HIGH RISK RURAL ROAD PROGRAM
(HRRRP)

SIGNING and DELINEATION IMPROVEMENT

New Hampshire - 2009

Welcome
&
Introductions

SAFETEA – LU

(**Safe, Accountable, Flexible, Efficient Transportation Equity Act)**

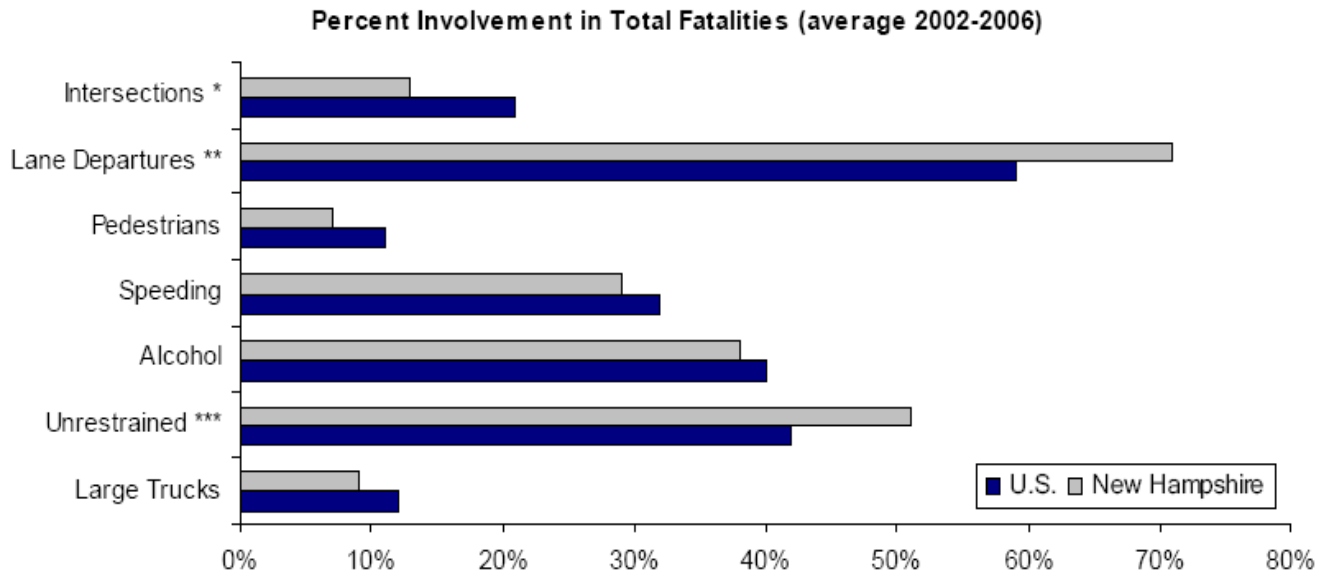
- New "Core" Highway Safety Improvement Program

High Risk Rural Roads

- **$90 Million/Year Set Aside (FY06 – FY09)**
  - **New Hampshire ($450,000/Year)**
- Eligible on any roadway functionally classified as:
  - Rural major collector
  - Rural minor collector
  - Rural local road
- Accident rate for fatalities and incapacitating injuries > statewide average
- Construction and operational improvements

NH Lane Departure Crashes

Safety Focus Areas

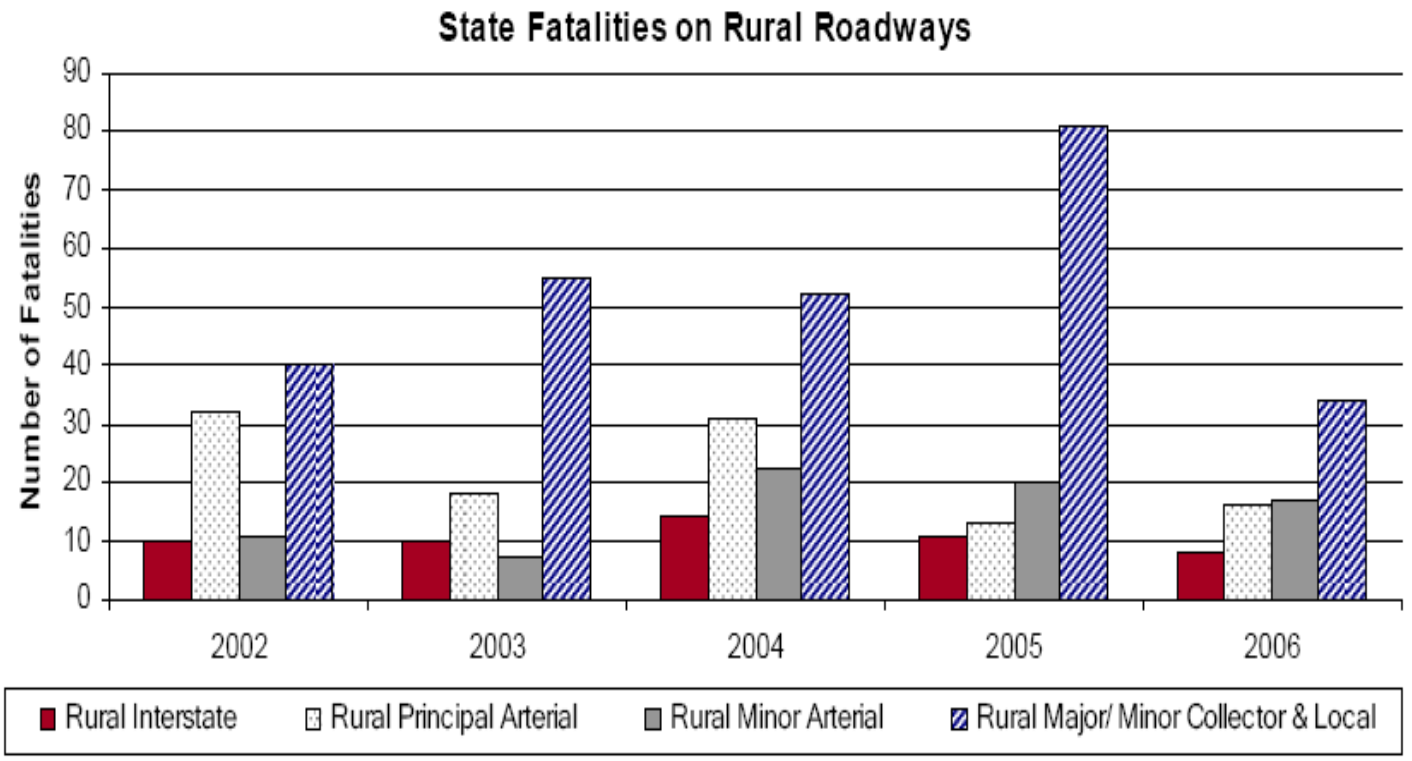


This chart represents safety focus areas and their corresponding percentages of total crash fatalities in New Hampshire and in the Nation. More than one of these focus areas may be involved as contributing factors in a single crash.

* Includes non-interchange intersection/intersection-related crashes.
** Includes single vehicle run-off-the-road, head-on, opposite direction sideswipe, and front-to-side crashes.
*** Unknown restraint use was proportionally distributed across known restraint use.

NH Crash Distribution Functional Class

Rural and Urban Roadways



Scope

Pilot Project

Improvement of Signing and
Delineation on HRRR Eligible Roads
to Decrease Lane Departure Crashes

Project Scope

- Seventeen Towns
  - Highest number of crashes on HRRR eligible roads
  - Selected Regionally: Two towns from each RPC

Why Do We Install Signs?

Required by MUTCD?

NO

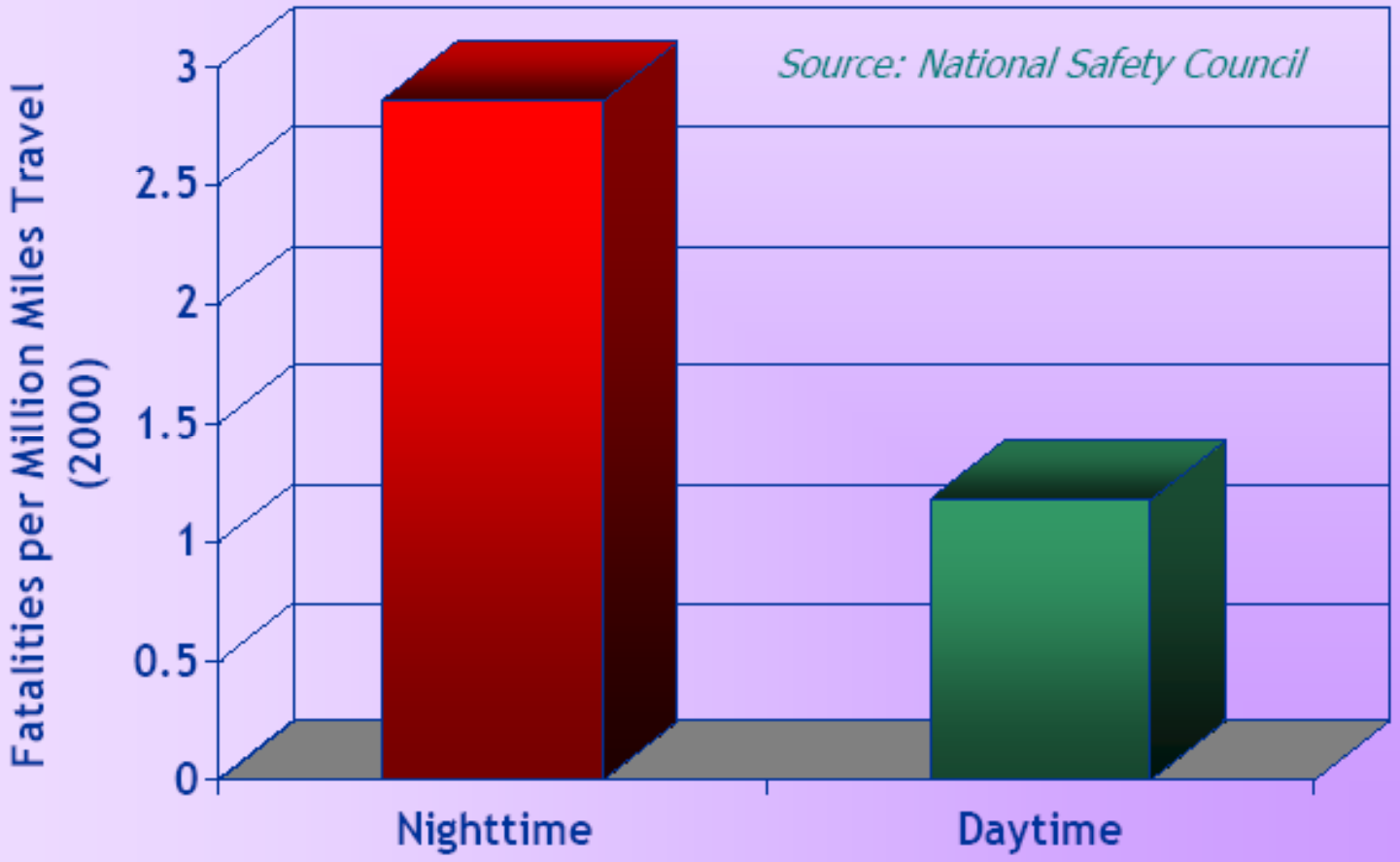
Engineering Decision?

YES!

Why?

To help drivers
(including older)

Night Travel and Crashes



Signs Provide Critical Information to Drivers

But, Retroreflectivity Degrades Over Time

Retroreflectivity

When Do We Replace Signs?

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
SIGNS											
Implement sign corrections to MUTCD standards	All	Injury	Urban	Local		5	15	10			Meta Analysis
	All	PDO	Urban	Local		5	7	6			Meta Analysis
Install chevron signs on horizontal curves	All	Fatal/ Injury	Rural	2-lane		38	20				
	All	All				15	35				
	All	All	Urban	Arterial (urban)		5	64	49			Simple Before-After
	All	All				15	20				
	All	All				15	35				
	All	All				15	50				
Install curve advance warning signs	All	Fatal/ Injury	Rural	2-lane		38	10				
	All	Injury				5	30	71			Meta Analysis
	All	PDO				5	8	76			Meta Analysis
	All	All				15	30				
	All	Fatal				15	55				
	All	All				15	30				
	All	All				15	23				
	All	Injury				15	20				
	Head-on	All				15	29				
	ROR	All				15	30				
	ROR	All	All	All		1	30				
Install curve advance warning signs (advisory speed)	All	Injury				5	13	9			Meta Analysis
	All	PDO				5	29	23			Meta Analysis
	All	All				15	29				
	All	All				15	20				
Install delineators (general)	All	All				15	11				
	Head-on	All				15	67				
	Night	All				15	25				
	ROR	All				15	34				
	Sideswipe	All				15	67				

Project Scope

BASIC SIGNING TREATMENTS FOR HORIZONTAL CURVES

1. Horizontal Alignment signs: Turn (W1-1), Curve (W1-2), Reverse Turn (W1-3), Reverse Curve (W1-4), Winding Road (W1-5), Hairpin Curve (W1-11), or Loop (W1-15) as an advance warning sign depending on the geometry of the curve(s)
2. Advisory Speed Plaque (W13-1) (with any of the Horizontal Alignment signs)
3. One-Direction Large Arrow (W1-6) sign
4. Combination Horizontal Alignment/Advisory Speed (W1-1a or W1-2a) sign
5. Curve Speed (W13-5) sign
6. Chevron Alignment (W1-8) sign
7. Delineators

Engineering Prep

- Identify two towns in each RPC with highest number of crashes on HRRRP eligible roads.
- Consult with state and town representatives to identify roads to include in evaluation.
- For each review all accident reports from the subject area for the preceding three years.

Engineering Fieldwork

- Focus determined by types and patterns of accidents revealed by the accident reports

- Concentrate on:
    - Curve and turn signing
    - Signing standardization

Project Tasks

1. Identify roads for evaluation
   - Crashes
   - State and town recommendations
2. Field evaluation to determine improvements
   - Geographic Location
   - Type of Traffic Control Device
3. Field engineering to determine specific improvement and location
   - Ball Bank, DMI, Level…
4. Installation
   - Contracted
   - State Specifications
5. Field review of installations
   - Acceptance
   - Inventory

Maintenance

- Town
  - Work With Property Owners to Control Vegetation
  - Maintains Signs
  - Reports Crashes

Low-Cost Safety Improvements

Stuart Thompson

Author

Eugene Calvert

Mendocino County

Department of Transportation

Curve and Turn Signing

Typical Problem:

What's wrong here?

- The Advisory Speed plate?
- The curve sign?
- Both?

Curve and Turn Signing

Solution:

- Measure speed with a ball bank indicator
- Select proper signs and spacing using standard warrants and criteria

Standardization

- Reduces accidents by reducing confusion - Provide consistency for the driver
- Used standard signing (MUTCD in U.S.A.)
- Measured – didn't guess
  - Ball bank indicator for advisory speeds
  - Hand level for down grades

Standardization

Similar situations should have similar signing and marking

25 MPH

35 MPH

Note object markers and delineators

Warning drivers of conditions ahead is also important

Later efforts concentrated on object markers -

- and delineators

Road System Traffic Safety Review

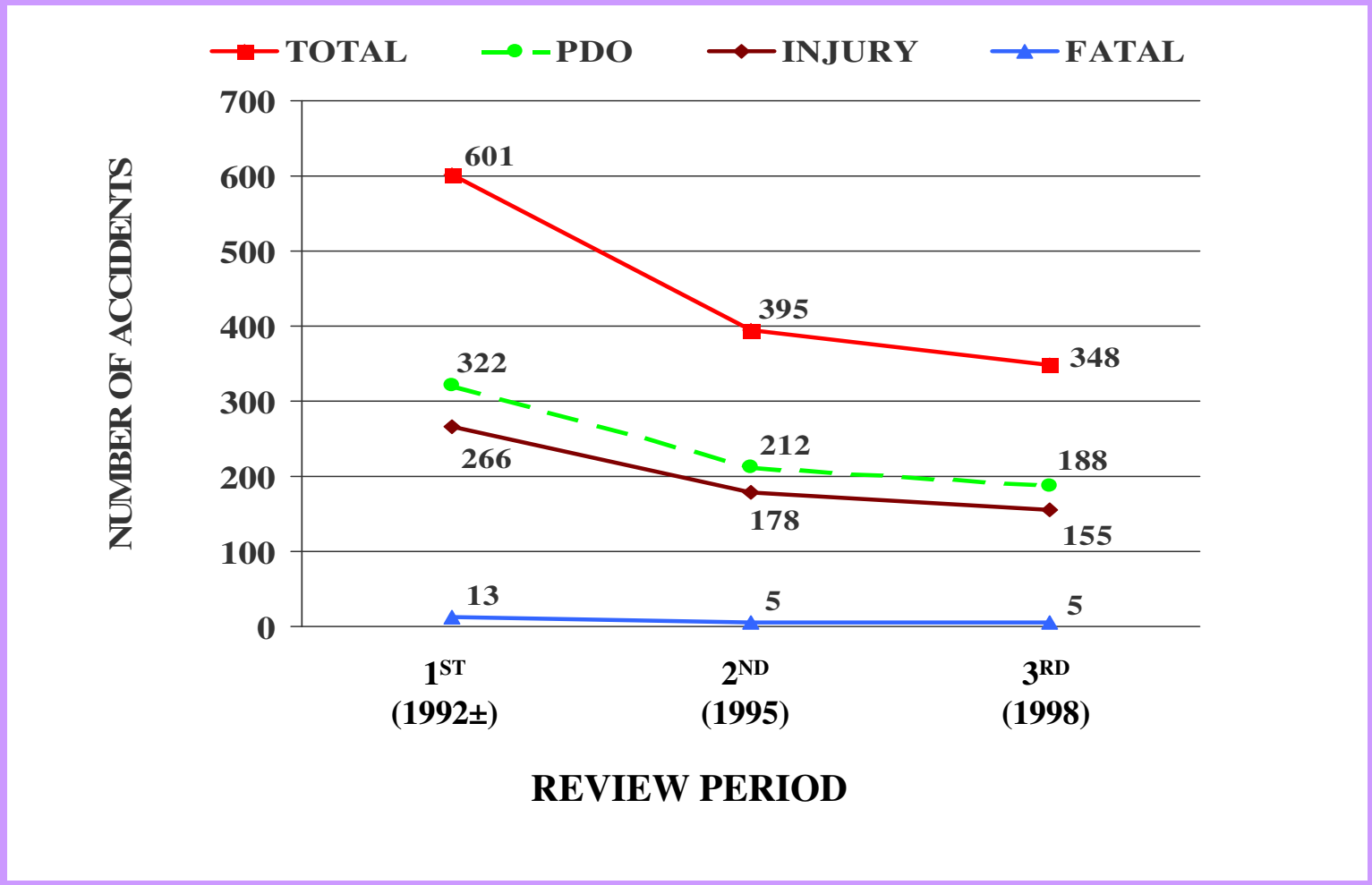
Mendocino County
Department of Transportation

Program History

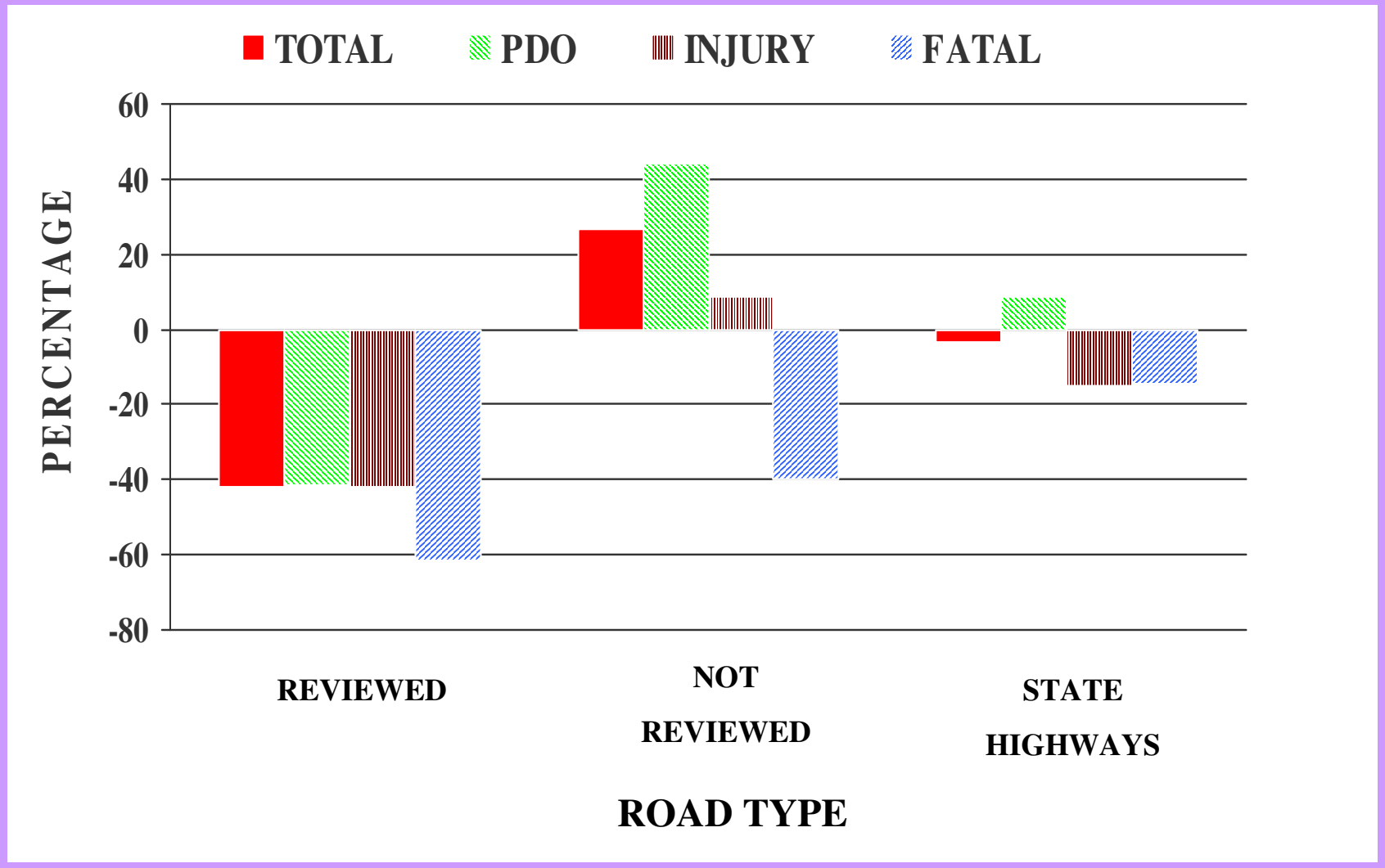
- Initiated in late 1980's to identify signing and marking deficiencies on County arterials and collectors

- Expanded during the 1990's to include all County Roads
  - 25 roads in 1992 review
  - 226 roads in 1998 review

Results – 42.1% Decline in Accidents



Six Year Percentage Change by Road Type and Accident Category



Costs

- Engineering (funded by RTPA):
  - $7,200(in 1992) + $7,560(in 1995) = $14,760
- Sign Installation:
  - 1992 changes in an HES Sign replacement Program at a cost of $46,300
  - 1995 changes were paid for by the County at an estimated cost of $100 per installation -
    - 182 x $100 = $18,200
- Total costs:
  - $14,760 + $46,300 + $18,200 = $79,260

Benefits

- Cost for a traffic accident (1998) = $34,100
  - 2 lane rural mountainous roads
  - Average speed 55 MPH or less

- Avoided costs for the six year period-
  - Case I – 369 avoided accidents:
    - 369 x $34,100 = $12,582,900
  - Case II – 696 avoided accidents:
    - 696 x $34,100 = $23,733,600

Costs Benefits Ratio

- Best case:
  - $79,260 / $12,582,900 = 0.006 (1/159)
- Most likely case:
  - $79,260 / $23,733,600 = 0.003 (1/299)

Reduced Accidents

- A significant reduction in accidents on the reviewed roads:
  - Accidents went down in all categories
  - 42.1% decline in total accidents

Substantial Benefits

- Between $12.6 and $23.7 million in avoided accident costs on just 19 roads in six years
- $79,260 total costs
- Cost/benefits between 1/159 and 1/299

Summary

- Road System Traffic Safety Reviews have resulted in:
  - A significant reduction in accidents on reviewed roads
  - Results better than the control roads
  - Substantial benefits in a relatively short time at an extremely low cost

Minimum Sign Retroreflectivity Requirements

New MUTCD Standard

Final Rule

- Published on Dec 21, 2007
  - Vol 72, No. 245
- Revision #2 of the 2003 Edition of the MUTCD
- Effective Jan 22, 2008

New MUTCD Language

Section 2A.09 Maintaining Minimum Retroreflectivity

- "Standard:

  Public agencies or officials having jurisdiction shall use an assessment or management method that is designed to maintain sign retroreflectivity at or above the minimum levels in Table 2A-3"

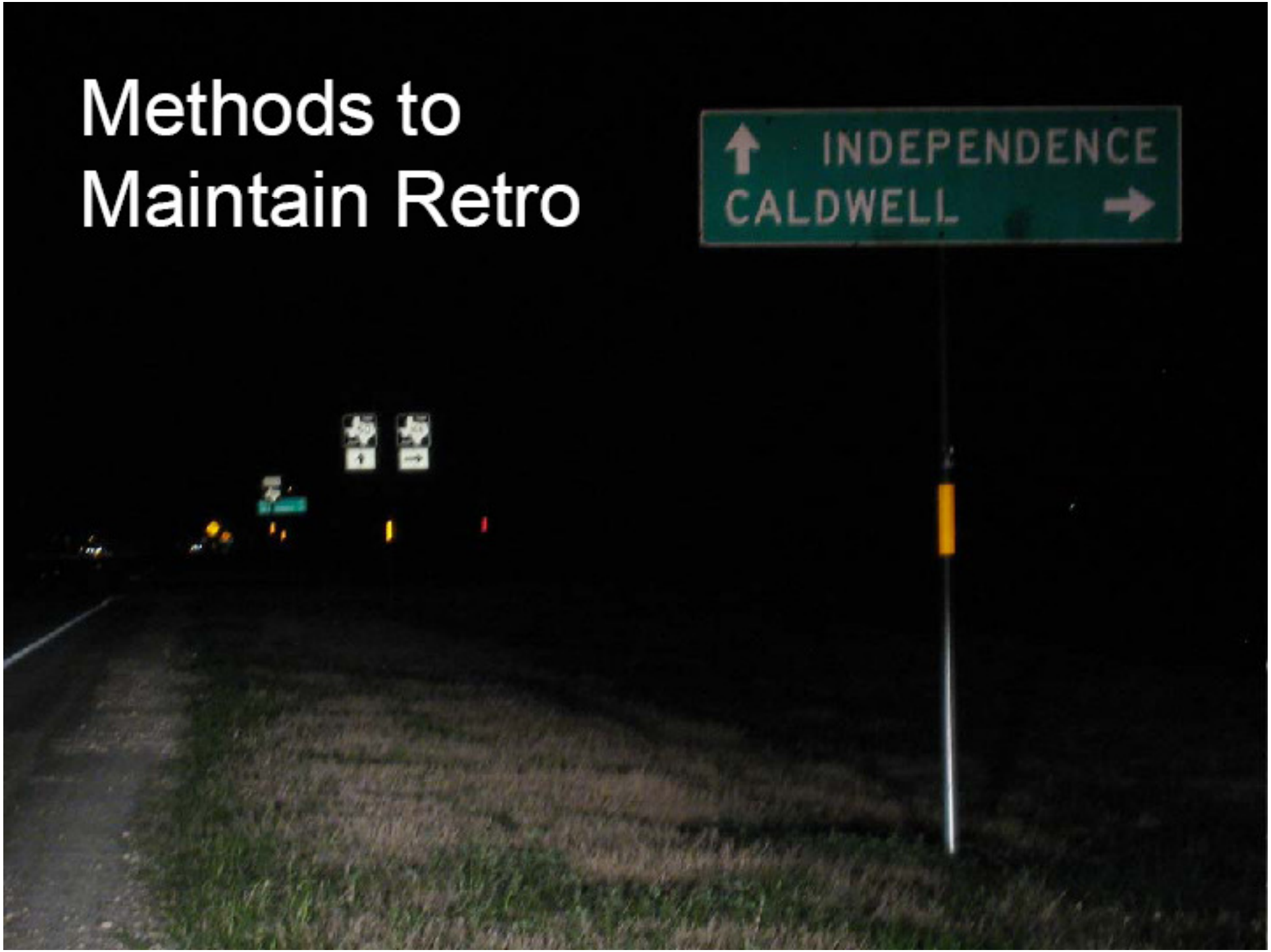
New MUTCD Language

Section 2A.09 Maintaining Minimum Retroreflectivity

- "Support:

  Compliance… is achieved by having a method in place and using the method to maintain the minimum levels established in Table 2A-3. Provided that… a method is being used, an agency would be in compliance… even if there are some individual signs that do not meet the… levels at a particular point in time.

Methods to Maintain Retro



New MUTCD Language

"…One or more of the following assessment or management methods should be used…"

- Visual Nighttime Inspection
  - Calibration Signs
  - Comparison Panels
  - Consistent Parameters
- Measured Sign Retro
- Expected Sign Life
- Blanket Replacement
- Control Signs
- Future Method Based On Engr. Study
- Combination Of Any

New MUTCD Table 2A.3
Minimum Maintained Retroreflectivity Levels

Sign Color	Sheeting Type (ASTM D4956-04) ①				Additional Criteria
	Beaded Sheeting			Prismatic Sheeting	
	I	II	III	III, IV, VI, VII, VIII, IX, X	
White on Green	W* G ≥ 7	W* G ≥ 15	W* G ≥ 25	W ≥ 250; G ≥ 25	Overhead
	W* G ≥ 7	W ≥ 120; G ≥ 15			Ground-mounted
Black on Yellow or Black on Orange	Y*; O*	Y ≥ 50; O ≥ 50			②
	Y*; O*	Y ≥ 75; O ≥ 75			③
White on Red	W ≥ 35; R ≥ 7				④
Black on White	W ≥ 50				—

① The minimum maintained retroreflectivity levels shown in this table are in units of cd/lx/m^2 measured at an observation angle of 0.2° and an entrance angle of -4.0°.
②For text and fine symbol signs measuring at least 1200 mm (48 in) and for all sizes of bold symbol signs
③For text and fine symbol signs measuring less than 1200 mm (48 in)
④Minimum Sign Contrast Ratio ≥ 3:1 (white retroreflectivity ÷ red retroreflectivity)
* This sheeting type should not be used for this color for this application.

Compliance Period: From "Effective" Date of Final Rule (January 22, 2008):

- 4 yrs (January, 2012)
  Establish and implement method(s)
- 7 yrs (January, 2015)
  Replace identified regulatory, warning, ground-mounted guide signs (except street-name)
- 10 yrs (January, 2018)
  Replace identified street name & overhead guide signs

More Information

- ATSSA www.retroreflectivity.net
  - Q&A
- FHWA fhwa.dot.gov/retro
  - Summary Brochure
  - Final Rule
  - Power Point Presentations
  - Newsletter Articles
- TTI tcd.tamu.edu
  - Research Reports