

June 24, 2002

Refer to: HSA-10/CC12J

Hayes E. Ross, Jr., P.E., Ph. D.
Texas Transportation Institute
The Texas A&M University System
3135 TAMU
College Station, TX 77843-3135

Dear Dr. Ross:

In your February 11 letter to Mr. Michael Halladay, former Acting Program Manager for Safety, you requested the Federal Highway Administration's (FHWA) acceptance of an alternative breakaway steel post system for use with currently-accepted versions of the ET-2000, including those using the ET-PLUS extruder head. To support your request, you included copies of the Texas Transportation Institute (TTI) October 2001 report, "NCHRP Report 350 Testing and Evaluation of the ET-PLUS with Steel Cable Release Post and Steel Yielding Terminal Posts" and videotapes of the two crash tests included in that report. After reviewing the information you submitted, Mr. Richard Powers of my staff recommended that an additional test be conducted. The results of that test were documented in TTI's June 2002 report, "NCHRP Report 350 Test 3-34 of the ET-PLUS with Steel Cable Release Post and Steel Yielding Terminal Posts" which was received on June 7.

Your first new post (named the cable release post or CRP) is a two-piece W150 x 14 steel section with a 1981-mm long base section in the ground and a 902-mm long upper section. The two sections are reinforced at the ground line to provide adequate anchorage strength for downstream hits but are designed to release the cable anchor quickly when the post is struck in an end-on type impact. It is used as the terminal end post. The next seven posts are used between the anchor post and the first standard line post as an alternative to the original wooden CRT posts or to the all-steel HBA breakaway posts that have also been found acceptable. These new posts are named steel yielding terminal posts or SYTP and are one-piece W200 x 15 hot-rolled steel sections 1830-mm long. The SYTP posts are modified by drilling two 21-mm diameter holes through each flange at the ground line. This modification results in a post that is similar to standard guardrail posts along its strong axis (perpendicular to the guardrail installation), but significantly weaker along its weak axis (parallel to the installation). Enclosure 1 contains detailed dimensions for the CRP and SYTP posts.

You successfully conducted NCHRP Report 350 tests 3-30, 3-34, and 3-35 using the new posts. Enclosure 2 shows the summary results of each of these tests. My staff agreed that the remaining tests could be waived, based on a review of previous testing of various ET-2000 configurations and the results of the tests noted above.

Based on staff analysis of the information you provided, the CRP/SYTP post and anchor system is acceptable for use on the national Highway System. I also agree that the CRP post, as described herein, may be used alone as the anchor post with all previously-accepted versions of the ET-2000 terminal as you requested. The remaining breakaway posts used with any of the previously accepted ET-2000 designs may be the original CRT weakened wood posts, the two-piece steel HBA posts, or the new SYTP posts. Although all three types of breakaway posts are similar, I am reluctant to endorse any random combination of breakaway posts in the same terminal installation, particularly given the significantly higher strong-axis moment capacity of the SYTP posts. For new installations there is no reason to use a "mix and match" approach, and damaged terminals are best repaired in-kind or replaced with a fully-tested design to minimize an agency's liability.

Sincerely yours,

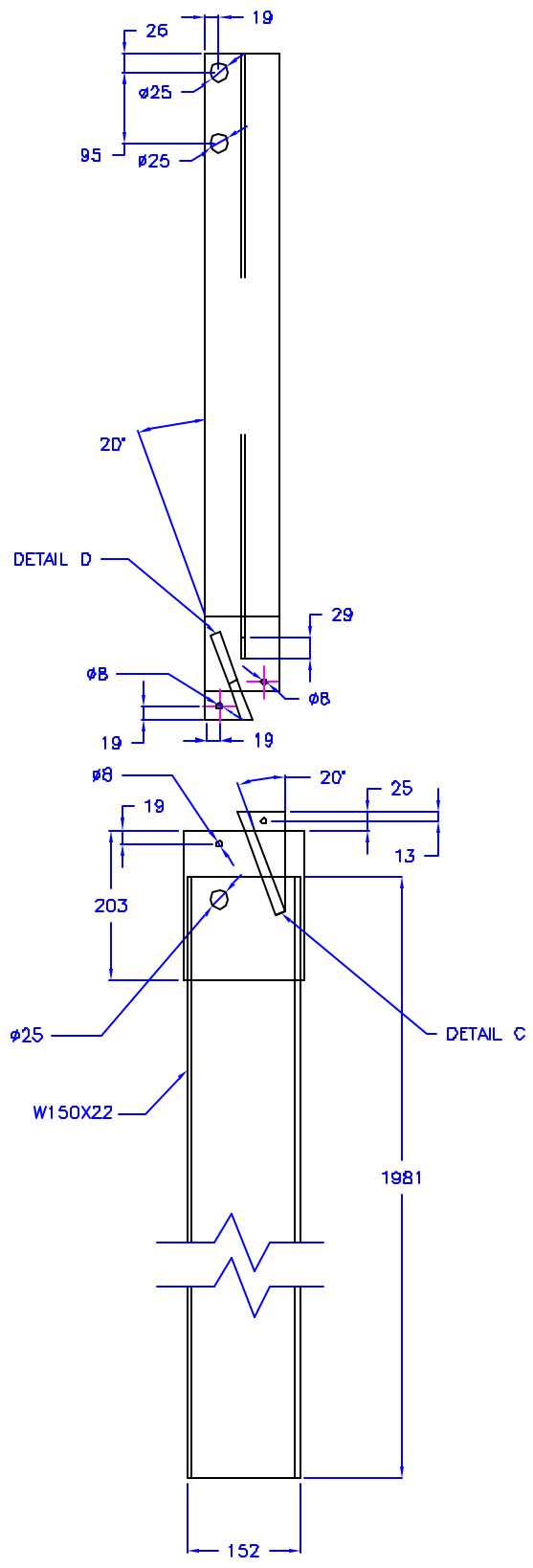
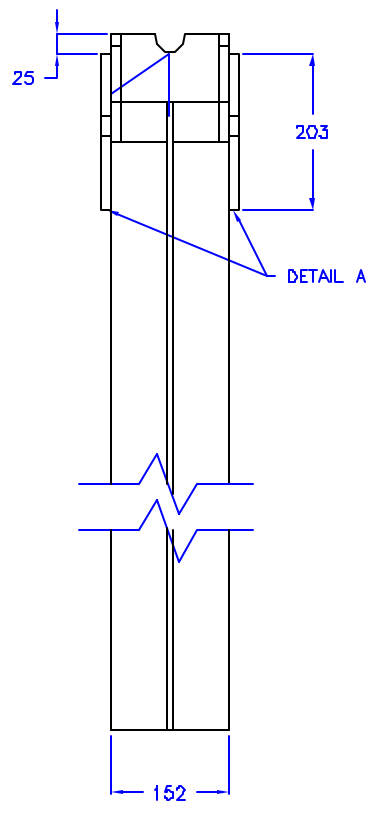
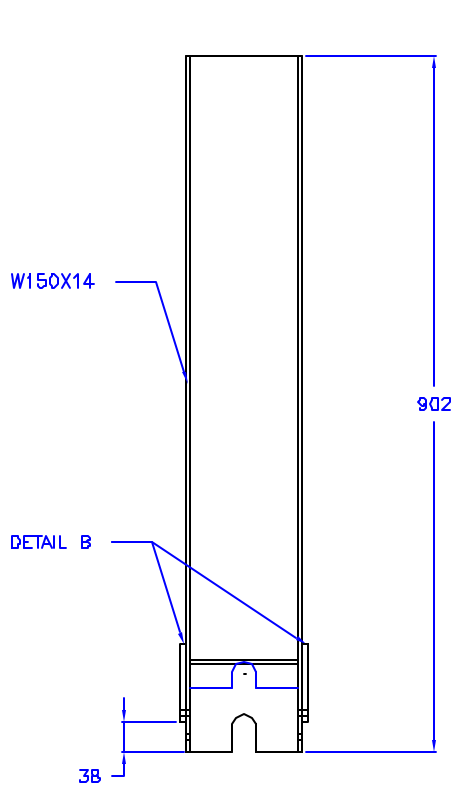
(original signed by Harry W. Taylor)

for

Carol H. Jacoby, P. E.

Director, Office of safety Design

2 Enclosures

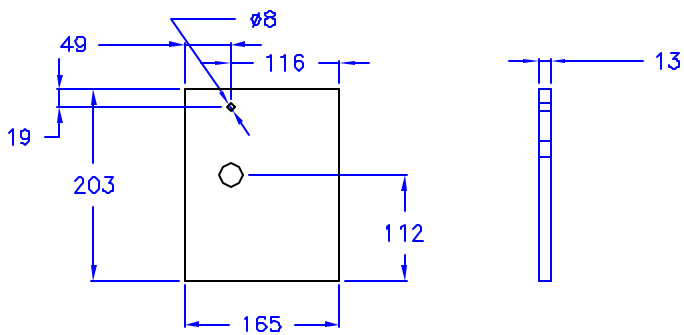


DETAIL 1
SHEET 1 of 2

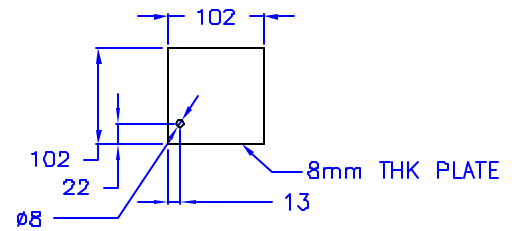
The Texas A&M University System

Revisions			TEXAS TRANSPORTATION INSTITUTE COLLEGE STATION, TEXAS 77843			
No.	Date	By	Project No.	Date	Drawn By	Scale
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					C.R.P. Detail	Sheet No. 1 of 2

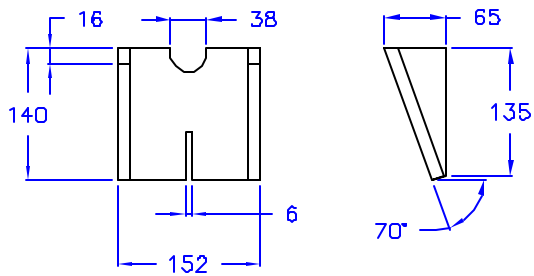
DETAIL A



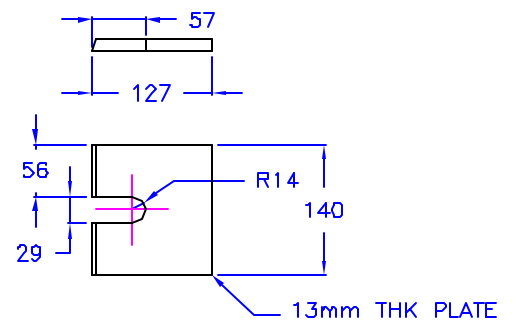
DETAIL B



DETAIL C



DETAIL D



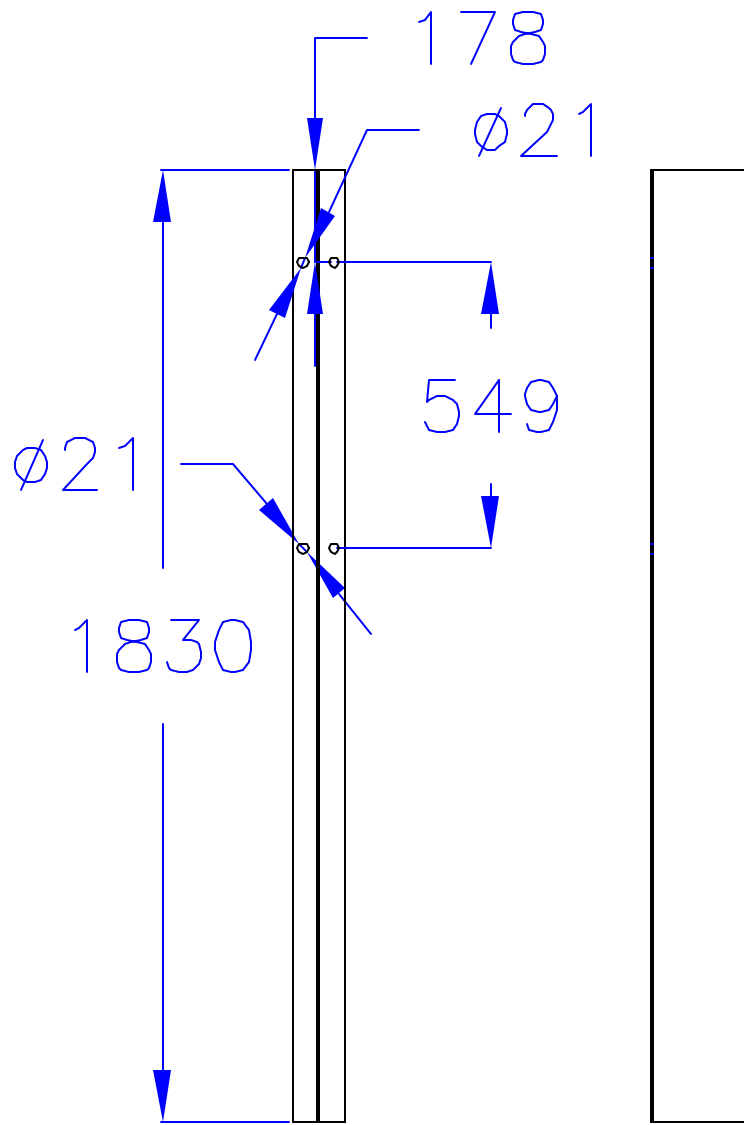
DETAIL 1

SHEET 2 of 2

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					C.R.P. Detail	Sheet No. 2 of 2

W200X15 STEEL POST

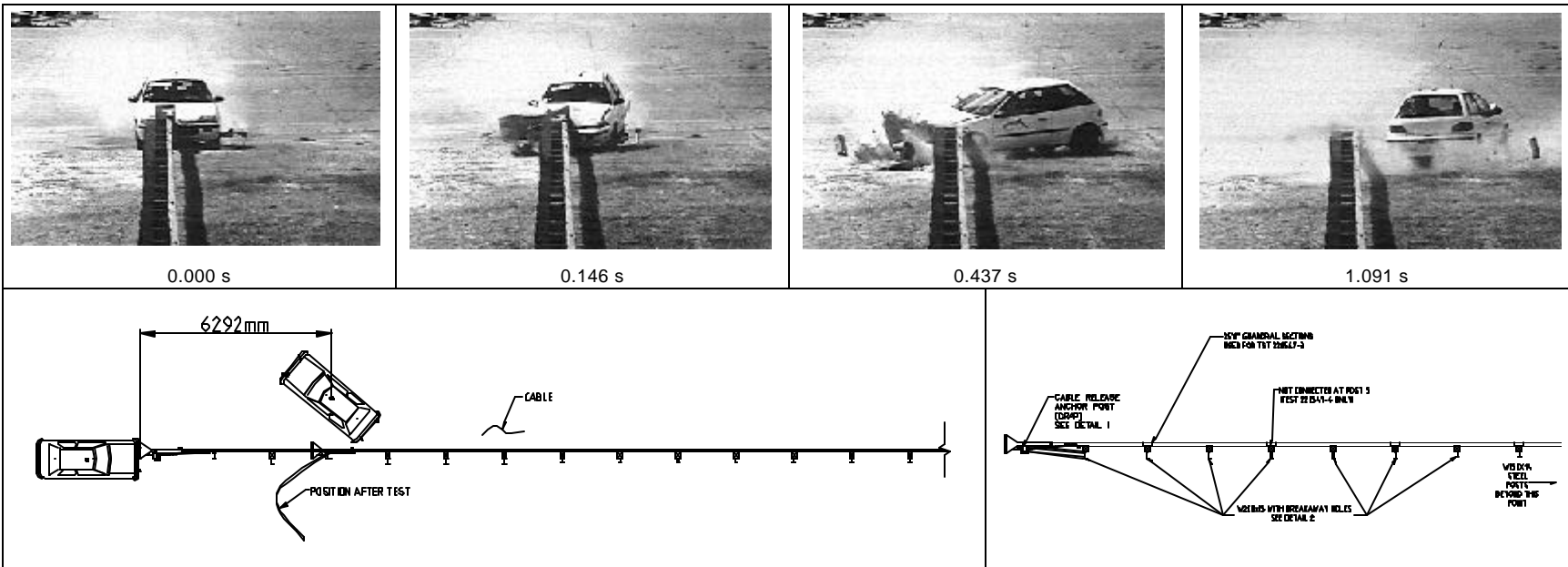


DETAIL 2



The Texas A&M University System

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No.	Date	By	Project No.	Date	Drawn By	Scale
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					C.R.P. Detail	Sheet No. 1 of 1



General Information

Test Agency Texas Transportation Institute
 Test No. 220547-4
 Date 08/22/01

Test Article

Type Terminal
 Name ET-PLUS with Controlled Release Posts
 Installation Length (m) 45.7
 Material or Key Elements ... ET-Plus head with 12.5 ft W-beam and Steel Breakaway Posts

Soil Type and Condition

..... Standard Soil, Dry

Test Vehicle

Type Production
 Designation 820C
 Model 1996 Geo Metro
 Mass (kg)
 Curb 858
 Test Inertial 840
 Dummy 76
 Gross Static 916

Impact Conditions

Speed (km/h) 100.0
 Angle (deg) 0

Exit Conditions

Speed (km/h) N/A
 Angle (deg) N/A

Occupant Risk Values

Impact Velocity (m/s)
 x-direction 8.2
 y-direction 0.8
 THIV (km/h) 30.1
 Ridedown Accelerations (g's)
 x-direction -11.0
 y-direction 4.8
 PHD (g's) 11.0
 ASI 0.89
 Max. 0.050-s Average (g's)
 x-direction -10.6
 y-direction 3.8
 z-direction 2.2

Test Article Deflections (m)

Dynamic N/A
 Permanent 5.9
 Working Width N/A

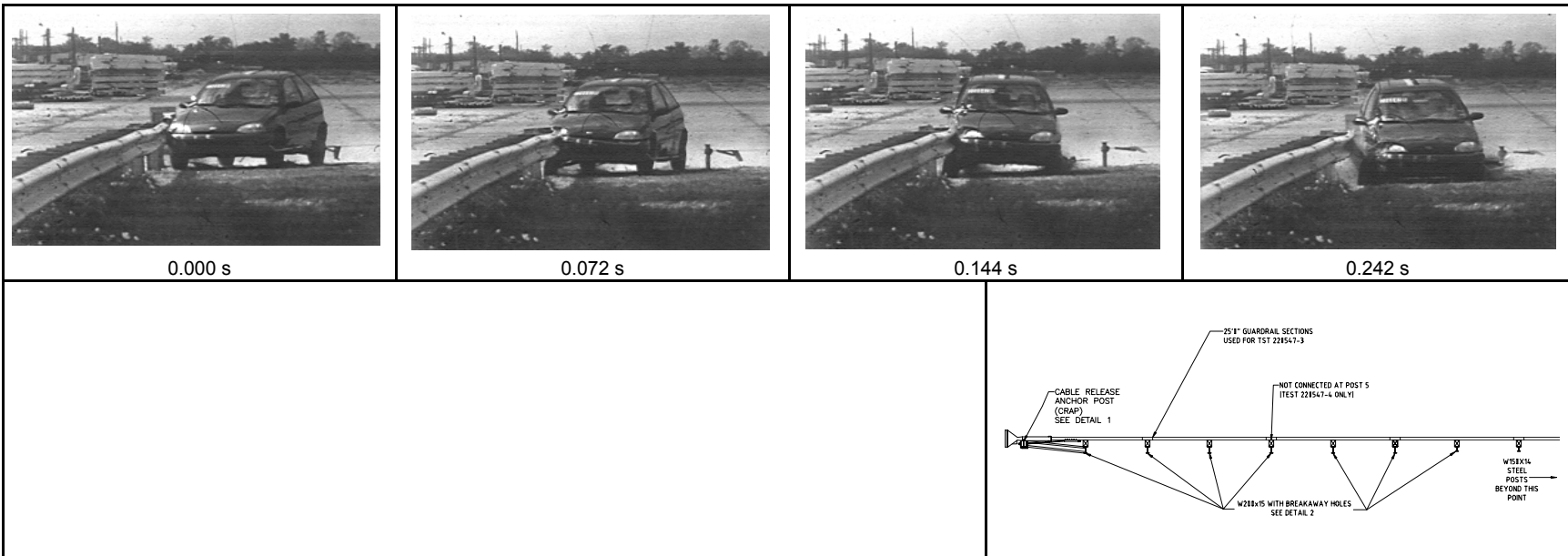
Vehicle Damage

Exterior
 VDS 12FD3
 CDC 12FNEW3
 Maximum Exterior
 Vehicle Crush (mm) 230
 Interior
 OCDI FS0000000
 Max. Occ. Compart.
 Deformation (mm) 20

Post-Impact Behavior

(during 1.0 s after impact)
 Max. Yaw Angle (deg) 217
 Max. Pitch Angle (deg) 10
 Max. Roll Angle (deg) -14

Summary of results for test 220547-4, NCHRP Report 350 test 3-30.



General Information

Test Agency Texas Transportation Institute
 Test No. 220547-6
 Date 04/17/02

Test Article

Type End Treatment
 Name ET-PLUS with Controlled Release Posts
 Installation Length (m) 45.7
 Material or Key Elements ... ET-PLUS head with 12.5 ft W-beam and Steel Breakaway Posts

Soil Type and Condition

Standard Soil, Dry

Test Vehicle

Type Production
 Designation 820C
 Model 1997 Geo Metro
 Mass (kg)
 Curb 846
 Test Inertial 820
 Dummy 76
 Gross Static 896

Impact Conditions

Speed (km/h) 99.2
 Angle (deg) 15.6

Exit Conditions

Speed (km/h) 83.2
 Angle (deg) 5.7

Occupant Risk Values

Impact Velocity (m/s)
 x-direction 3.7
 y-direction 6.2
 THIV (km/h) 24.2
 Ridedown Accelerations (g's)
 x-direction -3.5
 y-direction -6.2
 PHD (g's) 6.5
 ASI 1.07
 Max. 0.050-s Average (g's)
 x-direction -5.5
 y-direction -8.8
 z-direction -1.2

Test Article Deflections (m)

Dynamic 0.27
 Permanent 0.13
 Working Width 0.28

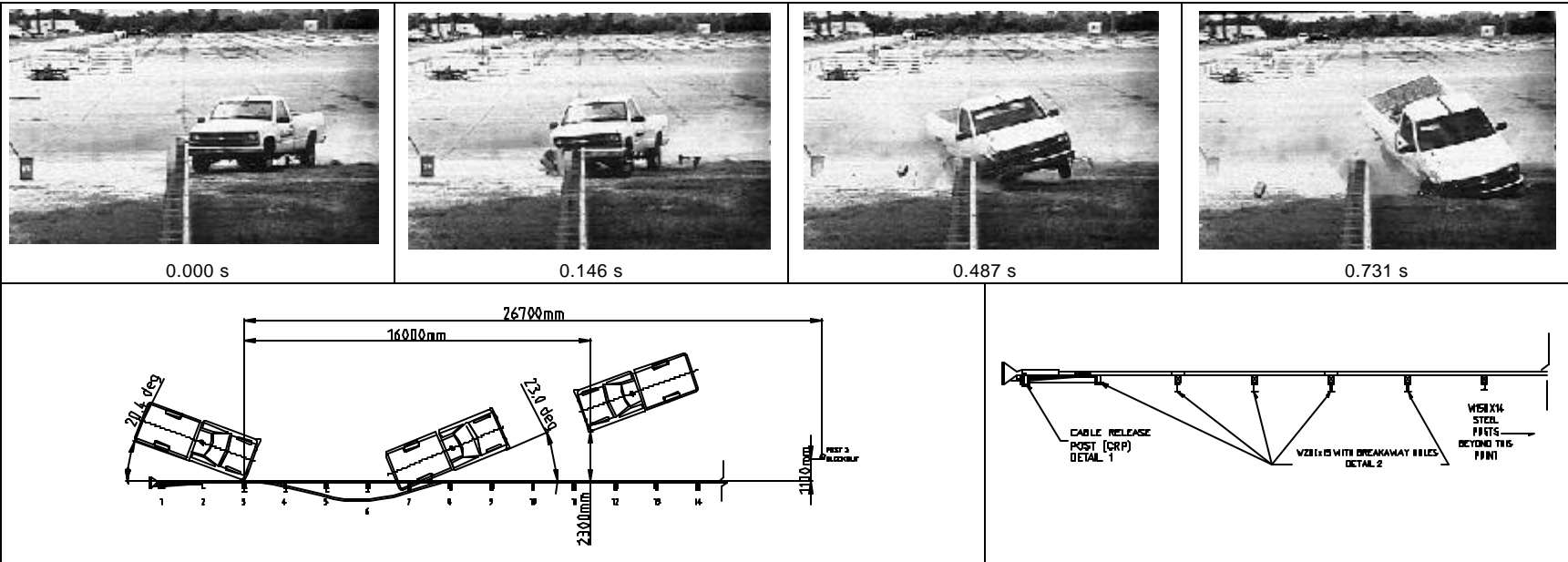
Vehicle Damage

Exterior
 VDS 01FR2
 CDC 01FREW2
 Maximum Exterior
 Vehicle Crush (mm) 130
 Interior
 OCDI RF0001000
 Max. Occ. Compart.
 Deformation (mm) 29

Post-Impact Behavior

(during 1.0 s after impact)
 Max. Yaw Angle (deg) -20.1
 Max. Pitch Angle (deg) -2.8
 Max. Roll Angle (deg) -4.3

Summary of results for test 220547-6, NCHRP Report 350 test 3-34.



General Information

Test Agency Texas Transportation Institute
 Test No. 220547-3
 Date 05/17/01

Test Article

Type Terminal
 Name ET-PLUS with Controlled Release Posts
 Installation Length (m) 45.7
 Material or Key Elements ... ET-Plus head with 12.5 ft W-beam and Steel Breakaway Posts

Soil Type and Condition

Standard Soil, Dry

Test Vehicle

Type Production
 Designation 2000P
 Model 1997 Chevrolet 2500 pickup truck
 Mass (kg)
 Curb 2120
 Test Inertial 2000
 Dummy No Dummy
 Gross Static 2000

Impact Conditions

Speed (km/h) 101.1
 Angle (deg) 20.4

Exit Conditions

Speed (km/h) 55.2
 Angle (deg) 23.0

Occupant Risk Values

Impact Velocity (m/s)
 x-direction 4.8
 y-direction 4.0
 THIV (km/h) 21.5
 Ridedown Accelerations (g's)
 x-direction -8.3
 y-direction -9.3
 PHD (g's) 11.3
 ASI 0.67
 Max. 0.050-s Average (g's)
 x-direction -5.5
 y-direction -5.1
 z-direction 3.2

Test Article Deflections (m)

Dynamic 0.830
 Permanent 0.745
 Working Width 1.201

Vehicle Damage

Exterior
 VDS 01RFQ2
 CDC 01FREK2
 &01RYEW3
 Maximum Exterior
 Vehicle Crush (mm) 450
 Interior
 OCDI RF0000000
 Max. Occ. Compart.
 Deformation (mm) 20

Post-Impact Behavior

(during 1.0 s after impact)
 Max. Yaw Angle (deg) -37
 Max. Pitch Angle (deg) -20
 Max. Roll Angle (deg) 20

Summary of results for test 220547-3, NCHRP Report 350 test 3-35.