A Focus Technology of the American Association of State Highway and Transportation Officials (AASHTO) Technology Implementation Group (TIG)

CABLE MEDIAN BARRIER
Why Median Barriers …

23,139 Road Departure Fatalities
16,214 From Run-Off-The Road (ROR) Crashes

740,000 Road Departure Injury Crashes

2,600,000 Road Departure Crashes

267 Fatalities Involving Crossover Median Head-On Collisions

Source: Federal Highway Administration, “Median Barriers” (2001)
Cable Barrier …

Safe

Effective

Cost Efficient

Proven Results

Replaceable
Share & Sponsor Technology Transfer
Promote Transportation Advancements
Encourage Implementation
Why Cable Median Barrier?

RESULTS
## Median Crossover Collisions
### Before & After Cable Barrier Placement

<table>
<thead>
<tr>
<th></th>
<th>North Carolina</th>
<th>Washington</th>
<th>Ohio</th>
<th>Texas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td>All Cross Median Collisions</td>
<td>60</td>
<td>23</td>
<td>42.4</td>
<td>11.2</td>
</tr>
<tr>
<td>Fatal Cross Median Collisions</td>
<td>4</td>
<td>2</td>
<td>4.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Disabling Injury Cross Median Collisions</td>
<td>7</td>
<td>2</td>
<td>5.2</td>
<td>1.5</td>
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</tbody>
</table>
Across Median Crashes Avoided

Disabling Injuries Reduced

Lives Saved

Fatal Crash Costs Decreased
## Cable Barrier Installations

<table>
<thead>
<tr>
<th>State</th>
<th>Current</th>
<th>Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Carolina</td>
<td>550 miles</td>
<td>50 miles</td>
</tr>
<tr>
<td>Washington</td>
<td>165 miles</td>
<td>20 miles</td>
</tr>
<tr>
<td>Ohio</td>
<td>121 miles</td>
<td>500 miles</td>
</tr>
<tr>
<td>Texas</td>
<td>600 miles</td>
<td>200 miles</td>
</tr>
</tbody>
</table>

Approximate mileage as of 12/31/2006
Cable Median Barrier

Life Saving

Injury Reducing Technology

Flexible

Customizable Solutions
Cable Median Barrier States

- States without Cable
- States with Cable installed
- States with Pending Projects
### Type of Cable Barrier Used

<table>
<thead>
<tr>
<th>State</th>
<th>Low Tension</th>
<th>High Tension</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Carolina</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Washington</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ohio</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Texas</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

- **U.S. Generic Low Tension Barrier**
- **Safence**
- **Brifen Safety Fence**
- **Gibraltar Cable Barrier**
- **Nucor Marion U.S. High Tension**
- **Trinity Cable Safety Systems (CASS)**
Barrier Installation Costs

Cable Guardrail Low Tension (1-Line)
$84,000 per mile

High Tension Cable Barrier (Socketed Post)
$230,000 per mile

Single Face Guardrail (2-Line)
$265,000 per mile

Double-Faced Guardrail (Strong Post)
$175,000 per mile
Barrier Installation Costs

Cable Median Barrier
$130,000-300,000 per mile*

W-Beam Guardrail
$250,000-600,000 per mile*

Precast Concrete Barrier
$300,000-2,700,000 per mile*

*Upper end of cost range reflects costs for extensive grading
## Barrier Installation Costs

<table>
<thead>
<tr>
<th>Type</th>
<th>Cost per Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Barrier</td>
<td>$310,000</td>
</tr>
<tr>
<td>Earth Mounding</td>
<td>$190,000</td>
</tr>
<tr>
<td>Barrier W-beam Guardrail</td>
<td>$83,000</td>
</tr>
<tr>
<td>High Tension Cable</td>
<td>$72,000</td>
</tr>
</tbody>
</table>
Barrier Installation Costs

Cable Median Barrier
(High Tension, Socket Post)
$45,000/mile
(Include a Three Foot Mow Strip + $45,000)

Precast Concrete Barrier
$120,000/mile

Precast Single Slope Concrete Barrier
$210,000

Cast in Place Concrete Barrier
$250,000
### Cable Median Barrier

#### Roadway Design: Side Slope & Placement

<table>
<thead>
<tr>
<th>Median Width</th>
<th>Offset at 60’ Median Widths</th>
<th>Cable Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>70’ or Less</td>
<td>8'</td>
<td>Pre-2006:</td>
</tr>
<tr>
<td>500 Miles</td>
<td></td>
<td>21” Bottom</td>
</tr>
<tr>
<td>Low Tension</td>
<td></td>
<td>27” Middle</td>
</tr>
<tr>
<td>Barrier</td>
<td></td>
<td>33” Top</td>
</tr>
<tr>
<td>11’ 6”</td>
<td></td>
<td>2006 Forward:</td>
</tr>
<tr>
<td>Deflection</td>
<td></td>
<td>20 ½” Bottom</td>
</tr>
<tr>
<td>4’ Offset</td>
<td></td>
<td>25 ¼” Middle</td>
</tr>
<tr>
<td>from Ditch</td>
<td></td>
<td>30” Top</td>
</tr>
<tr>
<td>Line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6:1 Slopes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or Flatter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Median Barrier Drawings
Roadway Design: Side Slope & Placement

Placed on 6:1 Slope or Flatter
43 Miles of Low Tension Installed

Placed Within 1’ of Low Point in Median
122 Miles of High Tension
(Predominately Socketed System)

Or

A Minimum of 8’ Offset from Low Point

Deflection Varies Depending on Post Spacing – Generally 9’-12’ with 16’ Post Spacing
Roadway Design: Side Slope & Placement

10’ Offset from Ditch Centerline

6:1 Depressed Median Slopes And Wide Paved Shoulders

50’-76’ Median Widths

10’ Paved Inside Shoulder

Concrete Sockets

8’ Deflection (generally)
Roadway Design: Side Slope & Placement

- Deflection 8’ or Less
- 6:1 Approach Slope
- 12’ From Travel Lane
- 20’ Post Spacing

End Cable Barrier Behind W-Beam

Place Cable Barrier on “Convex” Side of Curves

Texas Department of Transportation
## Cable Median Barrier

### Maintenance & Repair

<table>
<thead>
<tr>
<th></th>
<th>North Carolina</th>
<th>Washington</th>
<th>Ohio</th>
<th>Texas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance Repairs</td>
<td>N/A</td>
<td>219</td>
<td>171</td>
<td>Unknown</td>
</tr>
<tr>
<td>Average Posts Hit</td>
<td>N/A</td>
<td>6-7</td>
<td>5.65</td>
<td>10</td>
</tr>
<tr>
<td>Average Hours to Repair</td>
<td>N/A</td>
<td>2-14</td>
<td>48-120</td>
<td>Less Than One Hour</td>
</tr>
<tr>
<td>Average Repair Cost</td>
<td>N/A</td>
<td>$800</td>
<td>$631</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

- Average Repair Cost:
  - $800 per location
  - $631 per post

- Hours from time of accident:
  - Less Than One Hour
Lessons Learned

North Carolina
✓ 80% Decrease in Total Across Median Crashes – 86% Decrease in Fatal Across Median Crashes

Washington
✓ Cable Median Barriers Reduce Frequency and Severity of Median Cross-Over Collisions
✓ 95% of Vehicles that Hit the Cable Median Barrier Did Not Cross the Median
✓ Cable Median Barrier has Fewer Injuries and Secondary Collisions than Other Barriers

Ohio
✓ Location of Interchanges Does Not Have Impact on Barrier Plans
✓ Recommend Multi-Facet Approach

Texas
✓ Many Hits Since Cable Barrier Installed but No Penetrations To-Date
✓ Initial Negative Reaction from Emergency Services has been Reversed
Cable Median Barrier

Resources Available

Cable Barrier – A High Tension Transformation: The Utah Experience

Update on Guidelines for the Selection of Cable Barrier Systems, NCHRP Project 20-7(210)

Challenges to Weigh
To Learn More

AASHTO TIG  http://www.aashtotig.org

Federal Highway Administration  http://www.safety.fhwa.dot.gov

Brifen U.S.A.  http://www.brifenusa.com

Gibraltar  http://gibraltartx.com

Nucor Steel Marion  http://nsmarion.com

Safence  http://www.safence.com

Trinity  http://www.highwayguardrail.com
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