



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

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

June 21, 2011

In Reply Refer To:  
HSST/WZ-304

Mr. Greg Hannah, President  
Impact Recovery Systems  
4955 Stout Drive  
San Antonio, TX 78219

Dear Mr. Hannah:

This is in response to your February 7, letter requesting the Federal Highway Administration's (FHWA) acceptance of your company's Tuff Curb® XLP traffic channelizer as a crashworthy traffic control device for use in work zones and elsewhere on the National Highway System (NHS). Accompanying your letter was the FHWA Office of Safety Design form indicating successful performance when tested under the American Association of Safety Highway Transportation Officials Manual for Assessing Safety Hardware.

Tuff Curb® XLP is a longitudinal channelizing curb system produced by Impact Recovery Systems, Inc. Tuff Curb® XLP consists of two pieces. One is a single piece curb section measuring 40"L x 8"W x 2"H made of High Density Polyethylene and weighing approximately seven (7) pounds. It is attached to the roadway by way of lag bolts through three (3) anchor holes within the curb. The second piece is a coupler which bridges between curb sections, measuring 10"L x 8"W x 1.75"H also made of High Density Polyethylene and weighing approximately 2 pounds. It is attached to the roadway by way of two anchor holes which are co-aligned with adjoining curb sections and anchors by way of the same lag bolt. The Tuff Curb® XLP was subjected to a total of 8 impact tests as note in the enclosures.

This letter is the acknowledgement of the FHWA's acceptance of your request. The original completed form has been modified by the addition of the FHWA acceptance letter number and the date of our review. The form, of which a copy is enclosed for reference, will be posted on our Web site in the near future.

Sincerely yours,

Michael S. Griffith  
Director, Office of Safety Technologies  
Office of Safety

Enclosures



FHWA: HSST: NArtimovich: ms: x61331:6/9/11  
File: [h://directory folder/HSST/WZ-304\\_Tuff Curb.docx](h://directory folder/HSST/WZ-304_Tuff Curb.docx)  
cc: HSST Nick Artimovich



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WZ-304

Attachment 1

Page 1	<b>FEDERAL HIGHWAY ADMINISTRATION OFFICE OF SAFETY DESIGN</b>		Letter Number
	<b>Category 2 Work Zone Device Acceptance Letter</b>		Date
			02/23/2011
Contact Info	Petitioner / Developer Name and Address:		
	Impact Recovery Systems, Inc., c/o Greg Hannah 4955 Stout Drive San Antonio, TX 78219		
	I hereby certify that the device(s) covered by this Acceptance Letter meet(s) the crash - worthiness test and evaluation requirements of the FHWA and <del>NCHRP Report 350</del> .		* 2009 MASH
Signature	<i>Greg Hannah</i>		
Telephone #	(800) 736-5256		
Email Address	ghannah@impactrecovery.com		
	Laboratory / Engineer Name and Address		
	Texas Transportation Institute, Texas A&M University 3135 TAMU College Station, TX 77843-3135		
<input checked="" type="checkbox"/>	I hereby certify that the testing that supports this Acceptance Letter was conducted in accordance with <del>NCHRP Report 350</del> guidelines, that the device(s) tested is/are accurately described on this form, and that the test results indicate that the device meets all applicable <del>NCHRP Report 350</del> evaluation criteria.		* 2009 MASH
<input type="checkbox"/>	I have evaluated the requested modifications to these devices previously found acceptable by the FHWA in Acceptance Letter WZ-___, and hereby certify that, in my opinion, the modifications do not adversely affect the crash performance of the devices. I also certify that these devices are accurately described on this form.		
Signature	<i>D. Arrington</i>		
Telephone #	(979) 845-6375		
Email Address	d-arrington@ttimail.tamu.edu		
Keywords:			
	Type of Device (See page 3) Longitudinal Channelizing Barricade Curb (Curb channelizer system with or without road Composition of Sign or Rail substrate (See Page 3)		
	Thickness of substrate (inches):		
	Height of sign from the ground (inches), if applicable: (See Page 3)		
	Flags and or lights present during test? Indicate number of each:		
	# of flags:	# of lights:	Weight of lights: ea.
Device Name	Tuff Curb XLP		
Detailed Desc. Of Device, Materials, sizes, Fasteners, Substrates Foundation, Aux. Features Ballast, etc.	(May be attached on separate page(s) Tuff Curb® XLP is a longitudinal channelizing curb system consisting of two pieces. One is a single piece curb section measuring 40"L x 8"W x 2"H made of HDPE and weighing approximately seven (7) pounds. It is attached to the roadway by way of lag bolts through three (3) anchor holes within the curb. The second piece is a coupler which bridges between curb sections, measuring 10"L x 8"W x 1.75"H also made of HDPE, weighing approximately 2 pounds and attached coaxially with the curb section.		

Page 2	<b>FEDERAL HIGHWAY ADMINISTRATION OFFICE OF SAFETY DESIGN</b>		Letter Number
	<b>Category 2 Work Zone Device Acceptance Letter</b>		Date
			02/23/2011
	<b>Mandatory Attachments</b>		
	<b>Attachment # 1:</b> Test data summary page(s)		
	Attach. #1a	Test #	IRS6-9 - 12
	Attach. #1b	Test #	IRS6-13 - 16
	Attach. #1c	Test #	
	Attach. #1d	Test #	
Alternative	<b>Attachment # 1:</b> Description and discussion of modification(s) to crash tested and/or accepted device.		
	Date: 02/23/2011		
	<b>Attachment # 2:</b> PDF drawing(s) of device(s)		
	Attach. #2a	Drawing Title:	TUFF CURB XLP
		Drawing #:	
	Attach. #2b	Drawing Title:	TUFF CURB XLP COUPLER
		Drawing #:	
	Attach. #2c	Drawing Title:	
		Drawing #:	
	Attach. #2d	Drawing Title:	
		Drawing #:	
	Attach. #2e	Drawing Title:	
		Drawing #:	
	Attach. #2f	Drawing Title:	
		Drawing #:	
	Attach. #2g	Drawing Title:	
		Drawing #:	

Page 3	<b>FEDERAL HIGHWAY ADMINISTRATION OFFICE OF SAFETY DESIGN Category 2 Work Zone Device Acceptance Letter</b>	Letter Number
		Date
		02/23/2011

**Please select from the following Keywords for "Type of Device":**

- Longitudinal Channelizing Barricade
- Curb (Curb channelizer system with or without road tubes or other channelizers)
- Drum
- H-Footprint Sign Stand
- X-Footprint Sign Stand
- Trailer Mounted Signs (Does not include arrow boards or variable message signs or other Category 4 trailer mounted devices.)
- Automated Flagger Device (not trailer mounted)
- Tripod Sign Stand
- Type I Barricade
- Type II Barricade
- Type III Barricade
- Vertical Panel
- Intrusion Detector
- Ballast (Action relates to ballast on one or more devices)
- Channelizer (Individual units unlike cones, road tubes, or drums)

**Please select from the following Keywords for "Sign Substrate":**

- Roll-up / Fabric (with fiberglass spreaders – aluminum or steel spreaders are not allowed.)
- Plywood
- Aluminum – Solid
- Aluminum – Laminate
- Corrugated Plastic
- Extruded Plastic
- Waffleboard Plastic
- Wood / Lumber

**Please select from the following Keywords for "Height of Sign":**

The distance to the lowest point on the sign is:

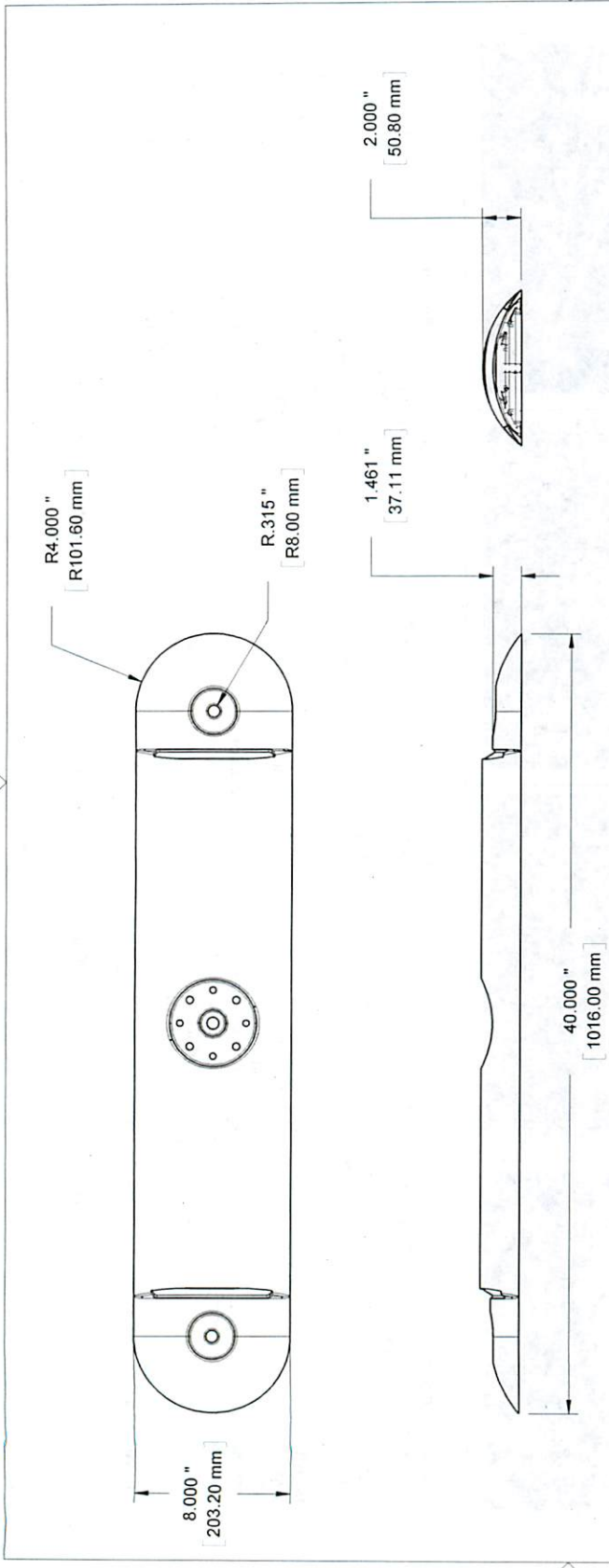
- Low            12 to 18 inches above the pavement
- Mid-A        20 to 24 inches above the pavement
- Mid-B        25 to 36 inches above the pavement
- Mid-C        37 to 59 inches above the pavement
- Tall           60 to 71 inches above the pavement
- Oversized    72 inches and taller

Page 4	FEDERAL HIGHWAY ADMINISTRATION OFFICE OF SAFETY DESIGN Category 2 Work Zone Device Acceptance Letter		Letter Number
			Date

Please note the following standard provisions that apply to FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, or conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of FHWA and NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- If the subject of this letter is a patented device it is considered "proprietary." The use of proprietary work zone traffic control devices in Federal-aid projects is generally of a temporary nature. They are *selected by the contractor* for use as needed and removed upon completion of the project. Under such conditions they can be presumed to meet requirement "a" given below for the use of proprietary products on Federal-aid projects. On the other hand, if proprietary devices are *specified by a highway agency* for use on Federal-aid projects they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with 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, a copy of which is enclosed.
- This Acceptance Letter shall not be construed as authorization or consent by the Federal Highway Administration to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The Acceptance Letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

WZ-304



**MANUFACTURING INFORMATION**

- 1. INJECTION MOLDED
- 2. UV STABILIZED HDPE
- 3. COLORS: WHITE, YELLOW, CUSTOM

**INTENDED USE**

- 1. FOR USE AS A TEMPORARY OR PERMANENT LONGITUDINAL CHANNELIZING CURBING SYSTEM ON ROADS, HIGHWAYS, AND PARKING LOTS.
- 2. CRASHWORTHINESS TESTED TO 2009 M.A.S.H. STANDARDS.
- 3. INSTALL USING 1/2"-5/8" CONCRETE LAG ANCHORS OR STANDARD ROAD EPOXY PRODUCTS



	4955 STOUT DR. · SAN ANTONIO, TX 78219 · (800) 736-5256	SIZE: <b>A</b>	PART NO:	DWG: TUFF CURB® XLP	REV:
	"Performance for a Safer Tomorrow"	SCALE: 1:8	IMPACT RECOVERY SYSTEMS, INC.	DATE: 02-10-11	DATE: 02-10-11



**General Information**

Test Agency..... Texas Transportation Institute  
 Test Standard Test No. .... MASH 3-91  
 Test No. .... 400001-IRS6-9 through IRS6-12  
 Date ..... 2011-01-19

**Test Article**

Type..... Curb/Longitudinal Channelizer  
 Name ..... Tuff Curb XLP with Coupler  
 Installation Length ..... 140 ft on long leg, 35 ft on short leg  
 Material or Key Elements ..... High-Density Polyethylene 2 inches tall x 8 inches wide x 40 inches long anchored with 4-inch x 1/2-inch wedge bolts

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

**Test Vehicle**

Designation.....2270P  
 Model.....2003 Dodge Ram 1500  
 Mass  
 Curb.....4760 lb  
 Test Inertial.....4760 lb  
 Driver..... 190 lb  
 Gross Static.....4950 lb

**Impact Conditions**

Speed .....62 mi/h  
 Angle .....Varies as above

**Test Article Deflections**

Dynamic .....0  
 Permanent .....0

**Vehicle Damage**

Exterior  
 VDS.....N/A  
 CDC .....12UDFW1  
 Max. Exterior  
 Vehicle Crush.....0  
 Interior  
 OCDI .....FS0000000  
 Max. Occupant Compartment  
 Deformation.....0

Figure 4. Summary of results for MASH test 3-91 on the Tuff Curb XLP with Coupler.



Table 6. Performance evaluation summary for MASH test 3-91 on the Tuff Curb XLP with Coupler.

Test Agency: Texas Transportation Institute

Test No.: 400001-IRS6-9 -- IRS 6-12

Date: 2011-01-19

MASH Evaluation Criteria	Test Results	Assessment
<b>Structural Adequacy</b>		
C. <i>Acceptable test article performance may be by redirection, controlled penetration, or controlled stopping of the vehicle.</i>	In all maneuvers, the 2270P vehicle penetrated the Tuff Curb XLP installation.	Pass
<b>Occupant Risk</b>		
D. <i>Detached elements, fragments, or other debris from the test article should not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformations of, or intrusions into, the occupant compartment should not exceed limits set forth in Section 5.3 and Appendix E of MASH.</i>	Only very small, if any, debris were present during any of the maneuvers. However, these debris did not penetrate, show potential for penetrating, nor to present undue hazard to others in the area. No occupant compartment deformations or intrusions occurred during any of the maneuvers with the 2270P vehicle.	Pass  Pass
E. <i>Detached elements, fragments, or other debris from the test article, of vehicular damage should not block the driver's vision or otherwise cause the driver to lose control of the vehicle.</i>	No blockage of the driver's vision occurred during any of the maneuvers with the 2270P vehicle.	Pass
F. <i>The vehicle should remain upright during and after collision. The maximum roll and pitch angles are not to exceed 75 degrees.</i>	The 2270P vehicle remained upright and stable during and after all maneuvers.	Pass
H. <i>Longitudinal and lateral occupant impact velocities should fall below the preferred value of 3.0 m/s (9.8 ft/s), or at least below the maximum allowable value of 5.0 m/s (16.4 ft/s).</i>	The vehicle was not instrumented with accelerometers.	N/A
I. <i>Longitudinal and lateral occupant ridedown accelerations should fall below the preferred value of 15.0 Gs, or at least below the maximum allowable value of 20.0 Gs.</i>	The vehicle was not instrumented with accelerometers.	N/A
<b>Vehicle Trajectory</b>		
N. <i>Vehicle trajectory behind the test article is acceptable.</i>	The 2270P vehicle exited behind the installation.	Pass



**General Information**

Test Agency..... Texas Transportation Institute  
 Test Standard Test No. .... MASH 3-90  
 Test No. .... 400001-IRS6-13 through IRS6-16  
 Date ..... 2011-01-19

**Test Article**

Type..... Curb/Longitudinal Channelizer  
 Name ..... Tuff Curb XLP with Coupler  
 Installation Length ..... 140 ft on long leg, 35 ft on short leg  
 Material or Key Elements ..... High-Density Polyethylene 2 inches tall x  
 8 inches wide x 40 inches long anchored with  
 4-inch x 1/2-inch wedge bolts

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

**Test Vehicle**

Designation.....1100C  
 Model.....2004 Kia Rio  
 Mass  
 Curb.....2310 lb  
 Test Inertial.....2310 lb  
 Driver.....190 lb  
 Gross Static.....2500 lb

**Impact Conditions**

Speed .....62 mi/h  
 Angle .....Varies as above

**Test Article Deflections**

Dynamic ..... 0  
 Permanent..... 0

**Vehicle Damage**

Exterior  
 VDS..... N/A  
 CDC ..... 12UDFW1  
 Max. Exterior  
 Vehicle Crush..... 0  
 Interior  
 OCDI ..... FS0000000  
 Max. Occupant Compartment  
 Deformation ..... 0

Figure 3. Summary of results for MASH test 3-90 on the Tuff Curb XLP with Coupler.

Table 7. Performance evaluation summary for MASH test 3-90 on the Tuff Curb XLP with Coupler.

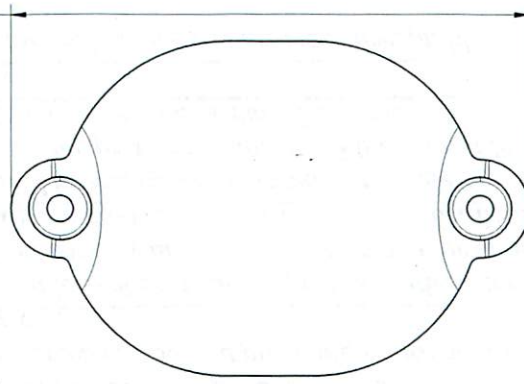
Test Agency: Texas Transportation Institute

Test No.: 400001-IRS13—IRS16

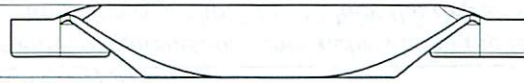
Test Date: 2011-01-19

MASH Evaluation Criteria	Test Results	Assessment
<b>Structural Adequacy</b>		
C. <i>Acceptable test article performance may be by redirection, controlled penetration, or controlled stopping of the vehicle.</i>	In all maneuvers, the 1100C vehicle penetrated the Tuff Curb XLP installation.	Pass
<b>Occupant Risk</b>		
D. <i>Detached elements, fragments, or other debris from the test article should not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformations of, or intrusions into, the occupant compartment should not exceed limits set forth in Section 5.3 and Appendix E of MASH.</i>	Only very small, if any, debris were present during any of the maneuvers. However, these debris did not penetrate, show potential for penetrating, nor to present undue hazard to others in the area. No occupant compartment deformations or intrusions occurred during any of the maneuvers with the 1100C vehicle.	Pass
E. <i>Detached elements, fragments, or other debris from the test article, of vehicular damage should not block the driver's vision or otherwise cause the driver to lose control of the vehicle.</i>	No blockage of the driver's vision occurred during any of the maneuvers with the 1100C vehicle.	Pass
F. <i>The vehicle should remain upright during and after collision. The maximum roll and pitch angles are not to exceed 75 degrees.</i>	The 1100C vehicle remained upright and stable during and after all maneuvers.	Pass
H. <i>Longitudinal and lateral occupant impact velocities should fall below the preferred value of 3.0 m/s (9.8 ft/s), or at least below the maximum allowable value of 5.0 m/s (16.4 ft/s).</i>	The vehicle was not instrumented with accelerometers.	N/A
I. <i>Longitudinal and lateral occupant ridedown accelerations should fall below the preferred value of 15.0 Gs, or at least below the maximum allowable value of 20.0 Gs.</i>	The vehicle was not instrumented with accelerometers.	N/A
<b>Vehicle Trajectory</b>		
N. <i>Vehicle trajectory behind the test article is acceptable.</i>	The 1100C vehicle exited behind the installation.	Pass

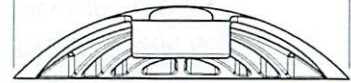
12.350 "  
313.69 mm



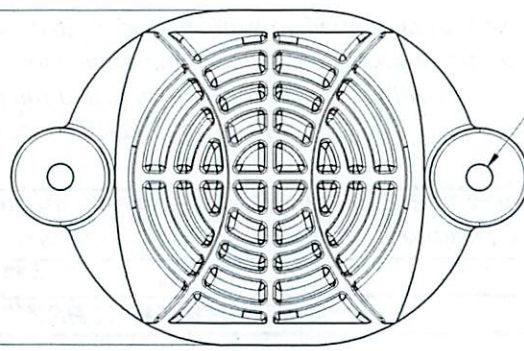
1.750 "  
44.45 mm



8.000 "  
203.20 mm



8.000 "  
203.20 mm



R.315 "  
R8.00 mm

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4955 STOUT DR. · SAN ANTONIO, TX 78219 · (800) 736-5256

SIZE <b>A</b>	PART NO.	DWG. TUFF CURB® XLP COUPLER	REV
SCALE 1:4	IMPACT RECOVERY SYSTEMS, INC.		DATE 02-10-11