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
<table>
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<tr>
<th><strong>FEDERAL HIGHWAY ADMINISTRATION</strong></th>
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<td><strong>OFFICE OF SAFETY DESIGN</strong></td>
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<td><strong>Category 2 Work Zone Device Acceptance Letter</strong></td>
</tr>
</tbody>
</table>

### Contact Info
**Petitioner / Developer Name and Address:**
Impact Recovery Systems, Inc., c/o Greg Hannah  
4956 Stout Drive  
San Antonio, TX 78219

**Signature:**
[Signature]

**Telephone #**
(800) 736-5256

**Email Address**
qhannah@impactrecovery.com

### Laboratory / Engineer Name and Address
**Texas Transportation Institute, Texas A&M University**  
3135 TAMU  
College Station, TX 77843-3135

**Signature:**
[Signature]

**Telephone #**
(979) 845-6375

**Email Address**
d-arrington@tmitmail.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)

### Device Name
**Device Name:** Tuff Curb XLP

### Detailed Desc. Of Device, Materials, sizes, Fasteners, Substrates, Foundation, Aux. Features, Ballast, etc.
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.
**FEDERAL HIGHWAY ADMINISTRATION**  
**OFFICE OF SAFETY DESIGN**  
**Category 2 Work Zone Device Acceptance Letter**

**Letter Number:**  
**Date:** 02/23/2011

### Mandatory Attachments

<table>
<thead>
<tr>
<th>Attachment #1: Test data summary page(s)</th>
</tr>
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<tbody>
<tr>
<td>Attach. #1a</td>
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<tr>
<td>Attach. #1b</td>
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<tr>
<td>Attach. #1c</td>
</tr>
<tr>
<td>Attach. #1d</td>
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</tbody>
</table>

### Alternative

**Attachment #1:** Description and discussion of modification(s) to crash tested and/or accepted device.

**Date:** 02/23/2011  
**Attachment #2:** PDF drawing(s) of device(s)

<table>
<thead>
<tr>
<th>Attach. #2a</th>
<th>Drawing Title: TUFF CURB XLP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attach. #2b</td>
<td>Drawing Title: TUFF CURB XLP COUPLER</td>
</tr>
<tr>
<td>Attach. #2c</td>
<td>Drawing Title:</td>
</tr>
<tr>
<td>Attach. #2d</td>
<td>Drawing Title:</td>
</tr>
<tr>
<td>Attach. #2e</td>
<td>Drawing Title:</td>
</tr>
<tr>
<td>Attach. #2f</td>
<td>Drawing Title:</td>
</tr>
<tr>
<td>Attach. #2g</td>
<td>Drawing Title:</td>
</tr>
</tbody>
</table>
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
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.
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
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.

<table>
<thead>
<tr>
<th>MASH Evaluation Criteria</th>
<th>Test Results</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structural Adequacy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Acceptable test article performance may be by redirection, controlled penetration, or controlled stopping of the vehicle.</td>
<td>In all maneuvers, the 2270P vehicle penetrated the Tuff Curb XLP installation.</td>
<td>Pass</td>
</tr>
<tr>
<td><strong>Occupant Risk</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. 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.</td>
<td>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.</td>
<td>Pass</td>
</tr>
<tr>
<td>E. 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.</td>
<td>No blockage of the driver’s vision occurred during any of the maneuvers with the 2270P vehicle.</td>
<td>Pass</td>
</tr>
<tr>
<td>F. The vehicle should remain upright during and after collision. The maximum roll and pitch angles are not to exceed 75 degrees.</td>
<td>The 2270P vehicle remained upright and stable during and after all maneuvers.</td>
<td>Pass</td>
</tr>
<tr>
<td>H. 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).</td>
<td>The vehicle was not instrumented with accelerometers.</td>
<td>N/A</td>
</tr>
<tr>
<td>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.</td>
<td>The vehicle was not instrumented with accelerometers.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Vehicle Trajectory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. Vehicle trajectory behind the test article is acceptable.</td>
<td>The 2270P vehicle exited behind the installation.</td>
<td>Pass</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>MASH Evaluation Criteria</th>
<th>Test Results</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structural Adequacy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Acceptable test article performance may be by redirection, controlled penetration, or controlled stopping of the vehicle.</td>
<td>In all maneuvers, the 1100C vehicle penetrated the Tuff Curb XLP installation.</td>
<td>Pass</td>
</tr>
<tr>
<td><strong>Occupant Risk</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. 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.</td>
<td>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.</td>
<td>Pass</td>
</tr>
<tr>
<td>E. 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.</td>
<td>No blockage of the driver’s vision occurred during any of the maneuvers with the 1100C vehicle.</td>
<td>Pass</td>
</tr>
<tr>
<td>F. The vehicle should remain upright during and after collision. The maximum roll and pitch angles are not to exceed 75 degrees.</td>
<td>The 1100C vehicle remained upright and stable during and after all maneuvers.</td>
<td>Pass</td>
</tr>
<tr>
<td>H. 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).</td>
<td>The vehicle was not instrumented with accelerometers.</td>
<td>N/A</td>
</tr>
<tr>
<td>I. Longitudinal and lateral occupant ride down accelerations should fall below the preferred value of 15.0 Gs, or at least below the maximum allowable value of 20.0 Gs.</td>
<td>The vehicle was not instrumented with accelerometers.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Vehicle Trajectory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. Vehicle trajectory behind the test article is acceptable.</td>
<td>The 1100C vehicle exited behind the installation.</td>
<td>Pass</td>
</tr>
</tbody>
</table>