



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

Memorandum

Subject: INFORMATION: Report 350 Acceptance of New York
3-Strand Cable Terminal Date: February 14, 2000

From: Dwight A. Horne *Dwight A. Horne* Reply to: HMHS-CC63
Director, Office of Highway Safety Infrastructure

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

The original 3-strand cable anchorage was developed by New York State Department of Transportation (NYSDOT) research engineers in the mid-1960's and it has performed acceptably in service. Later testing showed, however, that the cables did not always release when a vehicle impacted the barrier proper just upstream from the departure-end terminal. Vehicular snagging and subsequent rollovers occurred. To solve this potential problem, New York conducted a series of full-scale crash tests, the results of which were published as NYSDOT Research Report 148, "Cable Guiderail Breakaway Terminal Ends," in March 1990. Included in that report was a final terminal design that met NCHRP Report 230 test and evaluation criteria.

We have reviewed these 12 earlier tests and compared them to the 7 tests (tests 3-30, 3-31, 3-32, 3-33, 3-34, 3-35, and 3-39) currently recommended in Report 350 for a gating terminal. This analysis showed that the end-on test by NYSDOT with an 820-kg car impacting at a 5 degree angle at 109 km/h (test number 103) exceeded the requirements for NCHRP Report 350 test 3-30. Based on the stability of the small car, we also concluded that the end-on test with a 2000-kg pickup truck could be waived, as well as both NCHRP Report 350 end-on angle tests (3-32 and 3-33) which are often waived for gating terminals.

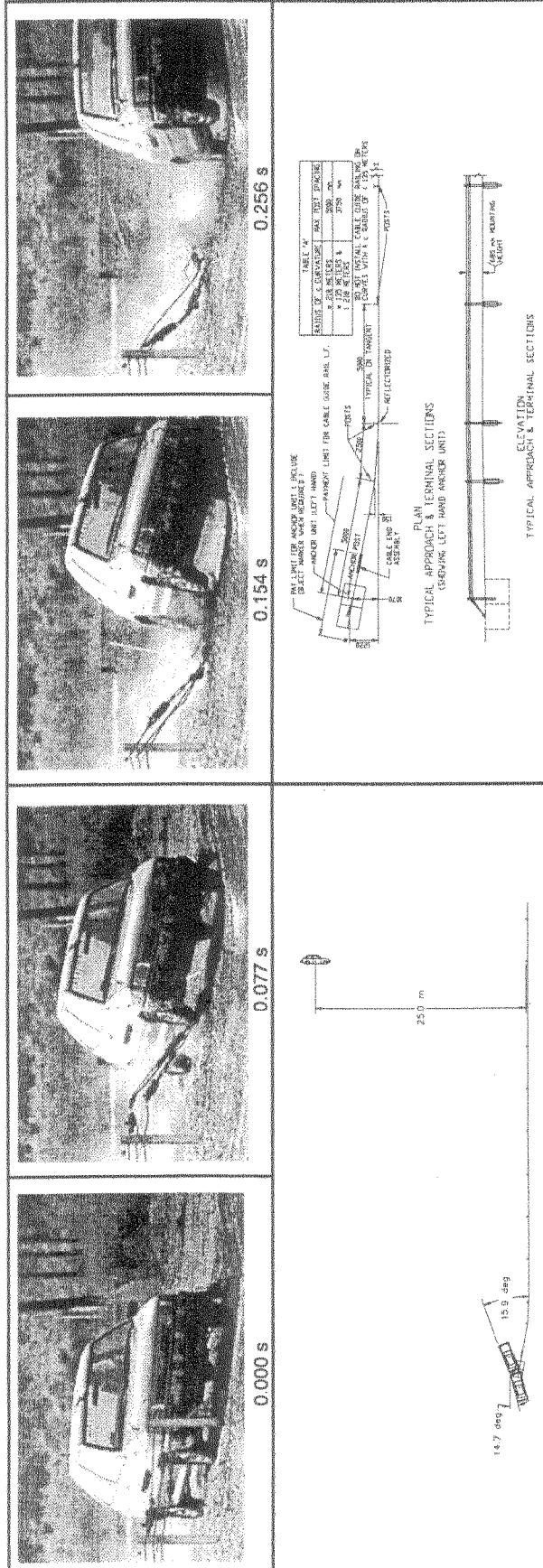
The NYSDOT test number 107 was similar to NCHRP Report 350 test 3-35, but was run with a 2064-kg station wagon impacting at 91 km/h and at 25 degrees. Test 3-35 specifies a 2000-kg pickup truck impacting at 100 km/h and 20 degrees. We have concluded that these tests have similar impact severities and warrant waiving test 3-35. Since the 3-strand cable barrier itself has been successfully tested with the pickup truck at 25 degrees and 100 km/h, we believe that an additional test at the beginning of the length of need at 20 degrees would be redundant. We noted, however, that the barrier length of need based on test number 107 begins approximately 12 meters downstream from the cable anchor assembly.

The NYSDOT test number 104 is similar to NCHRP Report 350 test 3-39 but was run with the car rather than the pickup truck as the small vehicle was more likely to snag on the reverse direction hit than is the larger truck.

After reviewing the previous test results and the design details of the final NYSDOT terminal, it was determined that the only additional test required was test 3-34, defined as the critical impact point (CIP) for a gating terminal. This test was successfully completed at the Texas Transportation Institute and described in the October 1998 report, entitled "NCHRP Report 350 Test 3-34 of the New York Cable Rail Terminal," by Buth, Menges, and Williams. A summary of that test is shown as Attachment 1.

Based on the above test results and analysis, we conclude that the NYSDOT design, as tested, meets the evaluation criteria for an NCHRP Report 350 test level 3 (TL-3) terminal. It should be used to anchor the 3-strand cable guardrail on new installations on the NHS. The general design details for this terminal are included in the 1995 "Guide to Standardized Highway Barrier Hardware" as drawing number SECO1, except that the cable clips shown on sheet 3 of 4 of the drawing were not used on any of the tested installations and should be omitted. Three 5-mm diameter brass rods should be used to hold the cables to the breakaway anchor post as shown in Attachment 2, the current New York design. Detailed drawings and specifications are available from NYSDOT and can be obtained by calling Mr. Peter Bradley at (518) 457-6399.

2 Attachments



General Information			
Test Agency	Texas Transportation Institute		
Test No.	404211-6		
Date	10/01/98		
Test Article			
Type	Terminal		
Name	New York 3-Cable Guardrail Terminal		
Installation Length (m)	119.8		
Material or Key Elements	3 @ 19-mm diameter wire rope cables with embedded concrete anchor block		
Soil Type and Condition	Standard Soil, Dry		
Test Vehicle			
Type	Production		
Designation	820C		
Model	1992 Ford Festiva		
Mass (kg)			
Curb	810		
Test Inertial	820		
Dummy	76		
Gross Static	896		
Impact Conditions			
Speed (km/h)	99.3		
Angle (deg)	14.7		
Exit Conditions			
Speed (km/h)	94.4		
Angle (deg)	15.7		
Occupant Risk Values			
Impact Velocity (m/s)			
x-direction	1.8		
y-direction	0.9		
THIV (km/h)	7.8		
Ridedown Accelerations (g/s)			
x-direction	-3.1		
y-direction	-3.0		
PHD (g/s)	6.3		
ASI	0.22		
Max. 0.050-s Average (g/s)			
x-direction	-2.3		
y-direction	-1.4		
z-direction	-2.0		
Test Article Deflections (m)			
Dynamic	nil		
Permanent	nil		
Vehicle Damage			
Exterior			
VDS	12FR1		
CDC	12FRLN1		
Maximum Exterior Vehicle Crush (mm)	nil		
Interior			
OCDI	RF0000000		
Max. Occ. Compart. Deformation (mm)	0		
Post-Impact Behavior			
(during 1.0 s after impact)			
Max. Yaw Angle (deg)	-25		
Max. Pitch Angle (deg)	11		
Max. Roll Angle (deg)	20		

Figure 14. Summary of results for test 404211-6 NCHRP Report 350 test 3-34.

