



**NCHRP REPORT 350 TEST 3-11 OF THE NUCOR
STEEL MARION, INC. CABLE BARRIER WITH POSTS
SPACED AT 5.1 m**

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Sponsored by
Nucor Steel Marion, Inc. and GSI Highway Products

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| 16. Abstract <p>The objective of the test reported herein was to evaluate the length-of-need portion of the Nucor Steel Marion, Inc. cable barrier system with posts placed in sockets spaced at 5.1 m. The Nucor Steel Marion, Inc. cable barrier with posts in sockets spaced at 5.1 m met the specifications for <i>NCHRP Report 350</i> test 3-11. Maximum deflection of the barrier was 2.31 m and working width was 2.35 m.</p> <p>This report presents the details of the installation, description of the full-scale crash test, and the results and evaluation of that crash test.</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 Nucor Steel Marion, Inc. cable barrier contained and redirected the pickup truck. The pickup truck did not penetrate, underide, or override the installation. Maximum deflection of the barrier was 2.31 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: Eight posts pulled out of the sockets; however, none of these posts penetrated or showed 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 vehicle did not intrude into adjacent traffic lanes as it came to rest within the barrier system. (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 4.9 m/s, and longitudinal ridedown acceleration was -4.3 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 was out of view of the overhead camera as it came to a stop; however, the vehicle remained within the system and did not exit. (PASS)

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: ⁽¹¹⁾

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*

Eight posts pulled out of the sockets; however, none presented a threat.

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*

2. *Windshield Damage*

a. None

b. *Minor chip or crack*

c. *Broken, no interference with visibility*

d. *Broken or shattered, visibility restricted but remained intact*

e. *Shattered, remained intact but partially dislodged*

f. *Large portion removed*

g. *Completely removed*

3. *Device Damage*

a. *None*

b. *Superficial*

c. *Substantial, but can be straightened*

d. *Substantial, replacement parts
needed for repair*

e. *Cannot be repaired*

CONCLUSIONS

The Nucor Steel Marion, Inc. cable barrier with posts in sockets spaced at 5.1 m met the specifications for *NCHRP Report 350* test 3-11, as shown in table 2. Maximum deflection of the barrier was 2.31 m and working width was 2.35 m.

Table 2. Performance evaluation summary for *NCHRP Report 350* test 3-11 on the Nucor Steel Marion, Inc. cable barrier.

Test Agency: Texas Transportation Institute

Test No.: 400001-SFR5

Test Date: 07-26-2005

| <i>NCHRP Report 350</i> Test 3-11 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 Nucor Steel Marion, Inc. cable barrier contained and redirected the pickup truck. The pickup truck did not penetrate, underride, or override the installation. Maximum deflection of the barrier was 2.31 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>Eight posts pulled out of the sockets; however, none of these posts penetrated or showed 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 vehicle did not intrude into adjacent traffic lanes as it came to rest within the barrier system.</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 4.9 m/s, and longitudinal ridedown acceleration was -4.3 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 was out of view of the overhead camera as it came to a stop; however, the vehicle remained within the system and did not exit.</p> | <p>Pass *</p> |

*Criterion K and M are preferable, not required.