



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

400 Seventh St., S.W.  
Washington, D.C. 20590

October 12, 2005

In Reply Refer To: HSA-10/B-96A

Mr. Rick Mauer  
Outside Sales National Representative  
Nucor Steel Marion Inc.  
912 Chaney Avenue  
Marion, Ohio 43302

Dear Mr. Mauer:

The Federal Highway Administration formally accepted your high-tension 3-strand cable median barrier in Ms. Carol H. Jacoby's August 30, 2002 letter to you. This original acceptance letter, designated as B-96, mistakenly described the Saferoads barrier as a 3-strand cable guardrail with wire ropes 520 mm, 650 mm, and 775 mm above the ground. As noted below, the cable heights were actually 545 mm, 650 mm, and 750 mm. Its line posts were standard 1664-mm long 6 kg/m U-channel posts installed on 2-meter centers with trapezoidal soil plates just below the ground line. The cables were attached to the line posts with proprietary 6.4-mm diameter locking hook bolts. The test installation was anchored at both ends with the Texas Transportation Institute's (TTI) proprietary Cable Guardrail Terminal and each cable was tensioned to 25 kN (5600 lbs.) for the ambient temperature of 21 degrees Celsius.

Your September 9, 2005 letter to Mr. Richard Powers of my staff requested acceptance of two variations on the original design. The first change was the use of your standard 6 kg/m U-channel line posts, 1219-mm long, set in 100-mm diameter 12-gauge steel pipe sockets in lieu of direct-driven posts with soil plates. Each socket was set in the center of a 300-mm diameter by 760-mm deep reinforced concrete footing. The second change was the post spacing. Whereas the original design used line posts on 2-m centers, you tested installations with post spacings of 3.8 m and 5.1 m. Detailed information on these tests was contained in copies of TTI's reports entitled "NCHRP Report 350 Test 3-11 on Saferoads Cable Rail with Socketed Posts Spaced at 3.8 m" (dated May 2005) and "NCHRP Report 350 Test 3-11 of the Nucor Steel Marion, Inc. Cable Barrier with Posts Spaced at 5.1 m" (dated September 2005). While reviewing your request, staff members noted a discrepancy between the heights of the cables noted in the report narratives and those shown on the report drawings. A revised report, "NCHRP Report 350 Test 3-11 of the Nucor Steel Marion, Inc. US High Tension Cable System (16 ft-8 in Line Post Spacing)," dated October 2005, confirmed the height of each cable, measured at its center at each line post, to be 545 mm, 650 mm, and 750 mm.



As seen in the report titles, NCHRP Report 350 Test No. 3-11 was run on both test installations. In the first test, conducted on March 29, 2002 with the 3.8-m post spacing, the pickup truck impacted at post 14 at 99.3 km/h and at an impact angle of 25.7 degrees. All Report 350 evaluation criteria were met and the barrier dynamic deflection was reported to be 1.8 m. In the second test, conducted on July 26, 2005 with the 5.1-m post spacing, the truck impacted at 98.1 km/h and 26.4 degrees. The dynamic deflection of the cable barrier in the second test was 2.3 m. Summary sheets from the TTI test reports for each test are enclosed.

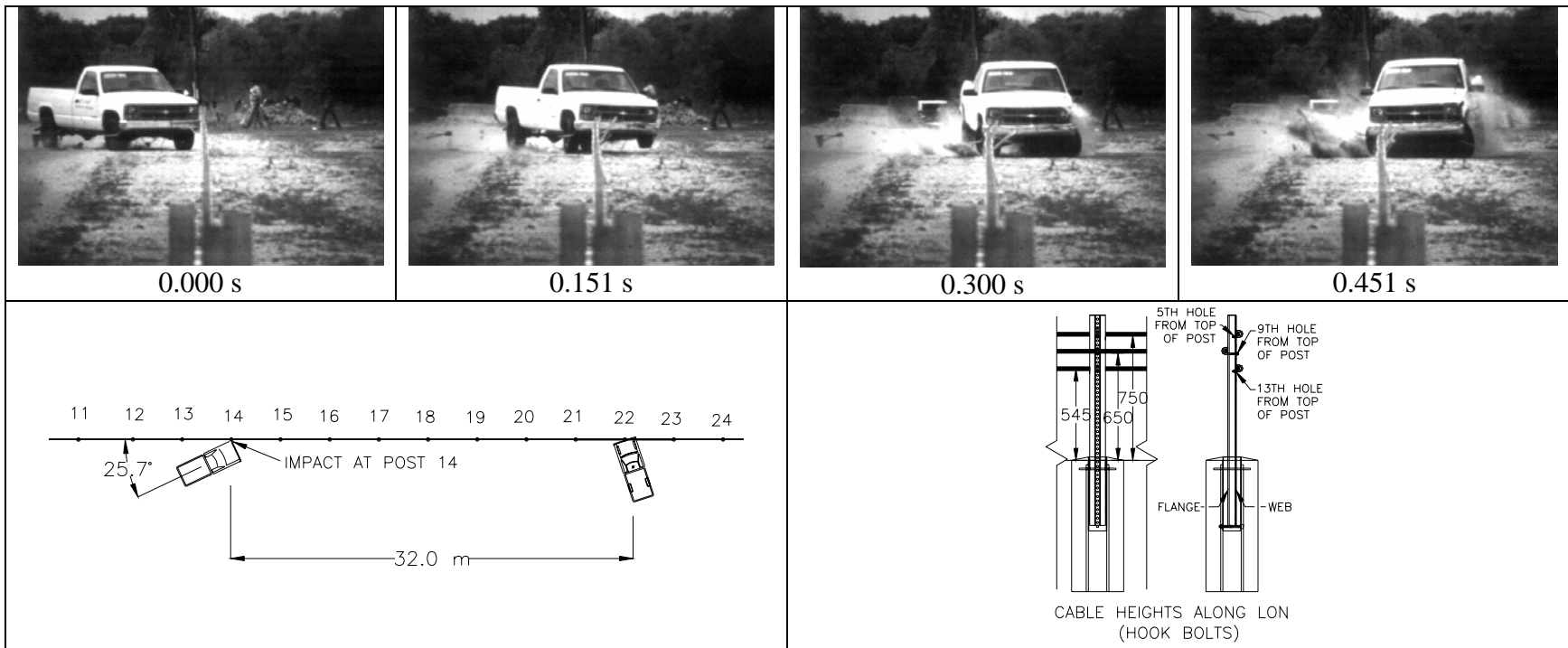
Both 3-strand cable barrier variations described above are acceptable for use on the National Highway System as NCHRP Report 350 test level 3 median barriers. Since both the TTI anchor used in the test installations and the locking hook bolts at each line post are considered proprietary, the provisions of Title 23 CFR, Section 635.411 apply to the use of this system on federally funded projects.

Sincerely yours,

*/original signed by/*

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

Enclosure



**General Information**

Test Agency..... Texas Transportation Institute  
 Test No. .... 400001-SFR4  
 Date ..... 03-29-2005

**Test Article**

Type..... Guardrail  
 Name ..... SAFERoads Cable Rail  
 Installation Length (m)..... 101.4  
 Material or Key Elements ..... Three-Cable Barrier System With Socketed Posts Spaced at 3.8 m  
 Soil Type and Condition..... Standard Soil, Dry

**Test Vehicle**

Type..... Production  
 Designation..... 2000P  
 Model..... 1999 Chevrolet 2500 Pickup  
 Mass (kg)  
 Curb..... 2201  
 Test Inertial..... 2074  
 Dummy ..... N/A  
 Gross Static..... 2074

**Impact Conditions**

Speed (km/h) .....99.3  
 Angle (deg) .....25.7

**Exit Conditions**

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

**Occupant Risk Values**

Impact Velocity (m/s)  
 Longitudinal..... 2.7  
 Lateral ..... 4.0  
 THIV (km/h) .....16.1  
 Ridedown Accelerations (g's)  
 Longitudinal.....-5.3  
 Lateral ..... 6.3  
 PHD (g's) .....7.2  
 ASI .....0.49  
 Max. 0.050-s Average (g's)  
 Longitudinal.....-3.0  
 Lateral ..... 3.9  
 Vertical ..... 1.6

**Test Article Deflections (m)**

Dynamic..... 1.80  
 Permanent ..... N/A  
 Working Width ..... 2.30

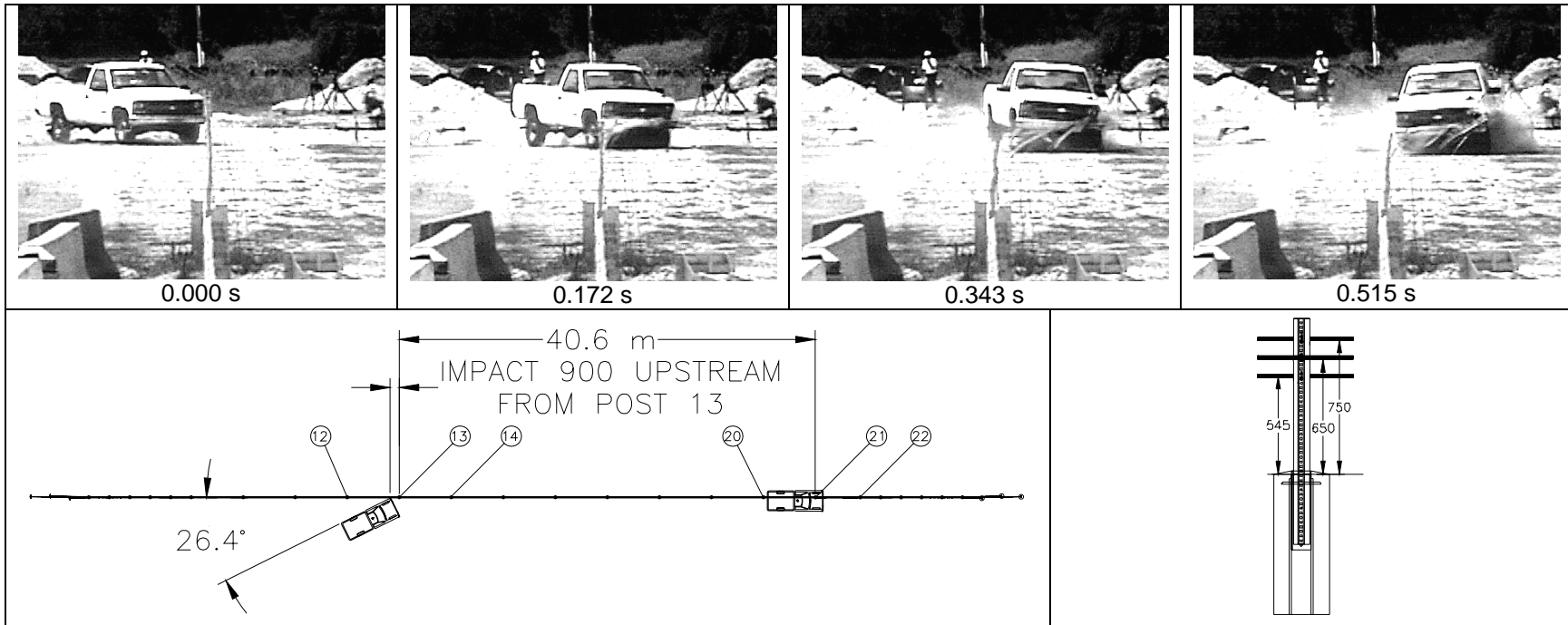
**Vehicle Damage**

Exterior  
 VDS..... 11FL2  
 CDC..... 11FLEW2  
 Maximum Exterior  
 Vehicle Crush (mm)..... 160  
 Interior  
 OCDI ..... LF0000000  
 Maximum Occupant  
 Cmnt. Deformation (mm) None

**Post-Impact Behavior**

(during 1.0 sec after impact)  
 Max. Yaw Angel (deg) ..... 32  
 Max. Pitch Angle (deg) ..... 2  
 Max. Roll Angle (deg) ..... 10

Figure 15. Summary of results for NCHRP Report 350 test 3-11 on the SAFERoads cable barrier with socketed posts spaced at 3.8 m.



**General Information**

Test Agency..... Texas Transportation Institute  
 Test No. .... 400001-SFR5  
 Date ..... 07-26-2005

**Test Article**

Type..... Cable Guardrail  
 Name ..... Nucor Steel Marion, Inc. Cable Barrier  
 Installation Length (m) ..... 100  
 Material or Key Elements ..... High Tension, 3 Cable Median Barrier

**Soil Type and Condition**

Standard Soil, Dry

**Test Vehicle**

Type..... Production  
 Designation..... 2000P  
 Model..... 2000 Chevrolet 2500 Pickup Truck  
 Mass (kg)  
 Curb..... 2164  
 Test Inertial..... 2123  
 Dummy..... No dummy  
 Gross Static..... 2123

**Impact Conditions**

Speed (km/h) ..... 98.1  
 Angle (deg) ..... 26.4

**Exit Conditions**

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

**Occupant Risk Values**

Impact Velocity (m/s)  
 Longitudinal ..... 4.9  
 Lateral ..... 3.8  
 THIV (km/h) ..... 19.9  
 Ridedown Accelerations (g's)  
 Longitudinal ..... -4.3  
 Lateral ..... 5.2  
 PHD (g's) ..... 6.1  
 ASI ..... 0.42  
 Max. 0.050-s Average (g's)  
 Longitudinal ..... -2.7  
 Lateral ..... 3.5  
 Vertical ..... 2.9

**Test Article Deflections (m)**

Dynamic ..... 2.31  
 Permanent ..... N/A  
 Working Width ..... 2.35

**Vehicle Damage**

Exterior  
 VDS ..... 11LFQ1  
 CDC ..... 11FLEW1  
 Max. Exterior  
 Vehicle Crush (mm) ..... 70  
 Interior  
 OCDI ..... FS0000000  
 Max. Occupant Compartment  
 Deformation (mm) ..... 0

**Post-Impact Behavior**

(during 1.0 sec after impact)  
 Max. Yaw Angle (deg) ..... 28  
 Max. Pitch Angle (deg) ..... -3  
 Max. Roll Angle (deg) ..... 5

Figure 16. Summary of results for NCHRP Report 350 test 3-11 on Nucor Steel Marion, Inc. cable barrier.