



**NCHRP REPORT 350 TEST 3-11 ON SAFEROADS
CABLE RAIL WITH SOCKETED POSTS
SPACED AT 3.8 M**

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16. Abstract <p>In a previous project, <i>NCHRP Report 350</i> test 3-11 was performed on the length-of-need of a cable barrier system using the 6 kg/m steel U-channel post, as manufactured by Marion Steel Company, with the new cable release posts and steel yielding terminal post, developed at TTI. Post spacing in the LON was 2 meters, and cable heights were the same as previously tested systems. The test performed involved a 2000 kg pickup truck impacting the LON of the barrier at a nominal speed and angle of 100 km/h and 25 degrees, respectively. The cable barrier with Marion Steel 6 kg/m U-channel posts with soil plates, direct driven, and spaced at 2 meters, and with the TTI breakaway terminal posts met the requirements of <i>NCHPR Report 350</i> test 3-11, with a maximum dynamic deflection of 1.9 m.</p> <p>In March 2004, testing was performed to evaluate the length-of-need of a cable barrier system using the 6 kg/m steel U-channel post spaced 5 m apart, with the new cable release posts and steel yielding terminal post. Post spacing in the LON of the barrier was 5 m, and cable heights were the same as previously tested systems. The cable barrier with Marion Steel 6 kg/m U-channel posts with soil plates, direct driven, and spaced 5 m apart, and TTI breakaway terminal posts met the requirements of <i>NCHPR Report 350</i> test 3-11, with a maximum dynamic deflection of 2.6 m.</p> <p>In September 2004, <i>NCHPR Report 350</i> test 3-11 was performed to evaluate the length-of-need portion of the SAFERoads Cable Guardrail system with posts driven directly in soil, without soil plates, spaced at 5 m. Maximum dynamic deflection during the test was 2.8 m. The SAFERoads cable barrier with direct driven posts, with no soil plate and spaced at 5 m apart, performed acceptably according to criteria for <i>NCHRP Report 350</i> test 3-11. During the same month, TL-3 testing was also performed to evaluate the length-of-need portion of the SAFERoads Cable Guardrail system with posts placed in sockets spaced at 2 m. Again, the SAFERoads cable barrier with socketed posts spaced at 2 m performed acceptably according to criteria for <i>NCHRP Report 350</i> test 3-11, with maximum dynamic deflection during the test of 1.6 m.</p> <p>This report summarizes the results from the test 3-11 of the SafeRoads cable system with posts installed in concrete sockets and spaced at 3.8m. The pickup was smoothly redirected with a maximum dynamic deflection of 1.8 m.</p>					
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SUMMARY AND CONCLUSIONS

ASSESSMENT OF TEST RESULTS

An assessment of the test based on the following applicable *NCHRP Report 350* safety evaluation criteria.

Structural Adequacy

- A. *Test article should contain and redirect the vehicle; the vehicle should not penetrate, underide, or override the installation although controlled lateral deflection of the test article is acceptable.*

Results: The SAFERoads cable barrier with socketed posts spaced at 3.8 m contained and redirected the pickup truck. The vehicle did not penetrate, underide, or override the barrier. Maximum dynamic deflection during the test was 1.8 m. (PASS)

Occupant Risk

- D. *Detached elements, fragments, or other debris from the test article should not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformation of, or intrusions into, the occupant compartment that could cause serious injuries should not be permitted.*

Results: Four posts pulled out of the sockets; three posts came to rest near the installation, while one came to rest 9.4 m toward the traffic side between posts 17 and 18. The posts did not penetrate or show potential for penetrating the occupant compartment, or to present undue hazard to others in the area. No occupant compartment deformation occurred. (PASS)

- F. *The vehicle should remain upright during and after collision although moderate roll, pitching, and yawing are acceptable.*

Results: The pickup truck remained upright during and after the collision period. (PASS)

Vehicle Trajectory

- K. *After collision, it is preferable that the vehicle's trajectory not intrude into adjacent traffic lanes.*

Result: The pickup truck did not intrude into adjacent traffic lanes as it came to rest adjacent to the installation. (PASS)

L. *The occupant impact velocity in the longitudinal direction should not exceed 12 m/s and the occupant ridedown acceleration in the longitudinal direction should not exceed 20 g's.*

Result: Longitudinal occupant impact velocity was 2.7 m/s, and longitudinal ridedown acceleration was -5.3 g's. (PASS)

M. *The exit angle from the test article preferably should be less than 60 percent of the test impact angle, measured at time of vehicle loss of contact with the test device.*

Result: The vehicle went out of view of the camera, and exit angle was not obtainable. (N/A)

The following supplemental evaluation factors and terminology, as presented in the FHWA memo entitled "Action: Identifying Acceptable Highway Safety Features," were used for visual assessment of test results: ⁽¹⁰⁾

Passenger Compartment Intrusion

1. *Windshield Intrusion*

a. *No windshield contact*

b. *Windshield contact, no damage*

c. *Windshield contact, no intrusion*

d. *Device embedded in windshield, no significant intrusion*

e. *Complete intrusion into passenger compartment*

f. *Partial intrusion into passenger compartment*

2. *Body Panel Intrusion*

yes or no

Loss of Vehicle Control

1. *Physical loss of control*

2. *Loss of windshield visibility*

3. *Perceived threat to other vehicles*

4. *Debris on pavement*

Physical Threat to Workers or Other Vehicles

1. *Harmful debris that could injure workers or others in the area*

2. *Harmful debris that could injure occupants in other vehicles*

Four posts pulled out of the sockets; three came to rest near the installation while one came to rest 9.4 m toward the traffic side between posts 17 and 18. These posts did not present undue hazard to others in the area.

Vehicle and Device Condition

1. *Vehicle Damage*

a. *None*

b. *Minor scrapes, scratches or dents*

c. *Significant cosmetic dents*

d. *Major dents to grill and body panels*

e. *Major structural damage*

- | | |
|--|--|
| <p>2. <i>Windshield Damage</i></p> <ul style="list-style-type: none"> a. <i>None</i> b. <i>Minor chip or crack</i> c. <i>Broken, no interference with visibility</i> d. <i>Broken or shattered, visibility restricted but remained intact</i> <p>3. <i>Device Damage</i></p> <ul style="list-style-type: none"> a. <i>None</i> b. <i>Superficial</i> c. <i>Substantial, but can be straightened</i> | <ul style="list-style-type: none"> e. <i>Shattered, remained intact but partially dislodged</i> f. <i>Large portion removed</i> g. <i>Completely removed</i>
<ul style="list-style-type: none"> d. <u><i>Substantial, replacement parts needed for repair</i></u> e. <i>Cannot be repaired</i> |
|--|--|

CONCLUSION

The SAFERoads cable barrier with socketed posts spaced at 3.8 m performed acceptably according to criteria for *NCHRP Report 350* test 3-11, as shown in table 2.

Table 2. Performance evaluation summary for *NCHRP Report 350* test 3-11 on the SAFERoads cable barrier with socketed posts spaced at 3.8 m.

Test Agency: Texas Transportation Institute

Test No.: 400001-SFR4

Test Date: 03-29-2005

<i>NCHRP Report 350</i> Evaluation Criteria	Test Results	Assessment
<p><u>Structural Adequacy</u> A. <i>Test article should contain and redirect the vehicle; the vehicle should not penetrate, underride, or override the installation although controlled lateral deflection of the test article is acceptable</i></p>	<p>The SAFERoads cable barrier with socketed posts spaced at 3.8 m contained and redirected the pickup truck. The vehicle did not penetrate, underride, or override the barrier. Maximum dynamic deflection during the test was 1.8 m.</p>	<p>Pass</p>
<p><u>Occupant Risk</u> D. <i>Detached elements, fragments, or other debris from the test article should not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformations of, or intrusions into, the occupant compartment that could cause serious injuries should not be permitted.</i></p>	<p>Four posts pulled out of the sockets; three posts came to rest near the installation while one came to rest 9.4 m toward the traffic side between posts 17 and 18. The posts did not penetrate or show potential for penetrating the occupant compartment, or to present undue hazard to others in the area. No occupant compartment deformation occurred.</p>	<p>Pass</p>
<p>F. <i>The vehicle should remain upright during and after collision although moderate roll, pitching, and yawing are acceptable.</i></p>	<p>The pickup truck remained upright during and after the collision period.</p>	<p>Pass</p>
<p><u>Vehicle Trajectory</u> K. <i>After collision, it is preferable that the vehicle's trajectory not intrude into adjacent traffic lanes.</i></p>	<p>The pickup truck did not intrude into adjacent traffic lanes as it came to rest adjacent to the installation.</p>	<p>Pass*</p>
<p>L. <i>The occupant impact velocity in the longitudinal direction should not exceed 12 m/s and the occupant ridedown acceleration in the longitudinal direction should not exceed 20 g's.</i></p>	<p>Longitudinal occupant impact velocity was 2.7 m/s, and longitudinal ridedown acceleration was -5.3 g's.</p>	<p>Pass</p>
<p>M. <i>The exit angle from the test article preferably should be less than 60 percent of test impact angle, measured at time of vehicle loss of contact with test device.</i></p>	<p>The vehicle went out of view of the camera, and exit angle was not obtainable.</p>	<p>N/A*</p>

*Criterion K and M are preferable, not required.