ..... 11.2 g  
 ASI ..... 1.05  
 Max. 0.050-s Average  
 Longitudinal ..... -4.2 g  
 Lateral ..... 8.3 g  
 Vertical ..... -2.5 g

**Post-Impact Trajectory**

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

**Vehicle Stability**

Maximum Yaw Angle ..... 35 degrees  
 Maximum Pitch Angle ..... 5 degrees  
 Maximum Roll Angle ..... 29 degrees  
 Vehicle Snagging ..... No  
 Vehicle Pocketing ..... No

**Test Article Deflections**

Dynamic, beyond toe ..... 25.1 inches  
 Permanent, at toe ..... 9.0 inches  
 Working Width ..... 51.1 inches

**Vehicle Damage**

VDS ..... 11LFQ4  
 CDC ..... 11FLEW3  
 Max. Exterior Deformation ..... 12.0 inches  
 OCDI ..... LF0020000  
 Max. Occupant Compartment Deformation ..... 1.5 inches

Figure 5.9. Summary of Results for MASH Test 3-11 on Zoneguard® Barrier.

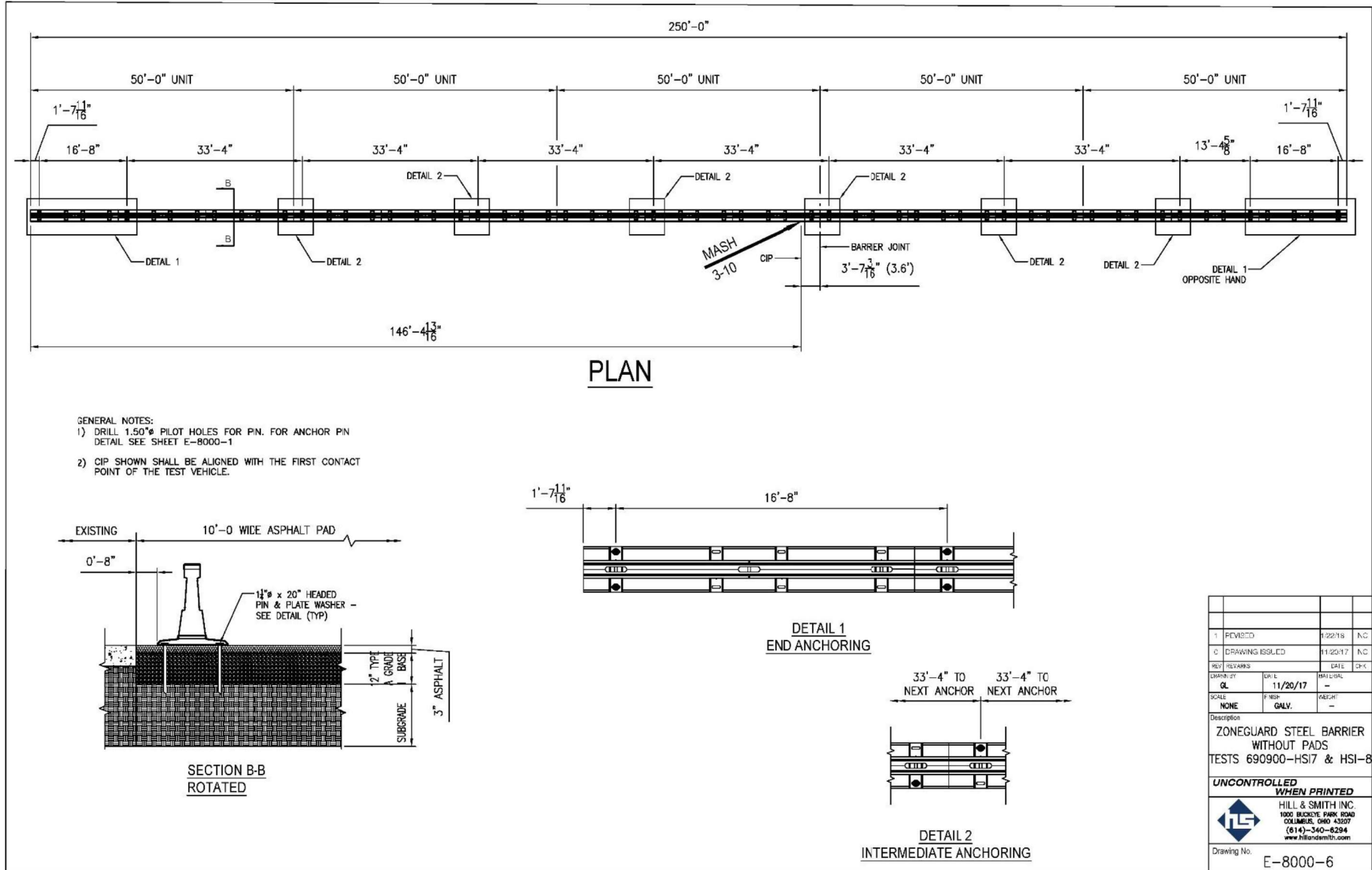


Figure 2.1. Details of the Zoneguard® Barrier without Pads with 19<sup>11</sup>/<sub>16</sub>-inch Lateral Spacing.