



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

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

February 10, 2016

In Reply Refer To:
HSST/ B-258

Mr. John Wright
Indiana Department of Transportation
100 N. Senate Ave.
Indianapolis, IN 46204

Dear Mr. Wright:

This letter is in response to your September 3, 2015 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-258 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

Decision

The following devices are eligible, with details provided in the form which is attached as an integral part of this letter:

- Indiana Anchored Temporary Concrete 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' 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 American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (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:	Indiana Anchored Temporary Concrete Barrier
Type of system:	Precast concrete F-Shape barrier, using J-J Hook connection, bent angle plates at third points of each barrier unit, wedge anchor studs, and bolt down top plates
Test Level:	MASH Test Level 3
Testing conducted by:	Texas Transportation Institute
Task Force 13 Designator:	NA
Date of request:	September 3, 2015
Date initially acknowledged:	October 21, 2015
Date of completed package:	February 2, 2016

FHWA concurs with the recommendation of the accredited crash testing laboratory as stated within 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

If a manufacturer makes any modification to any of their roadside safety hardware that has an existing eligibility letter from FHWA, the manufacturer must notify FHWA of such modification with a request for continued eligibility for reimbursement. The notice of all modifications to a device must be accompanied by:

- Significant modifications – For these modifications, crash test results must be submitted with accompanying documentation and videos.
- Non-signification modifications – For these modifications, a statement from the crash test laboratory on the potential effect of the modification on the ability of the device to meet the relevant crash test criteria.

FHWA's determination of continued eligibility for the modified hardware will be based on whether the modified hardware will continue to meet the relevant crash test criteria.

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 the 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-258 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.
- 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 yours,

A handwritten signature in blue ink that reads "Michael S. Griffith". The signature is written in a cursive style with a blue highlight behind it.

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:	September 03, 2015	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	John Wright	
	Company:	Indiana Department of Transportation	
	Address:	100 N. Senate Ave., Indianapolis, IN 46204	
	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.

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'B': Barriers (Roadside, Median, Bridge Railings)	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	Indiana Temporary Anchored 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.

Identification of the individual or organization responsible for the product:

Contact Name:	John Wright	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Indiana Department of Transportation	Same as Submitter <input checked="" type="checkbox"/>
Address:	100 N. Senate Ave., Indianapolis, IN 46204	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.

In regard to the Indiana DOT Temporary Anchored Concrete Barrier, TTI Proving Ground had/has no financial interests. Indiana DOT contracted for the service of crash testing this barrier according to specifications for American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH) Test 3-11, for which TTI Proving Ground was compensated for the cost to perform the test. No consulting relationships, research funding or other forms of research support, patents, copyrights, other intellectual property interests, licenses, contractual relationships, business ownership or investment interests are retained for the TTI Proving Ground.

PRODUCT DESCRIPTION

<input checked="" type="radio"/> New Hardware or Significant Modification	<input type="radio"/> Modification to Existing Hardware	
<p>INDOT conducted three tests for this Temporary Anchored Concrete Barrier system. All three tests used a standard 31 inch F-shape concrete barrier. Each barrier segment was 10 ft long, 31 inches tall and 24 inches wide at the bottom, tapering to 10 inches wide at the top. Due to different barrier wall suppliers, some barriers had a 3 inch reveal and some had a 2 inch reveal. Placement of those segments are detailed in each report. All barrier used J-J hooks for connection.</p> <p>Test 1 (Test Report # 690900-IND1) – conducted Jan. 8th, 2015. This test utilized a 90° bent angle plate at each joint. This test failed and is not part of this request. Photos, video and the report are attached for viewing purposes. This was the barrier that Indiana currently uses and had been used for some time with no reported flaws.</p> <p>Test 2 (Test Report # 690900-IND2) – conducted April 16th, 2015. This test utilized three bent angle plates per barrier and a 4 bolt top plate recessed into the barrier. The top plate holes were formed into the concrete using ferrule loops as discussed in the report. The test passed but we noticed a construction problem where it was hard to line up the 4 top plate bolts due to variances in the J-J hook installation. Also the ferrule loops were poured into the concrete barrier, so could not use existing temporary barrier and convert it into the anchor barrier, so, we preceded with a third test.</p> <p>Test 3 (Test Report # 690900-IND3) – conducted May 19th, 2015. This test utilized three bent angle plates per barrier and a 2 bolt top plate connecting the barriers that were not recessed. The top plate holes were pre-drilled and expansion anchors were inserted as discussed in the report. Note that the top plate bolts were tightened with no specific torque value.</p>		

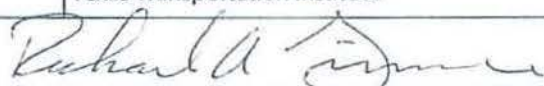
CRASH TESTING

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	<p>For anchored precast barrier systems, MASH Test 3-11 (2270 kg. Pickup @ 100 km/hr @ 25 degrees impact angle), which was performed for this project, is the critical test for barrier strength. Mash Test 3-10 (1100 kg small car @ 100 km/hr @ 25 degrees impact angle) is critical for vehicle stability and occupant risk. For MASH Test 3-10, and anchored barrier like the one tested for this project, the barrier lateral deflection is typically small and the barrier behaves more like a rigid barrier.</p> <p>A rigid New Jersey Barrier has been successfully tested to MASH 3-10 Specification (see Midwest Roadside Safety Facility Test Report 2214NJ-1). Other successful small car tests were reported on the F-Shape Barrier and New Jersey Safety Shape barrier. They are referenced as follows:</p> <p>1.) TTI no. 7069-3 reported in two volumes FHWA-RD93-058, "Testing of New Bridge Rail and Transitions Designs, Volume 1: Technical Report "FHWA-RD-93-064 "testing of New Bridge Rail and Transition Designs Volume 7: Appendix F 32-inch (813-mm) F-Shape Bridge Railing".</p> <p>2.) 42-inch Safety Shape Test with Small Car – TTI Test No. 4348-1 reported in "Development of High-Performance Median Barrier"</p> <p>For Test Report 2214NJ-1, the safety shape barrier was impacted by a 2579-lb passenger car at 60.8 mph and 26.1 degrees impact angle. This test was successful with respect to MASH criteria. While MASH Test 3-10 has not been performed to date on a rigid F-Shape barrier, the F-Shape has been successfully tested with an 817 kg. small car at 60 mph and 21.4 degrees impact angle and reported in Project 7069-3 herein. A comparable test on the New Jersey Shape was performed at a lesser 15 degree impact angle and reported in Project 4348-1 (843 kg. small car at 62.6 mph at 15.0 degrees impact angle). This test was also deemed successful.</p> <p>TTI has reviewed the data summaries for the small car tests provided herein on the F-Shape and New Jersey Shape. Based on the results of these tests, the F-Shape performed better for the small cars tests (more stable) even with a higher impact angle. Therefore, under the MASH guidelines, the F-Shape should perform better than the New Jersey Shape barrier which has been successfully tested to MASH. Therefore, the MASH Test 3-10 was deemed unnecessary for this testing.</p>	Non-Critical, not conducted

Required Test Number	Narrative Description	Evaluation Results
3-11 (2270P)	<p>TL-3 test of a 31 inch F-shape concrete barrier. Each barrier segment was 10 ft long, 31 inches tall and 24 inches wide at the bottom, tapering to 10 inches wide at the top.</p> <p>Test 1 (Test Report # 690900-IND1) – report submitted for viewing purposes only.</p> <p>Test 2 (Test Report # 690900-IND2) – The Indiana Anchored Temporary Barrier with wedge anchor studs contained and redirected the 2270P vehicle. Maximum dynamic deflection during the test was 11.9 inches. Maximum occupant impact velocity and subsequent ride down accelerations were 15.1 ft/s longitudinal OIV, 24.6 ft/s lateral OIV and 5.1 G longitudinal RDA and 11.2 G lateral RDA. No deformation or intrusion of the occupant compartment occurred. The 2270P vehicle remained upright during and after the collision event. Maximum roll was 18° and maximum pitch was 18°. Occupant risk factors are within limits specified in MASH. The test was successful for a TL-3 crash test.</p> <p>Test 3 (Test Report # 690900-IND3) – The Indiana Anchored Temporary Barrier with wedge anchor studs contained and redirected the 2270P vehicle. Maximum dynamic deflection during the test was 13.3 inches. Maximum occupant impact velocity and subsequent ride down accelerations were 16.7 ft/s longitudinal OIV, 24.3 ft/s lateral OIV and 8.9 G longitudinal RDA and 10.8 G lateral RDA. No detached elements, fragments or other debris was present to penetrate or to show potential for penetrating the occupant department, or to present hazzard to others in the area. The 2270P vehicle remained upright during and after the collision event. Maximum roll was 26° and maximum pitch was 25°. Occupant risk factors are within limits specified in MASH. The test was successful for a TL-3 crash test.</p>	PASS
3-20 (1100C)	Not relevant, transition not tested for this system	Non-Critical, not conducted
3-21 (2270P)	Not relevant, transition not tested for this system	Non-Critical, 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 Transportation Institute	
Laboratory Signature:		
Address:	Roadside Safety & Physical Security Texas A&M University System 3135 TAMU 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 Laboratory Testing Certificate # 3821.01 Accreditation date 02/19/2015 through 04-30/2017	

Submitter Signature*:  2016.02.02
07:01:57 -05'00'

Submit Form

ATTACHMENTS

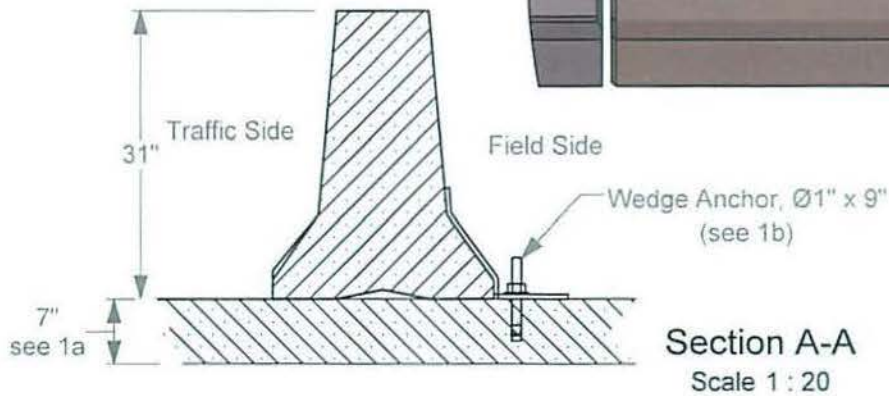
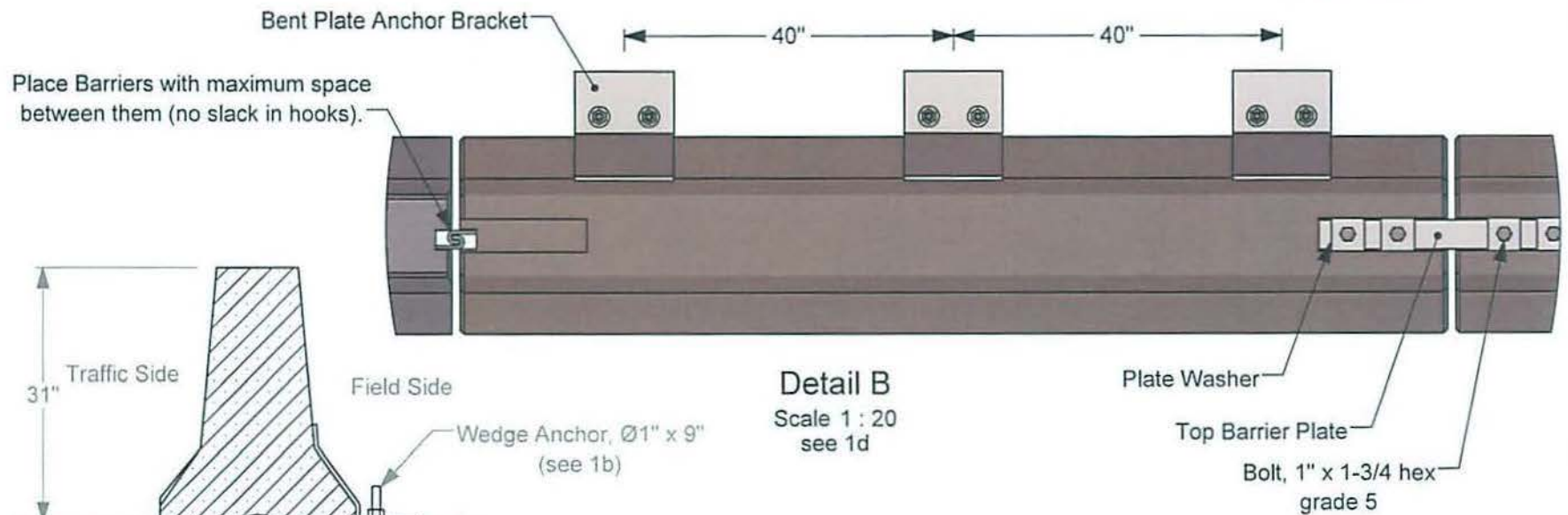
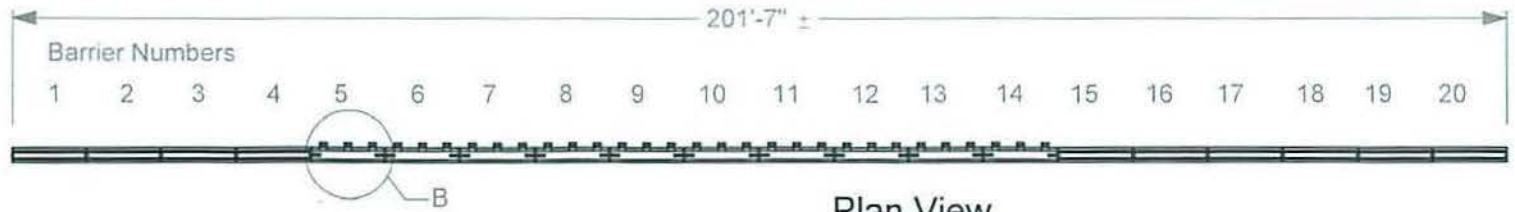
Attach to this form:

- 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		AASHTO TF13	Key Words
Number	Date	Designator	

Test Installation



1a. Nominal concrete apron thickness. Actual thickness may be up to 1" greater or less.

1b. Install Wedge Anchors according to manufacturer's instructions with 4-1/2" embedment. Two at each Bracket. Tighten to 250ft/lbs (minimum according to manufacturer's specifications).

1c. Barriers 1 - 4 and 15 - 20 were used in a previous test. Barriers 5 - 14 are new. Anchor Brackets are at Barriers 5 - 14, as shown in Plan View.

1d. Typical Bracket and Top Plate positions shown in Plan View and Detail B. Top Plates at each joint from 5-6 to 13-14.



Roadside Safety and Physical Security Division Proving Ground -

Project 690900-IND-2

Indiana Barriers

Drawn By GES

Scale 1:300 Sheet 1 of 6

Test Installation

Approved:

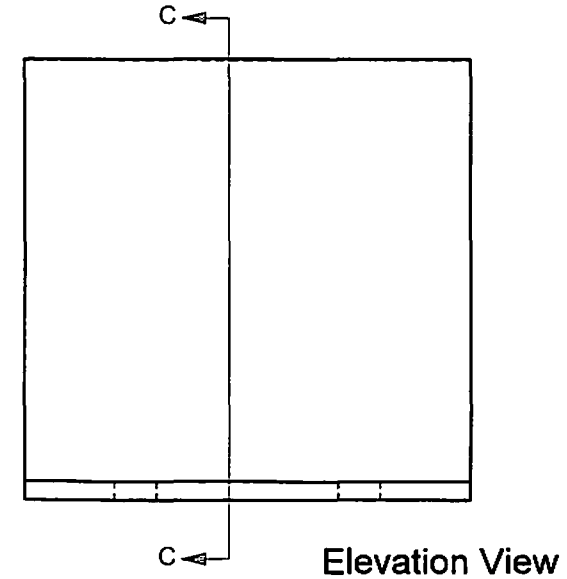
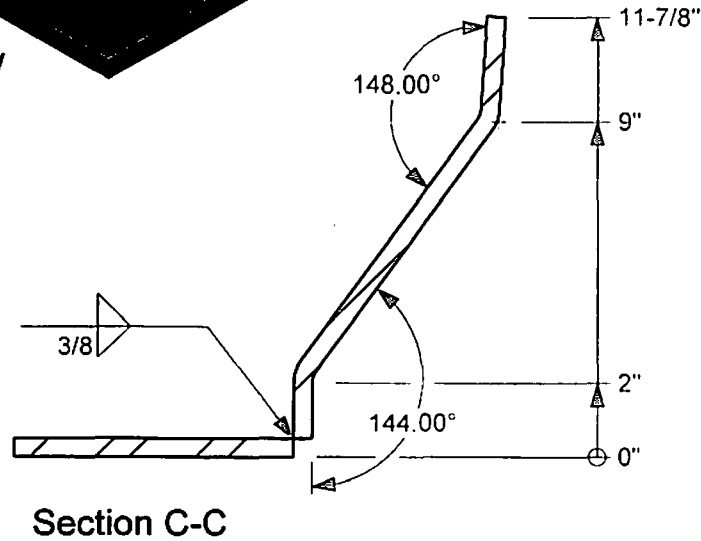
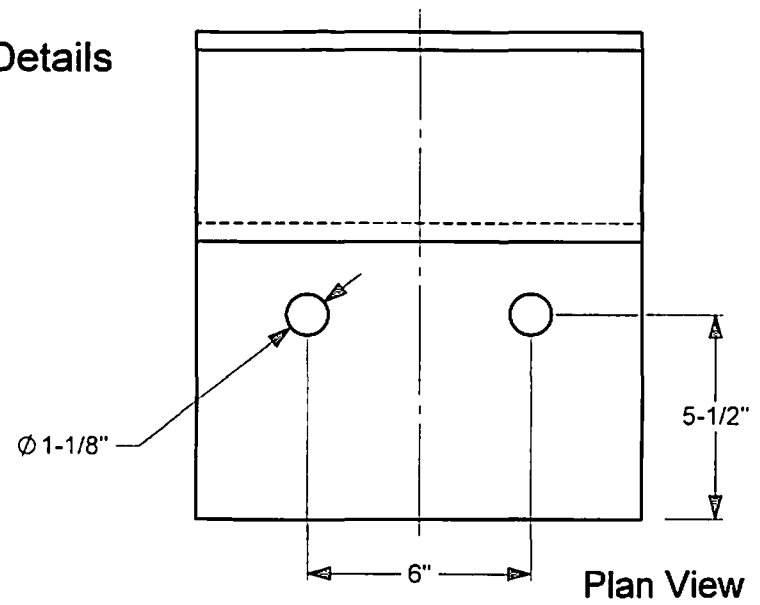
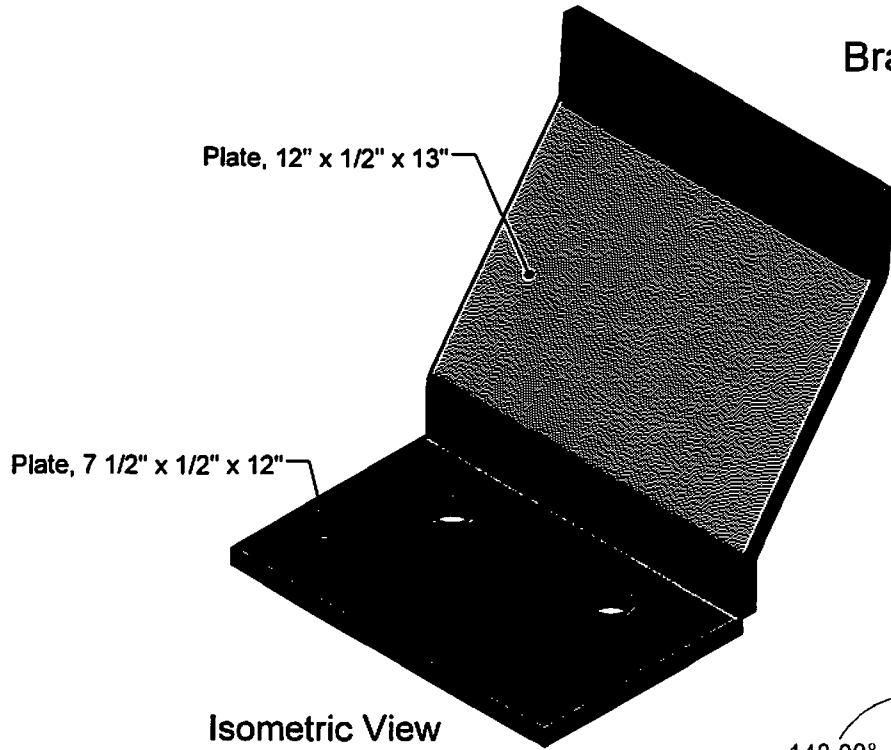
Date:

William Williams:

William Williams

2015-04-15

Bracket Details



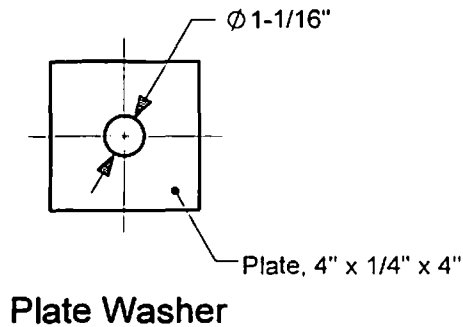
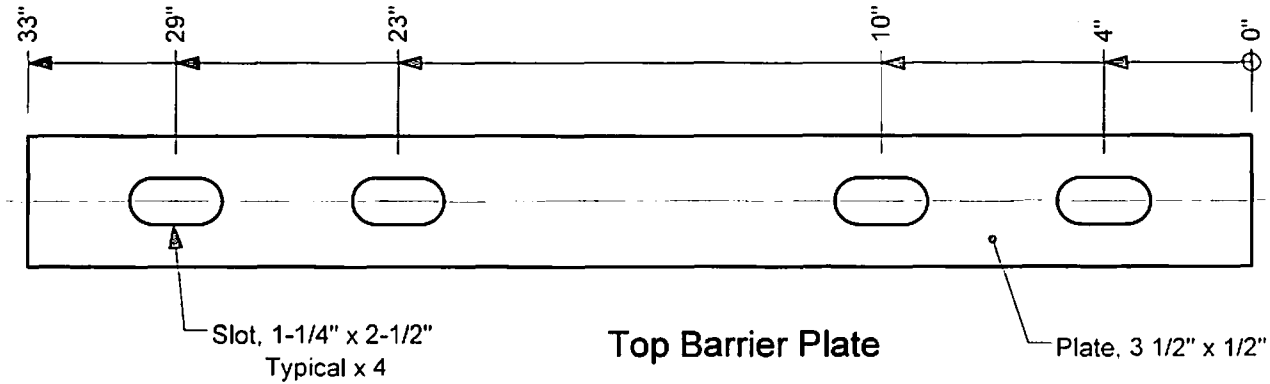
2a. This part was supplied by the client. Material specifications were not provided.



Roadside Safety and
Physical Security Division -
Proving Ground

Project 690900-IND-2 Indiana Barriers 2015-04-14
 Drawn By GES Scale 1:5 Sheet 2 of 6 Bracket Details

Connector Hardware



3a. These parts were supplied by the client. Material specifications were not provided.



Roadside Safety and
Physical Security Division -
Proving Ground

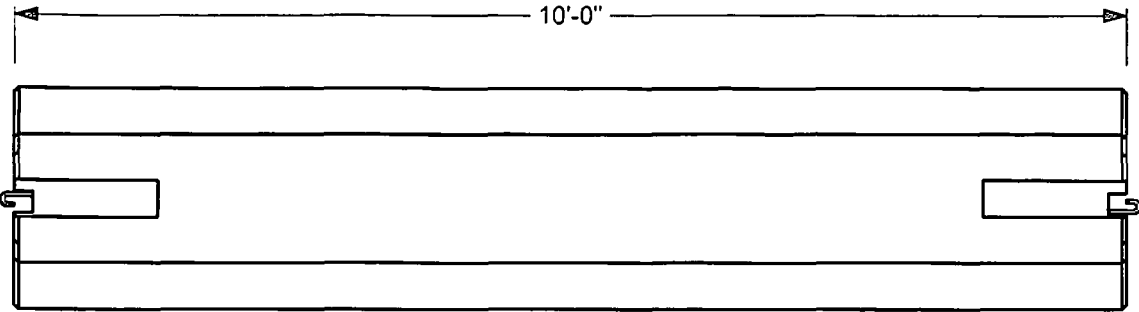
Project 690900-IND-2 Indiana Barriers

2015-04-14

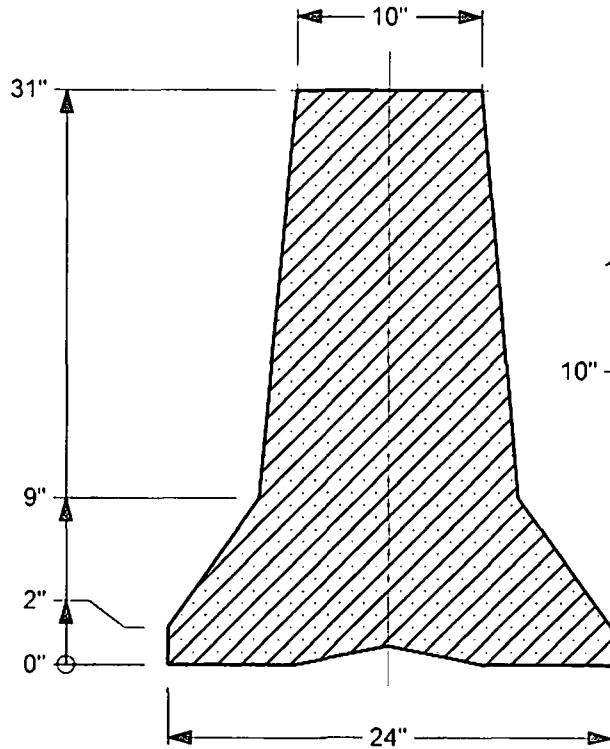
Drawn By GES Scale 1:5 Sheet 3 of 6 Connector Straps

Barriers 5-14

J-J Hook Connection

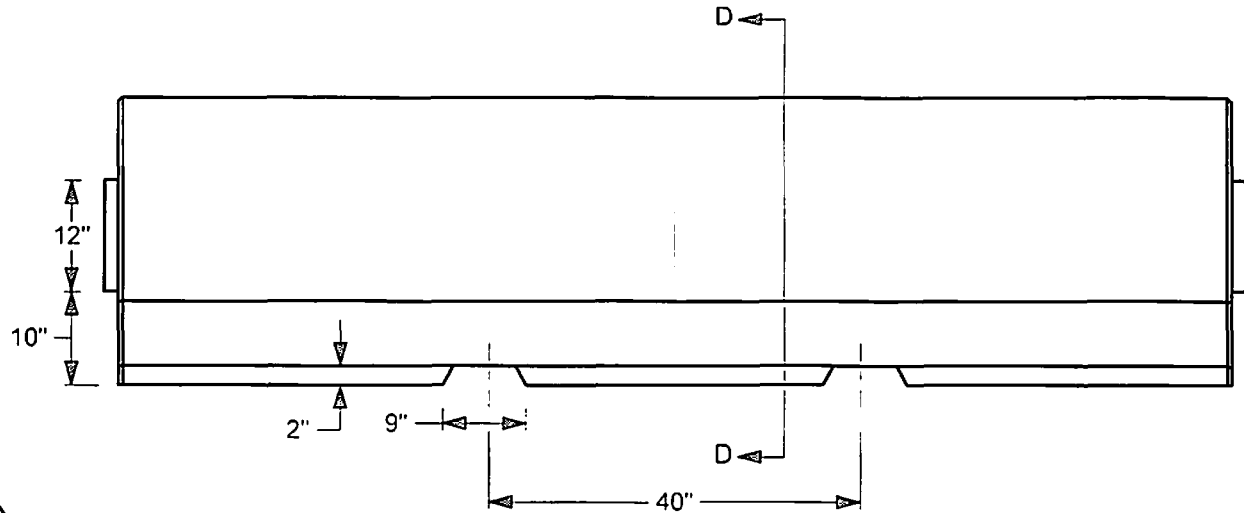


Plan View



Section D-D

Scale 1 : 10



Elevation View



Roadside Safety and
Physical Security Division -
Proving Ground

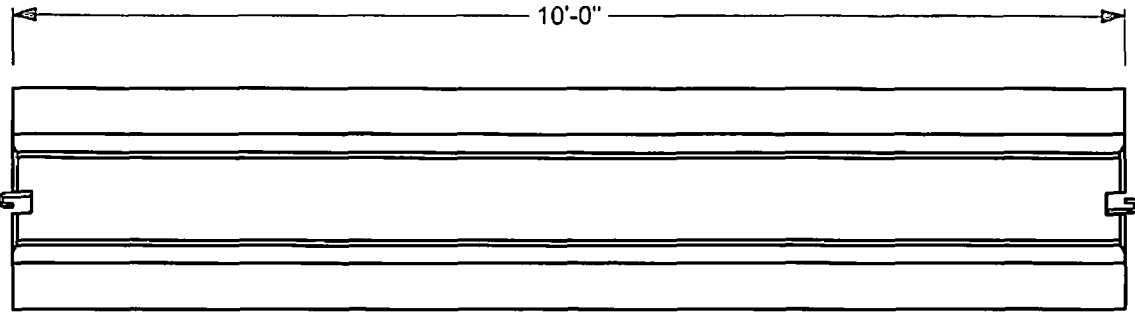
Project 690900-IND-2 Indiana Barriers

2015-04-14

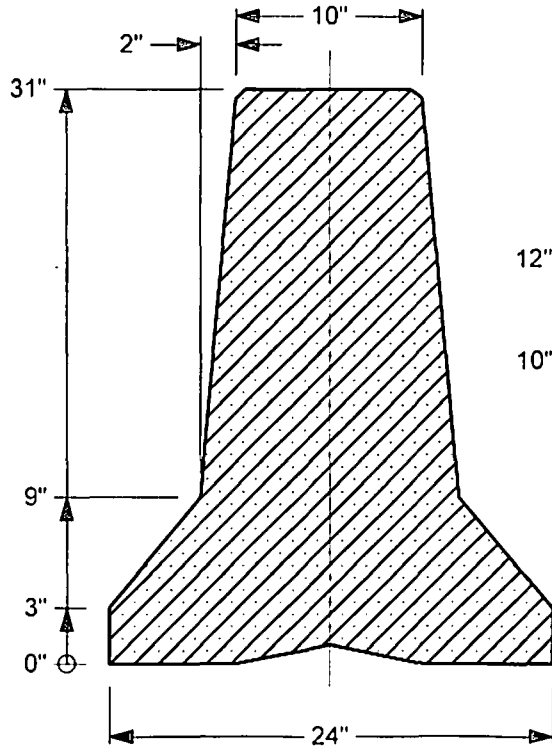
Drawn By GES Scale 1:20 Sheet 4 of 6 Barriers 5-14

Barriers 1-4 and 15-20

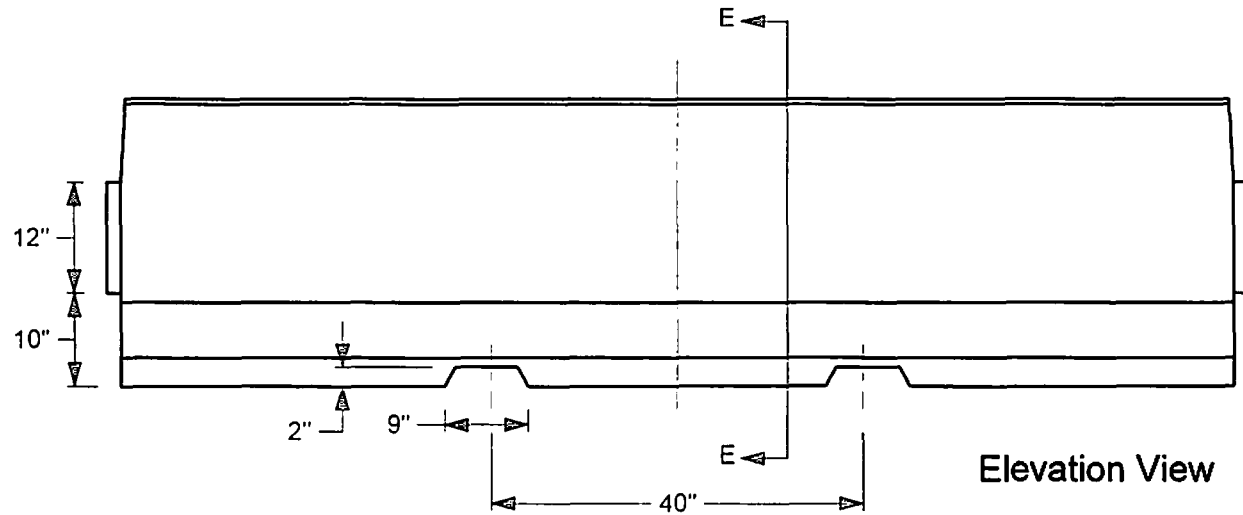
J-J Hook Connection



Plan View



Section E-E
Scale 1 : 10



Elevation View



Roadside Safety and
Physical Security Division -
Proving Ground

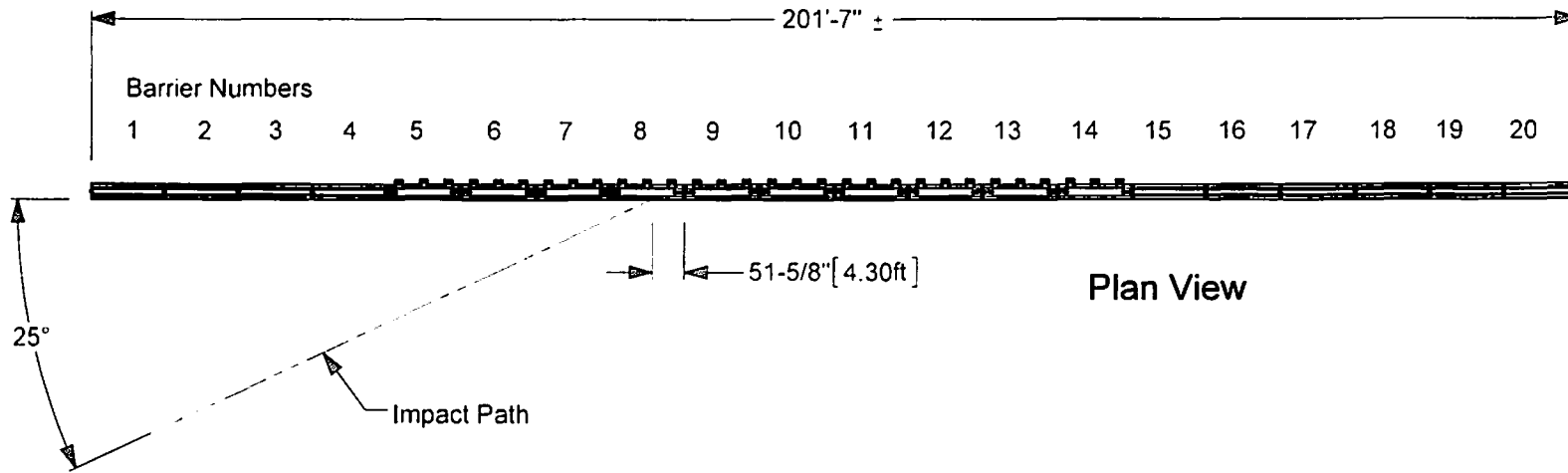
Project 690900-IND-2 Indiana Barriers

2015-04-14

Drawn By GES Scale 1:20 Sheet 5 of 6

Barriers 1-4 and 15-20

Impact Path

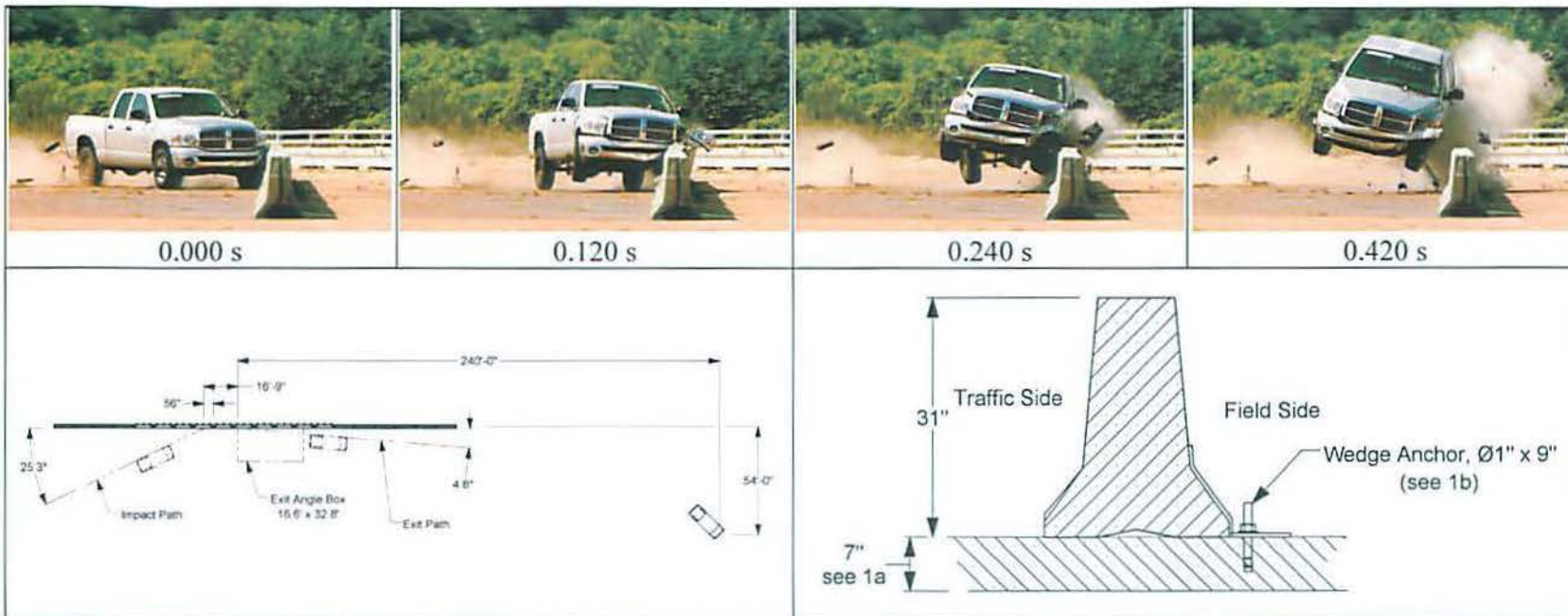


Roadside Safety and
Physical Security Division -
Proving Ground

Project 690900-IND-2 Indiana Barriers

2015-04-14

Drawn By GES Scale 1:20 Sheet 6 of 6 Impact Path



General Information

Test Agency..... Texas A&M Transportation Institute (TTI)
 Test Standard Test No. MASH Test 3-11
 TTI Test No. 690900-IND2
 Date 2015-04-16

Test Article

Type..... Temporary Concrete Barrier
 Name..... Indiana Anchored Temporary Barrier with Wedge Anchor Studs and Top Connectors
 Installation Length 201.6 ft
 Material or Key Elements ... 9 ft-11 inch F-shape concrete barriers anchored with steel anchor brackets, wedge anchor studs, 4-bolt top plates in pockets

Soil Type and Condition..... Concrete pavement, dry

Test Vehicle

Type/Designation..... 2270P
 Make and Model 2008 Dodge Ram 1500 Pickup
 Curb 4899 lb
 Test Inertial 5044 lb
 Dummy No dummy
 Gross Static 5044 lb

Impact Conditions

Speed 62.7 mi/h
 Angle 25.3 degrees
 Location/Orientation 4.7 upstrm 8-9
 Impact Severity 121.1 kip*ft (+5%)

Exit Conditions

Speed 53.8 mi/h
 Angle 4.8 degrees

Occupant Risk Values

Longitudinal OIV 15.1 ft/s
 Lateral OIV 24.6 ft/s
 Longitudinal RDA..... 5.1 G
 Lateral RDA 11.2 G
 THIV 31.9 km/h
 PHD 11.7 G
 ASI 1.64
 Longitudinal 50-ms Average..... -7.7 G
 Lateral 50-ms Avg -12.5 G
 Vertical 50-ms Avg -4.1 G

Post-Impact Trajectory

Stopping Distance 240 ft downstrm
 54 ft twd traffic

Vehicle Stability

Maximum Yaw Angle..... 54 degrees
 Maximum Pitch Angle..... 18 degrees
 Maximum Roll Angle 18 degrees
 Vehicle Snagging No
 Vehicle Pocketing..... No

Test Article Deflections

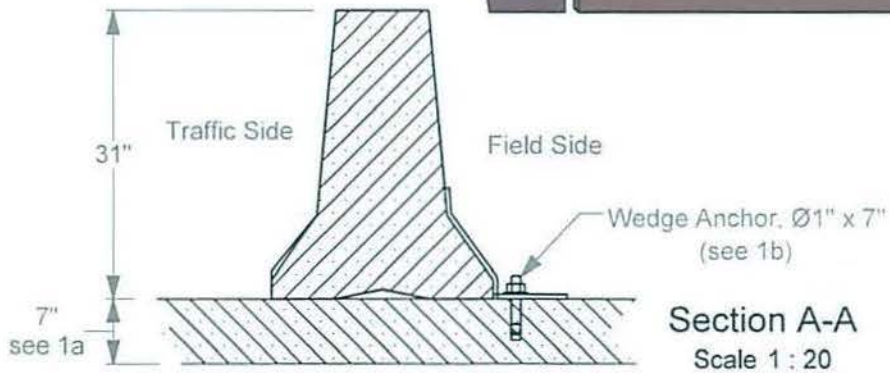
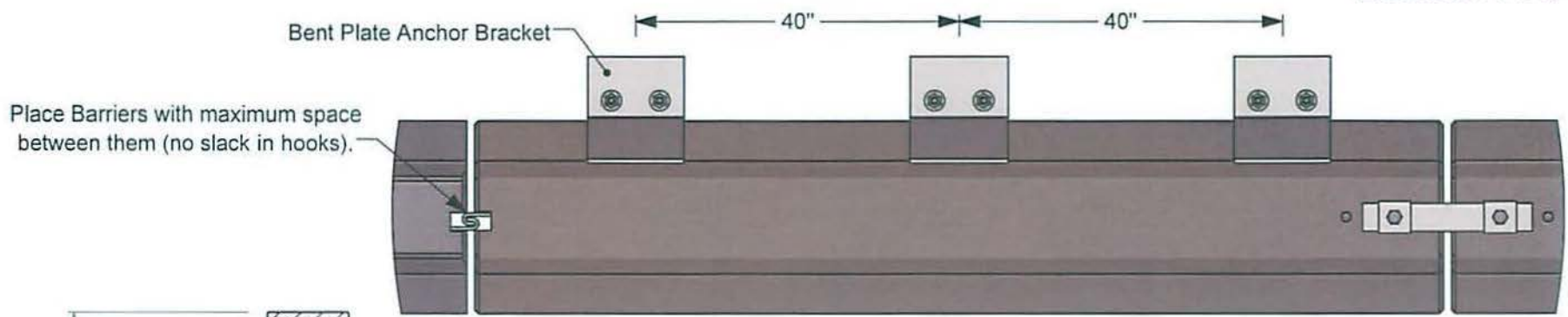
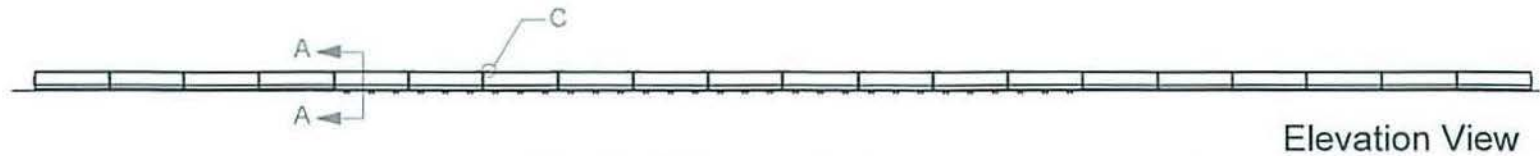
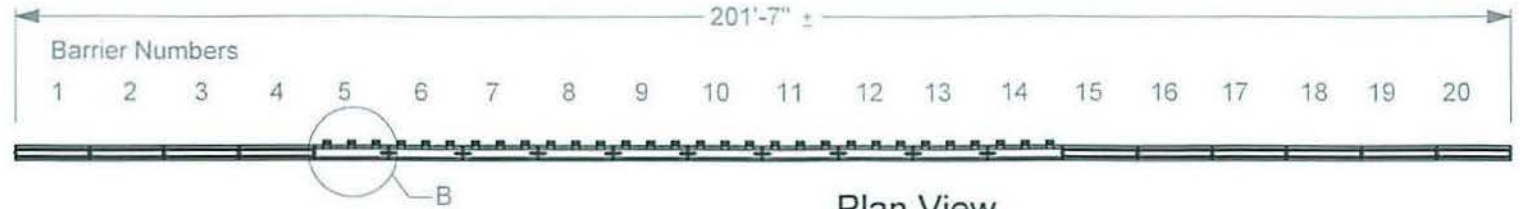
Dynamic 11.9 inches
 Permanent 11.9 inches
 Working Width 28.1 inches

Vehicle Damage

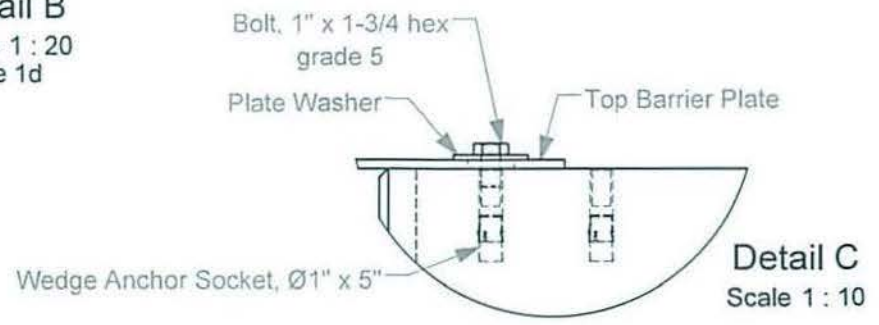
VDS 11LFQ5
 CDC 11FLEW4
 Max. Exterior Deformation..... 12.0 inches
 OCCD!..... FS0000000
 Max. Occupant Compartment Deformation..... None

Figure 5.9. Summary of Results for MASH Test 3-11 on Indiana Anchored Temporary Barrier with Wedge Anchor Studs.

Test Installation



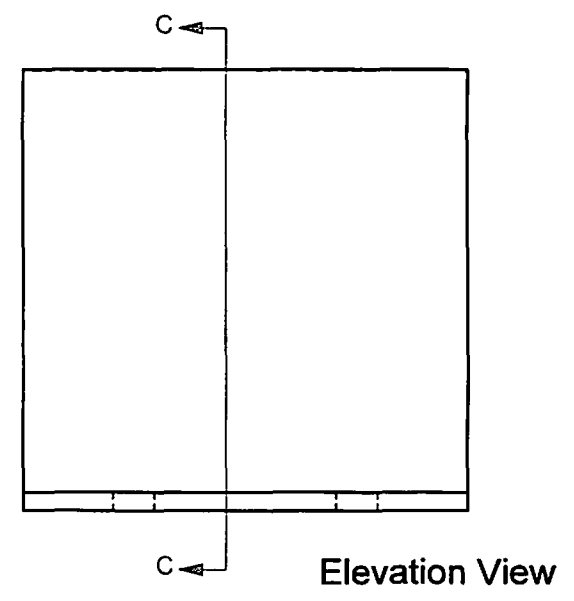
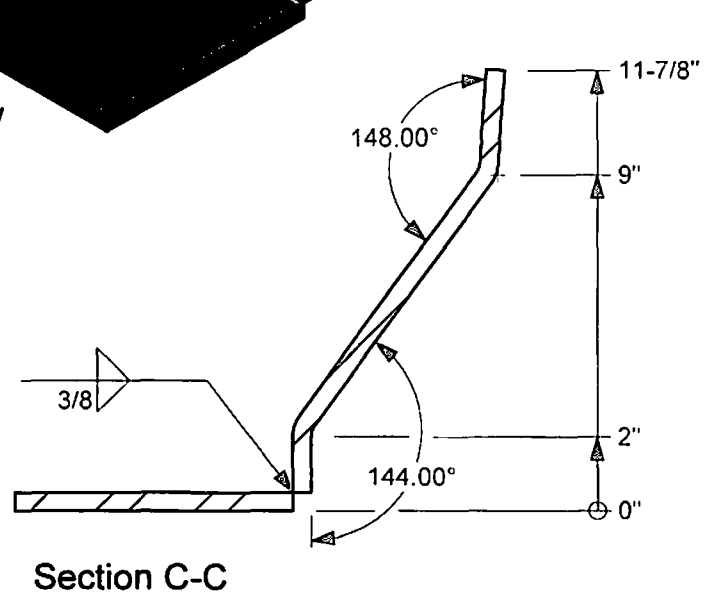
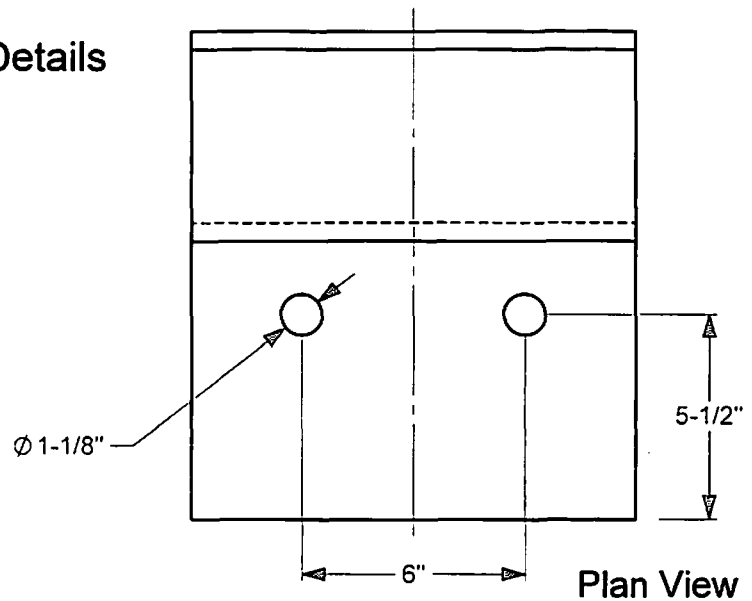
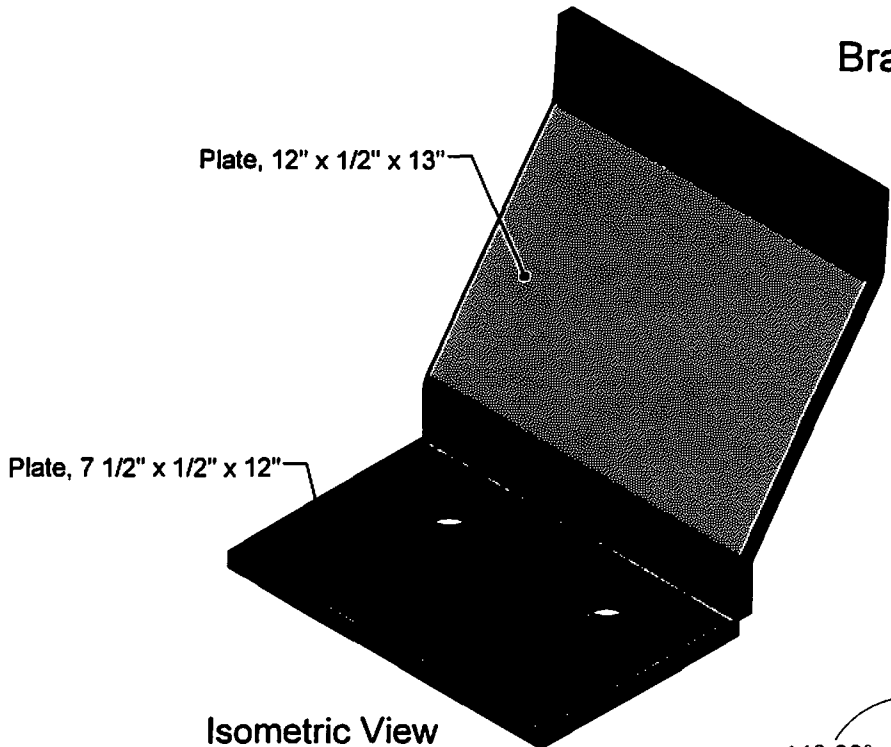
Detail B
Scale 1 : 20
see 1d



- 1a. Nominal concrete apron thickness. Actual thickness may be up to 1" greater or less.
- 1b. Install Wedge Anchors according to manufacturer's instructions with 4-1/2" embedment. Two at each Bracket. Tighten to 250ft/lbs (minimum according to manufacturer's specifications).
- 1c. Barriers 1 - 4 and 15 - 20 were used in a previous test. Barriers 5 - 14 are new. Anchor Brackets are at Barriers 5 - 14, as shown in Plan View.
- 1d. Typical Bracket and Top Plate positions shown in Plan View and Detail B.

		Roadside Safety and Physical Security Division Proving Ground -	
Project	690900-IND-3	Indiana Barriers	
Drawn By	GES	Scale	1:300 Sheet 1 of 6 Test Installation
Approved:			Date:
William Williams:		2015-05-14	

Bracket Details



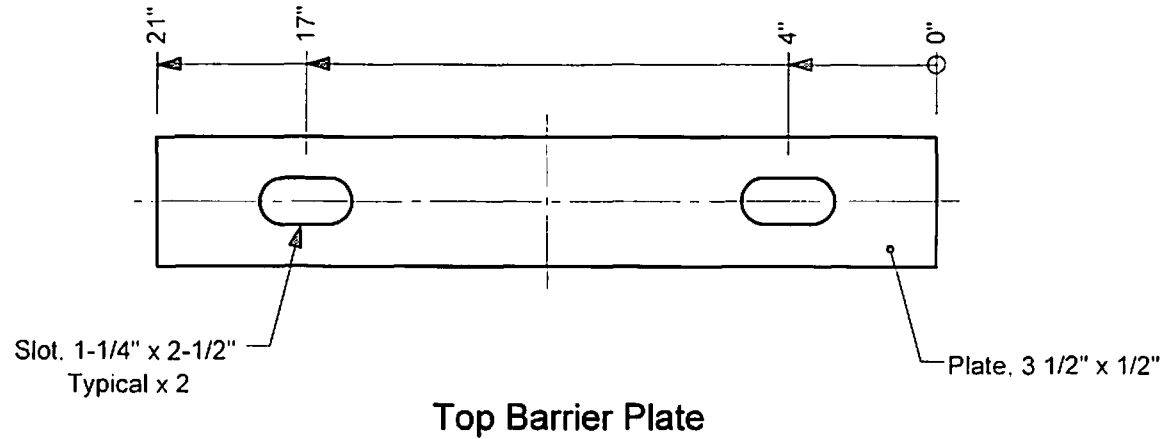
2a. This part was supplied by the client. Material specifications were not provided.



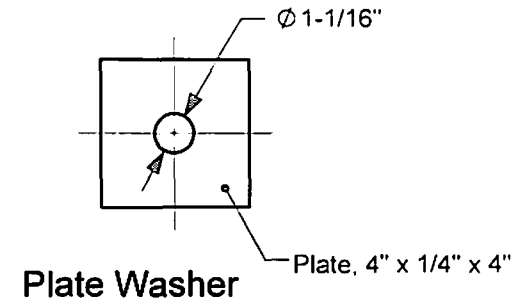
Roadside Safety and
Physical Security Division -
Proving Ground

T:\2014-2015\690900\IND - Indiana DOT - Williams\IND-3\Drafting\690900-IND-3 Drawing

Connector Hardware



Wedge Anchor Socket, Ø1" x 5"
(Internal threads not shown)



3a. These parts were supplied by the client. Material specifications were not provided.



Roadside Safety and
Physical Security Division -
Proving Ground

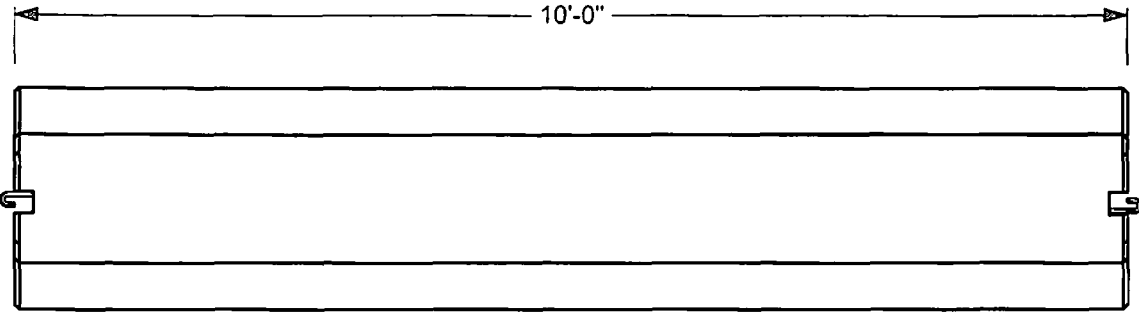
Project 690900-IND-3 Indiana Barriers

2015-05-14

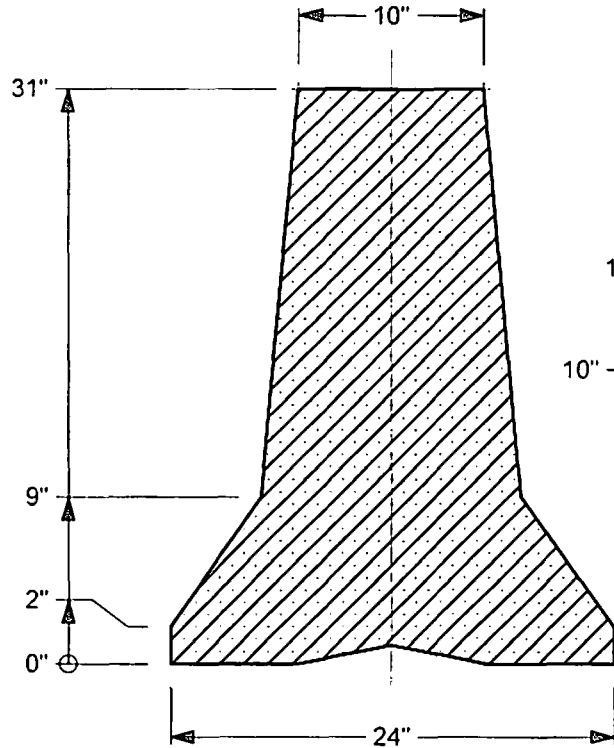
Drawn By GES Scale 1:5 Sheet 3 of 6 Connector Hardware

Barriers 5-14

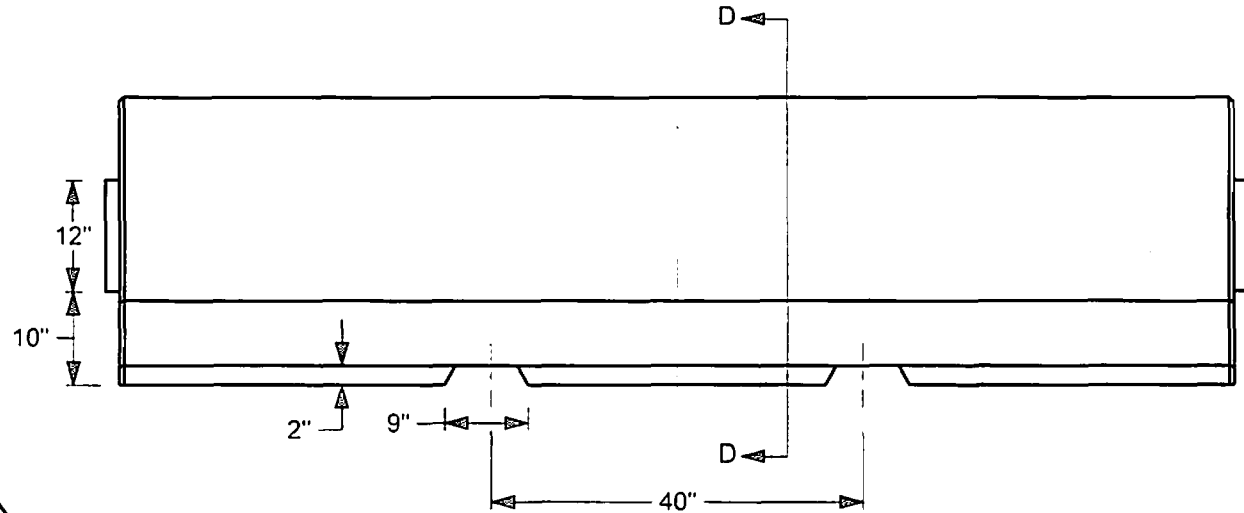
J-J Hook Connection



Plan View



Section D-D
Scale 1 : 10



Elevation View



Roadside Safety and
Physical Security Division -
Proving Ground

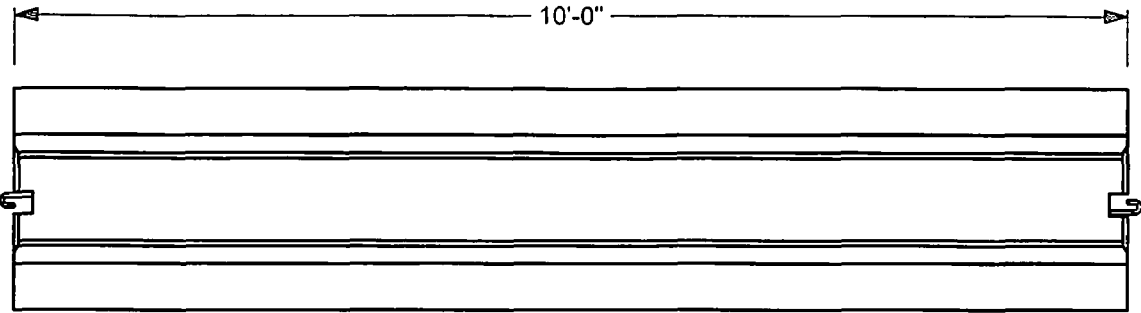
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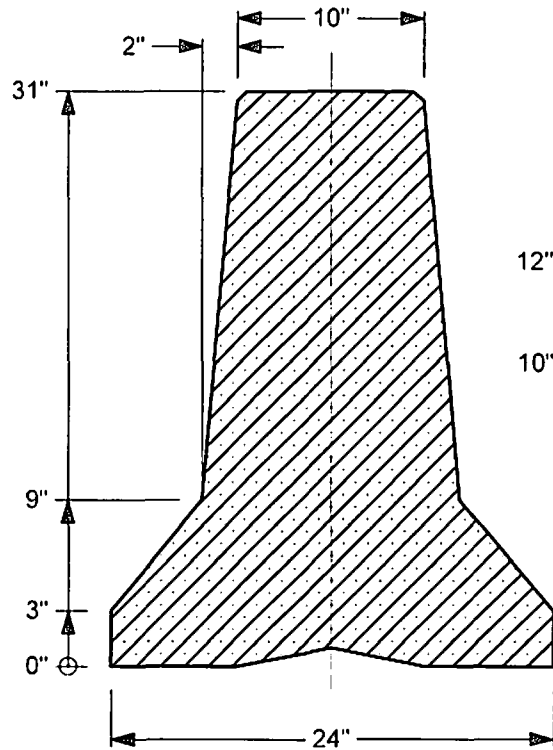
Drawn By GES Scale 1:20 Sheet 4 of 6 Barriers 5-14

Barriers 1-4 and 15-20

J-J Hook Connection

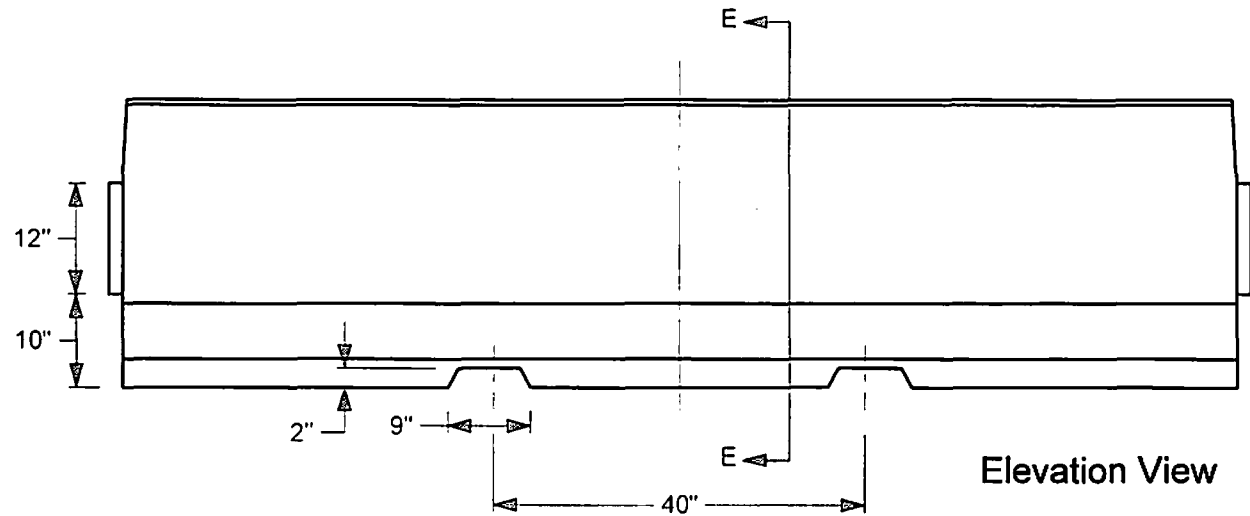


Plan View



Section E-E

Scale 1 : 10



Elevation View



Roadside Safety and
Physical Security Division -
Proving Ground

Project 690900-IND-3 Indiana Barriers

2015-05-14

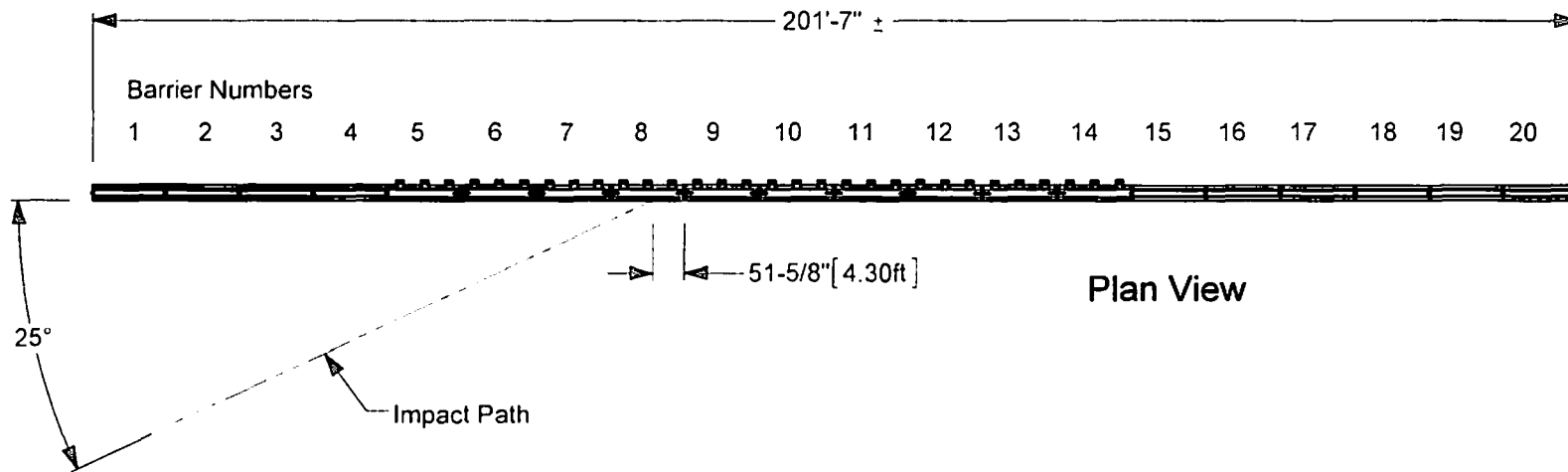
Drawn By GES

Scale 1:20

Sheet 5 of 6

Barriers 1-4 and 15-20

Impact Path

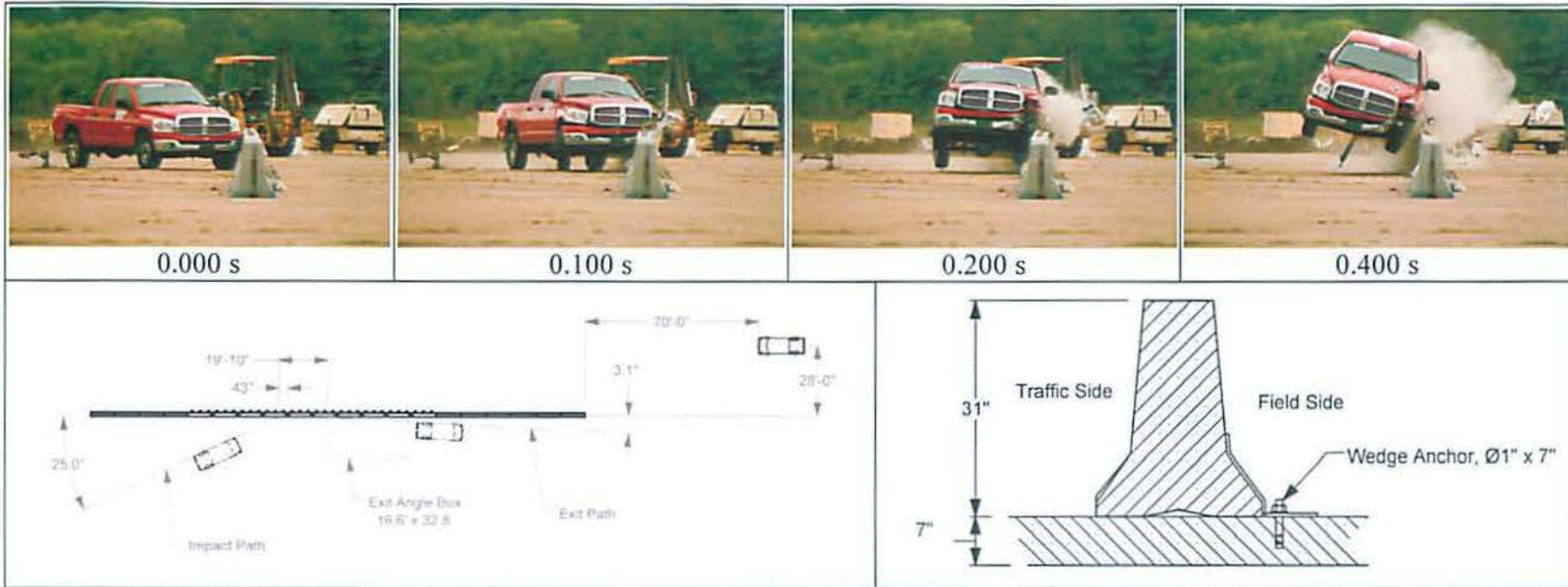


Roadside Safety and
Physical Security Division -
Proving Ground

Project 690900-IND-3 Indiana Barriers

2015-05-14

Drawn By GES Scale 1:20 Sheet 6 of 6 Impact Path



<p>General Information</p> <p>Test Agency Texas A&M Transportation Institute (TTI) Test Standard Test No. MASH Test 3-11 TTI Test No. 690900-IND3 Date 2015-05-19</p> <p>Test Article</p> <p>Type Temporary Concrete Barrier Name Indiana Anchored Temporary Barrier with Wedge Anchor Studs and Modified Top Connectors Installation Length Material or Key Elements 10-ft F-shape concrete barriers anchored with steel anchor brackets, wedge anchor studs, and 2-bolt top plates</p> <p>Soil Type and Condition..... Concrete pavement, dry</p> <p>Test Vehicle</p> <p>Type/Designation 2270P Make and Model 2008 Dodge Ram 1500 Pickup Curb 4956 lb Test Inertial 5021 lb Dummy No dummy Gross Static 5021 lb</p>	<p>Impact Conditions</p> <p>Speed 62.5 mi/h Angle 26.1 degrees Location/Orientation 43 inches upstream of 8-9</p> <p>Impact Severity 126.9 kip-ft (+9.9%)</p> <p>Exit Conditions</p> <p>Speed 53.9 mi/h Angle 3.8 degrees</p> <p>Occupant Risk Values</p> <p>Longitudinal OIV 16.7 ft/s Lateral OIV 24.3 ft/s Longitudinal RDA 8.9 G Lateral RDA 10.8 G THIV 31.7 km/h PHD 11.8 G ASI 1.66</p> <p>Max. 0.050-s Average</p> <p>Longitudinal -7.8 G Lateral 12.7 G Vertical -4.5 G</p>	<p>Post-Impact Trajectory</p> <p>Stopping Distance 193.5 ft downstrm 28 ft twd field side</p> <p>Vehicle Stability</p> <p>Maximum Yaw Angle 30 degrees Maximum Pitch Angle 25 degrees Maximum Roll Angle 26 degrees Vehicle Snagging No Vehicle Pocketing No</p> <p>Test Article Deflections</p> <p>Dynamic 13.3 inches Permanent 4.5 inches Working Width 30.1 inches</p> <p>Vehicle Damage</p> <p>VDS 11LFQ4 CDC 11FLEW3 Max. Exterior Deformation 20.0 inches OCCDI LF0000000 Max. Occupant Compartment Deformation 1.25 inches</p>
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Figure 5.10. Summary of Results for MASH Test 3-11 on the Indiana Anchored Temporary Barrier with Wedge Anchor Studs and Modified Top Connection.