



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

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

March 31, 2016

In Reply Refer To:
HHST/CC-57E

Mr. Bret Eckert P.E.
Engineering Applications Manager
Trinity Highway Products
3617 Cincinnati Avenue
Rocklin, CA 95677

Dear Mr. Eckert:

This letter is in response to your December 16, 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 CC-57E 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:

- QuadGuard® Elite System Modification

Scope of this Letter

To be found eligible for Federal-aid funding, roadside safety devices should meet the applicable crash test and evaluation criteria in place at the time the device, hardware or system is initially presented to FHWA for an eligibility determination. The applicable crash test and evaluation criteria is contained in the National Cooperative Highway Research Program (NCHRP) Report 350 (Report 350).

The FHWA, the Department of Transportation, and the United States Government do not regulate the manufacture of roadside safety devices. The determination of eligibility for Federal-aid reimbursement contained in this letter is based solely on a review of crash test results and certifications submitted by the manufacturer, and the crash test laboratory.

This eligibility letter does not establish approval, certification or endorsement of the device for any particular purpose or use.

Proper manufacturing, installation, and maintenance are required for this device to function as tested. Even so, there are multiple factors involved in a vehicle crash such as vehicle speed or the aspect of the vehicle to the device at the time of impact that can influence the outcome of a vehicle crash with any roadside hardware. This letter is not a determination by the FHWA, the Department of Transportation, or the United States Government that a vehicle crash involving this device will result in any particular outcome, nor is it a guarantee of the in-service performance of this device.

This finding of eligibility is limited to the device's compliance, at the time of testing, with the applicable crash test and evaluation criteria. It does not cover other structural features, nor conformity with the Manual on Uniform Traffic Control Devices.

Eligibility for Reimbursement

FHWA previously issued an eligibility letter for the roadside safety device, hardware or system described in FHWA eligibility letter with control number [insert control number]. This letter identifies a modification to that roadside safety device, hardware or system.

The original roadside safety device information is:

Name of system: QuadGuard Elite

Type of system: Crash Cushion

Date of original request: September 8, 1998

Date of original FHWA eligibility letter: December 30, 1998

FHWA Control number: CC-57

The pending modification(s) consists of the following changes:

1. Removed belt nose pullout bracket slots.
2. Lengthened threaded stud on the nose cylinder to diaphragm mounting hardware.
3. Updated stamping of logo on nose cylinder and increased nose cylinder attachment hole clearance.
4. Revised size of restoration limiting chain bracket attachment holes in QuadBeam panels from 22millimeter diameter to 22millimeter x 28millimeter slots.

Based on the crash test results and/or certifications submitted by the manufacturer and the crash test laboratory, FHWA finds that the device described herein meets the crash test and evaluation criteria of National Cooperative Highway Research Program (NCHRP) Report 350. Therefore, the device with the above listed modifications is eligible for reimbursement under the Federal-aid highway program.

It is the responsibility of the user of the hardware, the manufacturer of the hardware, and the contractor installing this device to ensure that this device is appropriate for the location, and installed and maintained properly.

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 roadside safety hardware that has an existing eligibility letter from FHWA, the manufacturer must notify FHWA of such modification.

Information that describes the significance of a modification is located in FHWA's policy memo Roadside Safety Hardware-Federal-aid Reimbursement Eligibility Process dated May 21, 2012.

The notice of any modification(s) to a device must be accompanied by:

- o Significant modifications – For these modifications, crash test results must be submitted with accompanying documentation and videos
- o 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, and
- o a request for FHWA's review for continued eligibility for reimbursement.

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 Report 350.

We reserve the right to modify or revoke this letter should the FHWA determine that the qualification testing was flawed, that in-service performance of this device reveals safety problems, or that the system is different from what is described in this letter and its accompanying documentation.

Standard Provisions

- This letter provides an AASHTO/ARTBA/AGC Task Force 13 designator that should be used for the purpose of the creation of a new and/or the update of an existing Task Force 13 drawing for posting on the on-line 'Guide to Standardized Highway Barrier Hardware' currently referenced in AASHTO Roadside Design Guide.
- To prevent misunderstanding by others, this letter of eligibility designated as FHWA control number CC-57E shall only be reproduced 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 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. 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, flowing style.

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:	March 24, 2016	<input type="radio"/> New <input checked="" type="radio"/> Resubmission
	Name:	Bret R. Eckert, P.E.	
	Company:	Trinity Highway Products, LLC	
	Address:	3617 Cincinnati Ave., Rocklin, CA 95765	
	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.

1-1-1				
System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'CC': Crash Cushions, Attenuators, & Terminals	<input type="radio"/> Physical Crash Testing <input checked="" type="radio"/> Engineering Analysis	QuadGuard® Elite	NCHRP Report 350	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 NCHRP Report 350 (Report 350) and that the evaluation results meet the appropriate evaluation criteria in the Report 350.

Identification of the individual or organization responsible for the product:

Contact Name:	Bret R. Eckert, P.E.	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Trinity Highway Products, LLC	Same as Submitter <input checked="" type="checkbox"/>
Address:	3617 Cincinnati Ave., Rocklin, CA 95765	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.		
<p>The QuadGuard® Elite technology is the commercial embodiment of intellectual property that is protected by patents that are owned by Trinity Highway Products, LLC (THP). THP does not pay royalties for sales of the QuadGuard® Elite system. The QuadGuard® Elite system was designed and developed by engineers at Energy Absorption Systems Inc. (EAS). The patent holders of record for the QuadGuard® Elite system are Michael H. Oberth and John V. Machado and both, Mr. Oberth as well as Mr. Machado, were employed by EAS. The associated United States Patent Office patent application numbers (5,797,592 & 5,733,062) are assigned to Energy Absorption Systems, Inc. / Trinity Industries, Inc.</p> <p>EAS sponsored certain crash tests of the QuadGuard® Elite system; such tests were conducted by E-Tech Testing Services, an independent, wholly-owned subsidiary of THP. E-Tech Testing Services is an International Standards Organization ("ISO") 17025 accredited laboratory with American Association for Laboratory Accreditation (A2LA) Mechanical Testing certificate 989.01. Full-scale crash testing on the QuadGuard® Elite system was performed in accordance with testing criteria, as set forth by the National Cooperative Highway Research Program ("NCHRP") in the NCHRP Report 350 (1993).</p>		

PRODUCT DESCRIPTION

<input checked="" type="radio"/> New Hardware or Significant Modification	<input checked="" type="radio"/> Modification to Existing Hardware	Non-Significant
<p>Original submission date December 23, 2015. The QuadGuard® Elite System Attenuator (QG Elite) was originally accepted on December 30, 1998 with FHWA eligibility letter HNG-14/CC-57 as a NCHRP 350 TL-3 Crash Cushion and as a TL-2 device on June 17, 1999 with FHWA eligibility letter TMHS/CC-57A. It was subsequently accepted with modifications on August 15, 2007 with FHWA eligibility letter HSSD/CC-57B for TL-3 and on November 14, 2008 as a TL-2 device with FHWA eligibility letter HSSD/CC-57C. The QuadGuard® Elite is a nongating redirective crash cushion product family. The system utilizes reusable high density polyethylene (HDPE) plastic energy absorbing cylinders. The cylinders are mounted within the traditional QuadGuard® collapsible frame.</p> <p>This request for continued eligibility is to notify the FHWA of necessary revisions that have occurred since May 18, 2015. All revisions have been justified through engineering analysis and judgement and have been determined to be either non-significant, effect is positive or inconsequential and will have no bearing on the as-tested performance of the system. These revisions include the following:</p> <ol style="list-style-type: none"> 1. Removed belt nose pullout bracket slots. (4058) 2. Lengthened threaded stud on the nose cylinder to diaphragm mounting hardware. (4058) 3. Updated stamping of logo on nose cylinder and increased nose cylinder attachment hole clearance. (4058) 4. Revised size of restoration limiting chain bracket attachment holes in QuadBeam panels from 22mm diameter to 22x28mm slots. <p>These non-significant changes will NOT affect the as tested performance of the system.</p>		

CRASH TESTING

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-30 (820C)	Test 3-30 was waived for the QuadGuard Elite in FHWA Eligibility letter CC-57 based on tests 3-31 on the narrowest unit and test 3-32 on the widest unit appeared most critical. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the QuadGuard® Elite system.	Non-Critical, not conducted
S3-30 (700C)	Not Applicable. Test S3-30 is an optional test and not required for QuadGuard® Elite system eligibility.	
3-31 (2000P)	Test No. 01-7611-002, Test Date October 9, 1998, Test Report "NCHRP Report 350 Crash Test Results for the QuadGuard® Elite System, Final Report, Project No. 01-7611, November 1998. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the QuadGuard® Elite system.	PASS

Required Test Number	Narrative Description	Evaluation Results
3-32 (820C)	Test No. 01-7611-001, Test Date September 29, 1998, Test Report "NCHRP Report 350 Crash Test Results for the QuadGuard® Elite System, Final Report, Project No. 01-7611, November 1998. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the QuadGuard® Elite system.	PASS
S3-32 (700C)	Not Applicable. Test S3-32 is an optional test and not required for QuadGuard® Elite system eligibility.	
3-33 (2000P)	Test 3-33 was waived for the QuadGuard® Elite in FHWA Eligibility letter CC-57 based on tests 3-31 on the narrowest unit and test 3-32 on the widest unit appeared most critical. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the QuadGuard® Elite system.	Non-Critical, not conducted
3-34 (820C)	Not Applicable. Test 3-34 is for redirective, gating devices and not applicable for QuadGuard® Elite system eligibility.	
S3-34 (700C)	Not Applicable. Test S3-34 is an optional test and not required for QuadGuard® Elite system eligibility.	
3-35 (2000P)	Not Applicable. Test 3-35 is for redirective, gating devices and not applicable for QuadGuard® Elite system eligibility.	
3-36 (820C)	Test 3-36 was waived for the QuadGuard® Elite in FHWA Eligibility letter CC-57 based on tests 3-31 on the narrowest unit and test 3-32 on the widest unit appeared most critical. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the QuadGuard® Elite system.	Non-Critical, not conducted
S3-36 (700C)	Not Applicable. Test S3-36 is an optional test and not required for QuadGuard® Elite system eligibility.	
3-37 (2000P)	Test 3-37 was waived for the QuadGuard® Elite in FHWA Eligibility letter CC-57 based on tests 3-31 on the narrowest unit and test 3-32 on the widest unit appeared most critical. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the QuadGuard® Elite system.	Non-Critical, not conducted
3-38 (2000P)	Test 3-38 was waived for the QuadGuard® Elite in FHWA Eligibility letter CC-57 based on tests 3-31 on the narrowest unit and test 3-32 on the widest unit appeared most critical. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the QuadGuard® Elite system.	Non-Critical, not conducted
3-39 (2000P)	Test 3-39 was waived for the QuadGuard® Elite in FHWA Eligibility letter CC-57 based on tests 3-31 on the narrowest unit and test 3-32 on the widest unit appeared most critical. The non-significant modifications described in the Product Description will have no bearing on the as-tested performance of the QuadGuard® Elite system.	Non-Critical, not conducted
3-40 (2000P)	Not Applicable. Test 3-40 is for nonredirective, gating devices and not applicable for QuadGuard® Elite system eligibility.	
S3-40 (700C)	Not Applicable. Test S3-40 is optional test for nonredirective, gating devices and not applicable for QuadGuard® system eligibility.	
3-41 (2000P)	Not Applicable. Test 3-41 is for nonredirective, gating devices and not applicable for QuadGuard® Elite system eligibility.	

3-42 (820C)	Not Applicable. Test 3-42 is for nonredirective, gating devices and not applicable for QuadGuard® Elite system eligibility.	
S3-42 (700C)	Not Applicable. Test S3-42 is optional test for nonredirective, gating devices and not applicable for QuadGuard® Elite system eligibility.	
3-43 (2000P)	Not Applicable. Test 3-43 is for nonredirective, gating devices and not applicable for QuadGuard® Elite system eligibility.	
3-44 (2000P)	Not Applicable. Test 3-44 is for nonredirective, gating devices and not applicable for QuadGuard® Elite system eligibility.	

Full Scale Crash Testing was done in compliance with NCHRP Report 350 by the following accredited crash test Laboratory. By signature below, the Laboratory agrees in support of this submission that all critical and relevant crash tests for the device listed above were conducted. (cite the laboratory's accreditation status as noted in the crash test reports.):

Testing Laboratory's signature concurs that these modifications are considered Non-Significant.		
Laboratory Name:	E-Tech Testing Services, Inc.	
Laboratory Signature:	Paul Kruse	Digitally signed by Paul Kruse Date: 2016.03.24 14:22:01 -07'00'
Address:	3617B Cincinnati Ave., Rocklin, CA 95765	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input checked="" type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	A2LA Certificate# 989.01, November 20, 2015 thru November 30, 2017	

Submitter Signature*: Bret Eckert P.E.

Digitally signed by
bret.eckert@trin.net
DN: cn=bret.eckert@trin.net
Date: 2016.03.24 15:25:42 -07'00'

Submit Form

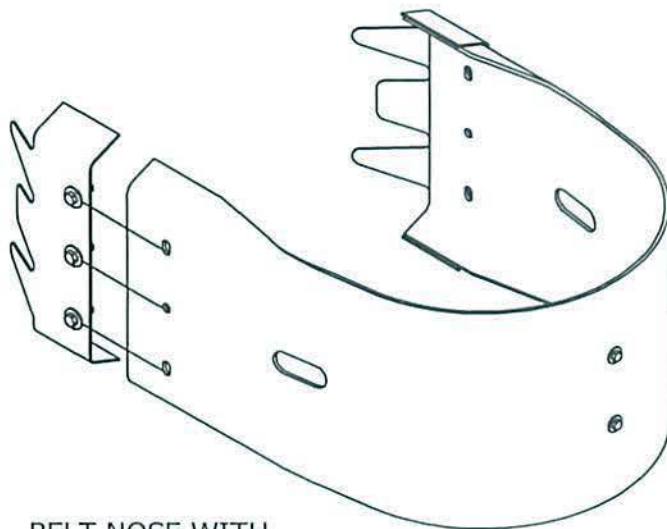
ATTACHMENTS

Attach to this form:

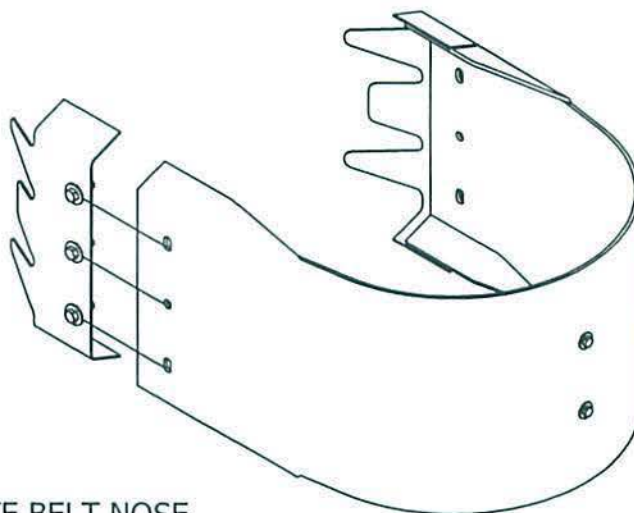
- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[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		AASHTO TF13	
Number	Date	Designator	Key Words



BELT NOSE WITH
PULLOUT BRACKET SLOTS

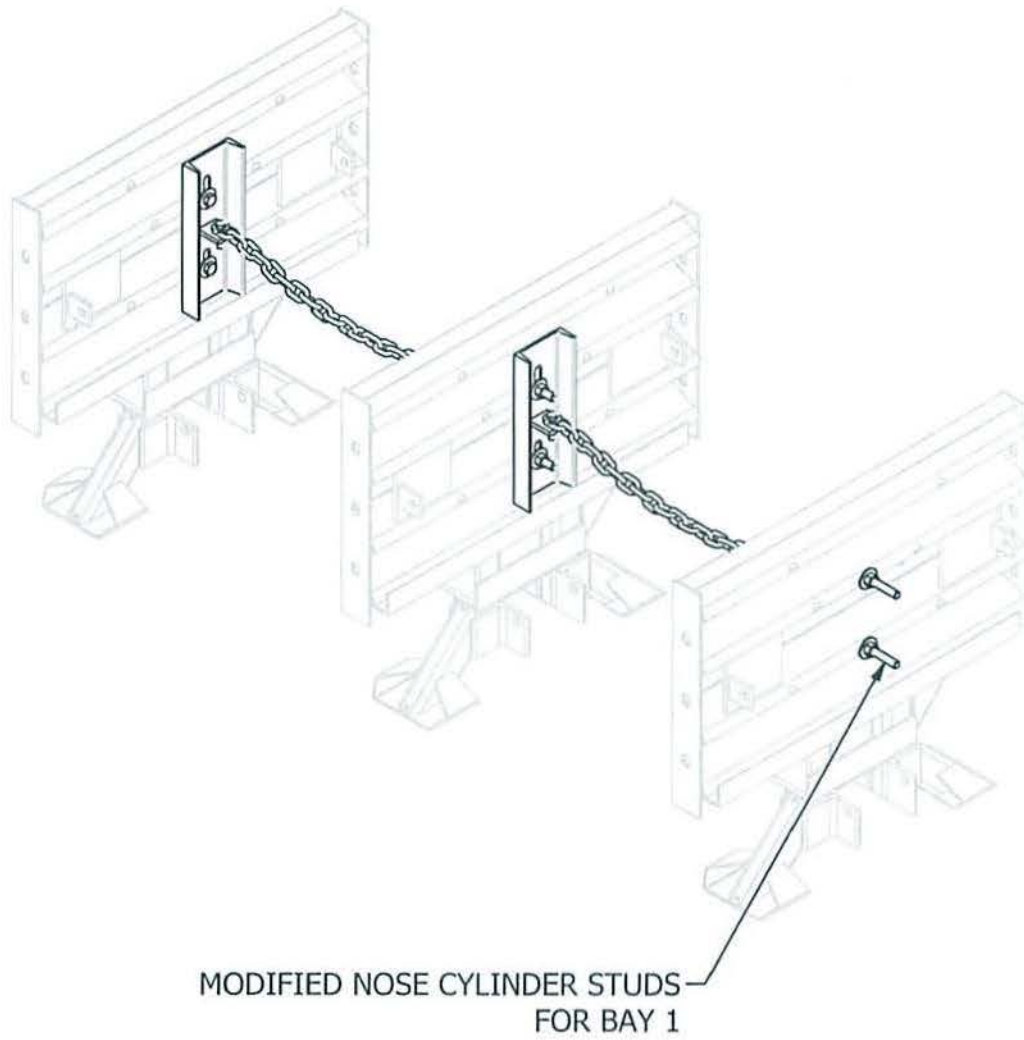


ALTERNATE BELT NOSE
WITHOUT PULLOUT BRACKET SLOTS

QUADGUARD® ELITE
BELT NOSE W/O
PULLOUT BRACKET SLOT



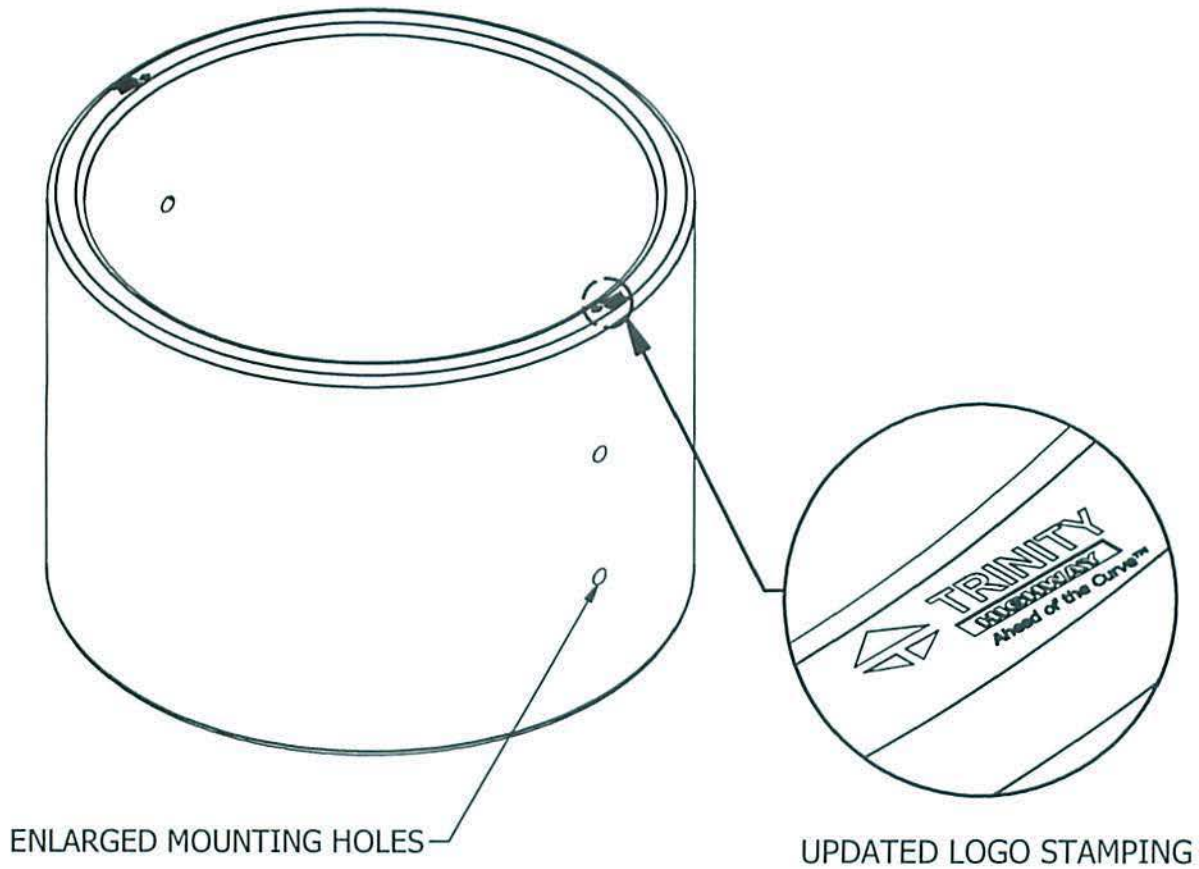
TRINITY
HIGHWAY



QUADGUARD® ELITE
MODIFIED NOSE CYLINDER STUD



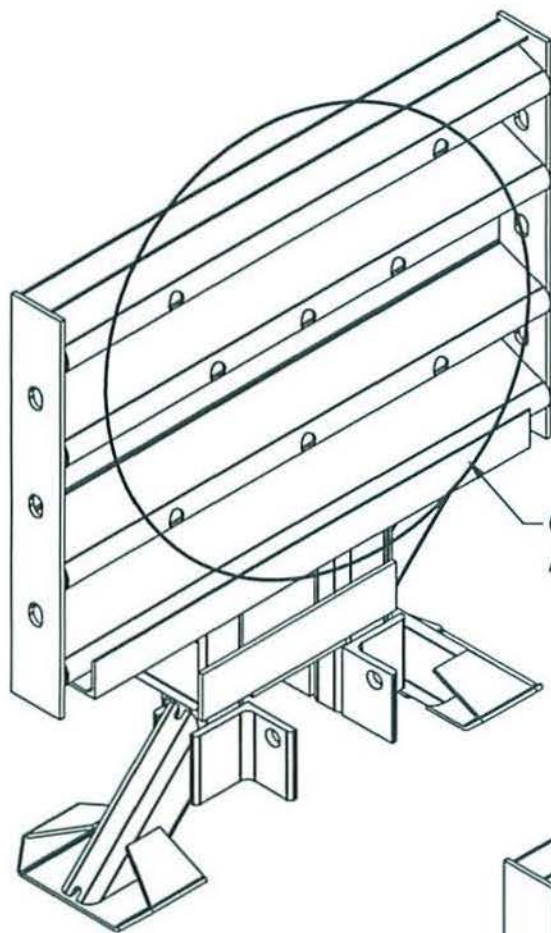
TRINITY
HIGHWAY



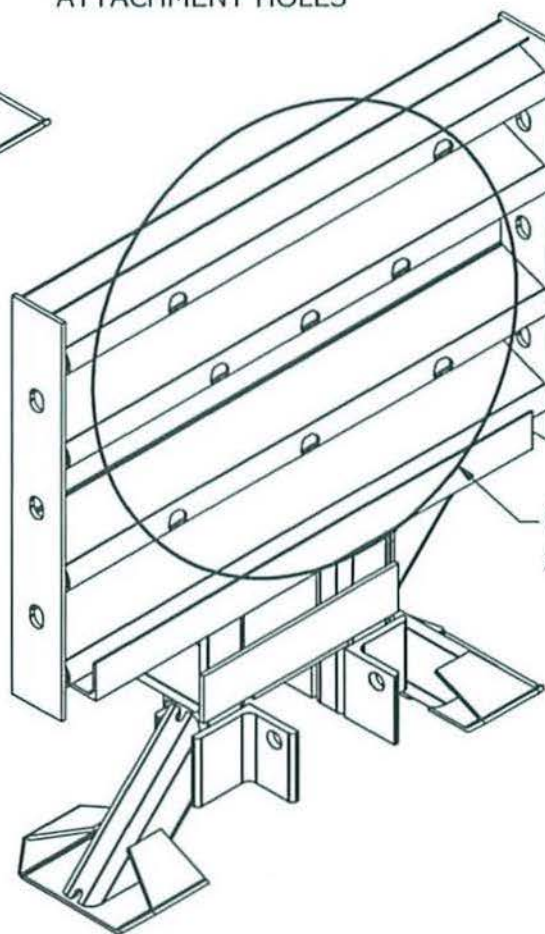
QUADGUARD® ELITE
NOSE CYLINDER IDENTIFICATION
AND HOLE DIAMETER



TRINITY
HIGHWAY



ORIGINAL
ATTACHMENT HOLES



MODIFIED
ATTACHMENT SLOTS

QUADGUARD® ELITE
DIAPHRAGM HOLES
TO SLOTS



TRINITY
HIGHWAY