U.S. Department of Transportation
Federal Highway Administration

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

June 10, 2011

In Reply Refer To:
HSST/B-214

Ms. Karla A. Lechtenberg, MSME, EIT
Research Associate Engineer
Midwest Roadside Safety Facility
130 Whittier Research
2200 Vine Street
Lincoln, NE 68583-0853

Dear Ms. Lechtenberg:

This letter is in response to your request for the Federal Highway Administration (FHWA) acceptance of a roadside safety system for use on the National Highway System (NHS).

Name of system:	Thrie Beam Transition to Concrete Barrier
Type of system:	Steel Post and W-beam Transition
Test Level:	AASHTO Manual for Assessing Safety Hardware Test Level 3
Testing conducted by:	Midwest Roadside Safety Facility
Date of request:	December 18, 2010
Date initially acknowledged:	December 18, 2010
Task Force 13 Designator:	STB12

You requested that we find this system acceptable for use on the NHS under the provisions of the American Association of State Highway and Transportation Officials (AASHTO) "Manual for Assessing Safety Hardware" (MASH).

Requirements
Roadside safety devices should meet the guidelines contained in the MASH.

Decision
The following device was found acceptable, with details provided below:

• Thrie Beam Transition to Concrete Barrier

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Description
The test installation was 24.59 meters (80.67 feet) long and consisted of seven (7) major structural components:

1. 3.66 meters (12 feet) long New Jersey safety shape end section;
2. 4.57 meters (15 feet) long x 102 millimeters (4 inches) high x 178 millimeters (7 inches) wide lip curb;
3. 813 millimeters (32 inches) long steel thrie beam to New Jersey safety shape connector plate (NJ connector plate);
4. Thrie beam terminal connector;
5. 3,810 millimeters (12 feet 6 inches) of nested 2.66 millimeters (12-gauge) thick thrie beam guardrail;
6. 1,905 millimeters (6 feet 3 inches) long, 2.66 millimeters (12-gauge) thick W-beam to thrie beam transition section;
7. 15.24 meters (50 feet) of standard 2.66 millimeters (12-gauge) thick W-beam guardrail attached to a simulated anchorage device.

A NJ connector plate connected the thrie beam rail to the New Jersey safety shape end section. The NJ connector plate was fabricated with 4.76 millimeters (3/16-inch) and 6.35 millimeters (1/4-inch) thick ASTM A36 steel. External dimensions of the connector plate were 813 millimeters (32 inches) long by 533 millimeters (21 inches) deep. A sloped section was placed on the end of the connector plate to eliminate any potential for vehicle snagging which may result from a "reverse hit" impact. Five 22-mm (7/8-inch) diameter by 305 millimeters (12 inches) long ASTM A325 bolts connected the NJ connector plate to the concrete safety shape. The entire system was constructed with seventeen (17) guardrail posts.

- Post numbers 3 through 17 were galvanized ASTM A36 steel W152x13.4 (W6x9) sections.
- Post numbers 3 through 10 measured 1,829 millimeters (6 feet) long, while post numbers 11 through 17 measured 1,981 millimeters (6 feet 6 inches) long.
- Post numbers 1 and 2 were timber posts measuring 140 millimeters wide x 190 millimeters deep x 1,080 millimeters long (5.5 inches x 7.5 inches x 42.5 inches) and were placed in 1,524- millimeters (5 feet) long steel foundation tubes with 457 millimeters wide x 610 millimeters long x 6 millimeters thick (18 inches x 24 inches x 1/4-inch) soil plates. The timber posts and foundation tubes were part of anchor systems designed to replicate the capacity of a tangent guardrail terminal.

Post numbers 1 through 9 were spaced 1,905 millimeters (75 inches) on center while post numbers 9 through 12 were spaced 953 millimeters (37.5 inches) on center. Post numbers 12 through 17 were spaced 476 millimeters (18.75 inches) on center. The spacing from post number 17 to the New Jersey safety shape end section was 261 millimeters (10.25 inches). The soil embedment depth for post nos. 3 through 9, 10, and 11 through 17 were 1,114 millimeters (43.875 inches), 1,080 millimeters (42.5 inches), and 1,245 millimeters (49 inches), respectively.

The posts were placed in a compacted coarse, crushed limestone material that met Grading B of AASHTO M147-65 (1990) as found in MASH. For post numbers 3 through 9, 152 millimeters wide x 203 millimeters deep x 362 millimeters long (6 inches x 8 inches x 14.25 inches) wood spacer blockouts were used to block the rail away from the front face of the steel posts.

For post number 10, a 152 millimeters wide x 203 millimeters deep x 483 millimeters long (6 inches x 8 inches x 19 inches) wood spacer blockout was used to block the rail away from the front face of the steel post. For post numbers 11 through 17, a 102 millimeters wide x 178 millimeters deep x 445 millimeters long (4 inches x 7 inches x 17.5 inches) structural tube spacer blockout was used to block the thrie beam guardrail away from the steel posts. Standard 2.66 millimeters (12-gauge) thick W-beam rails were placed between post numbers 1 and 9, as shown in Figure 5. The W-beam's top rail height was 689 millimeters (27.125 inches) with a 533 millimeters (21 inches) center mounting height. A standard 2.66 millimeters (12-gauge) thick W-beam to thrie beam transition section was placed between post numbers 9 and 11. Two nested 2.66 millimeters (12-gauge) thick thrie beam rails were placed between post number 11 and the thrie beam connector attached to the end of the New Jersey safety shape barrier, as shown in Figure 5. The thrie beam's top rail height was 788 millimeters (31 inches) with a 533 millimeter (21 inches) center mounting height. All lap-splice connections between the rail sections were configured to reduce vehicle snag at the splice during the crash test. All lap-splice connections between the rail sections were configured to reduce vehicle snag at the splice during the crash test. Design details are provided as enclosure to this correspondence.

Crash Testing

Crash testing conducted according to Test Level 3 (TL-3) of the MASH, longitudinal barrier transition systems must be subjected to two full-scale vehicle crash tests. The two full-scale crash tests are as follows:

1. Test Designation 3-20. An 1,100-kg (2,425-lb) passenger car impacting at a nominal speed and angle of 100.0 km/h (62.1 mph) and 25 degrees, respectively.
2. Test Designation 3-21. A 2,268-kg (5,000-lb) pickup truck impacting at a nominal speed and angle of 100.0 km/h (62.1 mph) and 25 degrees, respectively.

Findings

The Thrie Beam Transition to Concrete Barrier system was constructed and crash tested. A full-scale vehicle crash tests using a 2270P pickup truck vehicle were performed and was determined to be acceptable according to the TL-3 safety performance criteria presented in MASH. All physical crash test summaries are included as enclosure to this correspondence.

Therefore and as enumerated below, only the following portion of system and described in the request above and detailed in the enclosed drawings is acceptable for use on the NHS under the range of conditions tested, when such use is acceptable to a highway agency.

1. W6 x 9 Steel post number 11 through post number 17, 78 inches long with TS 7 inches x 4 inches x 3/13-inch steel tube blockouts; two (2) nested 12-gage thrie beam (12 feet 6 inches). The Thrie beam rail height is 31 inches high.

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

- This acceptance provides a 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 existing Task Force 13 drawing for posting on the on-line 'Guide to Standardized Highway Barrier Hardware' currently referenced in AASHTO 'Roadside Design Guide'.
- This acceptance is limited to the crashworthiness characteristics of the systems and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the system 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 system being marketed is significantly different from the version that was crash tested, we reserve the right to modify or revoke our 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 it will meet the crashworthiness requirements of the FHWA and the AASHTO MASH.
- To prevent misunderstanding by others, this letter of acceptance is designated as number B-214 and 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 at our office upon request.
- This acceptance 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. The acceptance letter is limited to the crashworthiness characteristics of the candidate system, 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.

Sincerely yours,

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

Enclosures

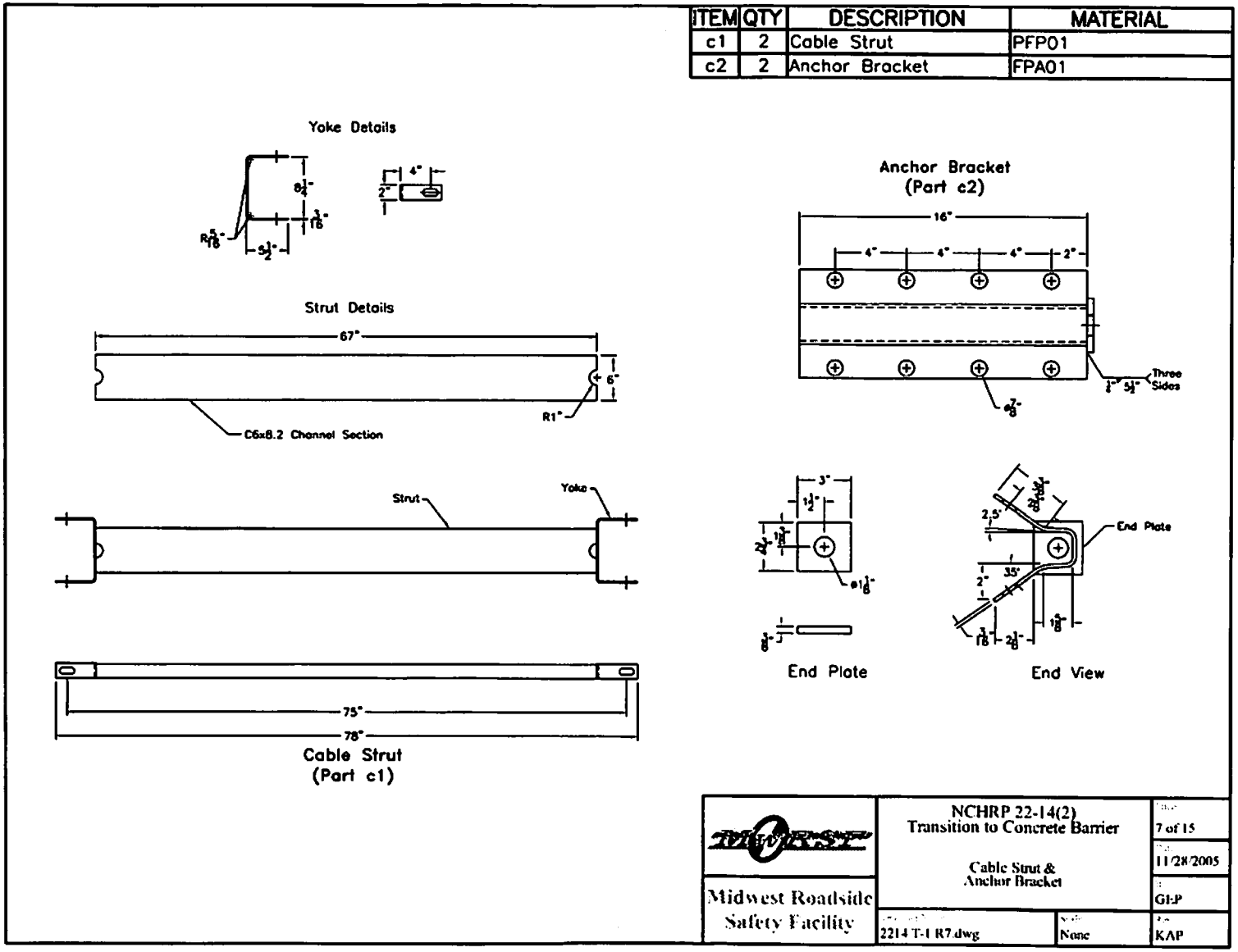


Figure A-7. Approach Guardrail Transition to Concrete Barrier Design - Anchorage Details (English)

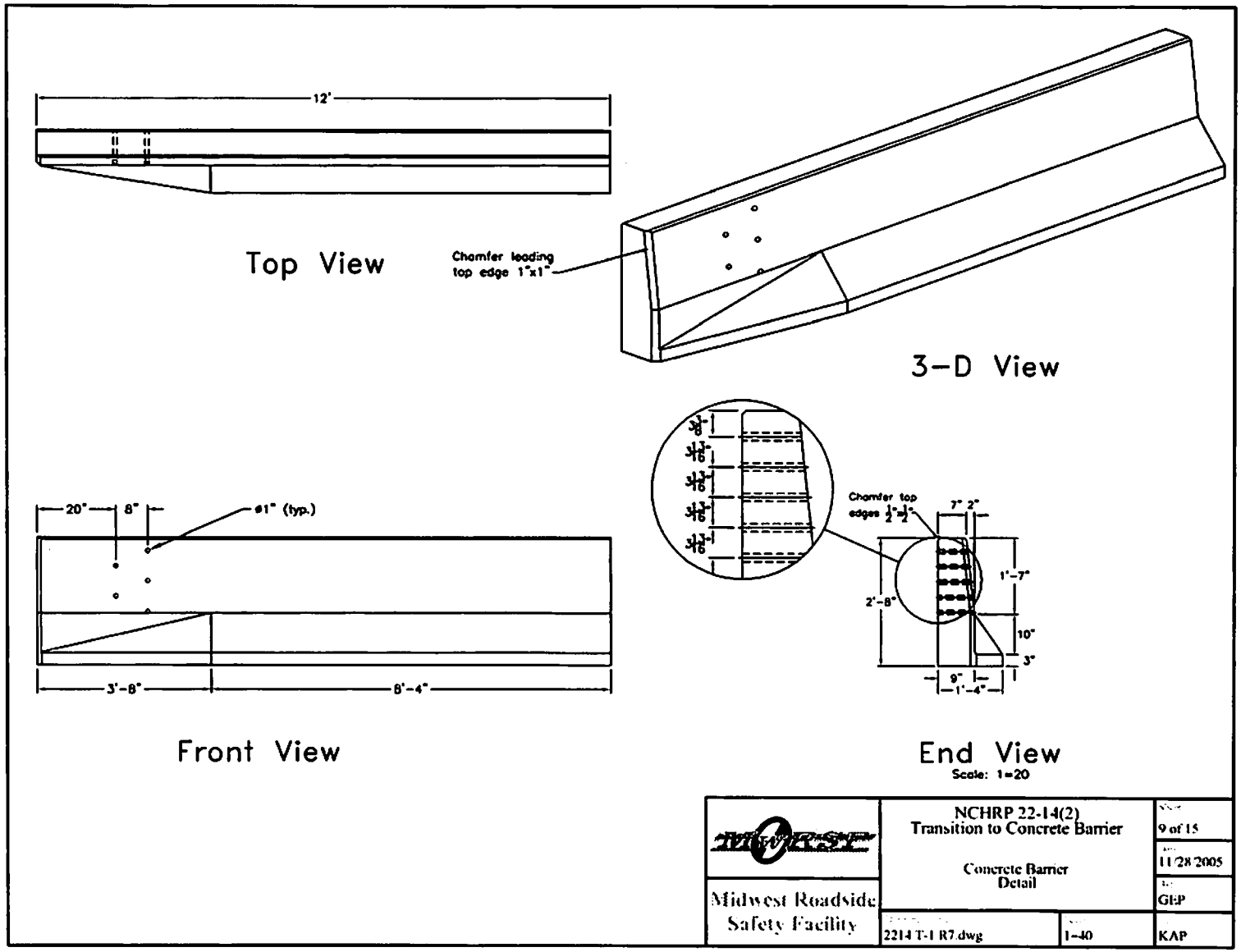


Figure A-9. Approach Guardrail Transition to Concrete Barrier Design - Concrete Barrier Details (English)

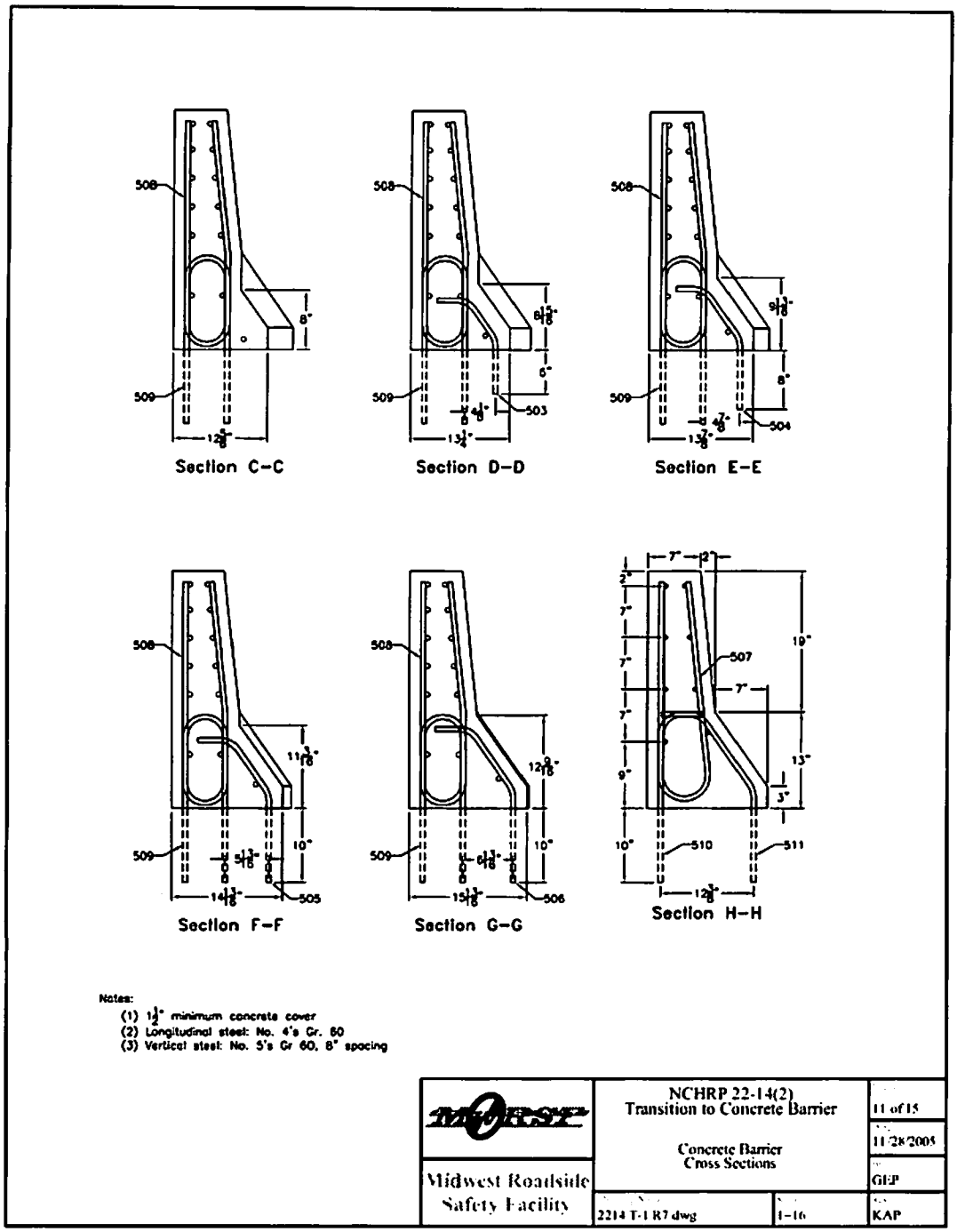
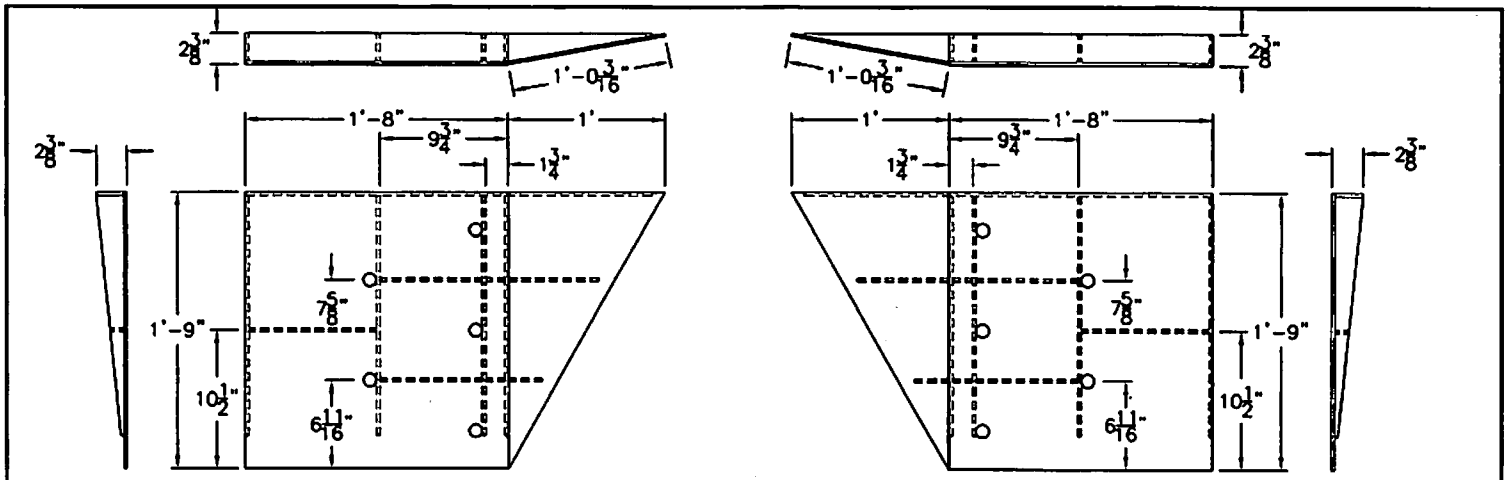


Figure A-11. Approach Guardrail Transition to Concrete Barrier - Cross Section Details (English)



Left–Hand Version

Right–Hand Version

NOTES:

1. All steel shall conform to ASTM A36.
2. Flat plate panels are $\frac{3}{16}$" thick.
3. Stiffeners are $\frac{1}{4}$" thick.
4. All hole diameters are 1".
5. Weld components with E60 rod.
6. Galvanize or paint.

WELDING INSTRUCTIONS:

(a) Stiffeners located on the outside edges of the cover plates shall be welded as follows: $\frac{3}{16}$" continuous back weld on external sides and $\frac{3}{16}$" fillet weld by 1" long spaced at 2" on internal sides.
(b) Stiffeners located on the inside of the cover plates shall be welded as follows: $\frac{3}{16}$" fillet weld by 1" long spaced at 2".
(c) Retangular and triangular cover plates shall be welded together with a $\frac{3}{16}$" continuous back weld on both sides.

MwRSF Midwest Roadside Safety Facility	NCHRP 22-14(2) Transition to Concrete Barrier Connector Plate Details 2214 T-1 R7.dwg | 1-10	Sheet 13 of 15 11/28/2005 GEP KAP

Figure A-13. Approach Guardrail Transition to Concrete Barrier Design - Connector Plate Details (English)

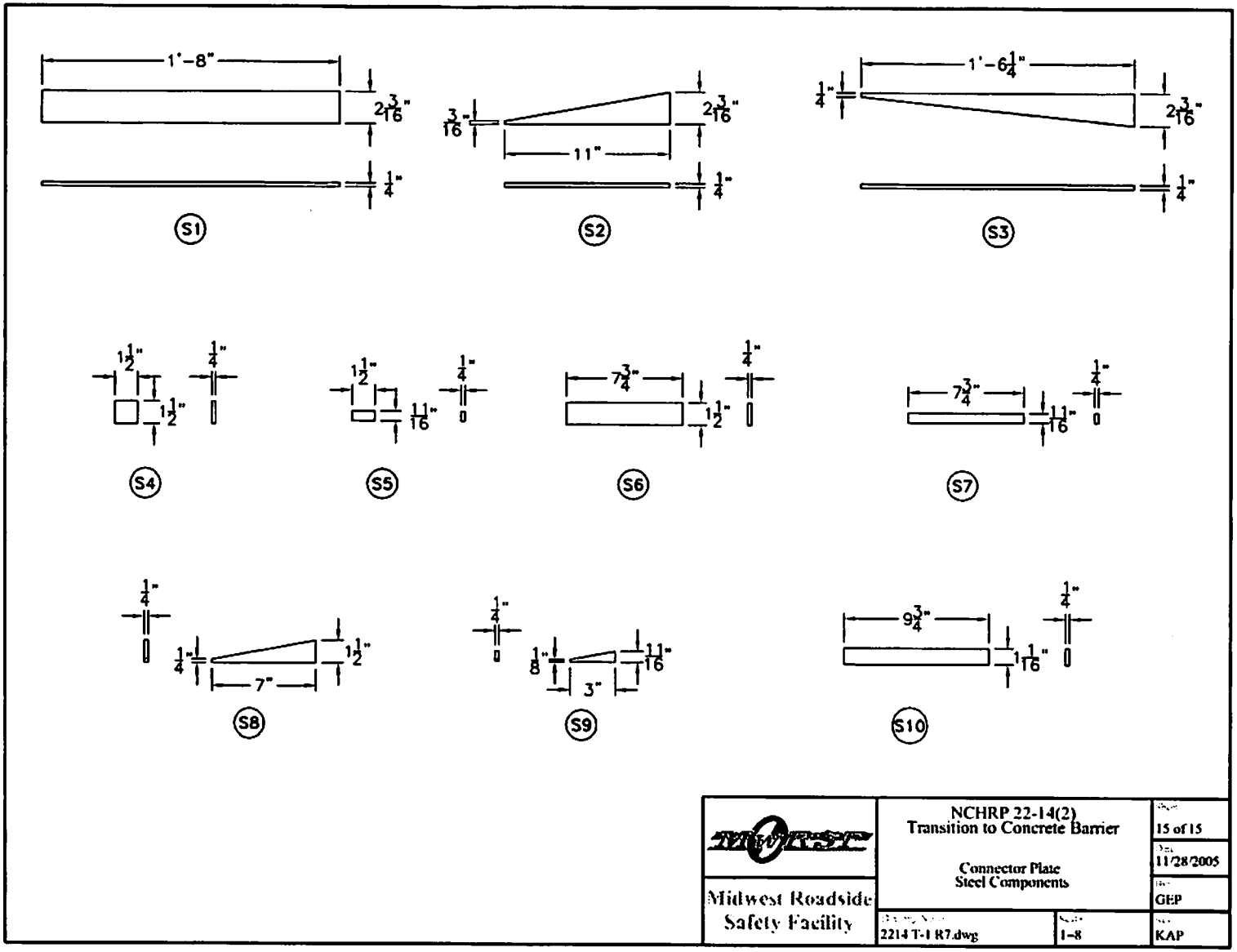


Figure A-15. Approach Guardrail Transition to Concrete Barrier Design - Connector Plate Details (English)