



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

February 15, 2019

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

In Reply Refer To:
HSST-1/B-317

Mr. Rajesh Taneja
New York State Thruway Authority
P. O. Box 189
Albany, NY, 12201-0189

Dear Mr. Taneja:

This letter is in response to your October 31, 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 B-317 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

Decision

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

- Three-Rail Steel Bridge Rail with Curb

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 AASHTO's 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: Three-Rail Steel Bridge Rail with Curb
Type of system: Longitudinal Barrier
Test Level: MASH Test Level 5 (TL5)
Testing conducted by: TamTI
Date of request: January 30, 2019

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 B-317 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 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:	10-31-2018	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Christopher Gaunt, P.E.	
	Company:	HNTB Corporation	
	Address:	Empire State Building, 350 Fifth Avenue, 57th Floor, New York, NY, 10118	
	Country:	United States of America	
	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
'B': Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	Three-Rail Steel Bridge Rail with Curb	AASHTO MASH	TL5

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:	Rajesh Taneja	Same as Submitter <input type="checkbox"/>
Company Name:	New York State Thruway Authority	Same as Submitter <input type="checkbox"/>
Address:	P. O. Box 189, Albany, NY, 12201-0189	Same as Submitter <input type="checkbox"/>
Country:	United States of America	Same as Submitter <input type="checkbox"/>

Enter below all disclosures of financial interests as required by the FHWA 'Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.

HNTB: HNTB Corporation is a paid consultant for New York State Thruway Authority (NYSTA) for the Governor Mario M. Cuomo (formerly Tappan Zee) Bridge Rail design and eligibility request. HNTB has no further financial interest in the use of this barrier system.

TTI: Texas A&M Transportation Institute (TTI) was contracted by HNTB to perform full-scale crash testing of the NYSTA Governor Mario M. Cuomo (formerly Tappan Zee) Bridge Rail design. There are no shared financial interests in the NYSTA Governor Mario M. Cuomo (formerly Tappan Zee) Bridge Rail design by TTI, or between HNTB and TTI, other than costs involved in the actual crash tests and reports for this submission to FHWA.

PRODUCT DESCRIPTION

- New Hardware or Significant Modification

 Modification to Existing Hardware

The bridge rail design tested was a three-rail steel bridge rail with a reinforced concrete curb that was constructed on a reinforced concrete grade beam and deck. The curb had a 7-inch tall face. Fabricated steel posts were mounted on the curb, spaced at 48 inches on center. There were three rows of 6-inch square HSS tubing rails bolted to the posts, with the top surface of the top rail at 38 inches above the curb, for a total rail height of 45 inches above grade. The top of the middle rail was 33 inches above grade, and the top of the bottom rail was 21 inches above grade.

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:	Nauman M. Sheikh	
Engineer Signature:	Nauman M. Sheikh	Digitally signed by Nauman M. Sheikh Date: 2018.10.12 17:32:31 -05'00'
Address:	TTI, TAMUS MS 3135, College Station, TX 77843-3135	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
5-10 (1100C)	<p>A 2011 Kia Rio traveling at an impact speed of 61.1 mi/h contacted the bridge rail 3.6 ft upstream of the joint between posts 30 and 31 at an impact angle of 25.2°. The bridge rail contained and redirected the 1100C vehicle. The vehicle did not penetrate, underride, or override the installation. There was 0.7 inch of dynamic deflection of the bridge rail during the test. No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or to present hazard to others in the area. Maximum occupant compartment deformation was 2.0 inches on the left side at the wheel/foot well area. The 1100C vehicle remained upright during and after the collision event. A gyroscope/accelerometer connection was severed during the test, However, based on video analysis, the vehicle did not exceed 75 degrees of roll or pitch. Longitudinal OIV was 18.7 ft/s, and lateral OIV was 30.5 ft/s. Longitudinal occupant ridedown acceleration was 2.7 g, and lateral occupant ridedown acceleration was 9.8 g.</p>	PASS

Required Test Number	Narrative Description	Evaluation Results
5-11 (2270P)	<p>A 2013 RAM 1500 traveling at an impact speed of 62.8 mi/h contacted the bridge rail 4.1 ft upstream of the joint between posts 20 and 21 at an impact angle of 25.7. The bridge rail contained and redirected the 2270P vehicle. The vehicle did not penetrate, underride, or override the installation. There was 1.0 inch of dynamic deflection of the bridge rail during the test. No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or to present hazard to others in the area. Maximum occupant compartment deformation was 3.0 inches on the left side at the floor pan to roof, and wheel/foot well and toe pan area. The 2270P vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 13° and 5°, respectively. Longitudinal OIV was 20.3 ft/s, and lateral OIV was 28.5 ft/s. Longitudinal occupant ridedown acceleration was 7.8 g, and lateral occupant ridedown acceleration was 8.5 g.</p>	PASS
5-12 (36000V)	<p>A 2006 Freightliner with a 2002 Utility trailer was traveling at an impact speed of 50.9 mi/h when it contacted the bridge rail 1.4 ft downstream of the splice between posts 10 and 11 at an impact angle of 15.2°. The bridge rail contained and redirected the 36000V vehicle. The vehicle did not penetrate, underride, or override the installation. There was 1.5 inches of dynamic deflection of the bridge rail during the test. No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or to present hazard to others in the area. Maximum occupant compartment deformation was 2.0 inches on the left side firewall/floor pan area. The 36000V vehicle remained upright during and after the collision.</p>	PASS
5-20 (1100C)	<p>Hardware is not a transition. This test is therefore not applicable and was not performed.</p>	Non-Relevant Test, not conducted
5-21 (2270P)	<p>Hardware is not a transition. This test is therefore not applicable and was not performed.</p>	Non-Relevant Test, not conducted
5-22 (36000V)	<p>Hardware is not a transition. This test is therefore not applicable and was not performed.</p>	Non-Relevant Test, 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 A&M Transportation Institute	
Laboratory Signature:	Darrell L. Kuhn	Digitally signed by Darrell L. Kuhn Date: 2018.10.15 10:48:18 -05'00'
Address:	TTI, TAMUS MS 3135, 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 Certificate Number: 2821.01 Valid To: April 30, 2019	

Submitter Signature*: Christopher Gaunt, PE

Digitally signed by Christopher Gaunt, PE
Date: 2018.10.31 15:19:07 -04'00'

Submit Form

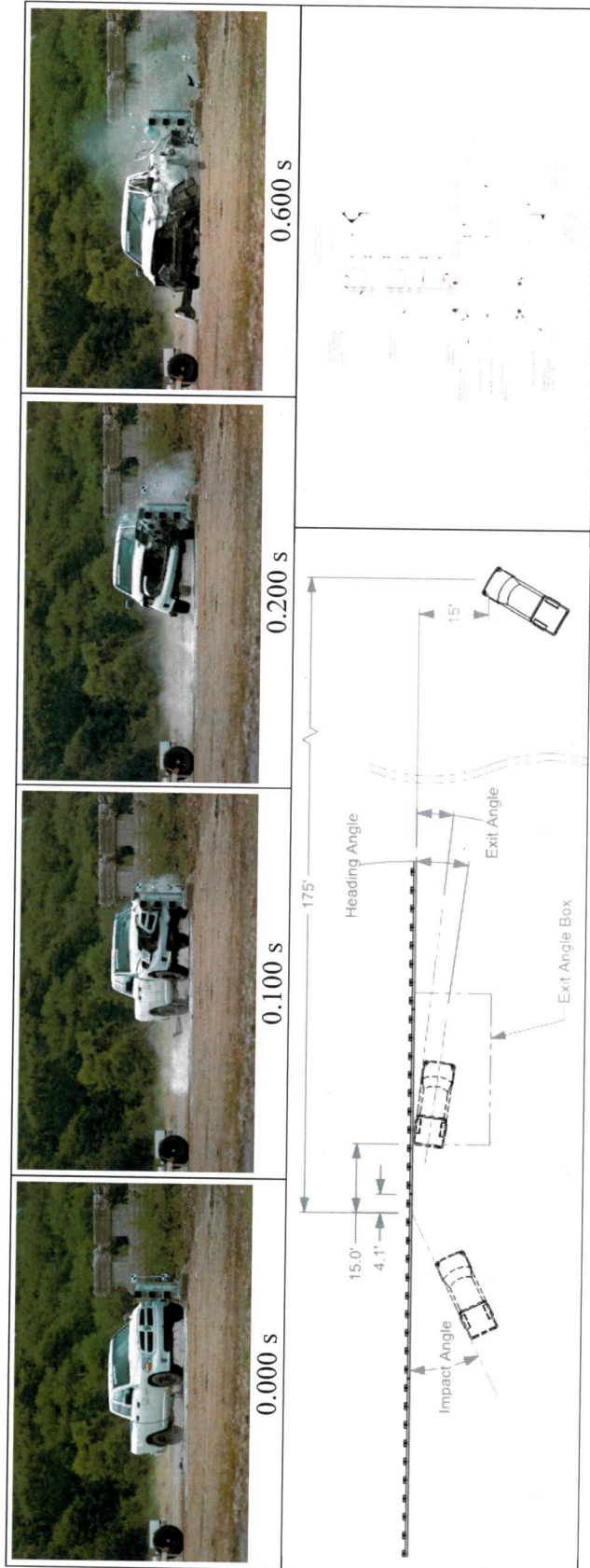
ATTACHMENTS

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.

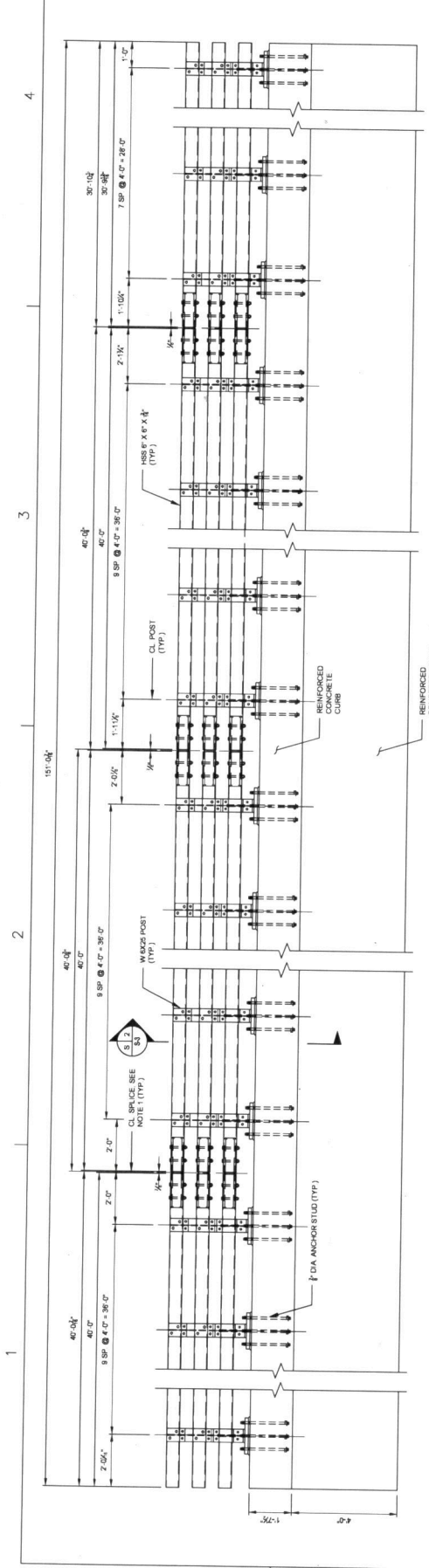
FHWA Official Business Only:

Eligibility Letter		
Number	Date	Key Words

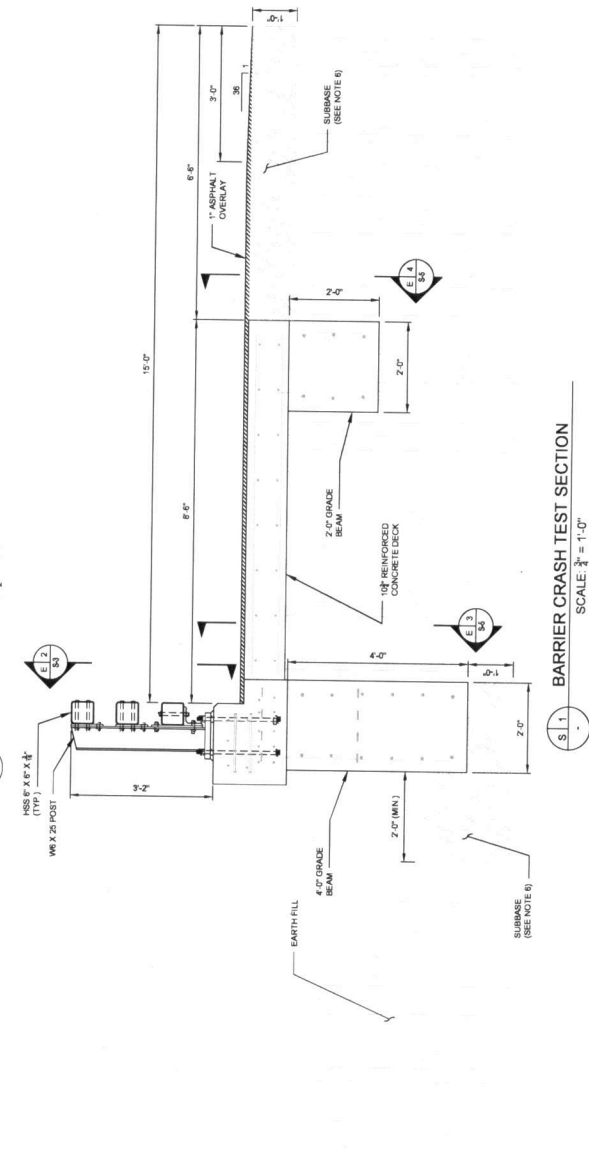


General Information	
Test Agency.....	Texas A&M Transportation Institute (TTI)
Test Standard Test No.....	MASH Test 5-11
TTI Test No.....	609891-02-2
Test Date.....	2018-06-18
Test Article	
Type.....	Longitudinal Barrier – Bridge Rail
Name.....	TZH Crossing Bridge Rail
Installation Length.....	151 ft
Material or Key Elements.....	7-inch tall concrete curb, 3 rows of HSS 6x6x3/16 square tube rails for a total height of 45 inches above grade
Soil Type and Condition	Concrete bridge deck, damp
Test Vehicle	
Type/Designation.....	2270P
Make and Model.....	2013 RAM 1500
Curb.....	5111 lb
Test Inertial.....	5016 lb
Dummy.....	165 lb
Gross Static.....	5181 lb
Impact Conditions	
Speed.....	62.8 mi/h
Angle.....	25.7°
Location/Orientation.....	4.1 ft upstream of Joint 20-21
Impact Severity	
129 kip-ft	
Exit Conditions	
Speed.....	49.9 mi/h
Exit Trajectory Angle.....	6.4°
Exit Heading Angle.....	7.5°
Occupant Risk Values	
Longitudinal OIV.....	20.3 ft/s
Lateral OIV.....	28.5 ft/s
Longitudinal Ridedown.....	7.8 g
Lateral Ridedown.....	8.5 g
THIV.....	35.4 ft/s
PHD.....	10.7 g
ASI.....	2.1
Max. 0.050-s Average	
Longitudinal.....	-10.6 g
Lateral.....	15.8 g
Vertical.....	3.1 g
Post-Impact Trajectory	
Stopping Distance.....	175 ft downstream
	15 ft toward traffic
Vehicle Stability	
Maximum Yaw Angle.....	44°
Maximum Pitch Angle.....	5°
Maximum Roll Angle.....	13°
Vehicle Snagging.....	No
Vehicle Pocketing.....	No
Test Article Deflections	
Dynamic.....	1.0 inch
Permanent.....	None
Working Width.....	13.9 inches
Working Width Height.....	41.7 inches
Vehicle Damage	
VDS.....	10-LFQ-5
CDC.....	10FLEW3
Max. Exterior Deformation.....	12.0 inches
OCDI.....	LF0021000
Max. Occupant Compartment Deformation.....	3.0 inches

Figure 6.6. Summary of Results for MASH Test 5-11 on Tappan Zee Hudson River Crossing Bridge Rail.



BARRIER CRASH TEST SECTION
SCALE: $\frac{3}{4}'' = 1'-0''$



- NOTES:**
1. FOR SPICE DETAILS SEE DWG NO S-4
 2. FOR CURB DETAILS SEE DWG NO S-5
 3. FOR DECK DETAILS SEE DWG NO S-5
 4. FOR GRADE BEAM DETAILS SEE DWG NOS S-5 AND S-6
 5. ALL STRUCTURAL STEEL SHALL BE FABRICATED AND WELDED TO CONFORM TO THE STEEL FABRICATOR'S QUALITY CONTROL PLAN.
 6. SURFACE SHALL BE TYPE 1 SURFACE COURSE IN CONFORMANCE WITH SPECIFICATION SECTION 703.04

DRAWN BY: A. HEISER		DESIGNED BY: A. HEISER		CHECKED BY: M. ZERNIK		DATE: APPTD.		SCALE: AS SHOWN	
REV.		DESCRIPTION		DATE		APPTD.		SCALE	
THIS IS A PORTION OF THE PROFESSIONAL SERVICE CONTRACT FOR THE DESIGN AND CONSTRUCTION OF THE BARRIER CRASH TEST SECTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND FOR THE PROTECTION OF ALL UTILITIES AND STRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES AND STRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES AND STRUCTURES.									
REV. 0		DESCRIPTION		DATE		APPTD.		SCALE	

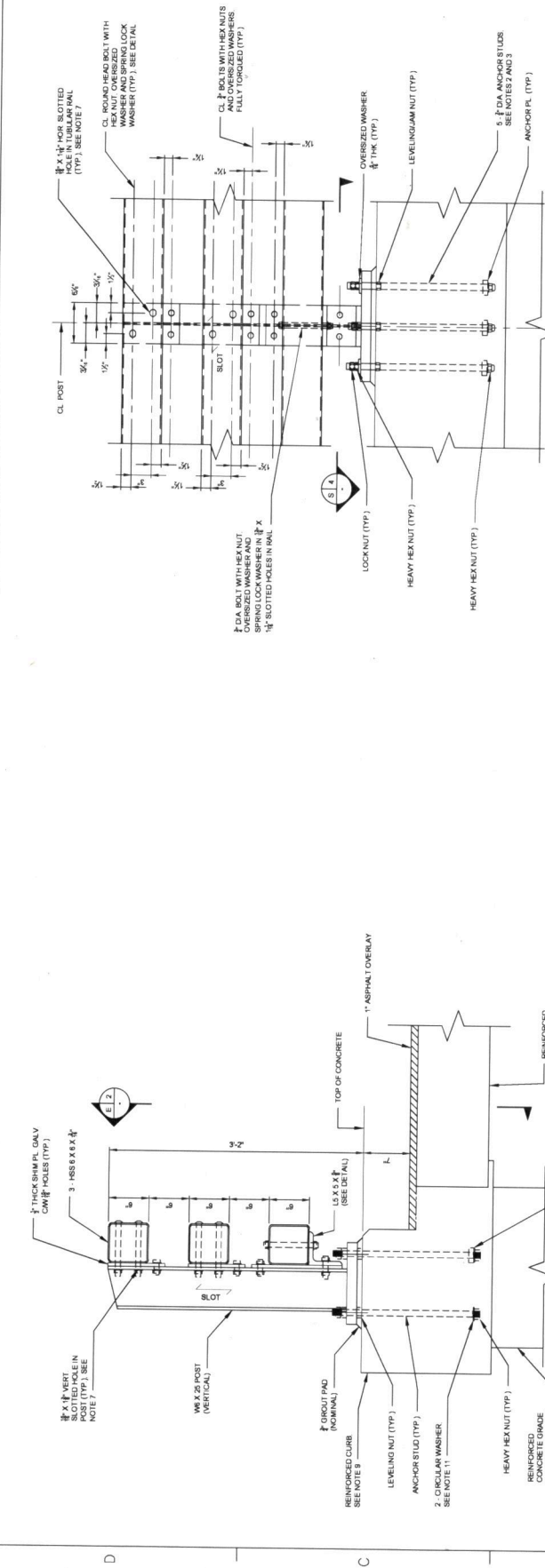


3 RAIL STEEL BARRIER CRASH TEST - BARRIER FOUNDATION AND INSTALLATION

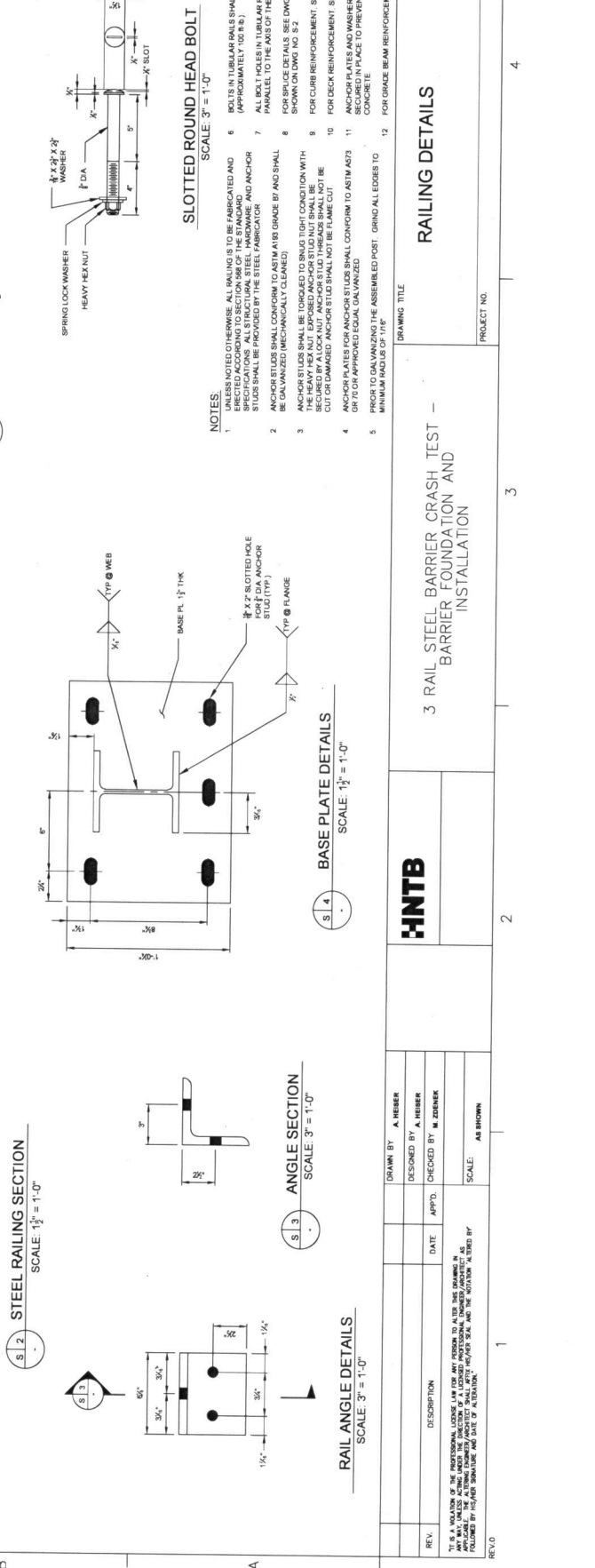
BARRIER CRASH TEST - ELEVATION AND SECTION

CONTRACT NO.	S-2
DRAWING NO.	SHEET 3 OF 7
DATE	MAY 28, 2017
REVISION NO.	0

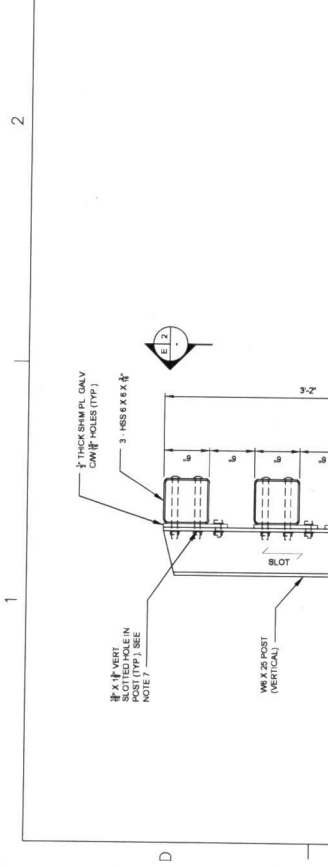
1 2 3 4



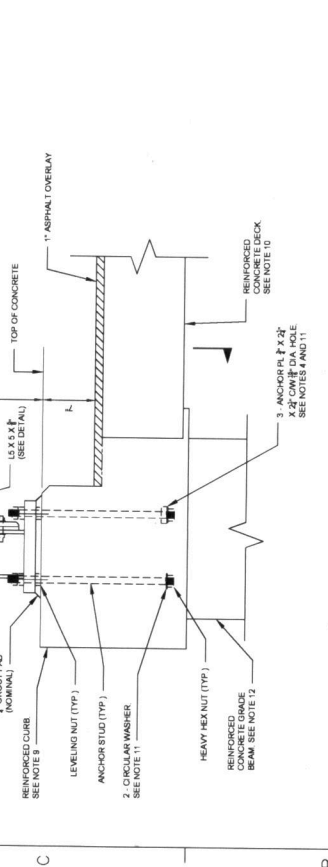
S.2 STEEL RAILING SECTION
SCALE: 1/2" = 1'-0"



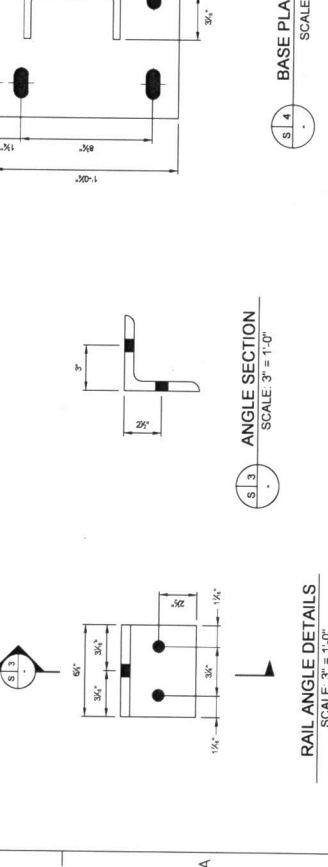
E.2 STEEL RAILING ELEVATION
SCALE: 1/2" = 1'-0"



S.4 BASE PLATE DETAILS
SCALE: 1/2" = 1'-0"



S.3 RAIL ANGLE DETAILS
SCALE: 3" = 1'-0"



S.5 SLOTTED ROUND HEAD BOLT
SCALE: 3" = 1'-0"

NOTES

1. CAP RAIL, POSTS, LEVELING NUTS, ANCHOR STUDS, AND ANCHOR PLATES SHALL BE FABRICATED AND SPECIFIED ACCORDING TO SECTION 05110 (STEEL FABRICATION) AND SHALL BE PROVIDED BY THE STEEL FABRICATOR.
2. ANCHOR STUDS SHALL CONFORM TO ASTM A193 GRADE B7 AND SHALL BE GALVANIZED (MECHANICALLY CLEANED).
3. HEAVY HEX NUTS SHALL BE TORQUED TO 50 FT-LB CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. ANCHOR STUD THREADS SHALL NOT BE CUT OR DAMAGED. ANCHOR STUDS SHALL NOT BE FLAME CUT.
4. ANCHOR PLATES FOR ANCHOR STUDS SHALL CONFORM TO ASTM A325 GRADE B AND SHALL BE GALVANIZED (MECHANICALLY CLEANED).
5. PRIOR TO GALVANIZING THE ASSEMBLED POST, GRIND ALL EDGES TO A MINIMUM RADIUS OF 1/8".
6. BOLTS IN TUBULAR RAILS SHALL BE TORQUED SNUG TIGHT (APPROXIMATELY 100 FT-LB).
7. SLOTTED HOLES IN TUBULAR RAILS AND POSTS SHALL BE SPACED AS SHOWN ON DWG. NO. S-2.
8. FOR CURB REINFORCEMENT, SEE DWG. NO. S-5.
9. ANCHOR PLATES AND WASHERS AT ANCHOR STUD ENDS SHALL BE SECURED IN PLACE TO PREVENT DISLODGING DURING CASTING OF CONCRETE.
10. FOR GRADE BEAM REINFORCEMENT, SEE DWG. NOS. S-9 AND S-6.

REV.	DESCRIPTION	DATE	APPRD.	DESIGNED BY	DRAWN BY
				A. REBER	A. REBER
				M. DEBEEK	M. DEBEEK
					AS BROWN

THIS IS A VOLUNTARY PROFESSIONAL LODGE PLAN FOR ANY PERSON TO USE THE DRAWINGS AND MAKE ANY CHANGES AT HIS OWN RISK. THE PROFESSIONAL ENGINEER'S LIABILITY IS LIMITED TO THE DATE OF THE ORIGINAL DESIGN AND THE DATE OF ANY REVISIONS. THE USER SHALL BE RESPONSIBLE FOR THE ACCURACY AND COMPLETENESS OF THE INFORMATION AND DATA PROVIDED TO THE ENGINEER.

CONTRACT NO. _____
DRAWING NO. **S-3**
DATE _____ SHEET 4 OF 7
PROJECT NO. _____ REVISION NO. 0

RAILING DETAILS

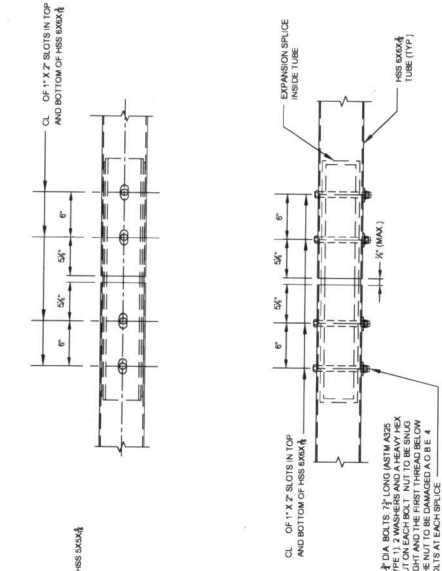
3 RAIL STEEL BARRIER CRASH TEST - BARRIER FOUNDATION AND INSTALLATION

HNTB

1 2 3 4



EXPANSION SPlice INSIDE TUBE
SCALE: 1/2" = 1'-0"



EXPANSION SPlice TUBE ASSEMBLY
SCALE: 1/2" = 1'-0"

- NOTES:**
1. ALL STRUCTURAL STEEL, WELDING, AND ANCHOR STUDS SHALL BE PROVIDED BY THE STEEL FABRICATOR.
 2. PROTRUSIONS CAUSED BY WELDING OR GALVANIZING ARE NOT PERMITTED ON THE ADJOINING SURFACES OF THE BOX BEAM RAILS, SPlice TUBES, AND FILL PLATES.
 3. FOR SPlice LOCATIONS SEE DWG NO. S-2.

DRAWING TITLE 3 RAIL STEEL BARRIER CRASH TEST - BARRIER FOUNDATION AND INSTALLATION		DRAWING NO. S-4	
CONTRACT NO.		SHEET 5 OF 7	
DATE MAY 24, 2017		REVISION NO. 0	
PROJECT NO.		4	
HNTB		2	
DRAWN BY: A. REBER DESIGNED BY: A. REBER CHECKED BY: M. ZDENEK		DATE:	
APP'D:		SCALE: AS SHOWN	
THIS IS A MANDATORY PROFESSIONAL LICENSE LAW FOR ANY PERSON IN THE STATE OF MISSISSIPPI WHO PERFORMS ENGINEERING OR ARCHITECTURAL SERVICES. IT IS THE RESPONSIBILITY OF THE LICENSEE TO OBTAIN AND MAINTAIN THE NECESSARY EDUCATION, EXPERIENCE, AND SKILLS TO PERFORM THE SERVICES. THE LICENSEE SHALL BE RESPONSIBLE FOR THE DESIGN, CALCULATION, AND CONSTRUCTION OF ANY STRUCTURE OR SYSTEM. THE LICENSEE SHALL BE RESPONSIBLE FOR THE SAFETY AND WELL-BEING OF THE PUBLIC. THE LICENSEE SHALL BE RESPONSIBLE FOR THE PROTECTION OF THE PUBLIC INTEREST. THE LICENSEE SHALL BE RESPONSIBLE FOR THE PROTECTION OF THE PUBLIC INTEREST. THE LICENSEE SHALL BE RESPONSIBLE FOR THE PROTECTION OF THE PUBLIC INTEREST.			
REV. NO.			