

August 24, 2004

Refer to: HSA-10/B-128

Mr. Byron Berger  
Acting Chief  
Roadside Safety Technology Branch  
Materials Engineering and Testing Services  
5900 Folsom Boulevard  
Sacramento, California 95819-4612

Dear Mr. Berger:

In Mr. Sudhakar Vatti's July 12 letter, he requested formal acceptance by the Federal Highway Administration of a see-through, combination steel post and beam bridge rail called the California ST-20S. This design, shown in Enclosure 1, was based on a previously accepted Wyoming DOT design for a test level 4 (TL-4) bridge rail and a modified version of your crash-tested ST-20 design. In your test, there was some hood snagging observed with the pickup truck, so you increased the rail face to post face distance in the ST-20S to reduce the likelihood of this occurrence. The final ST-20S design consists of four horizontal box-beam rail elements, the top and bottom ones being TS 203 x 76 x 7.9 structural tubes, and the middle two being TS 203 x 102 x 7.9 tubes. The summary results of the test you ran are shown in Enclosure 2.

Since your design uses thicker steel plate posts, has a greater rail offset than the Wyoming TL-4 rail, and has a lesser opening between the lower rail elements, you did not believe it necessary to conduct the small car test. Similarly, because the ST-20S is 1185-mm high (excluding the additional 187-mm tall top bicycle rail) versus the 830-mm high Wyoming design, you did not conduct the single-unit truck test. I concur that both of these tests can be waived based on the performance of the Wyoming design and on the differences between the two designs.

Therefore, the ST-20S design may be considered an NCHRP Report 350 bridge rail at TL-4 and used on the National Highway System when selected by the appropriate transportation authority. I assume that anyone needing detailed drawings and material specifications can obtain this information directly from your office.

Sincerely yours,

*/Original Signed by Harry W. Taylor/  
~for~*

John R. Baxter, P.E.  
Director, Office of Safety Design  
Office of Safety

2 Enclosures

**McGraw-Hill Construction**

REGISTERED ENGINEERS - CIVIL

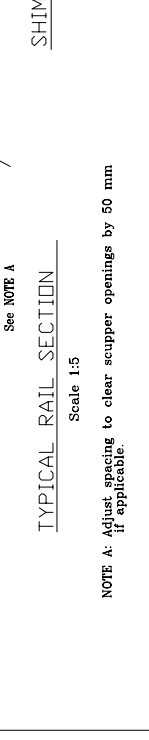
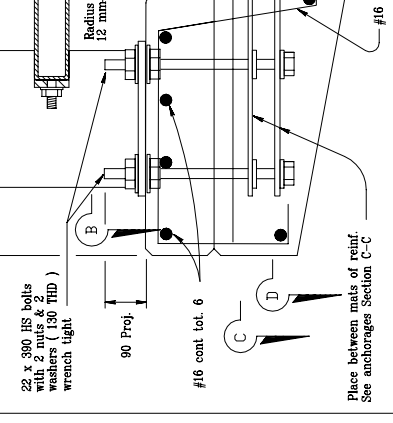
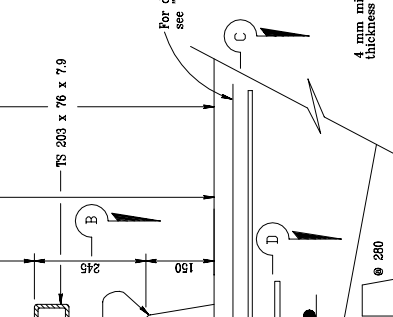
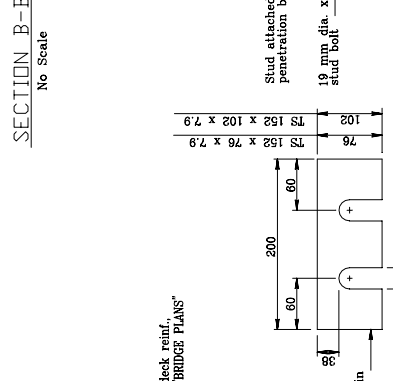
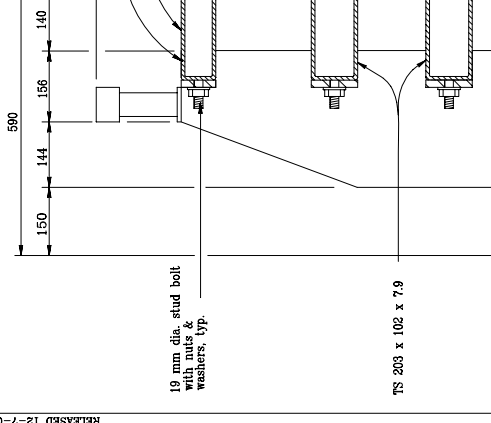
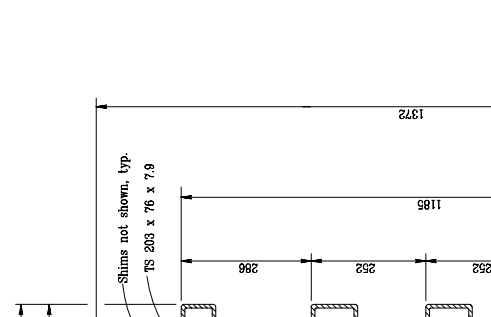
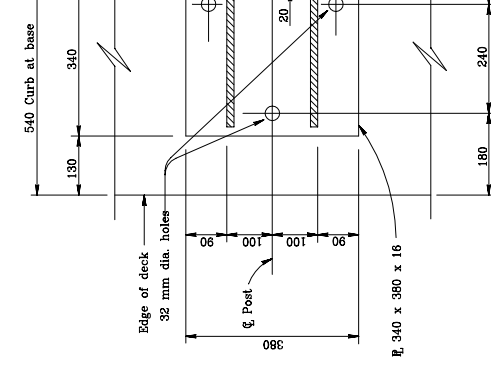
PLANS APPROVAL DATE

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PROFESSIONAL ENGINEER

REGISTERED CIVIL

DISP.	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS



STANDARD DRAWING

DESIGN BY: N. ARADYI  
 CHECKED BY: R. YER  
 DRAWING NO.: XX/XX  
 SUBMITTED BY: N. ARADYI

APPROVED BY: [Signature]

DATE: 8/18/06

STATE OF CALIFORNIA  
 DEPARTMENT OF TRANSPORTATION  
 DIVISION OF STRUCTURES  
 STRUCTURE DESIGN

CALIFORNIA ST-20S RAIL  
 DETAILS NO. 1

REVISIONS:

NO.	DATE	DESCRIPTION
1		
4		

SCALE: 1:5

NOTE A: Adjust spacing to clear scupper openings by 50 mm if applicable.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN



DIST.	COUNTY	ROUTE	ALTERNATE EAST SIDE PROJECT NO.	PROJECT NO.	DATE

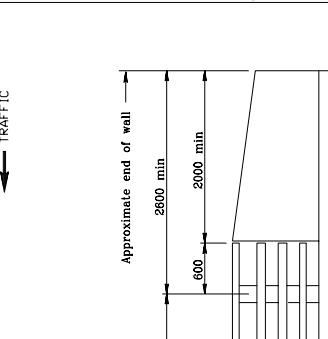
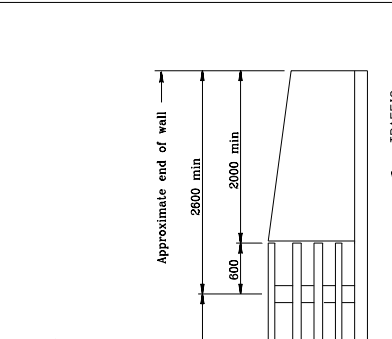
**REGISTERED ENGINEER - CIVIL**

PLANS APPROVAL DATE \_\_\_\_\_

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- MATERIAL**
- A) All structural steel shall be A36, Structural tubing shall be A500 grade B except as noted.
  - B) All bolts shall be high strength conforming to ASTM A325 Galvanized and wrench tight.
  - C) Stud bolts shall be high strength ASTM A108 and torque to 136 N-m.



**PROPOSED RAIL POST LAYOUT**

See Note 2

STANDARD DRAWING

DESIGN BY: N. ABDIN  
 CHECKED BY: N. ABDIN  
 DRAWN BY: R. YER  
 REVISIONS BY: N. ABDIN

APPROVED BY: Felix Altamirano  
 ENGINEER

STATE OF CALIFORNIA  
 DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES  
 STRUCTURE DESIGN

CALIFORNIA ST-20S RAIL  
 DETAILS NO. 2

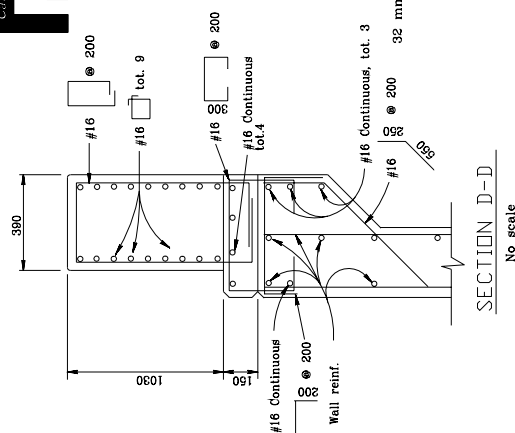
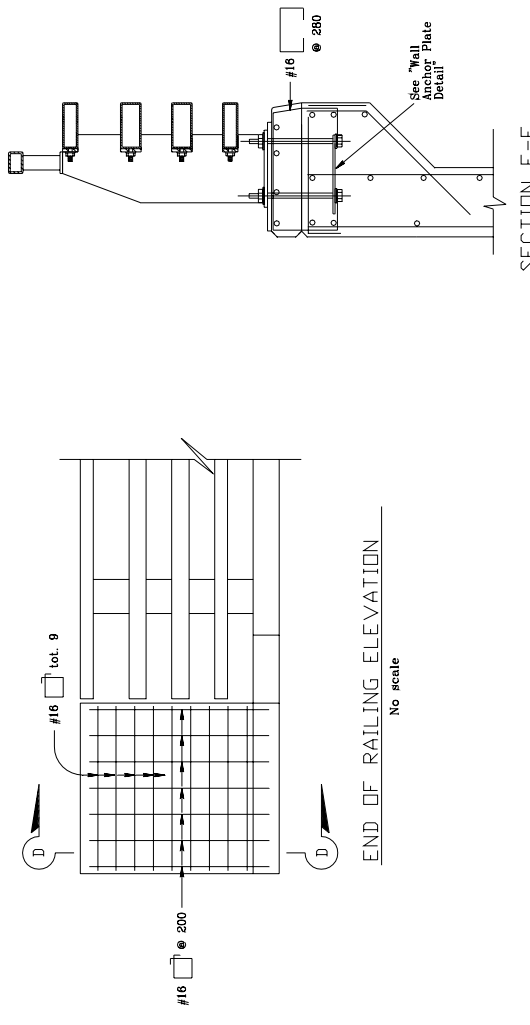
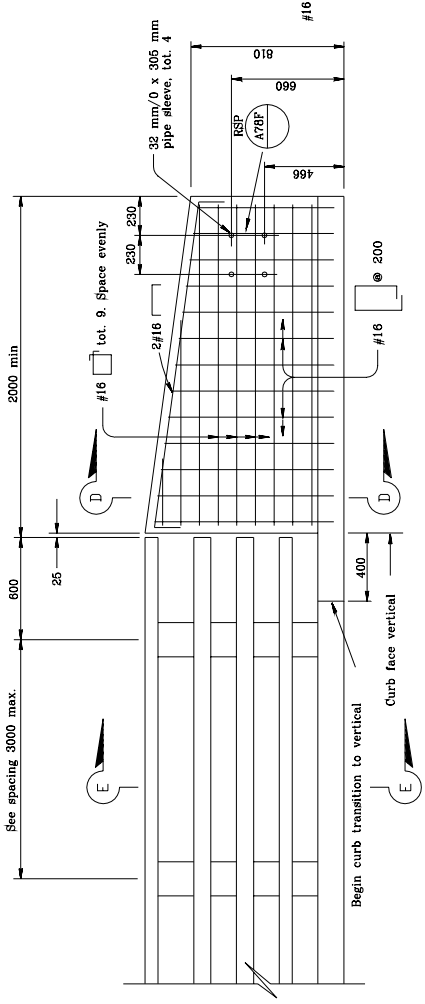
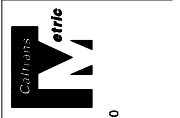
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 TIME PLOTTED => 8:14PM

PROJECT NO. \_\_\_\_\_  
 DRAWING NO. \_\_\_\_\_  
 SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

USER NAME: -RUSER  
 PROJECT: \_\_\_\_\_

PATH: S:\PC DES BR PRJ\MSK\RAY\A-102

DIST. COUNTY ROUTE DISTRICT PROJECT SHEET NO. 111111  
 REGISTERED ENGINEER - CIVIL  
 PLANS APPROVAL DATE  
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GENERAL NOTES

- All structural steel shall be galvanized after fabrication.
- Proposed railing layout shown is approximate. Final layout shall be reviewed by engineer before fabrication.
- Venting and pick-up holes in rails and sleeves shall be shown on fabricator's shop plans.
- Anchor bolts may be tack welded (shop or field) to anchorage.
- All rough edges on posts and rails shall be ground smooth.
- Tubing shall be bent or fabricated to fit horizontal curve when curve is less than 275 meters.
- After installation of rail, the exposed rail bolt threads shall be painted with two coats of zinc rich paint conforming to the requirement of section 76-1.05 galvanizing of the Standard Specifications.
- The alternative welded splice may be used in lieu of the Standard Splice.
- Each rail length shall be continuous over a minimum of two posts.
- The fabricator shall check that the tubular sleeves splices conform to the dimensions indicated to assure proper clearance.
- Except for expansion splices, not more than one splice shall be permitted per same side of post.
- See contract plans for approach guardrail details.

Reinf. same as for Section D-D except as noted

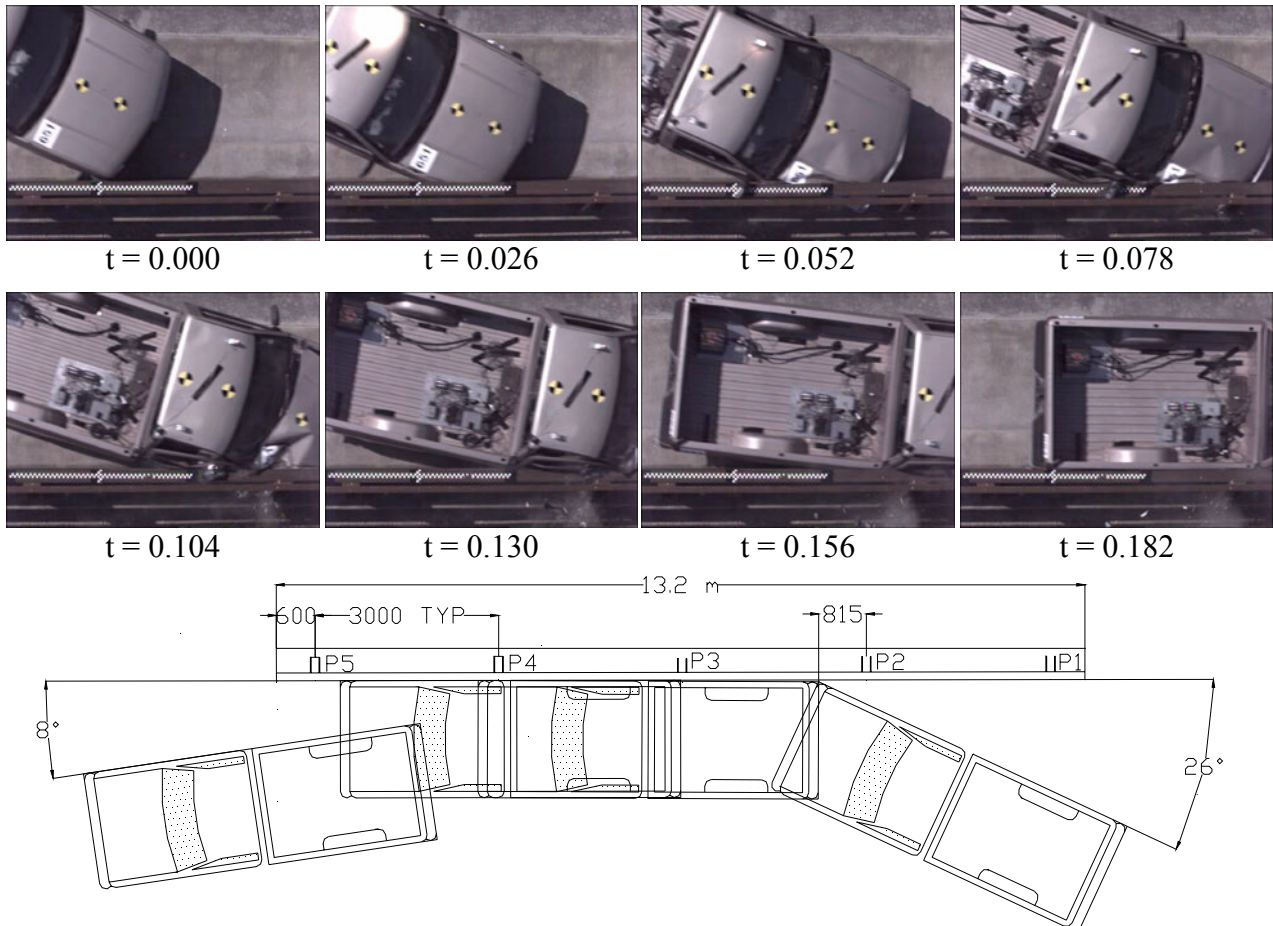
STANDARD DRAWING DESIGNED BY: N. ARDIZZI DRAWING NO.: XX/XX DATE: XX/XX/XX	DIVISION OF STRUCTURES STRUCTURE DESIGN	BRIDGE NO. CONTRACT NO. PROJECT NO.	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	SHEET NO. 3 TOTAL SHEETS 4
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DETAILS NO. 3



Figure 2-23 - Test 651 Data Summary Sheet



General Information:

Test Agency ..... California DOT  
 Test Number ..... 651  
 Test Date ..... September 30, 2003

Test Article:

Name ..... ST-20 Bridge Rail  
 Installation Length... 13.2 m  
 Description ..... 1372 mm-tall, steel, see-through bridge rail on a simulated bridge deck

Test Vehicle:

Model ..... 1992 Chevy 2500  
 Inertial Mass ..... 1961 kg

Impact Conditions:

Velocity ..... 100.4 km/h  
 Angle ..... 26°

Exit Conditions:

Velocity ..... 83 km/h  
 Angle ..... 0°  
 Trajectory ..... 8°

Test Dummy:

Type ..... NA  
 Weight / Restraint ..... NA  
 Position ..... NA

Vehicle Interior:

OCDI ..... RF0001000  
 VDS<sup>5</sup> ..... FR-4  
 CDC<sup>6</sup> ..... 02RFEW6

<i>Occupant Risk Values</i>	<i>Longitudinal</i>	<i>Lateral</i>
Occupant Impact Velocity	6.18 m/s	Not avail.
Ridedown Acceleration	-7.00 g	Not avail.

The vehicle exited smoothly. The front right tire was locked up, but the vehicle continued to track off of the left front wheel.