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

Memorandum

Subject: INFORMATION: Report 350 Acceptance of W-Beam Transition to a Vertical Concrete Parapet

Date: February 14, 2000

From: Dwight A. Horne *Dwight A. Horne*
Director, Office of Highway Safety Infrastructure

Reply to: HMHS-B65

To: Resource Center Directors
Division Administrators
Federal Lands Highway Division Engineers

Since only a few guardrail-to-bridge rail transition designs have been successfully tested to NCHRP Report 350, the FHWA extended the date by which all new transition designs used on the NHS must meet Report 350 to October 1, 2002. This date was established through discussions with AASHTO. Until then, the States may continue to use any of the transition designs that have been tested under NCHRP Report 230. Most of these designs were included in FHWA Technical Advisories T 5040.26, dated January 28, 1988, and T 5040.34, dated June 8, 1993.

My March 6, 1998, acceptance letter (B-47) identified two Thrie-beam transition designs to a New Jersey shaped concrete parapet that meet Test Level 3 (TL-3) evaluation criteria. A Thrie-beam transition design to a vertical concrete parapet will be tested this year under an FHWA research project and two additional Thrie-beam transition designs to vertical concrete parapets will be tested to TL-3 and TL-4 under SP&R Pooled Fund Project No. (2-134). Also scheduled for testing this year is a w-beam transition with a steel channel rubrail to a concrete safety shape parapet. This is a type of transition design that is in widespread use at present.

This memorandum contains information on a nested w-beam transition with a w-beam rubrail connected to a vertical concrete parapet. When crash tested with a pickup truck, this design met the evaluation criteria for Test 3-21 and is accepted for use on the NHS as meeting TL-3 in NCHRP Report 350. It is very similar to the transition design shown as Figure 1B in FHWA Technical Advisory T 5040.26. The most significant difference in the new design is the substitution of two 2285-mm long W200 X 19 steel posts for the two 1830-mm long W150 X 13.5 steel posts immediately adjacent to the parapet in the Report 230 design. Another key difference is the routed 150 mm x 200 mm wood blockouts that were used in lieu of steel blockouts for the Report 350 design. A drawing of the Report 350 design and a summary of the full-scale crash test results are shown in Attachments 1 and 2, respectively.

The crash test was conducted using an independent concrete end block that is 3200-mm long. This end block has a vertical concrete end for attaching the top and bottom w-beam rails. Its side is tapered to transition to a NJ-shape bridge rail. A similar design could be used to taper to an F-shape bridge rail. If the end of the bridge rail has a vertical face, the independent concrete end block can be omitted and the terminal connectors can be directly attached to the vertical concrete parapet. However, the reinforcement in the end of the vertical concrete parapet must be adequate to resist the lateral and longitudinal forces transmitted through the terminal connectors.

To eliminate a potential snag point, the top of the vertical concrete parapet must be tapered downward to match the height of the top w-beam at the terminal connector. The top and bottom w-beam rails must be lapped over the terminal connectors in the direction of traffic in order to minimize snagging on the connectors.

If a wood post design is desired, then 200-mm x 200-mm x 2285-mm long wood posts can be substituted for the W200 x 19 steel posts, and 150-mm x 200-mm x 1830-mm long wood posts can be substituted for the W150 x 13.5 steel posts. The wood blockouts should be the same size as their respective wood posts. Although this wood post design has not been crash tested, it may be considered acceptable because earlier tests on transitions have demonstrated that steel post transitions are more critical than their wood post counterparts.

2 Attachments

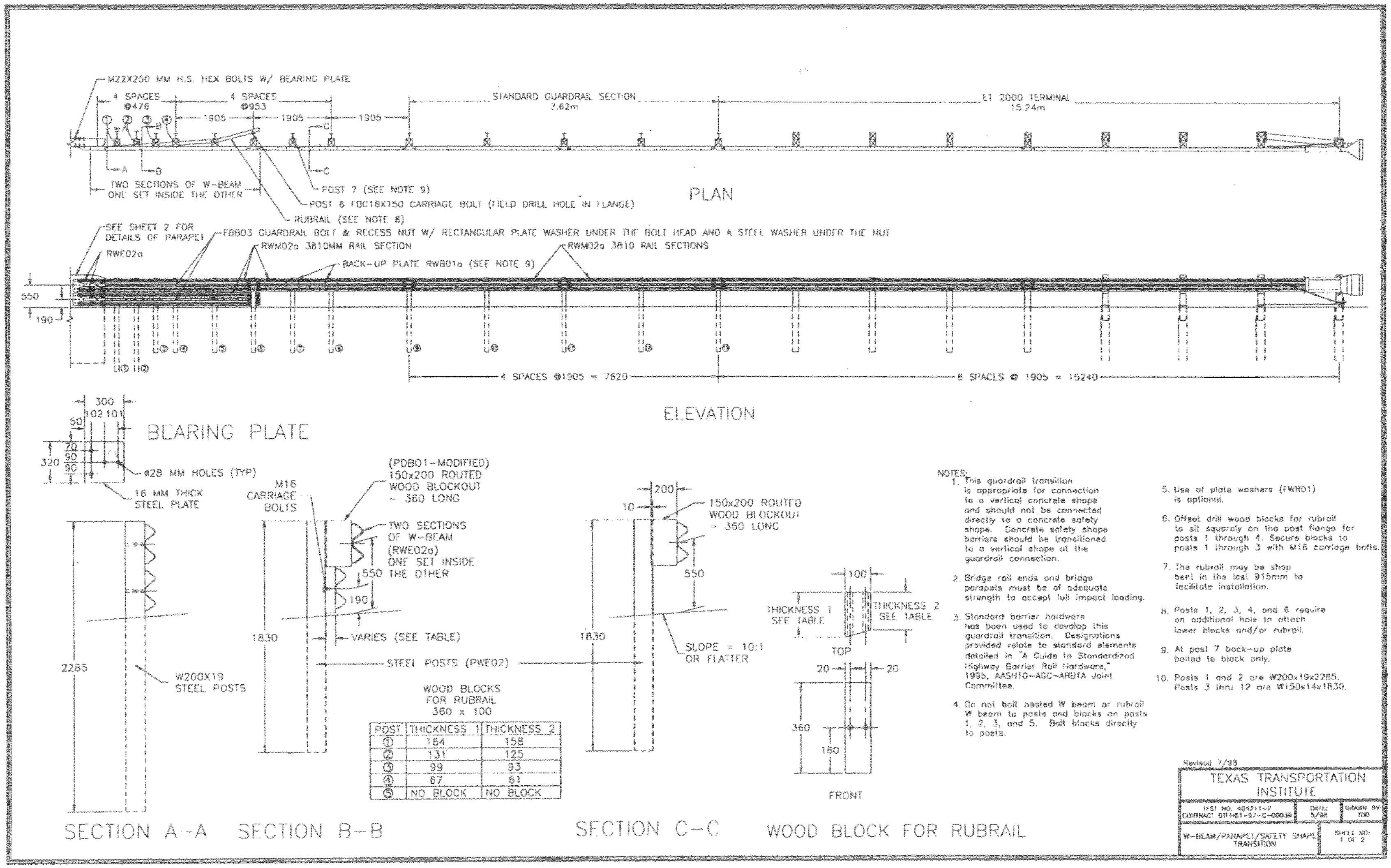


Figure 2. Details of the transition and layout of the installation for test 404211-2.

ATTACHMENT 1 (1 OF 2)

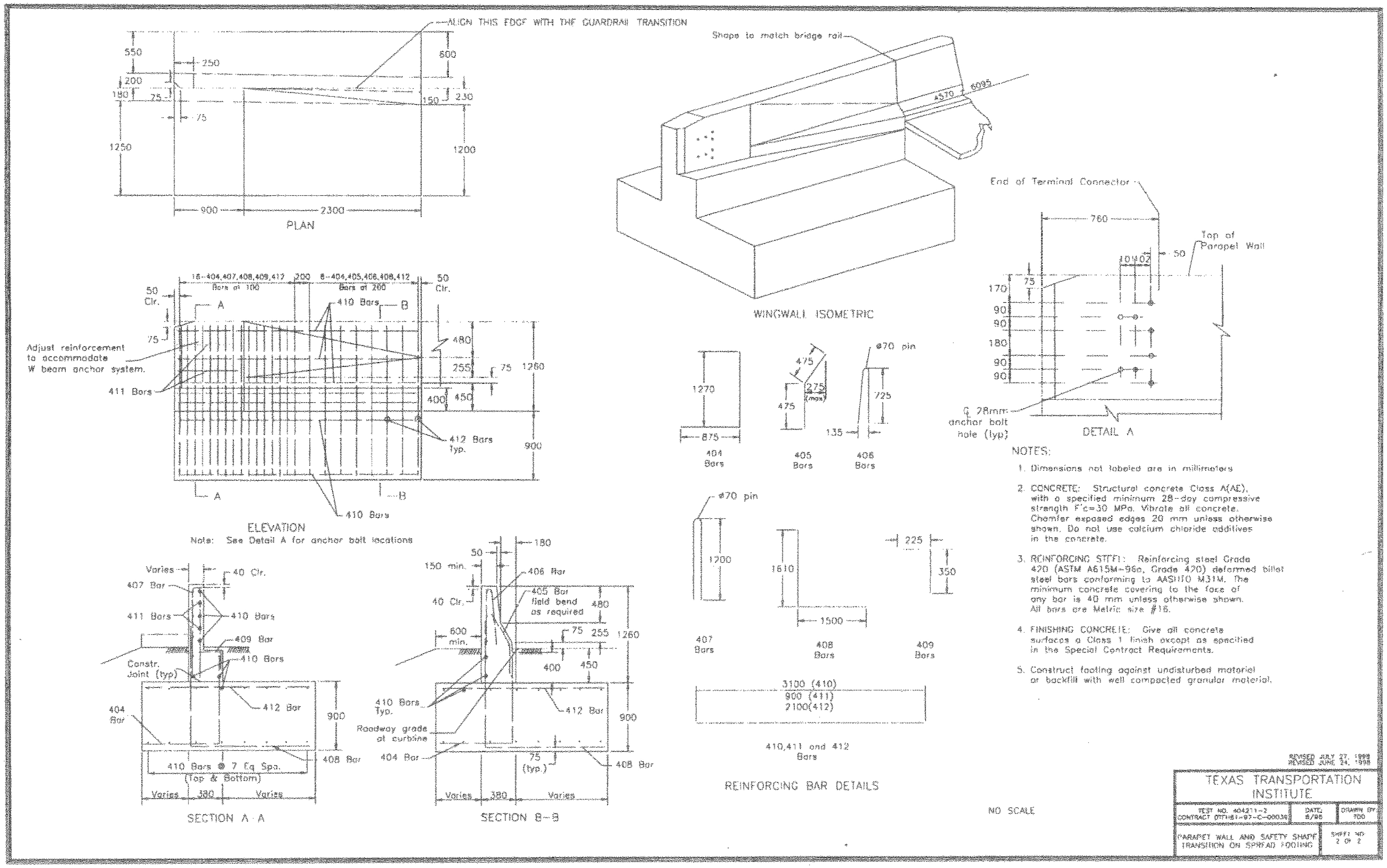
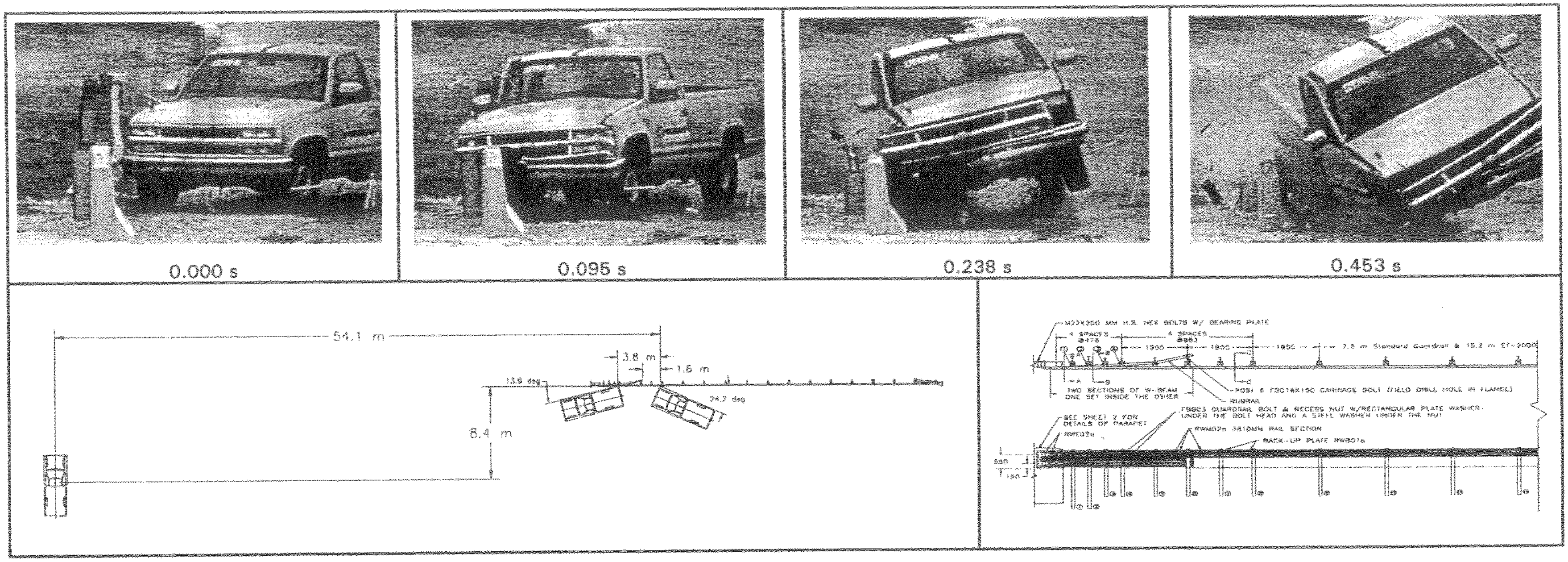


Figure 1. Details of the vertical wall parapet



General Information

Test Agency	Texas Transportation Institute
Test No.	404211-12
Date	11/05/98

Test Article

Type	Transition
Name	Vertical Wall Transition
Installation Length (m)	35.3
Material or Key Elements	W-Beam With W-Beam Rub Rail & Steel Posts to Vertical Concrete Bridge Rail

Soil Type and Condition ... Standard Soil, Damp

Test Vehicle

Type	Production
Designation	2000P
Model	1994 Chevrolet 2500 Pickup Truck
Mass (kg)	
Curb	1925
Test Inertial	2000
Dummy	77
Gross Static	2077

Impact Conditions

Speed (km/h)	101.3
Angle (deg)	24.2

Exit Conditions

Speed (km/h)	73.3
Angle (deg)	13.9

Occupant Risk Values

Impact Velocity (m/s)	
x-direction	7.3
y-direction	7.8
THIV (km/h)	35.6
Ridedown Accelerations (g's)	
x-direction	-6.7
y-direction	-10.1
PHD (g's)	23.9
ASI	1.85
Max. 0.050-s Average (g's)	
x-direction	-10.9
y-direction	-13.9
z-direction	-9.5

Test Article Deflections (m)

Dynamic	0.07
Permanent	0.03

Vehicle Damage

Exterior	
VDS	01RFQ4
CDC	01FYEK2 & 01RDEW3
Maximum Exterior Vehicle Crush (mm)	500
Interior	
OCDI	RF0104000
Max. Occ. Compart. Deformation (mm)	90

Post-Impact Behavior

(during 1.0 s after impact)

Max. Yaw Angle (deg)	-50
Max. Pitch Angle (deg)	8
Max. Roll Angle (deg)	25

Figure 11. Summary of Results for test 404211-12, *NCHRP Report 350* test 3-21