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

May 3, 2019

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

In Reply Refer To:
HSST-1/B-320

Mr. Gary Lallo
Hill and Smith, Inc.
1000 Buckeye Park Road
Columbus, OH 43207160

Dear Mr. Lallo:

This letter is in response to your October 17, 2018 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-320 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: Portable Longitudinal Barrier
Test Level: MASH Test Level 3 (TL3)
Testing conducted by: Texas A&M Transportation Institute (TamTI)
Date of request: December 31, 2018

FHWA concurs with the recommendation of the accredited crash testing laboratory on the attached form for length of need on asphalt surfaces only.

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-320 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.

- If the subject device is a patented product it may be considered to be proprietary. If proprietary systems are specified by a highway agency for use on Federal-aid projects: (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with the existing highway facilities or that no equally suitable alternative exists; or (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

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:	October 17, 2018	◉ New ○ 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)	◉ Physical Crash Testing ○ 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 ☒
Company Name:	Hill & Smith, Inc.	Same as Submitter ☒
Address:	1000 Buckeye Park Road, Columbus, OH 43207	Same as Submitter ☒
Country:	USA	Same as Submitter ☒
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

(●) New Hardware or Significant Modification ( ) Modification to Existing Hardware

The tested device is 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 31½ inches tall (without rubber pads) with a 27 9/16 inch wide sloped base. 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 × 20-inch long pins 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:	Roger P. Bligh	
Engineer Signature:	Roger Bligh — Digitally signed by Roger Bligh Date: 2018.10.29 10:21:44 -05'00'	
Address:	3100 SH 47, Bldg 7091, Bryan, Texas 77807	Same as Submitter ☐
Country:	USA	Same as Submitter ☐

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	Test 3-10 involves a 1100C vehicle impacting the test article at a target speed of 62 mph and a target angle of 25 degrees. The target CIP 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 23, 2018 are found in TTI Test Report number 690900-HSI8. The test vehicle was traveling at an impact speed of 62.9 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 24.8 degrees. After loss of contact with the barrier, the vehicle came to rest 216 ft downstream of the impact and 24 ft toward traffic lanes. The barrier contained and redirected the 1100C vehicle. The vehicle did not penetrate, underride, or override the installation. Maximum dynamic deflection during the test was 2.6 inches at the toe, and 9.7 inches at the top of the barrier, which was 1.0 inch 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. Working width was 28.6 inches at the toe (ground level). No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or present undue hazard to others in the area. Maximum occupant compartment deformation was 2.0 inches in the left front firewall area. The 1100C vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 13 and 21 degrees, respectively. Longitudinal OIV was 18.4 ft/s, and lateral OIV was 25.3 ft/s. Maximum longitudinal ridedown acceleration was 8.0 g, and maximum lateral ridedown acceleration was 7.4 g. Maximum exterior crush to the vehicle was 10.5 inches in the side plane at the left front corner just above bumper height. The device performed acceptably for MASH test 3-10.	PASS

Required Test Number	Narrative Description	Evaluation Results
3-11 (2270P)	Test 3-11 involves a 2270P vehicle impacting the test article at a target speed of 62 mph and a target angle of 25 degrees. The test sponsor prescribed target CIP was the centerline of the test vehicle aligned with a point 4.3 ft upstream of the pins adjacent to the joint between barrier sections 6 and 7. This was equivalent to a contact point by the left corner of the vehicle's front bumper located 11.4 ft upstream of the pins adjacent to the joint between barrier sections 6 and 7. The results of the test conducted on November 21, 2016 are found in TTI Test Report number 690900-HSI5. The test vehicle was traveling at an impact speed of 64.5 mi/h, and the left front corner of the bumper contacted the Zoneguard® Barrier 10.8 ft upstream of the pins adjacent to the joint between barrier sections 6 and 7 (equivalent to the centerline of the vehicle aligned 3.7 ft upstream of the pins) at an impact angle of 26.1 degrees. After loss of contact with the barrier, the vehicle came to rest 250 ft downstream of the impact and 13 ft toward field side. The barrier contained and redirected the 2270P vehicle. The vehicle did not penetrate, underride, or override the installation. Maximum dynamic deflection at the top of the barrier during the test was 23.4 inches beyond the toe, and maximum permanent deflection was 10.0 inches at the toe. Working width was 50.9 inches. No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or present undue hazard to others in the area. Maximum occupant compartment deformation was 3.0 inches in the left firewall area near the toe pan. The 2270P vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 20 and 17 degrees, respectively. Longitudinal OIV was 13.4 ft/s, and lateral OIV was 17.7 ft/s. Maximum longitudinal ridedown acceleration was 6.0 g, and maximum lateral ridedown acceleration was 8.6 g. Maximum exterior crush to the vehicle was 14.0 inches in the side plane at the left front corner at bumper height. The device performed acceptably for MASH test 3-11.	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 Proving Ground Laboratory	
Laboratory Signature:	Darrell L. Kuhn — Digitally signed by Darrell L. Kuhn Date: 2018.10.29 11:44:45 -05'00'	
Address:	TTI, TAMU 3135, College Station, TX 77843-3135	Same as Submitter ☐
Country:	USA	Same as Submitter ☐
Accreditation Certificate Number and Dates of current Accreditation period :	ISO 17025 Laboratory Certificate Number: 2821.01 Valid To: April 30, 2019	

Submitter Signature*: Gary Lallo — Digitally signed by Gary Lallo Date: 2018.12.31 16:47:18 -05'00'

Submit Form

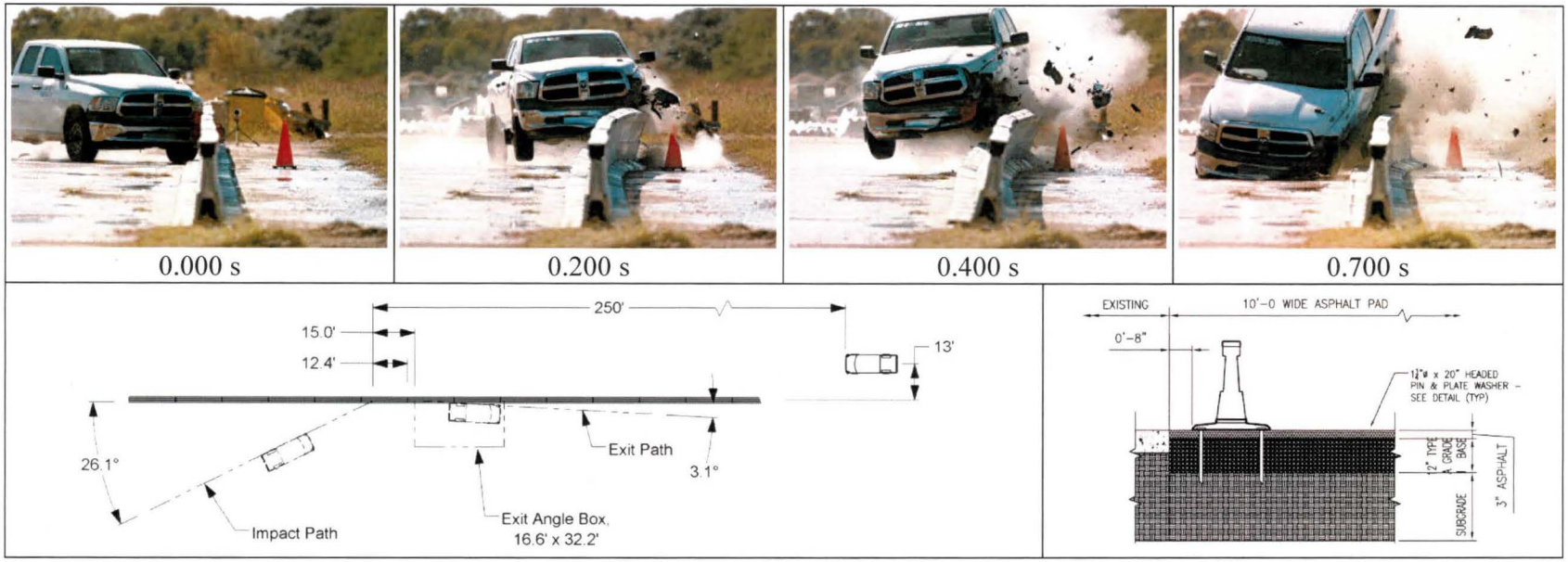
ATTACHMENTS

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 3-11
- TTI Test No. 690900-HSI5
- Test Date 2016-11-21

Test Article
- Type ..... Longitudinal Portable Traffic Barrier
- Name ..... Zoneguard® Barrier
- 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 $27^{9}/_{16}$-inch wide sloped base

Soil Type and Condition ..... Anchored on Asphalt, Dry

Test Vehicle
- Type/Designation 2270P
- Make and Model ..... 2013 Dodge RAM 1500 Pickup
- Curb ..... 4884 lb
- Test Inertial ..... 5056 lb
- Dummy ..... No dummy
- Gross Static ..... 5056 lb

Impact Conditions
- Speed ..... 64.5 mi/h
- Angle ..... 26.1 degrees
- Location/Orientation ..... 149 inches upstream of joint 6-7

Impact Severity ..... 136 kip-ft

Exit Conditions
- Speed ..... 56.8 mi/h
- Angle ..... 3.1 degrees

Occupant Risk Values
- Longitudinal OIV ..... 13.4 ft/s
- Lateral OIV ..... 17.7 ft/s
- Longitudinal Ridedown ..... 6.0 g
- Lateral Ridedown ..... 8.6 g
- THIV ..... 24.9 km/h
- PHD ..... 9.0 g
- ASI 1.07

Max. 0.050-s Average
- Longitudinal ..... −5.6 g
- Lateral ..... 8.2 g
- Vertical ..... −3.6 g

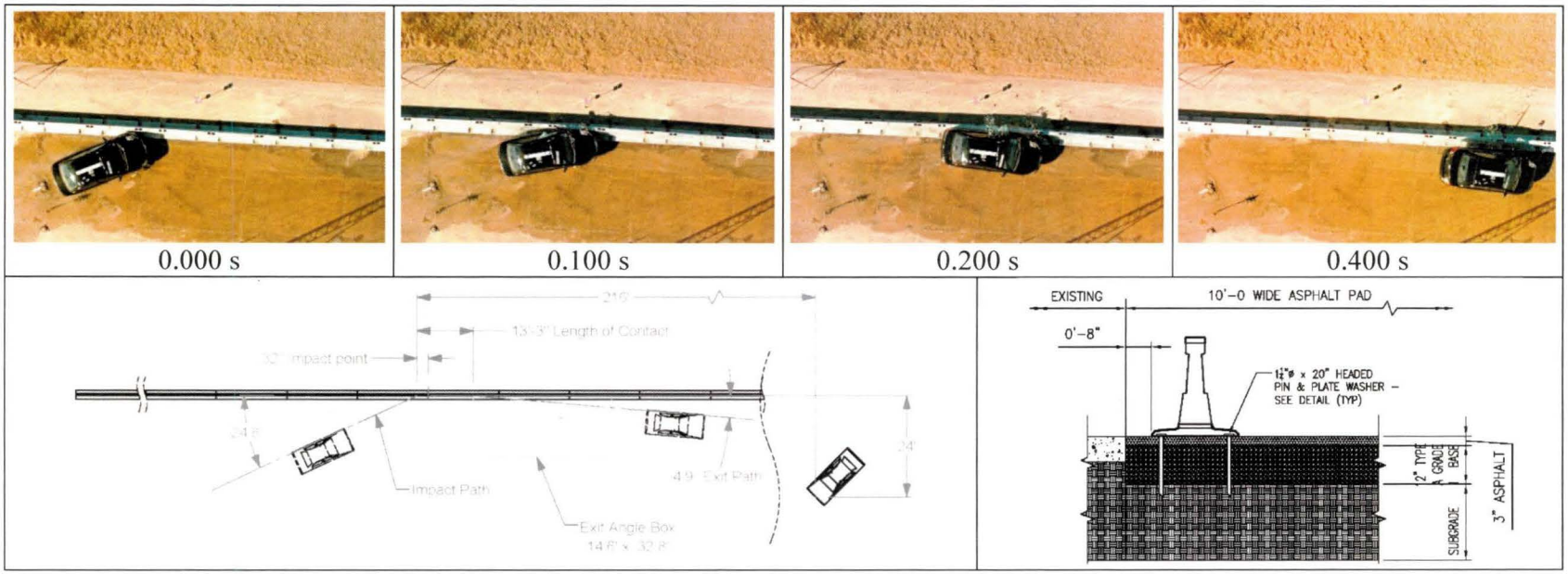
Post-Impact Trajectory
- Stopping Distance ..... 250 ft downstream 13 ft twd field side

Vehicle Stability
- Maximum Yaw Angle ..... 38 degrees
- Maximum Pitch Angle ..... 17 degrees
- Maximum Roll Angle ..... 20 degrees
- Vehicle Snagging ..... No
- Vehicle Pocketing ..... No

Test Article Deflections
- Dynamic, beyond toe ..... 23.4 inches
- Permanent, toe ..... 10.0 inches
- Working Width ..... 50.9 inches

Vehicle Damage
- VDS 11LFQ4
- CDC 11FLEW4
- Max. Exterior Deformation ..... 14.0 inches
- OCDI LF0020000
- Max. Occupant Compartment Deformation ..... 3.0 inches

Figure 5.6. Summary of Results for *MASH* Test 3-11 on Zoneguard® Barrier Anchored with Round Headed Anchoring Pins at 33 ft-4 inch Spacing, on center, on Asphalt Pavement.



General Information
- Test Agency ..... Texas A&M Transportation Institute (TTI)
- Test Standard Test No. ..... MASH Test 3-10
- TTI Test No. 690900-HSI8
- Test Date 2018-01-23

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 $27^{9}/_{16}$-inch wide sloped base anchored to asphalt with anchors laterally spaced at 21¼ inches

Soil Type and Condition ..... Placed on asphalt surface, damp

Test Vehicle
- Type/Designation 1100C
- Make and Model ..... 2010 Kia Rio
- Curb ..... 2514 lb
- Test Inertial ..... 2447 lb
- Dummy ..... 165 lb
- Gross Static ..... 2612 lb

Impact Conditions
- Speed ..... 62.9 mi/h
- Angle ..... 24.8°
- Location/Orientation ..... 2.7 ft upstream of joint 9-10

Impact Severity ..... 57 kip-ft

Exit Conditions
- Speed ..... 54.3 mi/h
- Angle ..... 4.9°

Occupant Risk Values
- Longitudinal OIV ..... 18.4 ft/s
- Lateral OIV ..... 25.3 ft/s
- Longitudinal Ridedown ..... 8.0 g
- Lateral Ridedown ..... 7.4 g
- THIV ..... 33.7 km/h
- PHD ..... 8.1 g
- ASI 1.90

Max. 0.050-s Average
- Longitudinal ..... -9.0 g
- Lateral ..... 14.0 g
- Vertical ..... -5.1 g

Post-Impact Trajectory
- Stopping Distance ..... 216 ft downstream
  24 ft twd traffic

Vehicle Stability
- Maximum Yaw Angle ..... 26°
- Maximum Pitch Angle ..... 21°
- Maximum Roll Angle ..... 13°
- Vehicle Snagging ..... No
- Vehicle Pocketing ..... No

Test Article Deflections
- Dynamic, at top ..... 9.7 inches
- Dynamic, at toe ..... 2.6 inches
- Permanent, at toe ..... 1.0 inch
- Working Width ..... 28.6 inches
- Working Width Height ..... At grade

Vehicle Damage
- VDS 11LFQ4
- CDC 11FLEW3
- Max. Exterior Deformation ..... 10.5 inches
- OCDI LF0020000
- Max. Occupant Compartment Deformation ..... 2.0 inches

Figure 5.6. Summary of Results for *MASH* Test 3-10 on Zoneguard® Barrier.

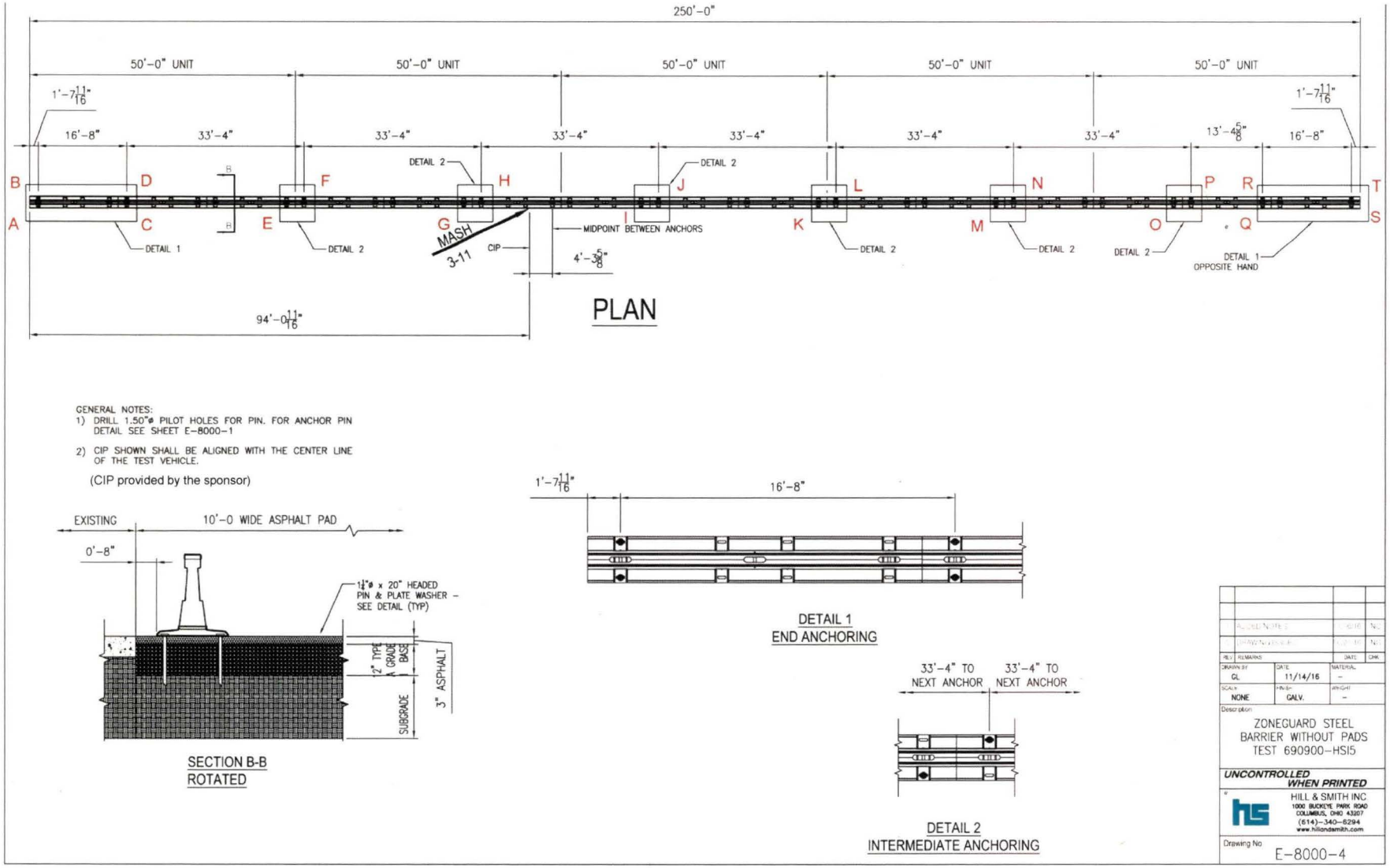


Figure 2.1. Details of the Zoneguard® Barrier anchored with Round Headed Anchoring Pins at 33 ft-4 inch Spacing on Asphalt Pavement.