Measuring the Impacts of Speed Reduction Technologies: A Dynamic Advanced Curve Warning System Evaluation

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**Background**

- Identified as a problem area
  - Sharp curve & excessive speed
  - High crash frequency rate
- ODOT installed Changeable Message Signs
  - April 2004
  - Uses radar to display speeds
- Portland State University
  - Classic before/after study

- Crash rate above average
  - 1.18 per MVMT vs. 0.22 per MVMT
- 33 reported crashes
  - 13 crashes southbound
  - 20 crashes northbound
- 12 injuries (3 severe)
- 70% of crashes involved one vehicle
- More truck crashes southbound
  - 11 overturning incidents
Other Similar Applications

**Truck Rollover**
- California (I-5 Sacramento River Canyon)
- Texas (freeway off-ramp loops)
- Maryland and Virginia (freeway off-ramp loops – with WIM, speed, height detection)

**Truck Downgrade Warnings**
- Colorado (I-70, Eisenhower Tunnel)
- Oregon (I-84, Emigrant Hill)
Location

- Near MP 108 on I-5 in southwest Oregon.
- Geographic constraints necessitate undesirable highway geometry.
Myrtle Creek Curves

Northbound Sign

Southbound Sign
Installation

Changeable Message Signs (CMS)
- Used existing sign bridges in both directions

Radar Unit
- Pole-mounted, 20ft high
- Doppler technology
  - Vehicle speeds
  - Travel direction
- Detects “fastest signal”

$140,000 total system cost
# CMS Messages

<table>
<thead>
<tr>
<th>Panel</th>
<th>Default Message</th>
<th>Warning Message</th>
<th>Excessive Speed Message</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Speeds less than 50 mph</em></td>
<td><em>Speeds 50 to 70 mph</em></td>
<td><em>Speeds over 70 mph</em></td>
</tr>
<tr>
<td>1</td>
<td>CAUTION</td>
<td>SLOW DOWN</td>
<td>SLOW DOWN</td>
</tr>
<tr>
<td>2</td>
<td>SHARP CURVES AHEAD</td>
<td>YOUR SPEED IS XX MPH</td>
<td>YOUR SPEED IS OVER 70 MPH</td>
</tr>
</tbody>
</table>
Northbound Pictures

Before

After

YOUR SPEED IS OVER 70 MPH
Southbound Pictures
Objectives of the Myrtle Creek Study

Before and after analysis
- Crash frequency
- Speed data

Post-installation driver awareness
- Motorist survey
Measures of Effectiveness

- Change in mean speed
  - Passenger cars
  - Commercial vehicles
- Change in speed distribution
  - Passenger cars
  - Commercial vehicles
- Public response to the sign
Speed Data Collection

**Sampling**
- 4 before days
- 3 after days

**Technique**
- UltraLyte laser speed detector & computer
- Passenger vs. commercial vehicles
Data Collection Location

Southbound –
- Data collected from vehicle in ramp gore

Northbound –
- Data collected from behind concrete barrier downstream from the sign bridge
Data Analysis

**Cosine correction**
- No road geometry adjustment

**Commercial vs. Passenger vehicles**

**Data analyzed in 200 foot bins**
- Distance from sign bridge

**Statistics used for comparison**
- Mean
- Standard deviation
- 95th percent confidence interval
Comparison of Mean Zones - Southbound, Passenger Vehicles

Results
Comparison of Mean Zones - Southbound, Commercial Vehicles

Results

Travel Direction

Zone Location (feet from sign)
Results

Comparison of Mean Zones - Northbound, Passenger Vehicles

<table>
<thead>
<tr>
<th>Zone Location (feet from sign)</th>
<th>MPH</th>
<th>Before Mean</th>
<th>After Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign Start of Curve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sign Visible</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Travel Direction

Graph showing data points with error bars for MPH before and after mean comparisons at various zone locations from the sign.
Comparison of Mean Zones - Northbound, Commercial Vehicles

Results
Speed Distributions

Before

After

Speed Category

35-<40  40-<45  45-<50  50-<55  55-<60  60-<65  65-<70  >70

Before

After
Survey Results

At nearest rest area
- NB – 35 miles north
- SB – 26 miles south

Northbound & Southbound Combined, n = 87
- 85% passenger vehicles
- 90% noticed sign
- 74% saw speed displayed
- 81% useful information
- 77% adequate location
- 89% visibility adequate
Conclusions

- Reduction of speeds for majority of vehicles
  - 3 mph SB
  - 2 mph NB

- Public response to the device was positive

- Need to monitor crashes for some time
Thank You!

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