



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

March 26, 2019

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

In Reply Refer To:
HSST-1/ WZ - 381

Pexco, LLC
3110 70th Ave East
Tacoma, WA 98424

Dear Mr. Schulz:

This letter is in response to your May 1, 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 WZ - 381 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

Decision

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

- Type III Barricade with X-Tube upright and footing

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 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: Type III Barricade with X-Tube upright and footing

Type of system: Work Zone

Test Level: MASH Test Level 3

Testing conducted by: E-Tech Testing Services, Inc

Date of request: May 1, 2018

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

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 WZ-381 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 Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	April 25, 2018	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Craig Schulz	
	Company:	Pexco, LLC	
	Address:	3110 70th Ave East - Tacoma, WA 98424	
	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
'WZ': Crash Worthy Work Zone Traffic Control Devices	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	Type III Barricade with X-Tube upright and angle iron Footing	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:	Craig Schulz	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Pexco, LLC	Same as Submitter <input checked="" type="checkbox"/>
Address:	3110 70th Ave East - Tacoma, WA 98424	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.

Pexco, LLC is the manufacturer of the Barricade Panels - the product is sold as components and systems using uprights and feet as tested. These products are not protected by patents and have been sold for years on the open market.

Pexco, LLC sponsored certain crash tests of the X-Tube Angle Iron Type III barricade; these test were conducted by E-Tech Testing Services, an independent, wholly-owned subsidiary of Trinity Highway. Full crash testing of the product was conducted in June of 2017.

PRODUCT DESCRIPTION

New Hardware or Significant Modification
 Modification to Existing Hardware

This product has been in successful use on the Nations highways for years, the testing was conducted to be compliant to MASH guidelines for 12/31/2019 Sunset Dates for WZ products. The product is used to warn, close or inform roadway users to potential hazards and direct movement.

The product consists of three primary components:

- 1.) Three 1" X 8" UV stabilized High Density Polyethylene (HDPE) Hollow boards which are available sheeted with retroreflective tape in a variety of lengths from 4' -12' in length (12' was tested as this is worst case).
- 2.) Two Polymer Rigid Polyvinyl Chloride (RPVC) X-Tube Uprights 1.75" x 1.75" x 60" upright.
- 3.) Two of the 14 gauge angle iron steel feet 60" long.

The board are fastened to the uprights with standard nuts and bolts. The assembly is pinned to the feet with a quick release pin to withstand accidental removal, although designed to give on impact.

The entire assembly weighed in at 19.5 kg (42.9 lbs)

No sandbags or lights were used in testing.

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:	Paul Kruse	
Engineer Signature:	Paul Kruse	Digitally signed by Paul Kruse Date: 2018.05.03 06:53:49 -07'00'
Address:	3617B Cincinnati Ave. - Rocklin, CA 95765	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-70 (1100C)	Test not required as test article is less than 100kg	Non-Relevant Test, not conducted

Required Test Number	Narrative Description	Evaluation Results
3-71 (1100C)	<p>E-TECH Test 81-0461-001 Test Date 6-27-2017</p> <p>Per MASH, the test article is to be impacted on the critical impact point (CIP) at the critical impact angle (CIA) with an impacting 1100C vehicle at 100 km/hr. The orientations chosen were to impact the test article at 0 and 90 degrees. The vehicle used was a Grey primered black 2012 Ford Fiesta sedan.</p> <p>The actual impact velocities were 101.6 km/h and 100.1 km/h for the 0 and 90 deg sign stands, respectively. The point of impact was determined as the test vehicle's centerline passing through the center of the sign stands.</p> <p>For the 0 deg test article, the 1100C vehicle's front bumper first impacted the lower HPDE panel of the test article. As the lower panel began to wrap around the vehicles bumper and the vertical uprights began to twist, the bottom of the middle panel contacted the vehicle's hood. The lower panel detached from the rest of the test article and remained wrapped around the vehicle's front bumper, fenders, front wheels and front doors. The test article then slid up the vehicle's hood and windshield slightly elevating the test article off the ground. The bottom of top panel contacted the vehicle's roof and slid over the top of the vehicle. As the vehicle passed under the test article, the feet twisted under the test vehicle from the sides between the front and rear wheels. The rear wheels then rolled over the feet deforming them. The test article slid to a stop and remained upright.</p> <p>For the 90 deg test article, the 1100C vehicle's front bumper first impacted the cantilevered lower HDPE panel of the test article. The lower panel was pushed forward then buckled as the uprights began to deform. The lower corner of the middle panel then contacted the test vehicle's hood and buckled as it slid up towards the windshield. The lower corner of the upper panel initially contacted the vehicle's windshield and cracked/deformed the windshield as the panel began to buckle. The entire test article remained forward of the windshield and continued to push forward. Pieces of the test article began to separate as the vehicle came to rest.</p>	PASS

3-72 (2270P)	<p>E-TECH Test 81-0461-002 Test Date: 6-28-2017</p> <p>Per MASH, the test article is to be impacted on the critical impact point (CIP) at the critical impact angle (CIA) with an impacting 2270P vehicle at 100 km/hr. The orientations chosen were to impact the test article at 0 and 90 degrees. The test was run on June 28, 2017 using a grey primer over silver 2011 Dodge Ram 1500 Crew Cab pickup truck.</p> <p>The actual impact velocities were 101.7 km/h and 100.4 km/h for the 0 and 90 deg sign stands, respectively.</p> <p>For the 0 deg test article, the 2270P vehicle's front bumper first impacted the lower HDPE panel of the test article and the grill impacted the middle panel. As the uprights began to buckle, one of the angle iron feet contacted the passenger running board under the passenger front door and tore the outer sheet metal skin. There was no additional damage/penetration beyond the outer layer.</p> <p>For the 90 deg test article, the 2270P vehicle's front bumper and grill first impacted the cantilevered lower and middle HDPE panels of the test article respectively. The lower corner of the top panel then contacted the test vehicle's hood but did not approach the windshield as it was still attached to the upright in front of the vehicle.</p> <p>The test vehicle sustained negligible damage to the front bumper, hood and roof. The front plastic grill was damaged and slightly displaced. As the legs of the barricade (0 deg orientation only) wrapped around the front end of the vehicle, the leg of the test article temporarily lodged into the vehicle's rocker panel but did not enter the occupant compartment whatsoever. There was no damage to the windshield. The damage to the test vehicle was categorized as FC-0 (negligible) on the Vehicle Damage Index and as 12FCLW0 (negligible) on the Collision Deformation Classification Scale along the principal direction of force. There was negligible deformation to the occupant compartment based upon pre and post-test measurements. The Vehicle Compartment Deformation Index (VCDI) was categorized as AS0000000 as there was no measurable or visual deformation of the occupant compartment.</p>	PASS
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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:	E-Tech Testing Services, Inc.	
Laboratory Signature:	Timothy Mortensen Digitally signed by Timothy Mortensen Date: 2018.05.03 11:57:32 -07'00'	
Address:	3617B Cincinnati Ave. Rocklin, CA 95765	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	A2LA Certificate 0989.01 (1/12/2018 - 11/30/2019)	

Submitter Signature*: **Craig Schulz** Digitally signed by Craig Schulz
Date: 2018.05.22 12:53:26 -07'00'

Submit Form

ATTACHMENTS

Attach to this form:

- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[Hardware Guide Drawing Standards](#)]. For proprietary products, a single isometric line drawing is usually acceptable to illustrate the product, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are relevant to understanding the dimensions and performance of the device should also be submitted to facilitate our review.

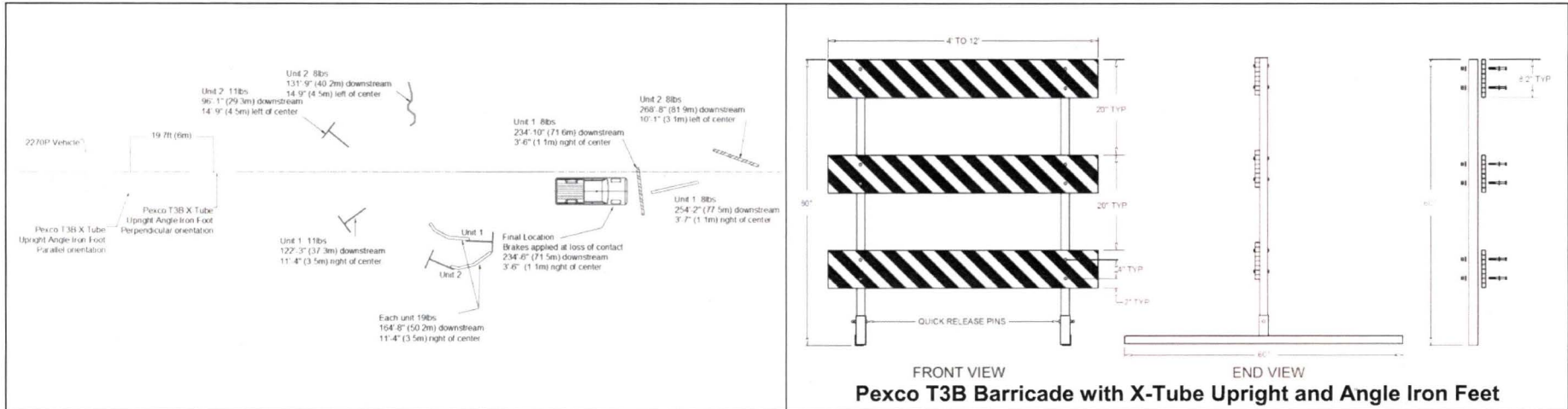
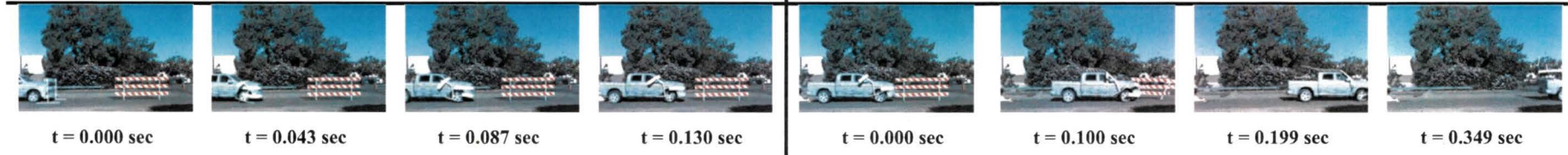
FHWA Official Business Only:

Eligibility Letter		Key Words
Number	Date	



Normal (0 deg) Orientation

Perpendicular (90 deg) Orientation



General Information

Test Agency E-TECH Testing Services
 Test Designation MASH Test 3-72
 Test No. 81-0461-002
 Date 6/28/2017

Test Article

Type Pexco
 12 m wide T3B Barricade with X-Tube Upright and Angle Iron Feet Work-Zone Traffic Control Device
 Dimensions 1.52 m OA Height x 3.66 m Wide
 Installation Details Three horizontal panels measuring 1.52 m, 1.02 m and 0.51 m high (Top of Panel to Grade)
 Material and Key and Elements 19.5 kg Complete, Steel Legs, RPVC Uprights and (3) 3.66 m wide HDPE Panels with Reflective Sheeting
 Foundation Type Asphalt, clean and dry and Condition

Test Vehicle

Type Production Model
 Designation 2270P
 Model 2011 Dodge Ram 1500
 Curb 2285.0 kg
 Test Inertial 2275.0 kg
 Dummy N/A
 Gross Static 2275.0 kg

Impact Conditions

Speed (Normal Orientation) 101.7 kph
 Speed (Perpendicular Orientation) 100.4 kph
 Impact Severity (Normal Orientation) 908.0 kJ
 Impact Severity (Perp. Orientation) 884.7 kJ

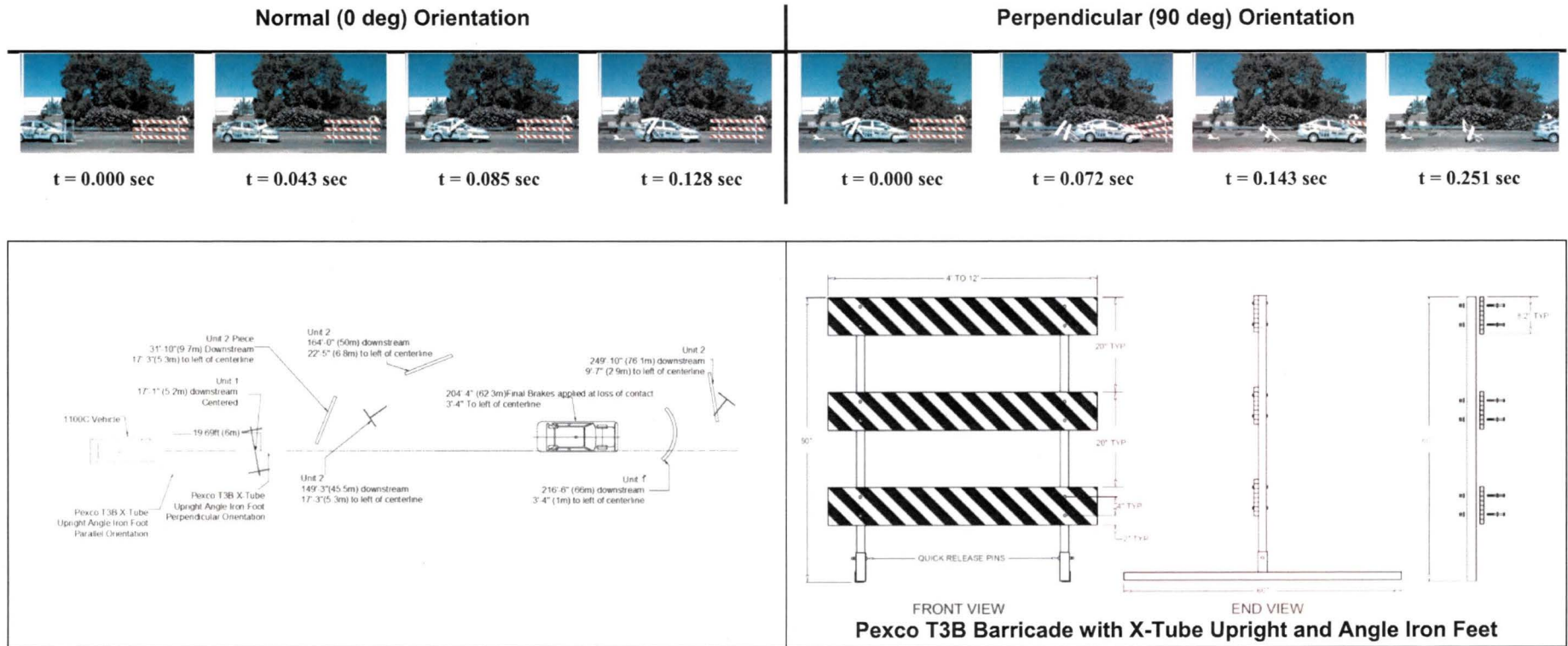
Exit Conditions

Speed (Normal Orientation) 100.4 kph
 Speed (Perpendicular Orientation) 99.8 kph
 Angle (deg) 0

Vehicle Damage

Exterior
 VDS FC-0 (negligible)
 CDC 12FCLW0 (negligible)
 Occupant Compartment Deformation
 Windshield N/A
 All other areas N/A

Figure 7 - Summary of Results – Pexco T3B Barricade with X-Tube Upright and Angle Iron Feet Test 81-0461-002



General Information

Test Agency E-TECH Testing Services
 Test Designation MASH Test 3-71
 Test No. 81-0461-001
 Date 6/27/2017

Test Article

Type Pexco
 12 m wide T3B Barricade with
 X-Tube Upright and Angle Iron Feet
 Work-Zone Traffic Control Device
 Dimensions 1.52 m OA Height x 3.66 m Wide
 Installation Details Three horizontal panels measuring 1.52 m,
 1.02 m and 0.51 m high (Top of Panel to Grade)
 Material and Key 19.5 kg Complete, Steel Legs, RPVC Uprights
 and Elements and (3) 3.66 m wide HDPE Panels with Reflective
 Sheeting
 Foundation Type Asphalt, clean and dry
 and Condition

Test Vehicle

Type Production Model
 Designation 1100C
 Model 2012 Ford Fiesta Sedan
 Curb 1139.0 kg
 Test Inertial 1118.0 kg
 Dummy N/A
 Gross Static 1118.0 kg

Impact Conditions

Speed (Normal Orientation) 101.6 kph
 Speed (Perpendicular Orientation) 100.1 kph
 Impact Severity (Normal Orientation) 445.6 kJ
 Impact Severity (Perp. Orientation) 432.2 kJ

Exit Conditions

Speed (Normal Orientation) 100.1 kph
 Speed (Perpendicular Orientation) 99.4 kph
 Angle (deg) 0

Vehicle Damage

Exterior
 VDS FC-0 (negligible)
 CDC 12FCLW0 (negligible)
 Occupant Compartment Deformation
 Windshield 25 mm (max)
 All other areas Negligible

Figure 2 - Summary of Results – Pexco T3B Barricade with X-Tube Upright and Angle Iron Feet Test 81-0461-001



APPENDICES

Appendix A - Details of Test Article

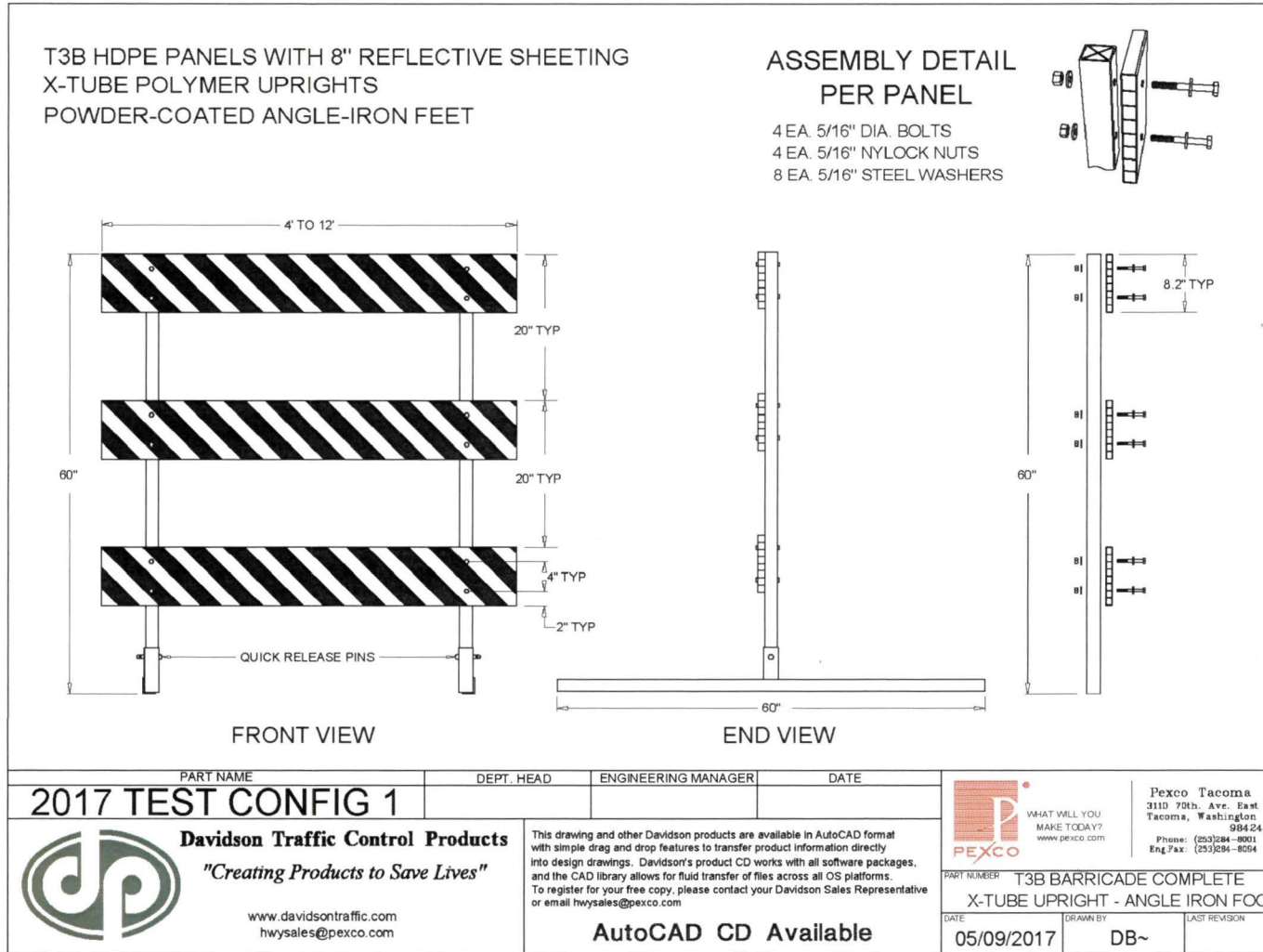


Illustration 1 – Pexco T3B Barricade with X-Tube Upright and Angle Iron Feet Technical Drawing

Yassin, Menna (FHWA)

From: Craig Schulz <Craig.Schulz@pexco.com>
Sent: Tuesday, March 19, 2019 10:48 AM
To: Yassin, Menna (FHWA)
Subject: RE: Data not visible on form

Importance: High

Hello Menna,

This is your form how can I add to it, I have no edit or author authorities?

Here is the complete text copied out of the forms you just sent back pasted in this email.

X-TUBE and Angle Iron Footing

3-71 (1100C)

-TECH Test 81-0461-001

Test Date 6-27-2017

Per MASH, the test article is to be impacted on the critical impact point (CIP) at the critical impact angle (CIA) with an impacting 1100C vehicle at 100 km/hr. The orientations chosen were to impact the test article at 0 and 90 degrees. The vehicle used was a Grey primered black 2012 Ford Fiesta sedan.

The actual impact velocities were 101.6 km/h and 100.1 km/h for the 0 and 90 deg sign stands, respectively. The point of impact was determined as the test vehicle's centerline passing through the center of the sign stands.

For the 0 deg test article, the 1100C vehicle's front bumper first impacted the lower HPDE panel of the test article. As the lower panel began to wrap around the vehicles bumper and the vertical uprights began to twist, the bottom of the middle panel contacted the vehicle's hood. The lower panel detached from the rest of the test article and remained wrapped around the vehicle's front bumper, fenders, front wheels and front doors. The test article then slid up the vehicle's hood and windshield slightly elevating the test article off the ground. The bottom of top panel contacted the vehicle's roof and slid over the top of the vehicle. As the vehicle passed under the test article, the feet twisted under the test vehicle from the sides between the front and rear wheels. The rear wheels then rolled over the feet deforming them. The test article slid to a stop and remained upright.

For the 90 deg test article, the 1100C vehicle's front bumper first impacted the cantilevered lower HDPE panel of the test article. The lower panel was pushed forward then buckled as the uprights began to deform. The lower corner of the middle panel then contacted the test vehicle's hood and buckled as it slid up towards the windshield. The lower corner of the upper panel initially contacted the vehicle's windshield and cracked/deformed the windshield as the panel began to buckle. The entire test article remained forward of the windshield and continued to push forward. Pieces of the test article began to separate as the vehicle came to rest.

No portion of the test articles engaged the undercarriage of the vehicle thus there was no notable damage to the undercarriage of the test vehicle (i.e. floor pan, foot well, oil pan, gas tank, trunk, etc.).

The test vehicle sustained negligible damage to the front bumper, hood and roof. As the ends of the barricade (0 deg orientation only) wrapped around the front end of the car, it contacted the driver mirror which partially detached. There was deformation on the windshield from direct contact from the HDPE panel with reflective sheeting (90

deg orientation only) which resulted in localized deformation, with 25 mm max. deformation. The damage to the test vehicle was categorized as FC-0 (negligible) on the Vehicle Damage Index and as 12FCLW0 (negligible) on the Collision Deformation Classification Scale along the principal direction of force. There was negligible deformation to the occupant compartment based upon pre and post-test measurements. The Vehicle Compartment Deformation Index (VCDI) was categorized as AS0000000 as there was no measurable or visual deformation of the occupant compartment.

The device was reviewed as successfully meeting all MASH evaluation criteria, for test 3-71 under both normal and perpendicular orientations.

3-72 (2270P)
E-TECH Test 81-0461-002
Test Date: 6-28-2017

Per MASH, the test article is to be impacted on the critical impact point (CIP) at the critical impact angle (CIA) with an impacting 2270P vehicle at 100 km/hr. The orientations chosen were to impact the test article at 0 and 90 degrees. The test was run on June 28, 2017 using a grey primer over silver 2011 Dodge Ram 1500 Crew Cab pickup truck.

The actual impact velocities were 101.7 km/h and 100.4 km/h for the 0 and 90 deg sign stands, respectively.

For the 0 deg test article, the 2270P vehicle's front bumper first impacted the lower HDPE panel of the test article and the grill impacted the middle panel. As the uprights began to buckle, one of the angle iron feet contacted the passenger running board under the passenger front door and tore the outer sheet metal skin. There was no additional damage/penetration beyond the outer layer.

For the 90 deg test article, the 2270P vehicle's front bumper and grill first impacted the cantilevered lower and middle HDPE panels of the test article respectively. The lower corner of the top panel then contacted the test vehicle's hood but did not approach the windshield as it was still attached to the upright in front of the vehicle.

The test vehicle sustained negligible damage to the front bumper, hood and roof. The front plastic grill was damaged and slightly displaced. As the legs of the barricade (0 deg orientation only) wrapped around the front end of the vehicle, the leg of the test article temporarily lodged into the vehicle's rocker panel but did not enter the occupant compartment whatsoever. There was no damage to the windshield. The damage to the test vehicle was categorized as FC-0 (negligible) on the Vehicle Damage Index and as 12FCLW0 (negligible) on the Collision Deformation Classification Scale along the principal direction of force. There was negligible deformation to the occupant compartment based upon pre and post-test measurements. The Vehicle Compartment Deformation Index (VCDI) was categorized as AS0000000 as there was no measurable or visual deformation of the occupant compartment.

No portion of the test articles engaged the undercarriage of the vehicle thus there was no notable damage to the undercarriage of the test vehicle (i.e. floor pan, foot well, oil pan, gas tank, trunk, etc.).

Craig Schulz | Pexco LLC
Global Sales / Product Line Manager - Traffic
3110 70th Ave East | Tacoma, WA 98424
Office: (253) 284-8005 | Cell: (253) 886-7171 | Fax: (253) 284-8080
Email: craig.schulz@pexco.com Visit us at: www.pexco.com

From: Yassin, Menna (FHWA) <menna.yassin@dot.gov>
Sent: Tuesday, March 19, 2019 7:33 AM
To: Craig Schulz <Craig.Schulz@pexco.com>
Subject: Data not visible on form

Hello Mr. Schulz,

We are in the final stage of review for the X-Tube and the PSST barrier, but unfortunately there is an issue with the eligibility form information, the text is not visible on some of the pages. Would you be able to send me another form for both devices that includes the remaining text (you can copy and past the invisible text to another page). As of now the text is being cut off (page 4 is blank) for test 3-71 and for test 3-72 also has missing text. Examples below. I've attached the versions of the forms I have.

	The entire test article remained forward of the windshield and continued to push forward. Pieces of the test article began to separate as the vehicle came to rest.		
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	measurements. The Vehicle Compartment Deformation Index (VCDI) was categorized as ASD000000 as there was no measurable or visual deformation of the occupant compartment.		
Version 10.0 (05/16) Page 6 of 6			
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.):			

Sincerely,
Menna Yassin, PE
Highway Safety Engineer | Safety Design Team
USDOT, Federal Highway Administration | Office of Safety
1200 New Jersey Avenue, SE
Washington, DC 20590
Phone: 202-366-2833
Email: Menna.Yassin@dot.gov



U.S. Department of Transportation
Federal Highway Administration