U.S. Department of Transportation
Federal Highway Administration

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

December 7, 2010

In Reply Refer To:
HSSI/B-205

Mr. David Whitesel
Office of Roadside Safety and Cooperative Research
California Department of Transportation
5900 Folsom Boulevard, MS-5
Sacramento, California 95819

Dear Mr. Whitesel:

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:	CRMcrete Weed Barrier
Type of system:	W-Beam Guardrail with rubberized concrete weed barrier
Test Level:	NCHRP Report 350 TL-3
Testing conducted by:	CALTRANS
Date of request:	February 25, 2010
Date initially acknowledged:	April 1, 2010
Date of completed package:	October 19, 2010

You requested that we find this system acceptable for use on the NHS under the provisions of the National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

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

- CRMcrete Weed Barrier under strong steel or wood post W-beam guardrail.

Requirements
Roadside safety devices should meet the guidelines contained in the NCHRP Report 350 or the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware. The FHWA Memorandum "Identifying Acceptable Highway Safety Features" of July 25, 1997, provides further guidance on crash testing requirements of longitudinal barriers.

RECOVERY.GOV

Description

The CRMcrete weed barrier was composed of a 6-sack concrete mix with 5 lb per cubic yard of concrete reinforcing fibers and 3 percent by weight crumb rubber material. The weed barrier was 4 feet, 8 inches wide by 2 inches thick and the leave-out holes were 16 x 16 inches, but the post was not centered in the hole (see enclosed file Test 659 Test Article). The 28-day compressive strength was 1863 psi. The percentage of crumb rubber in the mix may be varied as long as the 28-day compressive strength is less than 1863 psi. The width of the weed barrier may be adjusted to suit conditions without affecting performance.

The weed barrier was tested under a "Modified G4(1S)" guardrail installed in native soil. The design height was 27-3/4 inches with a tolerance of plus or minus one-half inch. The actual height (measured at posts) downstream of the impact point ranged from 27-3/4 inches to 28-1/4 inches. A drawing of the California Department of Transportation standard guardrail is enclosed for reference.

Crash Testing

A single crash test was conducted, the NCHRP Report 350 Test 3-31 using a 1972-kg pickup truck at 99.5 km/hr at an impact angle of 24.3 degrees. The test details and results may be found in the Test Data Summary Sheet and the Test Assessment Summary which are enclosed for reference.

Findings

The vehicle was redirected upright, and all occupant impact forces were within acceptable limits. The maximum permanent deflection was 1.9 feet and the dynamic deflection was estimated to be 40 inches. Because the NCHRP Report 350 Test 3-10 using the 820 kg small car would not deflect the posts enough to engage the weed barrier the test was not conducted. Therefore, the system 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.

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

- 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 NCHRP Report 350.

- To prevent misunderstanding by others, this letter of acceptance is designated as number B-205 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

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Randall D. Hiatt
REGISTERED CIVIL ENGINEER

May 1, 2006
PLANS APPROVAL DATE

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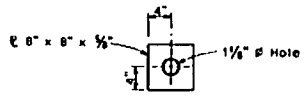
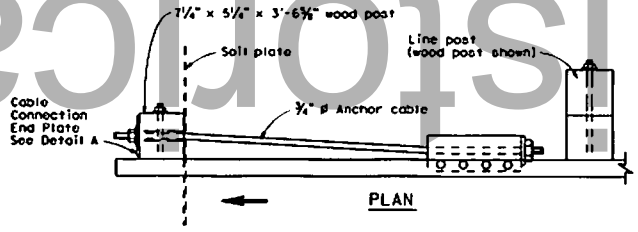
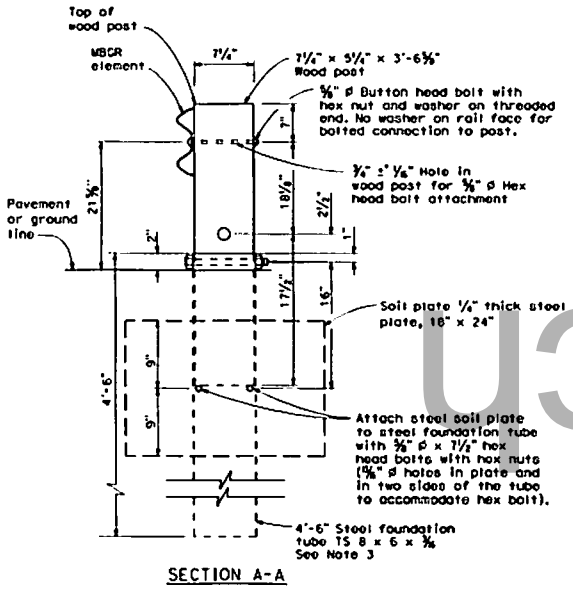


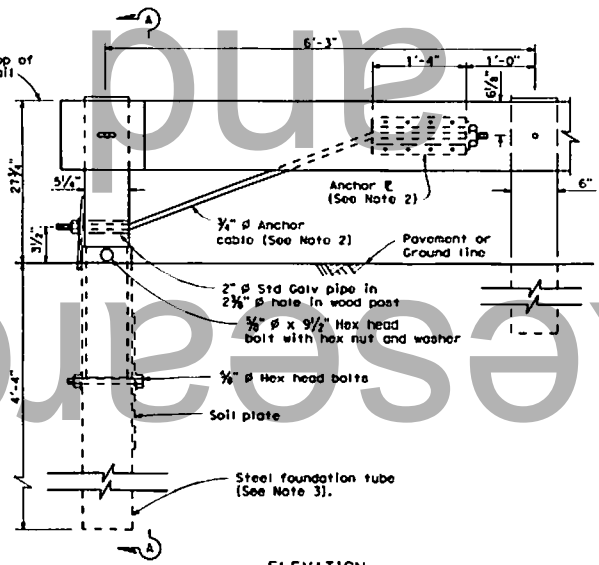
DETAIL A
CABLE CONNECTION
END PLATE



PLAN



SECTION A-A



ELEVATION
END ANCHOR
ASSEMBLY (TYPE SFT)
See Note 1

NOTES:

1. See the A77E, A77F and A77G series of Standard Plans for typical use of End Anchor Assembly (Type SFT).
2. For details of the anchor plate and ¾" cable, see Standard Plan A77H3.
3. A 6'-0" length steel foundation tube, TS 8 x 6 x ⅜, without a soil plate, may be furnished and installed in place of the 4'-6" length steel foundation tube and soil plate shown. Minimum embedment of the 6'-0" length tube shall be 5'-9". A ⅝" ø hex head bolt and nut shall be installed in the hole in the 6'-0" length tube to keep the wood post from dropping into the tube.
4. Direction of traffic indicated by ⟶.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

METAL RAILING
END ANCHOR ASSEMBLY
(TYPE SFT)

NO SCALE

A77H1

11 97 03

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May 1, 2006
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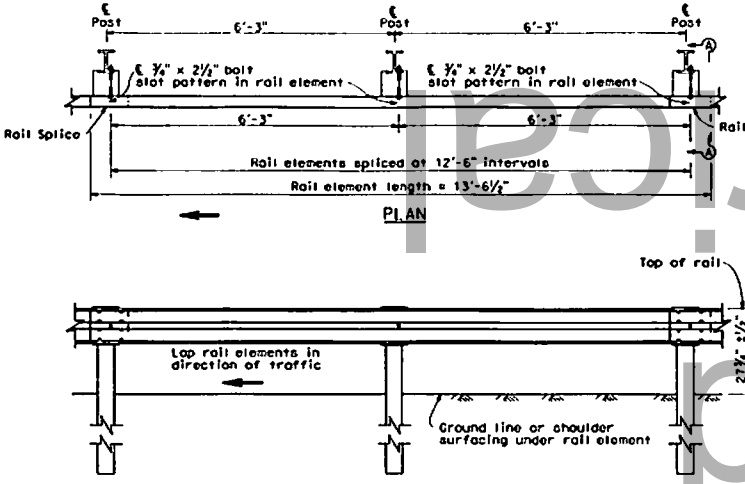
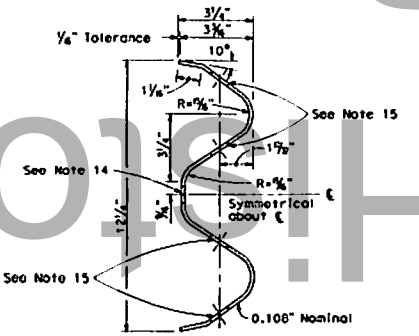
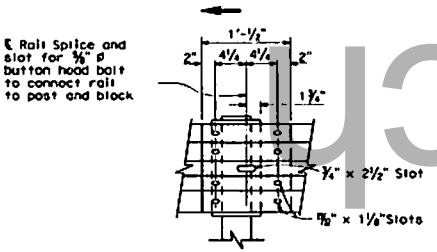


METAL BEAM GUARD RAILING WITH STEEL POSTS AND NOTCHED WOOD OR NOTCHED RECYCLED PLASTIC BLOCKS



SECTION THRU RAIL ELEMENT



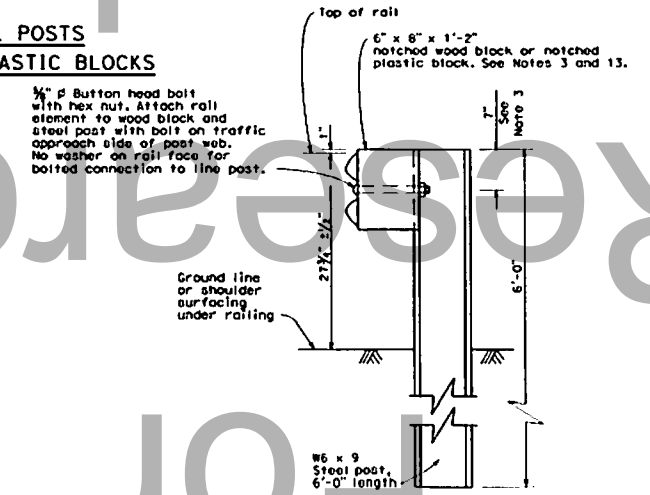
ELEVATION

RAIL ELEMENT SPLICE DETAIL

a) Connect the over lapped end of the rail elements with ⅝" ø x 1⅜" button head oval shoulder splice bolts inserted into the ⅞" x 1⅛" slots and bolted together with ⅝" ø recessed hex nuts. Recess of hex nut points toward rail element. A total of 8 bolts and nuts are to be used at each rail splice connection.

b) The ends of the rail elements are to be overlapped in the direction of traffic (see details).

c) Where end cap is to be attached to the end of a rail element, a total of 4 of the above described splice bolts and nuts are to be used.



SECTION A-A

TYPICAL STEEL LINE POST INSTALLATION

See Note 4

NOTES:

1. For details of wood post installations, see Standard Plan A77A1.
2. For details of standard hardware used to construct guard railing, see Standard Plan A77B1.
3. For details of steel posts, notched wood blocks and notched recycled plastic blocks used to construct guard railing, see Standard Plan A77C2.
4. For additional installation details, see Standard Plan A77C3.
5. Guard railing post spacing to be 6'-3" center to center, except as otherwise noted.
6. For guard railing typical layouts, see the A77E, A77F and A77G Series of Standard Plans.
7. For terminal system end treatment details, see the A77L Series of Standard Plans.
8. For guard railing end anchor details, see Standard Plans A77H1 and A77I2.
9. For details of guard railing transition to bridge railing, see Standard Plan A77J4.
10. For additional details of guard railing connection to bridge railings, see Standard Plans A77J1, A77J2 and A77K1.
11. For dike positioning and guard railing delineation details, see Standard Plan A77C4.
12. Direction of adjacent traffic indicated by ⟶.
13. Notched face of block faces steel post.
14. Slotted hole for bolted connection of rail element to block and post. See "Section Thru Rail Element".
15. Slotted holes for splice bolts to overlap ends of rail element. See "Section Thru Rail Element".

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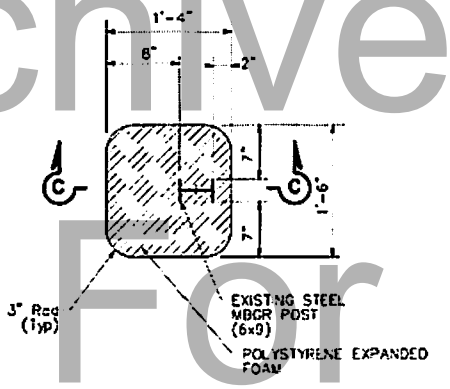
DEPARTMENT OF TRANSPORTATION

METAL BEAM GUARD RAILING STANDARD RAILING SECTION (STEEL POST WITH NOTCHED WOOD OR NOTCHED RECYCLED PLASTIC BLOCK)

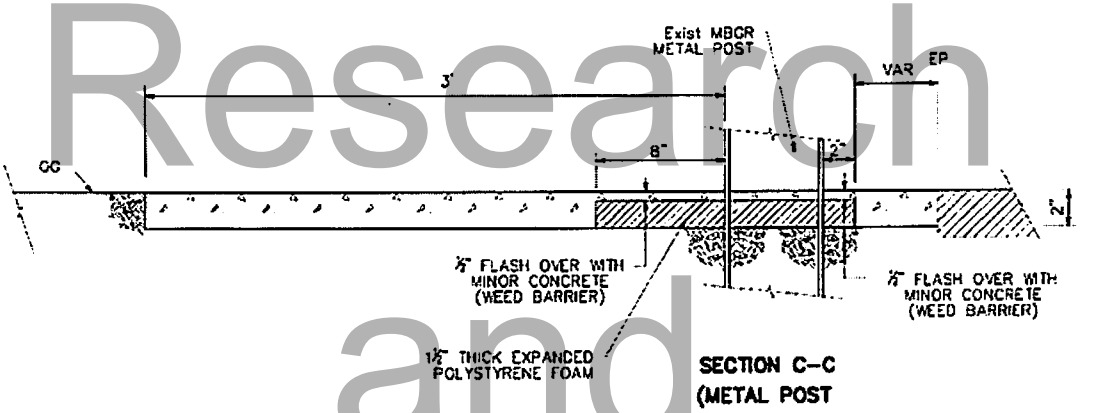
NO SCALE

A77A2

2006 STANDARD PLAN A77A2

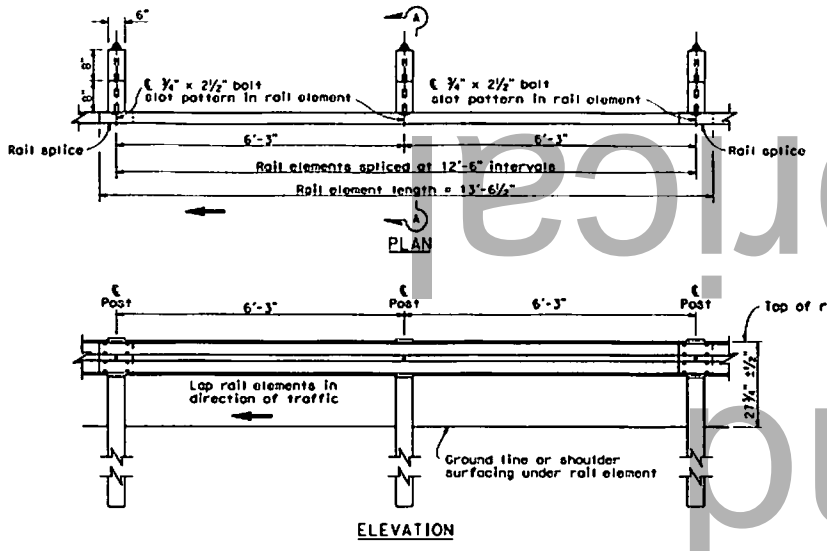


SECTION A–A
(METAL POST)

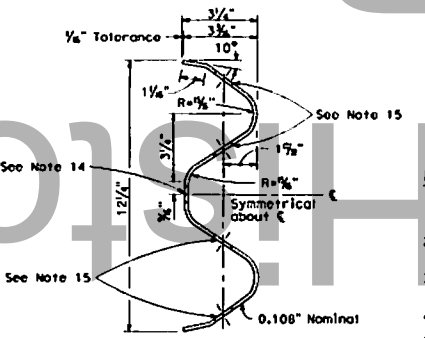


SECTION C–C
(METAL POST

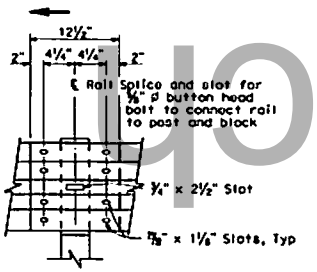
Figure #-## CRMcrete Weed Barrier Plan and Cross Section



METAL BEAM GUARD RAILING WITH WOOD POST AND BLOCKS



SECTION THRU RAIL ELEMENT



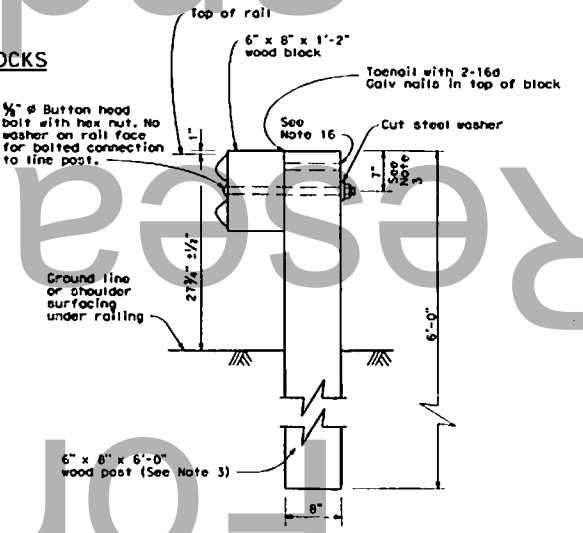
ELEVATION

RAIL ELEMENT SPLICE DETAIL

a) Connect the over lapped end of the rail elements with ⅞" ø x 1⅜" button head oval shoulder splice bolts inserted into the ⅞" x 1⅛" slots and bolted together with ⅞" ø recessed hex nuts. Recess of hex nut points toward rail element. A total of 8 bolts and nuts are to be used at each rail splice connection.

b) The ends of the rail elements are to be overlapped in the direction of traffic (see details).

c) Where end cap is to be attached to the end of a rail element, a total of 4 of the above described splice bolts and nuts are to be used.



SECTION A-A

TYPICAL WOOD LINE POST INSTALLATION

See Note 4

NOTES:

1. For details of steel post installations, see Standard Plan A77A2.
2. For details of standard hardware used to construct guard railing, see Standard Plan A77B1.
3. For details of wood posts and wood blocks used to construct guard railing, see Standard Plan A77C1.
4. For additional installation details, see Standard Plan A77C3.
5. Guard railing post spacing to be 6'-3" center to center, except as otherwise noted.
6. For guard railing typical layouts, see the A77E, A77F and A77G Series of Standard Plans.
7. For terminal system end treatment details, see the A77L Series of Standard Plans.
8. For guard railing end anchor details, see Standard Plans A77H1 and A77I2.
9. For details of guard railing transition to bridge railing, see Standard Plan A77J4.
10. For additional details of guard railing connection to bridge railings, see Standard Plans A77J1, A77J2 and A77K1.
11. For guard railing connection details to abutments and walls, see Standard Plan A77J3.
12. Direction of adjacent traffic indicated by ⟵.
13. For typical guard railing delineation and dike positioning details, see Standard Plan A77C4.
14. Slotted hole for bolted connection of rail element to block and post. See "Section Thru Rail Element".
15. Slotted holes for splice bolts to overlap ends of rail element. See "Section Thru Rail Element".
16. Additional hole in uppermost portion of line post is for potential future adjustments of railing height. See Standard Plan A77C1.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Randell D. Hiatt
REGISTERED CIVIL ENGINEER
May 1, 2006
PLANS APPROVAL DATE
Randell D. Hiatt No. C50200 Exp. 6-30-07 CIVIL
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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

METAL BEAM GUARD RAILING STANDARD RAILING SECTION (WOOD POST WITH WOOD BLOCK)

NO SCALE

A77A1

11-8-05

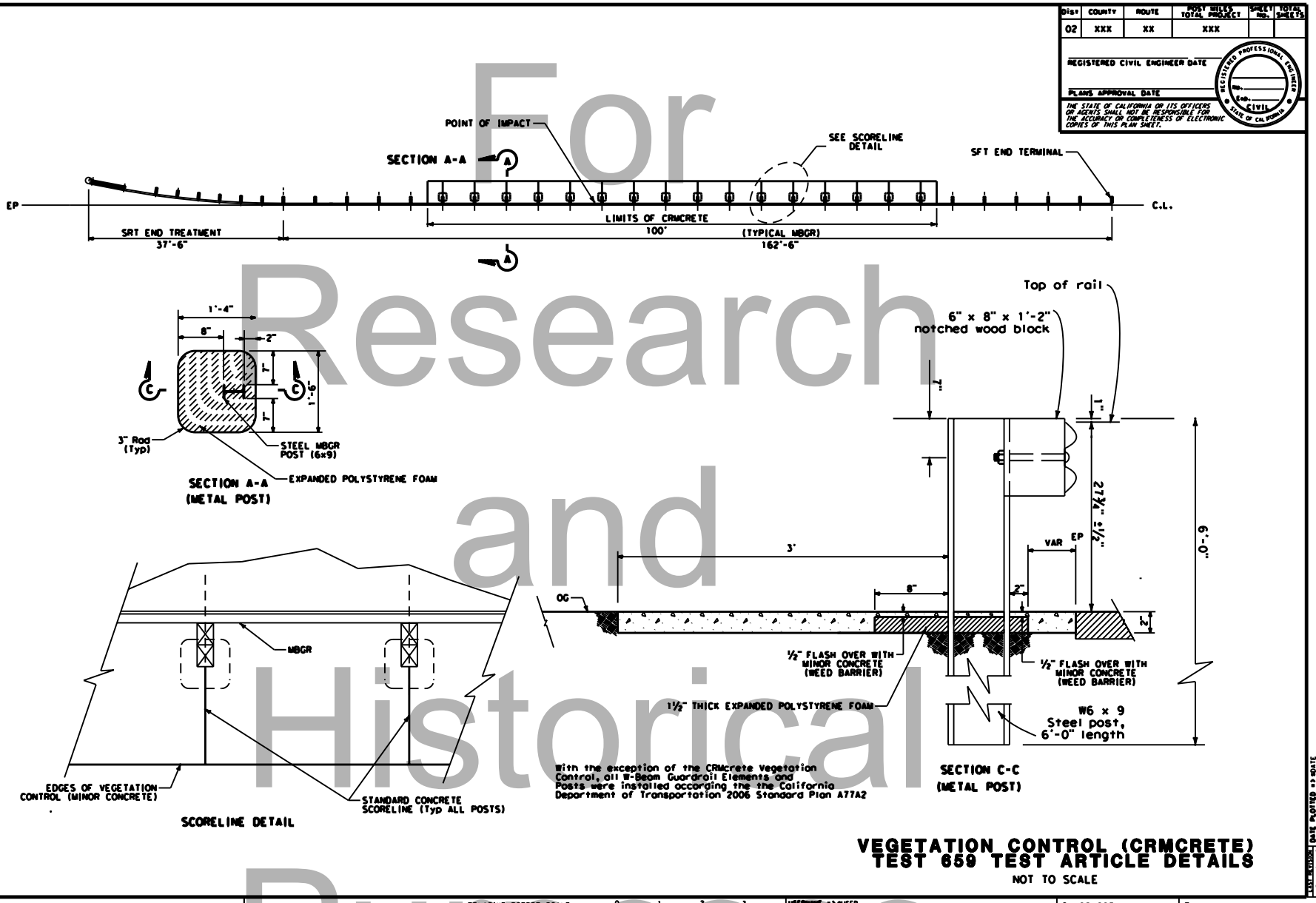

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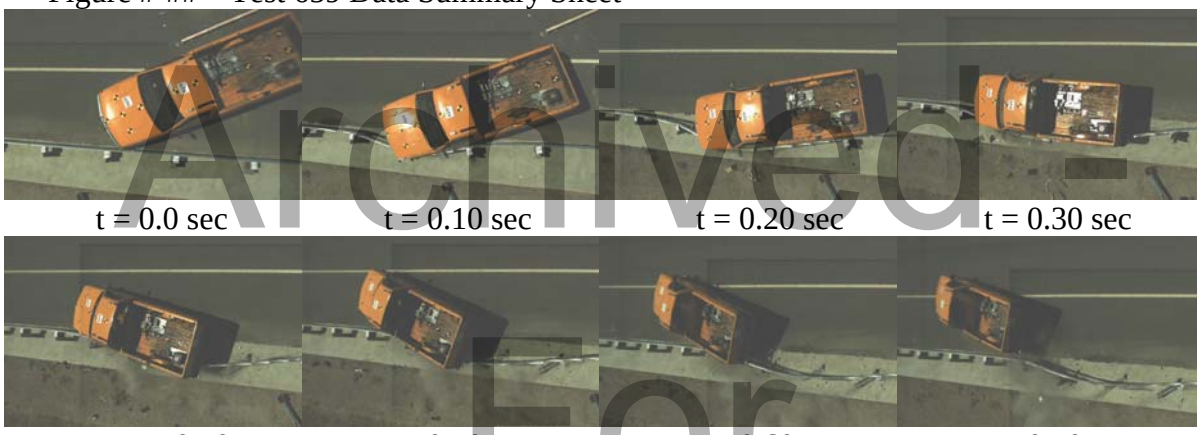
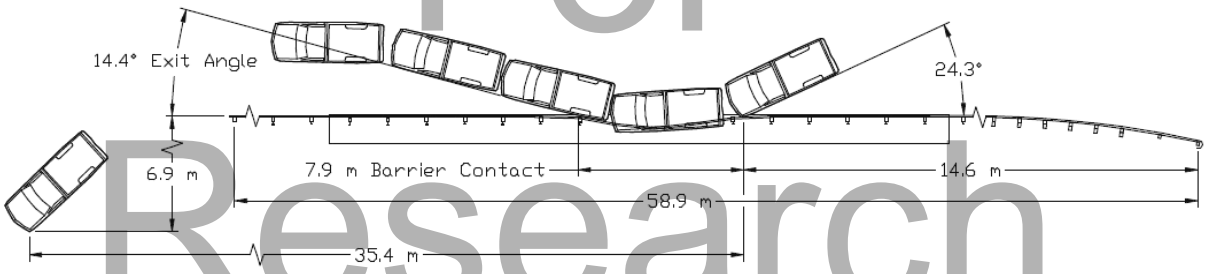
Figure #-## – Test 659 Data Summary Sheet





Test Barrier

Type: Steel Post Metal Beam Guardrail with Rubberized Concrete Weed Barrier; Posts in native soil; Styrofoam leave-out area 8” behind Posts, 2” in front, and 7” on sides.

Length: 60.96 m , total length including SFT and SRT End Treatments.

Test Date: August 25, 2009

Test Vehicle:

Model: 1994 Chevrolet 2500 2WD Pickup

Inertial Mass: 1972 kg

Test Dummy:

Type: None used

Weight/ Position: N/A

Impact/ Exit Conditions:

Impact / Exit Velocity: 99.5 km/h / N/A

Impact / Exit Angle: 24.3° / 14.4° (from survey of scrapes on pavement)

Impact Severity: 127.6 kJ

Test Data:

Occ. Impact Velocity (Long / Lat):	5.5 m/s / -4.9 m/s
Ridedown Acceleration (Long / Lat):	-8.6 g / 9.3 g
ASI	0.73
Exterior: VDS[6]/CDC[7]	FL-3, LD-1/10LFEW9
Interior: OCDI[3]	LF000100
Max. Roll/Pitch/Yaw Angles:	-11.3° / -8.8° / 45.8°

Barrier Damage: Permanent deflection at posts 19-23, with the CRMcrete in the leave-out area broken out as expected. Posts 20-22 yielded and were bent over. The W-Beam rail was deflected and deformed but intact. Maximum dynamic deflection was estimated at 40 inches. Maximum permanent deflection of the rail was 1.9 ft at approximately 14.2 ft downstream of impact.