Lessons Learned from 45+ Years of Traffic Engineering Research

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University of New Mexico
WELCOME
TO
Fabulous
LAS VEGAS
NEVADA
Background

- Beginning June 1961, worked 4 summers for Oregon Highway Department
- BS degree, Physics, HMC
- MS Engineering, UW (1968)
- PhD Civil Engineering, UW (1969)
- University of Maryland (1970-77)
- FHWA, Summer 1971
- University of New Mexico (1977-2011)
1960’s Two-Way Left-Turn Lanes
Expen$ive TWLTL
Make Sure that the Device is Legal
1960s Freeway Benefit Analyses

- Before-and-After study of
  - Travel time
  - Fuel consumption
  - Traffic accidents
- Select test routes through Seattle with intermediate checkpoints
- Five test vehicles, from small car to tractor-trailer
Test Routes
I-5 Through Seattle
Differential Truck Speed Limit

- Speed limits on MD Interstate Freeways
  - Passenger vehicles: 60, 65, and 70 mph
  - Trucks: 60 mph
- Rationale: large trucks require a longer stopping distance
- Problem: enforced differential increases the standard deviation of speeds
- Speeds monitored by vehicle type at 84 directional study sites
Fig. 6-4. Field setup with automatic speed measuring device.
1970s Era Radar
Maryland Truck Size Limits
MD Roadside Hazards
Signing for Real-Time Route Diversion

Four Routes

US 29
I95
US 1
BW Parkway
Five Candidate Signs

FREEWAY CONDITION

- Normal
- Congested

Next 2 Miles

FREEWAY CONDITION

- Normal
- Congested

Use Alternate Route

Spring Avenue
Distribute Survey on Interstate Ramp
NM Fatal Overturning Crashes

- IIHS-sponsored
- 151 sites
- Upstream comparison sites
- Steeper downgrades
- Sharper curvature
- Pickup trucks
151 Fatal Overturning Crashes

- 0% (8%)
- 3% (12%)
- 1% (15%)
- 22% (20%)
- 13% (4%)
- 3% (32%)

3% on Road
Guardrail Installation & Improvement

- Should priority be given to:
  - New installation where warranted
  - Bring existing guardrail to modern standards
- Field studies at guardrail and run-off-the-road crash sites
- Data collection similar to fatal OT study
Roadside Hazard Parameters

- Object Type
- Object Placement
- Roadway Alignment
- Shoulders
- Roadside Slopes
### Rural Pedestrian Safety

#### Pedestrian Fatality Rates

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>NM</th>
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<tbody>
<tr>
<td>Per 100 mvm</td>
<td>0.37</td>
<td>0.77</td>
</tr>
<tr>
<td>Per 100 K Population</td>
<td>2.8</td>
<td>7.0</td>
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<tr>
<td>Per 100 K Drivers</td>
<td>4.2</td>
<td>10.0</td>
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</table>

#### San Juan – McKinley Counties, NM

- 12.5% of all NM accidents
- 20.9% of pedestrian accidents
- 35.0% of fatal pedestrian accidents
# Pedestrian Accident Characteristics

<table>
<thead>
<tr>
<th></th>
<th>SJ/McK</th>
<th>NM</th>
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<tbody>
<tr>
<td>Non-Intersection</td>
<td>76%</td>
<td>68%</td>
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<tr>
<td>Fatal</td>
<td>26</td>
<td>13</td>
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<tr>
<td>Darkness</td>
<td>57</td>
<td>39</td>
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<tr>
<td>HBD</td>
<td>38</td>
<td>12</td>
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<tr>
<td>Possible Countermeasures</td>
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<td></td>
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<tr>
<td>-----------------------------------------</td>
<td>-------</td>
<td></td>
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<tr>
<td>Shoulder Improvements</td>
<td>36%</td>
<td></td>
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<tr>
<td>Improved Lighting</td>
<td>29</td>
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<tr>
<td>Improved Signing</td>
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<td>Visibility Improvements</td>
<td>12</td>
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<tr>
<td>Other</td>
<td>19</td>
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</table>
Rail-Highway Grade Crossings

- In 1982, NM had 845 public rail-highway grade crossings
- Field studies at 57 crossings with one or more accidents in 30-month period (23/yr)
- 35% had active control installed after the accident
- [By 2011, train crashes down to 6]
Typical Rail-highway Grade Crossings
What's Wrong Here?
Low-Cost Treatment for ROR Crashes
Engineering Factors in Alcohol-Involved Traffic Accidents

- 1984 study of 2528 fatal NM accidents
- Of 4105 drivers and pedestrians
  - 21.2% had been drinking (HBD), drunk
  - 11.3% HBD impaired
  - 9.6% HBD sobriety unknown
  - 57.9% not drinking/unknown
- Pedestrian: darkness and rural areas
- Horizontal curves more common
Wide Edgelines

- Use critical rate method to identify high ROR sections on NM’s FAP and FAS
- Paint 8 inch wide edgelines on 19, keep other for comparison sites
- Treatment sites dropped 10%, from 1.59 to 1.43/mvm
- Comparison sites dropped 16%, from 1.59 to 1.34/mvm
Construction Zone Crashes

- Projects beginning between 1/83 and 12/85
- Drop *minor* projects
- 168 major projects on rural state highways
- Problem in identifying crashes
- Overall 26% accident increase during construction (33% on Interstate)
- *Following to close, improper lane change, multiple-vehicle, rear end overrepresented*
65 MPH Speed Limit

- April 2, 1987
- Installed 65 mph sign on I-25
- Contacted by IIHS
- Series of studies on urban and rural Interstates
- Initially, 7% > 70 mph
- By April 1995, 32% > 70 mph
NM Rural Interstate Speeds
April 1987 - October 2007

Percent Exceeding 70 mph

Hourly Traffic Volumes and Accident Rates

- Hourly volumes from 44 rural permanent count stations
- 1985-87 accidents on a 10 mile segment surrounding these stations
- Peak hour for accidents is 6 pm with 6.3%, followed by 7 am and 5 pm with 5.6% each
- Minimum at 4 am with 2.7%
- Peak rate was 3.2/mvm at 2 am
1985–87 Accident Rates
Near Permanent Count Stations

Accident Rate, per MVM

0.0 0.8 1.6 2.4 3.2

0 2 4 6 8 10 12 14 16 18 20 22 24

Hour
Guidelines for Beacon Installation

- Western state survey – most relied on MUTCD
- Consider speed, sight distance, crash experience, and roadway parameters
- Intersection beacons *may* reduce crashes by 20-30%
- Most NM beacons were in the southeast quadrant, adjacent to Texas
"You are more likely to die on the highways of New Mexico than in any other state in the USA. And if you do die in an accident, chances are someone was drinking."

- Analyzed 1345 counties with Interstates
- NM had 8 of the top 100 counties
- Reanalysis found numerous problems
Controlling Speeds in Work Zones

- City Streets
Freeway Work Zones
History of the Interstate Highway System

- Original paper at the 2006 District Meeting
- Series of 15 WesternITE articles, available at www.unm.edu/~jerome
- Western Highlights of Interstate, 2011 District Meeting