



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

September 6, 2022

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

In Reply Refer To:
HSST-1/B-367

Kristin Langer
Pennsylvania Department of Transportation
400 North St., 7th Floor, Harrisburg
Pennsylvania 17120
USA

Dear Ms. Langer:

We received your correspondence of February 16, 2022 requesting issuance of a reimbursement eligibility letter under the Federal-aid highway program for the roadside safety system, device, design, product, or hardware (collectively “device”) described below. This letter is assigned Federal Highway Administration (FHWA) control number B-367.

ELIGIBILITY LETTERS

The FHWA issues Federal-aid reimbursement eligibility letters for new roadside safety devices that are crash tested in accordance with the industry standard of the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH).

FHWA, the Department of Transportation, and the United States (government) do not regulate roadside safety devices, crash test facilities, or the manufacturing industry. Issuance of eligibility letters is discretionary and provided only as a service to the states. FHWA may, at its discretion, decline to issue, revise, or rescind an eligibility letter. Eligibility letters are only issued by the FHWA headquarters Office of Safety.

Eligibility letters are issued only as notice to the states that a device is eligible for reimbursement under the Federal-aid highway program. They do not establish approval or certification for any other purpose. Issuance of an eligibility letter is not a prerequisite or requirement for state transportation agencies seeking to use Federal-aid funds for roadside safety devices. State agencies may use a device for which an eligibility letter has not been issued and seek Federal-aid reimbursement.

FEDERAL-AID REIMBURSEMENT

The request for issuance of this letter certified the device was crash tested in accordance with the industry standard of AASHTO’s MASH. This eligibility letter is based on that certification and the material offered in support of its issuance. The device described below is eligible for reimbursement under the Federal-aid highway program.

Name of system: MASH TL-3 Evaluation of PA 3-Rail Bridge Barrier
Type of system: Bridge Barrier
Test Level: Test Level 3
Testing conducted by: Texas A&M Transportation Institute
Date of request: February 16, 2022

Information about the device, including material such as the eligibility request, crash test reports, drawings, or images are included in one or more attachment(s) to this letter.

Eligibility letter B-367 is inapplicable to devices, optional equipment, alternate materials, or other features that were not crash tested in accordance with AASHTO's MASH.

This letter is issued only for the subject device as crash tested under AASHTO's MASH. Later modification(s) of the device are not eligible for Federal-aid reimbursement under this letter. Notice of later modification(s) should be given to transportation agencies, facility owners, and operators (collectively "agencies").

Agencies should be provided appropriate information about the device's design, installation, maintenance, materials, and mechanical properties.

Issuance of this letter is discretionary, and it may be revised or rescinded at FHWA's discretion. This letter is not a determination of compliance with the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) or ownership of any intellectual property rights.

This eligibility letter is not a determination by the government that a crash involving the subject device will result in any particular outcome. It is limited to only the device's eligibility for Federal-aid reimbursement.

INTELLECTUAL PROPERTY

Issuance of this eligibility letter does not convey property rights of any sort nor any exclusive privilege. This letter is not authorization or consent by the government for the use, manufacture, or sale of any patented or proprietary system, device, design, product, or hardware for which the requester is not the patent owner. Eligibility letters are not an expression of any view, position, or determination by the government as to the validity, scope, or ownership of any intellectual property rights to a specific device. These letters do not grant, impute, suggest, or otherwise establish any ownership, distribution, or licensing rights to the requester. The government expresses no opinion about the intellectual property rights relating to any device for which this or any other eligibility letter is issued.

PUBLIC DISCLOSURE

To prevent any misunderstanding, and as discussed above, this eligibility letter is assigned FHWA control number B-367. It should only be reproduced in full with its attachment(s). This letter and the material offered by the requester supporting its issuance is public information. All eligibility letters and supporting material are subject to public disclosure under the Freedom of

Information Act (FOIA). Eligibility letters are available to the public at https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/.

If you have any questions please contact Aimee Zhang at Aimee.Zhang@dot.gov.

Sincerely,

A handwritten signature in black ink that reads "Michael S. Griffith". The signature is written in a cursive style with a large, stylized "M" and "G".

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:	January 26, 2022	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Tom Macioce, P.E.	
	Company:	Pennsylvania Department of Transportation	
	Address:	400 North St., 7th Floor, Harrisburg, Pennsylvania 17120	
	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
'B': Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	MASH TL-3 Evaluation of PA 3-Rail Bridge Barrier	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:	Tom Macioce, P.E.	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Pennsylvania Department of Transportation	Same as Submitter <input checked="" type="checkbox"/>
Address:	400 North St., 7th Floor, Harrisburg, Pennsylvania 17120	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.		
Texas A&M Transportation Institute (TTI) was contracted by Gannett Fleming, Inc. to perform full-scale crash testing of the PA 3-Rail Bridge Barrier. There are no shared financial interests in the PA 3-Rail Bridge Barrier by TTI, or between the Pennsylvania Department of Transportation (PennDOT) and TTI, or between Gannett Fleming, Inc. and TTI other than the costs involved in the actual crash tests and reports for this submission to FHWA.		
610481-01 -1, -2,		

PRODUCT DESCRIPTION

New Hardware or Significant Modification
 Modification to Existing Hardware

The test installation consisted of a steel reinforced concrete deck and curb, with HSS 4x3x3/16-inch steel rails supported by steel posts anchored to the top of the curb. The deck and curb were each 78 ft 7¾ inches long. The 11-inch-thick deck was cantilevered 72 inches outward from its support wall, with the field side of the 18-inch-wide curb flush with the field side of the deck. The curb was 10½ inches tall, and a 2½ inch thick lift of TxDOT Type D asphalt was applied to the top of the concrete deck, which brought the curbs effective height to 8 inches above grade. The three rails were mounted to the posts via wood blockouts, and oriented such that they were 4 inches tall, with their respective top surfaces located 15¾ inches, 23 inches, and 30¾ inches above grade. The 13 posts, were spaced on 75-inch centers, beginning at 19¾ inches from the upstream end of the deck. Between posts 3 and 4 and between posts 7 and 8, there were ½-inch expansion joints in the deck and curb and 1-inch-long sleeved joints in the rails.

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:	D. Lance Bullard, Jr.	
Engineer Signature:	D. Lance Bullard, Jr.	Digitally signed by D. Lance Bullard, Jr. Date: 2022.02.04 13:36:20 -06'00'
Address:	1254 Avenue A, Bldg 7091, Bryan, Texas 77807 USA	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
3-10 (1100C)	<p>Test 3-10 involves an 1100C vehicle impacting the test article at a target impact speed of 62 mi/h \pm2.5 mi/h and a target impact angle of 25° \pm1.5°. The target CIP was for the right corner of the front bumper to impact 3.6 ft \pm1 ft upstream of the upstream edge of post 8.</p> <p>The results of the test conducted on August 9, 2021, are found in TTI Test Report number 610481-01. The test vehicle was traveling at an impact speed of 63.0 mi/h as it made contact with the rail 3.9 ft upstream of the upstream edge of post 8 at an impact angle of 25.0°. After loss of contact with the barrier, the vehicle came to rest 185 ft downstream of the impact point and 144 ft towards the traffic side.</p> <p>The bridge rail contained and redirected the 1100C vehicle. The vehicle did not penetrate, underride, or override the installation. The 1100C vehicle exited within the exit box criteria.</p> <p>Working width was 19.7 inches. Maximum dynamic deflection was 2.5 inches during the test. Maximum permanent deformation was 1.25 inches.</p> <p>No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or present hazard to others in the area.</p> <p>Maximum exterior crush to the vehicle was 9.0 inches in the side plane at the right front corner just above bumper height.</p> <p>Maximum occupant compartment deformation was 2.0 inches in the right front firewall/toe pan area.</p> <p>The 1100C vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 11° and 9°, respectively. Longitudinal OIV was 20.4 ft/s, and lateral OIV was 35.0 ft/s. Longitudinal occupant ridedown acceleration was 3.0 g, and lateral occupant ridedown acceleration 11.3 g. The occupant risk factors were within the MASH allowable limits.</p> <p>The PA 3-Rail Bridge Barrier performed acceptably for MASH Test 3-10.</p>	PASS

Required Test Number	Narrative Description	Evaluation Results
3-11 (2270P)	<p>Test 3-11 involves a 2270P vehicle impacting the test article at a target impact speed of 62 mi/h \pm2.5 mi/h and a target impact angle of 25° \pm1.5°. The target CIP was for the right corner of the front bumper to impact at 4.3 ft \pm1 ft upstream of the upstream edge of post 4.</p> <p>The results of the test conducted on July 2, 2021 are found in TTI Test Report number 610481-01. The test vehicle was traveling at an impact speed of 62.8 mi/h as it made contact with the barrier 4.3 ft upstream of the upstream edge of post 4 at an angle of 25.0°. After loss of contact with the barrier, the vehicle came to rest 225 ft downstream of the impact point and 9 ft towards the traffic side.</p> <p>The bridge rail contained and redirected the 2270P vehicle. The vehicle did not penetrate, underride, or override the installation. The 2270P vehicle exited within the exit box criteria.</p> <p>Working width was 19.5 inches. Maximum dynamic deflection during the test was 5.4 inches. Maximum permanent deformation was 2.75 inches.</p> <p>No detached elements, fragments, or other debris were present to penetrate or show potential for penetrating the occupant compartment, or present hazard to others in the area.</p> <p>Maximum exterior crush to the vehicle was 14.0 inches in the side plane at the right front corner at bumper height. Maximum occupant compartment deformation 2.0 inches in the right front firewall area.</p> <p>The 2270P vehicle remained upright during and after the collision event. Maximum roll and pitch angles were 41° and 9°, respectively. Longitudinal OIV was 17.4 ft/s, and lateral OIV was 26.4 ft/s. Longitudinal occupant ridedown acceleration was 3.8 g, and lateral occupant ridedown acceleration 9.2 g. The occupant risk factors were within the MASH preferred limits.</p> <p>The PA 3-Rail Bridge Barrier performed acceptably for MASH Test 3-11.</p>	PASS
3-20 (1100C)	This bridge rail is not a transition system.	Non-Relevant Test, not conducted
3-21 (2270P)	This bridge rail is not a transition system.	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:	Digitally signed by Darrell L. Kuhn 'Date: 2022.01.28 09:33:14 -06'00		
Address:	1254 Avenue A, Bldg 7091, Bryan, Texas 77807 USA	Same as Submitter	<input type="checkbox"/>
Country:	USA	Same as Submitter	<input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	ISO 17025-2017 Laboratory A2LA Certificate Number: 2821.01 Valid To: April 30, 2023		

Submitter Signature*: Digitally signed by Kristin L. Langer
'Date: 2022.12.07 10:08:03 -05'00



Submit Form

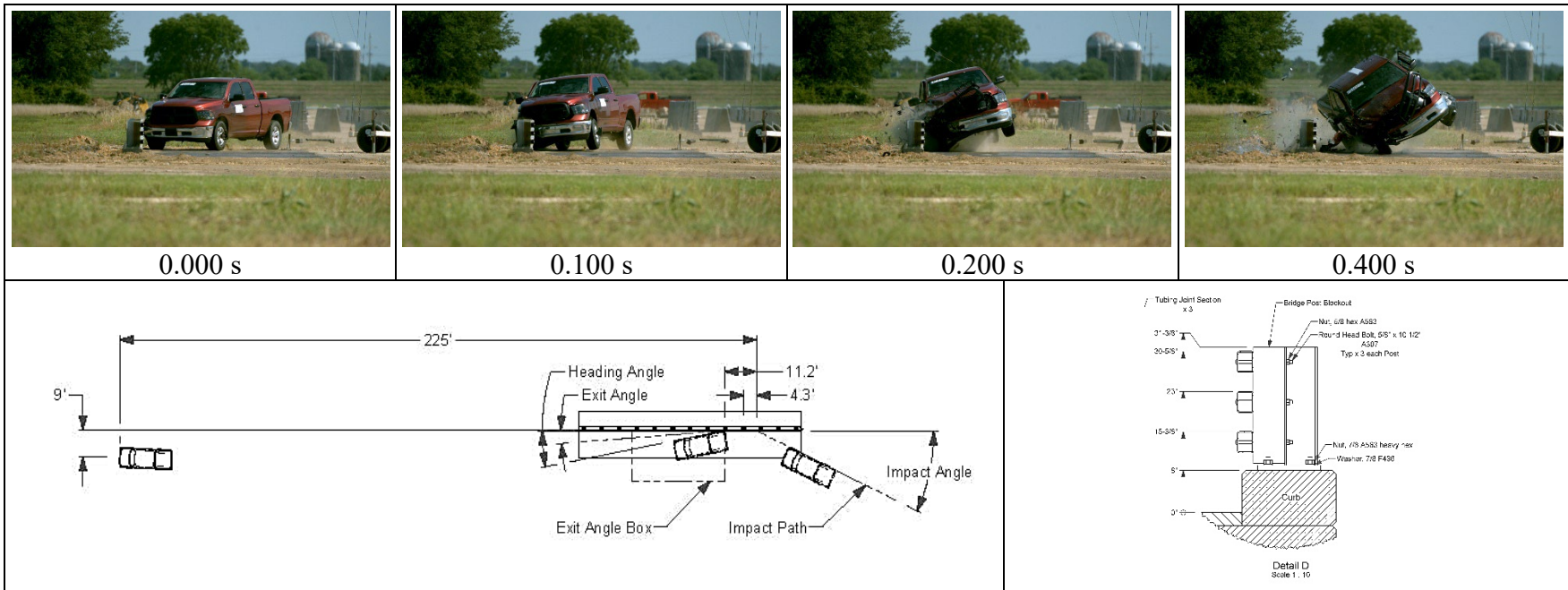
ATTACHMENTS

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 3-11
 TTI Test No. 610481-01-1A
 Test Date 2021-07-02

Test Article

Type Longitudinal Barrier—Bridge Rail
 Name PA 3-Rail Bridge Barrier
 Installation Length 78 ft-7³/₄ inches
 Material or Key Elements ... 3 HSS 4x3x³/₁₆ inch steel rails on steel posts anchored to concrete curb on deck

Soil Type and Condition

Concrete bridge deck, dry

Test Vehicle

Type/Designation 2270P
 Make and Model 2015 RAM 1500 Pickup
 Curb 5054 lb
 Test Inertial 5060 lb
 Dummy No dummy
 Gross Static 5060 lb

Impact Conditions

Speed 62.8 mi/h
 Angle 25.0°
 Location/Orientation 4.3 upstream of Edge of post 4

Impact Severity

119 kip-ft

Exit Conditions

Speed 52.1 mi/h
 Trajectory/Heading Angle... 4.2°/10.7°

Occupant Risk Values

Longitudinal OIV 17.4 ft/s
 Lateral OIV 26.4 ft/s
 Longitudinal Ridedown 3.8 g
 Lateral Ridedown 9.2 g
 THIV 9.5 m/s
 ASI 1.8

Max. 0.050-s Average

Longitudinal -8.1 g
 Lateral -13.5 g
 Vertical 2.9 g

Post-Impact Trajectory

Stopping Distance 225 ft downstream
 9 ft twd traffic lanes

Vehicle Stability

Maximum Yaw Angle 41°
 Maximum Pitch Angle 9°
 Maximum Roll Angle 46°
 Vehicle Snagging No
 Vehicle Pocketing No

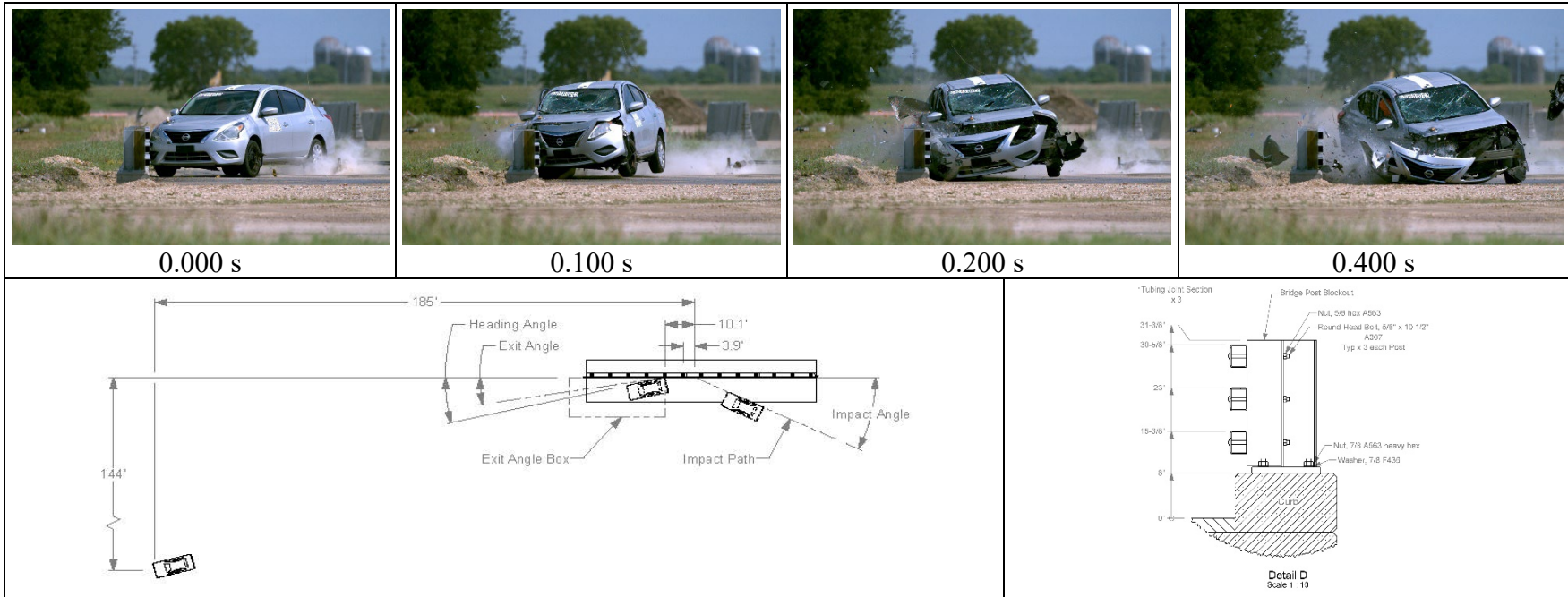
Test Article Deflections

Dynamic 5.4 inches
 Permanent 2.75 inches
 Working Width 19.5 inches
 Height of Working Width 63.3 inches

Vehicle Damage

VDS 01RFQ5
 CDC 01FREW3
 Max. Exterior Deformation 14.0 inches
 OCDI RF0010000
 Max. Occupant Compartment Deformation 2.0 inches

Figure 4.1. Summary of Results for MASH Test 3-11 on PA 3-Rail Bridge Barrier System.



General Information

Test Agency..... Texas A&M Transportation Institute (TTI)
 Test Standard Test No..... MASH Test 3-10
 TTI Test No. 610481-01-2
 Test Date..... 2021-08-09

Test Article

Type Longitudinal Barrier—Bridge Rail
 Name..... PA 3-Rail Bridge Barrier
 Installation Length..... 78 ft-7¾ inches
 Material or Key Elements... 3 HSS 4x3x¾ inch steel rails on steel posts anchored to concrete curb on deck

Soil Type and Condition

..... Concrete bridge deck, dry

Test Vehicle

Type/Designation..... 1100C
 Make and Model 2015 Nissan Versa
 Curb..... 2420 lb
 Test Inertial..... 2448 lb
 Dummy 165 lb
 Gross Static..... 2613 lb

Impact Conditions

Speed 63.0 mi/h
 Angle 25.0°
 Location/Orientation 3.9 ft upstream of Edge of Post 8

Impact Severity

..... 58 kip-ft

Exit Conditions

Speed 54.2 mi/h
 Trajectory/Heading Angle... 9.0°/12.8°

Occupant Risk Values

Longitudinal OIV 20.4 ft/s
 Lateral OIV..... 35.0 ft/s
 Longitudinal Ridedown 3.0 g
 Lateral Ridedown 11.3 g
 THIV 12.4 m/s
 ASI..... 2.8

Max. 0.050-s Average

Longitudinal -11.5 g
 Lateral..... -21.3 g
 Vertical..... 3.8 g

Post-Impact Trajectory

Stopping Distance..... 185 ft downstream
 144 ft twd traffic

Vehicle Stability

Maximum Roll Angle 11°
 Maximum Pitch Angle 9°
 Maximum Yaw Angle 52°
 Vehicle Snagging No
 Vehicle Pocketing No

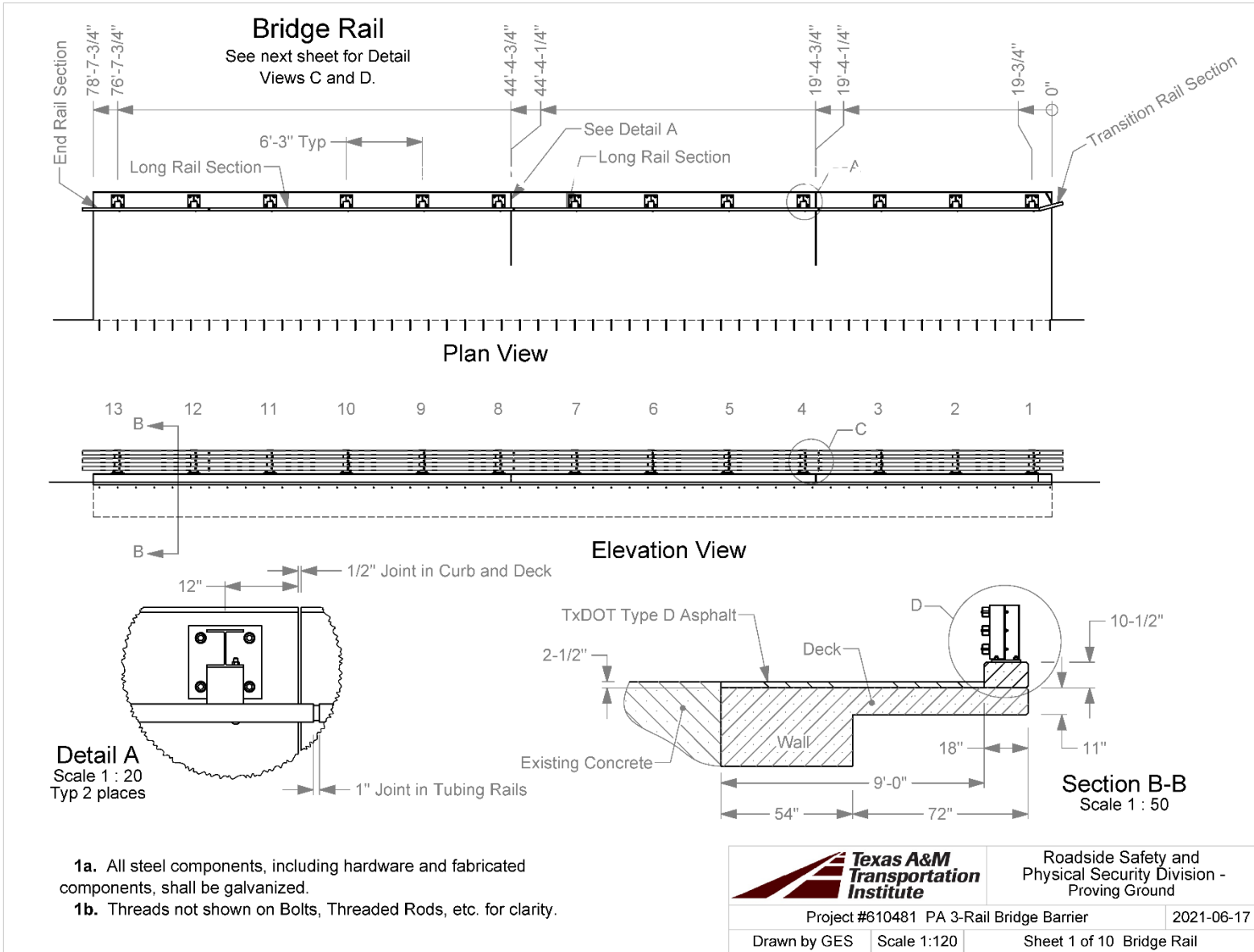
Test Article Deflections

Dynamic..... 2.5 inches
 Permanent..... 1.25 inches
 Working Width..... 19.7 inches
 Height of Working Width 10.5 inches

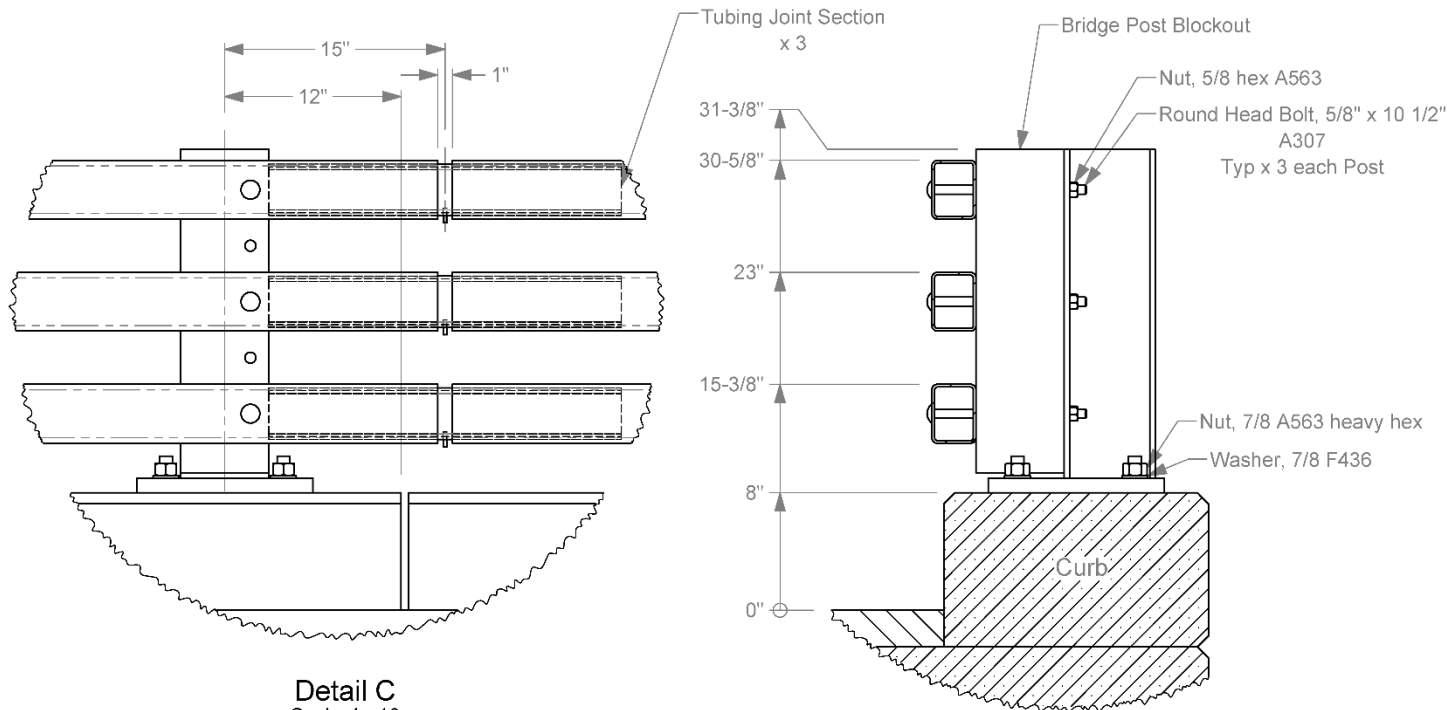
Vehicle Damage

VDS..... 01RFQ6
 CDC..... 01FREW4
 Max. Exterior Deformation..... 9.0 inches
 OCDI..... RF0010000
 Max. Occupant Compartment Deformation 2.0 inches

Figure 4.15. Summary of Results for MASH Test 3-10 on PA 3-Rail Bridge Barrier System.




Detail Views

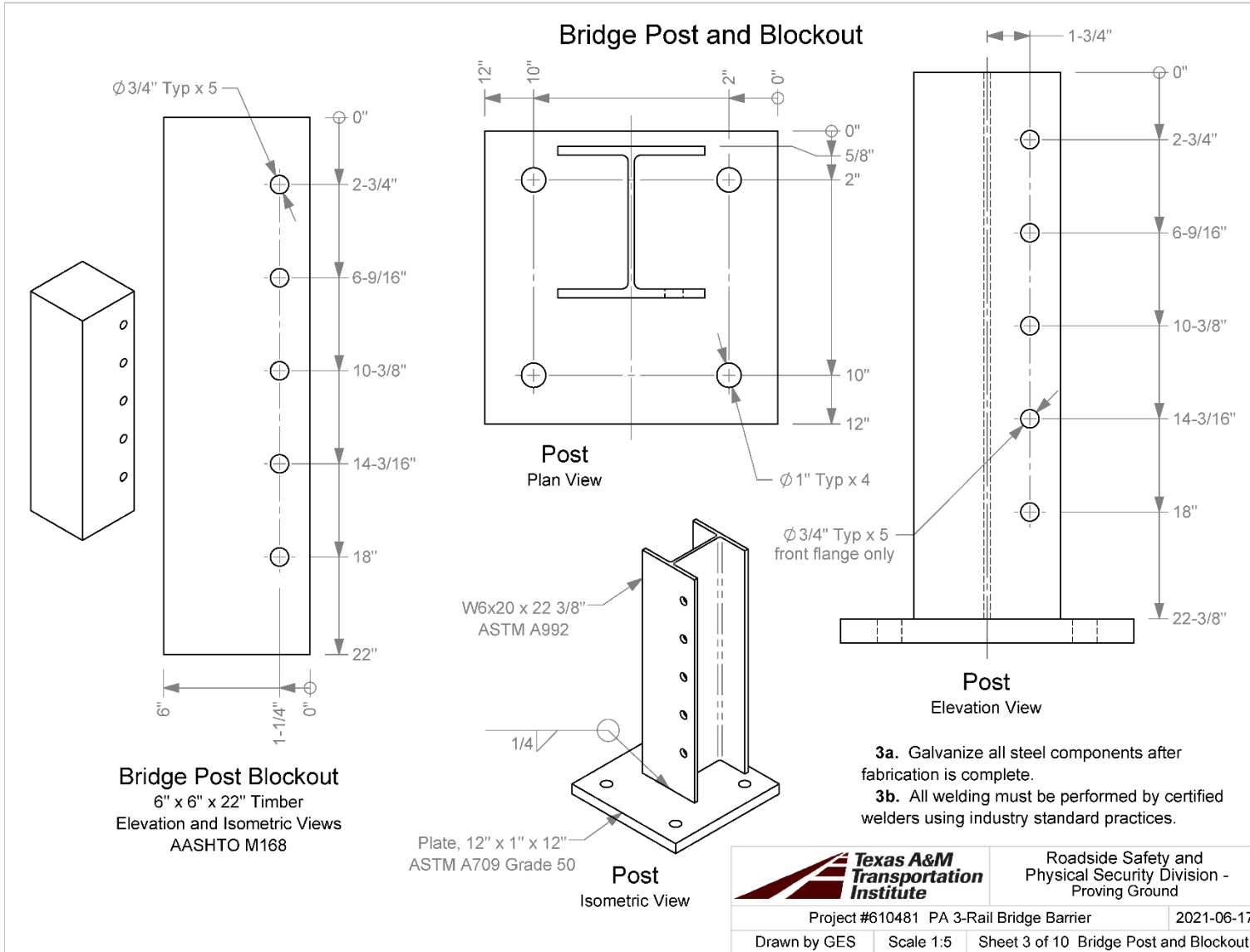


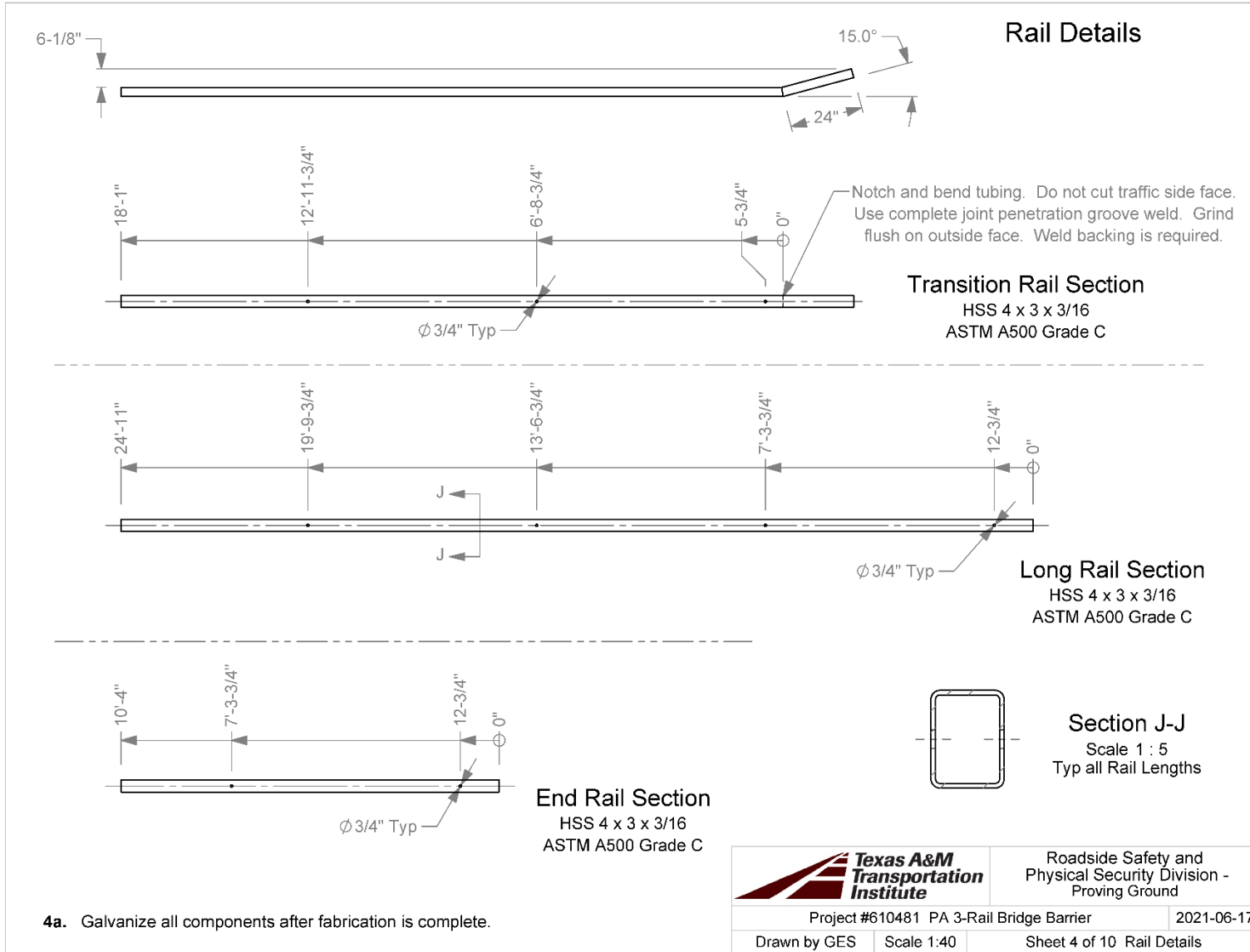
Detail C
Scale 1 : 10
Typical at all joints. Thrie-beam rail not shown for clarity.

Detail D
Scale 1 : 10

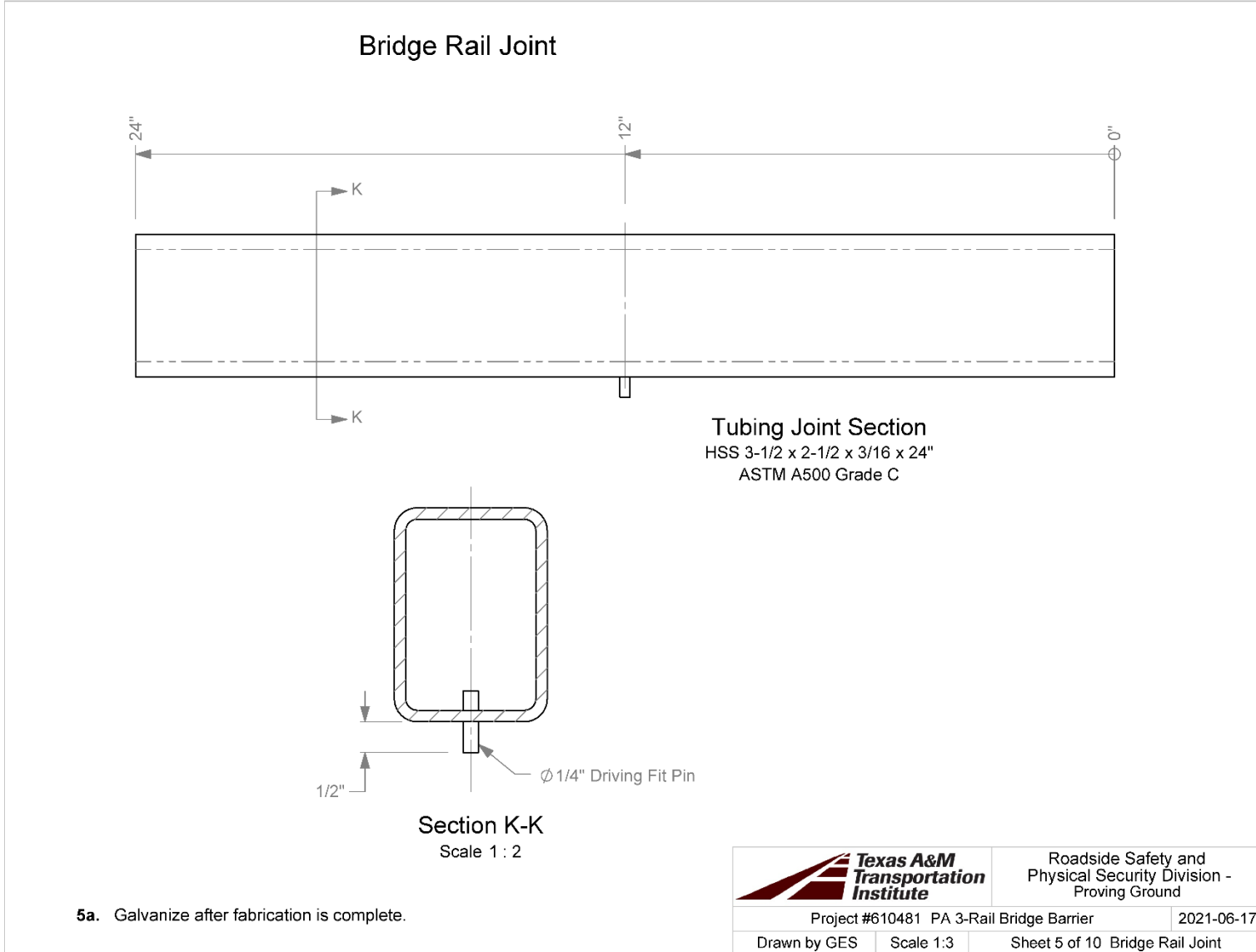
- 2a.** All steel components, including hardware and fabricated components, shall be galvanized.
- 2b.** Threads not shown on Bolts, Threaded Rods, etc. for clarity.

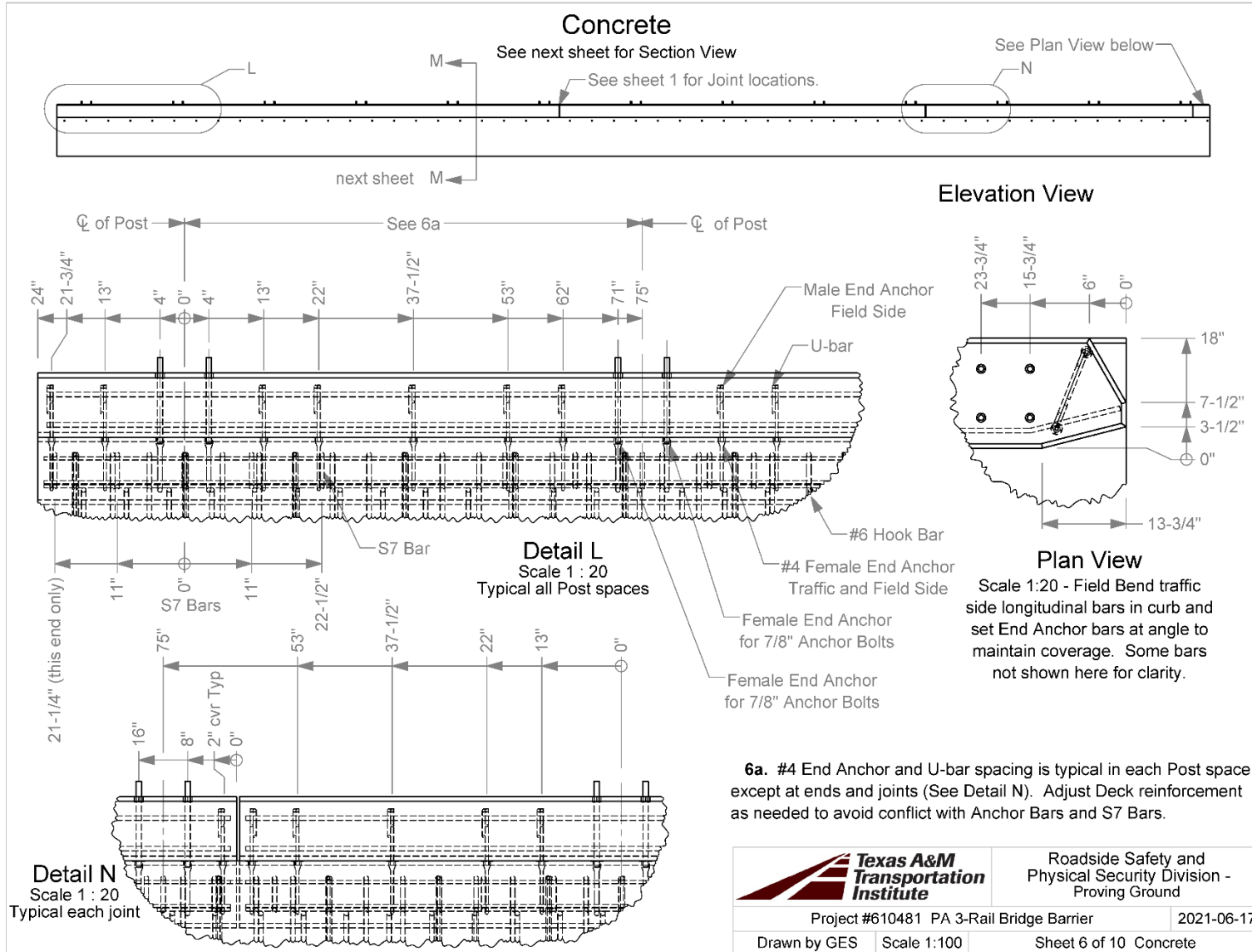
		Roadside Safety and Physical Security Division - Proving Ground	
		Project #610481 PA 3-Rail Bridge Barrier	2021-06-17
Drawn by GES	Scale 1:120	Sheet 2 of 10 Detail Views	



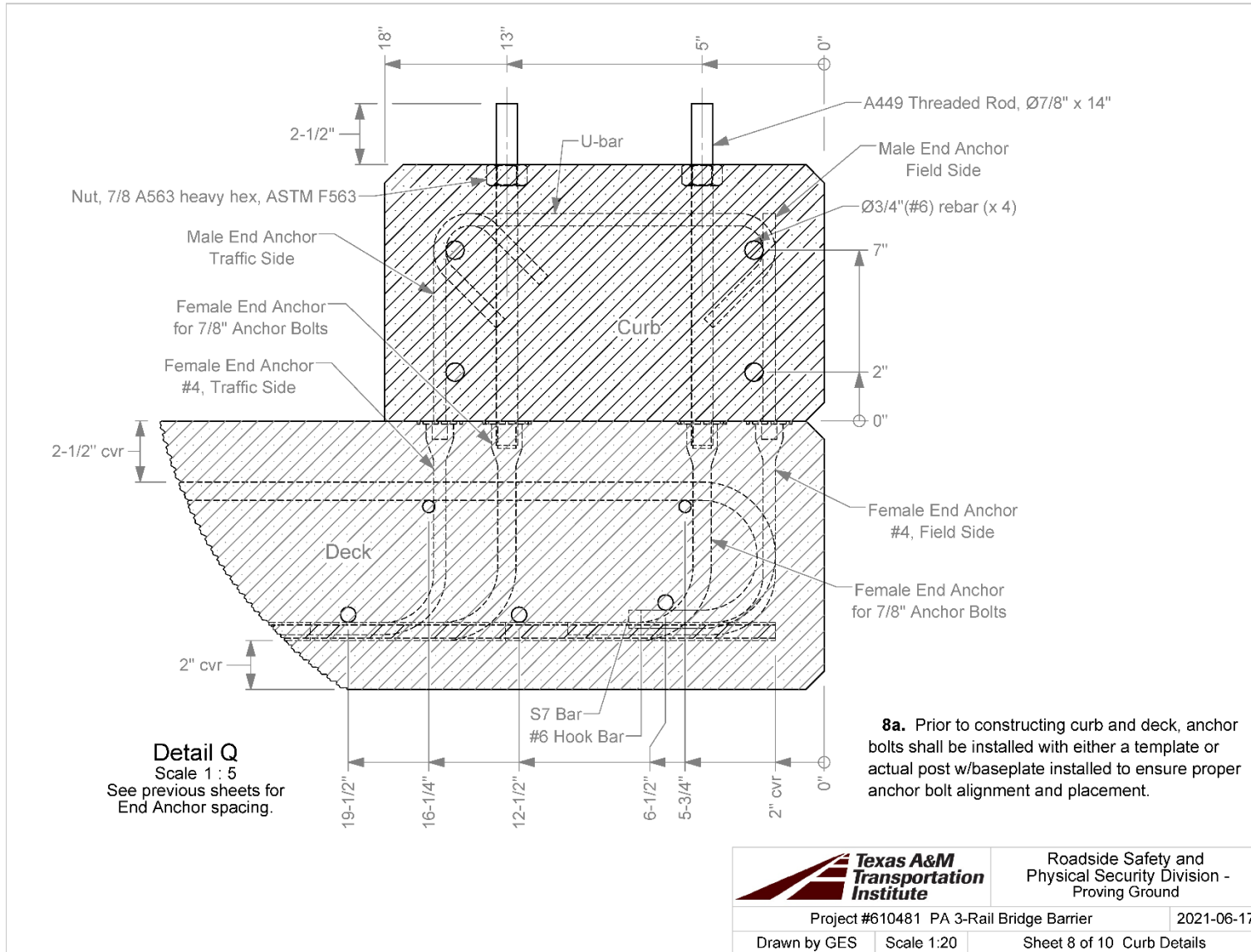


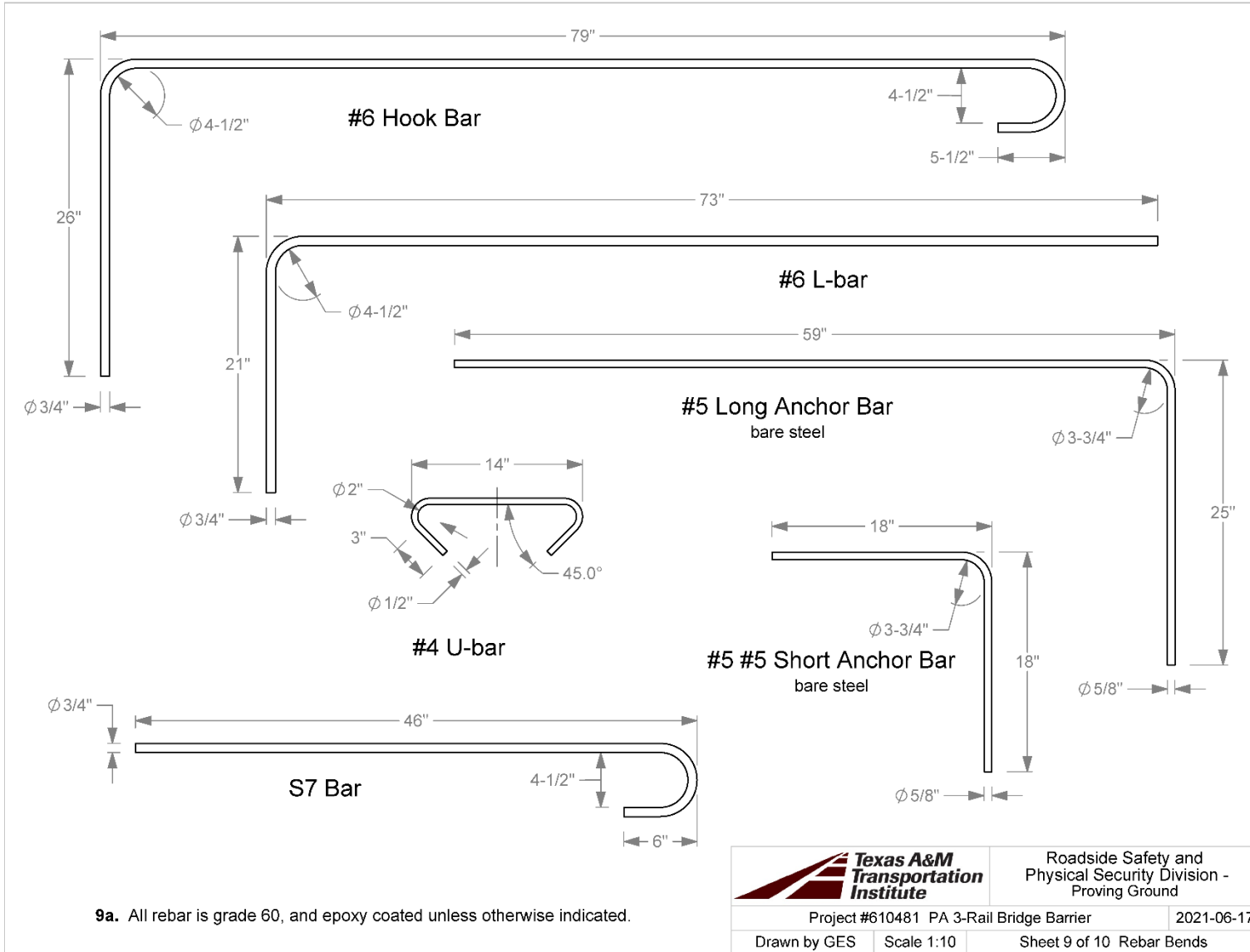
		Roadside Safety and Physical Security Division - Proving Ground
Project #610481 PA 3-Rail Bridge Barrier		2021-06-17
Drawn by GES	Scale 1:40	Sheet 4 of 10 Rail Details

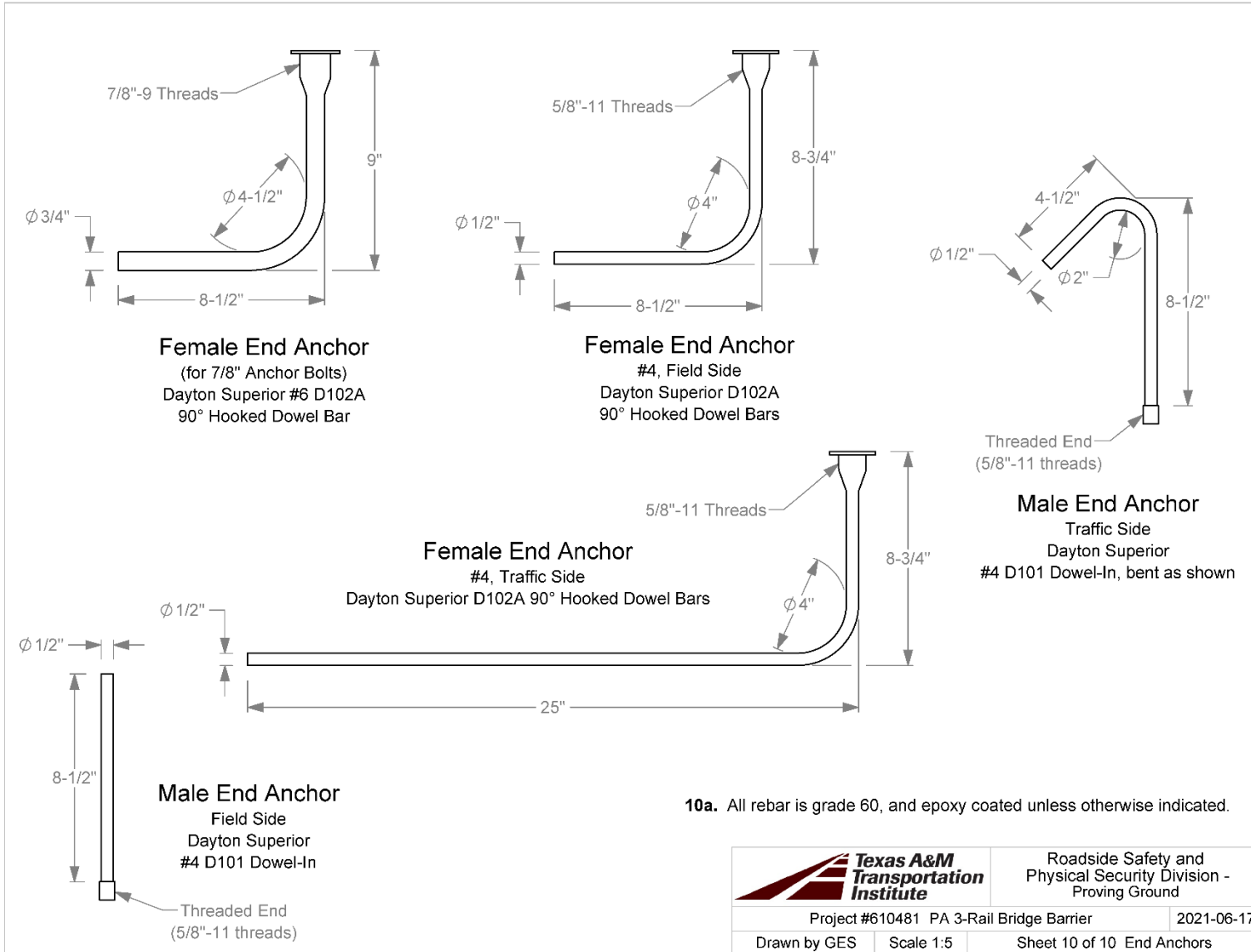





		Roadside Safety and Physical Security Division - Proving Ground
Project #610481 PA 3-Rail Bridge Barrier		2021-06-17
Drawn by GES	Scale 1:100	Sheet 6 of 10 Concrete







		Roadside Safety and Physical Security Division - Proving Ground
Project #610481 PA 3-Rail Bridge Barrier		2021-06-17
Drawn by GES	Scale 1:5	Sheet 10 of 10 End Anchors

