



# 2015 NH Traffic Safety Conference

Meredith, New Hampshire  
April 28, 2015

Ronald Grandmaison, PE  
Project Manager, NHDOT

Rumble Strip Technology

Everyone has a destination...



**Our job is to get them there safely  
and efficiently...**



**There are many ways to attempt to influence drivers...**



# And some are merely illusions...



# Highway Safety Improvement Program (HSIP)

- **Rumble Strips** are one of the nine FHWA Proven Safety Countermeasures to address crashes that occur in the focus areas of intersections, pedestrians, and roadway departure



# Highway Safety Improvement Program (HSIP)

- \$9.0 Million per year to NH
  - \$500,000 set aside for rumble strip installation statewide
    - Mostly to replace existing locations that have been impacted by paving projects
    - Have taken a systemic approach for the next 5 years
  - Common public misconception - funds can ONLY be used for Safety Improvements

# Why install rumble strips/stripes?

Run off the road (ROR) crashes and head-on collisions due to fatigued, inattentive, or otherwise impaired drivers are a major contributor to New Hampshire's fatal and injury crashes. Rumble strips are placed as a countermeasure for driver error, rather than roadway deficiencies. Milled shoulder rumble strips/stripes (SRS) and milled centerline rumble stripes (CRS) are a low-cost safety measure that alerts drivers when they drift from their travel lane, providing an opportunity for the driver to maneuver their vehicle out of harms way.

Another recognized benefit of shoulder rumble strips/stripes is that they alert pedestrians and bicyclists of possible danger from errant vehicles approaching from behind that leave the travel way and enter the shoulder area.



# Why install rumble strips/stripes?

Nationally,

Center line rumble strips on rural two-lane roads:

- 44% reduction of head on / fatal and injury crashes;

Center line rumble strips on urban two-lane roads:

- 64% reduction of head-on / fatal and injury crashes;

Shoulder rumble strips on rural two-lane roads:

- 36% reduction of run-off -road fatal and injury crashes.

# Why install rumble strips/stripes?



Every unsafe act, distracted driving, impaired driving, speeding...  
**carries the risk of a fatality.**



Crashes 2003-2010

# New Hampshire Driving Toward Zero Deaths Coalition Members:

- 3m Company
- AAA
- Brain Injury Association of New Hampshire
- Children's Hospital at Dartmouth
- City of Manchester
- Dartmouth-Hitchcock Trauma Program
- Federal Highway Administration
- Federal Motor Carrier Safety Administration
- Jacobs Engineering
- Manchester Community College
- Nashua Regional Planning Commission
- National Highway Traffic Safety Administration
- New Hampshire Department of Health and Human Services
- Department of Justice-Office of the Attorney General New Hampshire
- Department of Safety New Hampshire
- Department of Transportation
- **New Hampshire Highway Safety Agency**
- New Hampshire State Liquor Commission
- Traffic Records Coordinating Committee
- Upper Valley/Lake Sunapee Regional Planning Commission
- Vanasse Hangen Brustlin, Inc.
- Victims Inc.

# Fatal Crash Reporting - DOS

## New Hampshire Fatal Crashes 2013

January thru April

### Impact Location / Roadway Departure

Case	Date	Vehicles Involved	Fatalities Resulted	Town	Route	FHE (First Harmful Event)
13-001	1/5/2013	1	1	Jaffrey	Fitzwilliam Road (100 ft North of Scott Pond Road)	Right Side Road Departure
13-002	1/12/2013	1	1	Seabrook	Ledge Road (2000 ft. West of London Lane)	Left Side Road Departure
13-003	1/21/2013	2	1	Plainfield	Route 12A (Near intersection of Freeman Road)	Centerline Encroachment (Snow Covered Roadway)
13-004	1/23/2013	2	1	Bristol	Route 104 1000 ft West of Homestead Restaurant	Centerline Encroachment (Solar Glare)
13-005	1/27/2013	2	4	Hillsborough	Route 9 1360 ft East of Route 202	Centerline Encroachment (Cause Unknown)
13-006	1/26/2013	2	1	N. Haverhill	Route 10 125 ft North of Petticoat Lane	Failure to Yield( Left turn from driveway across path)
13-007	2/5/2013	2	2	Alton	Route 28 3000 ft North of Quarry Road	Centerline Encroachment(Alcohol / Drug Related)
13-008	2/8/2013	1	1	Auburn	Route 28 Bypass 1732 ft North of Rattlesnake Hill Rd	Left Side Road Departure
13-009	2/10/2013	1	1	New Ipswich	Route 124 600 ft East of Spindleback Lane	Left Side Road Departure
13-010	2/15/2013	1	1	Portsmouth	Interstate 95 Mile Marker 14.2	Right Side Road Departure
13-011	2/8/2013	1	1	East Kingston	East Road 1 Mile South of Main Street	Left Side Road Departure
13-012	2/23/2013	2	1	Durham	Route 4 4000 Feet East of Main Street	Centerline Encroachment (Unsafe Lane Use)
13-013	2/27/2013	2	1	Milton	Route 125 (1362 White Mtn Highway)	Centerline Encroachment (Cause Unknown)
13-014	2/27/2013	2	1	Gorham	Route 16 1100 Ft North of Southern Cascade Flats	Centerline Encroachment (Possible Medical Event)
13-015	3/11/2013	1	1	Candia	Route 101 300 Feet West of MM 109.2	Left Side Road Departure
13-016	3/16/2013	1	1	Newmarket	North Main Street near intersection of Bay Road	Right Side Road Departure
13-017	3/16/2013	1	1	Raymond	Chester Road Node 0020 250 ft to Node 0021	Left Side Road Departure
13-018	3/24/2013	1	1	Meredith	Route 25 (in front of #182)	Left Side Road Departure
13-019	3/30/2013	1	1	Manchester	Interstate 293 Exit 4 NB	Right Side Road Departure
13-020	4/3/2013	2	1	Milan	Route 110 2500 ft. West of York Pond Road	Centerline Encroachment (Cause Unknown)
13-021	4/5/2013	1	1	Belmont	Route 106 800 ft South of Stone Road	Left Side Road Departure
13-022	4/7/2013	2	1	Claremont	Main Street 800 ft North of North Street	Centerline Encroachment (Alcohol Related)
13-023	4/14/2013	1	1	Jaffrey	Route 202 750 ft North of Childrens Woods	Left Side Road Departure
13-024	4/14/2013	1	1	Farmington	Hometown Road in front of #289	Left Side Road Departure
13-025	4/19/2013	1	1	Laconia	Messer Street & Opeechee Street	Left Side Road Departure
13-026	4/20/2013	2	2	Amherst	Route 101 & Schoolhouse Road	Centerline Encroachment (turning left)
13-027	4/24/2013	1	1	Winchester	Fullum Pond Road 1000 ft South Old Chesterfield Rd	Left Side Road Departure

Centerline Encroachment = 10/27 = 37%

Left Side Road Departure = 12/27 = 44%

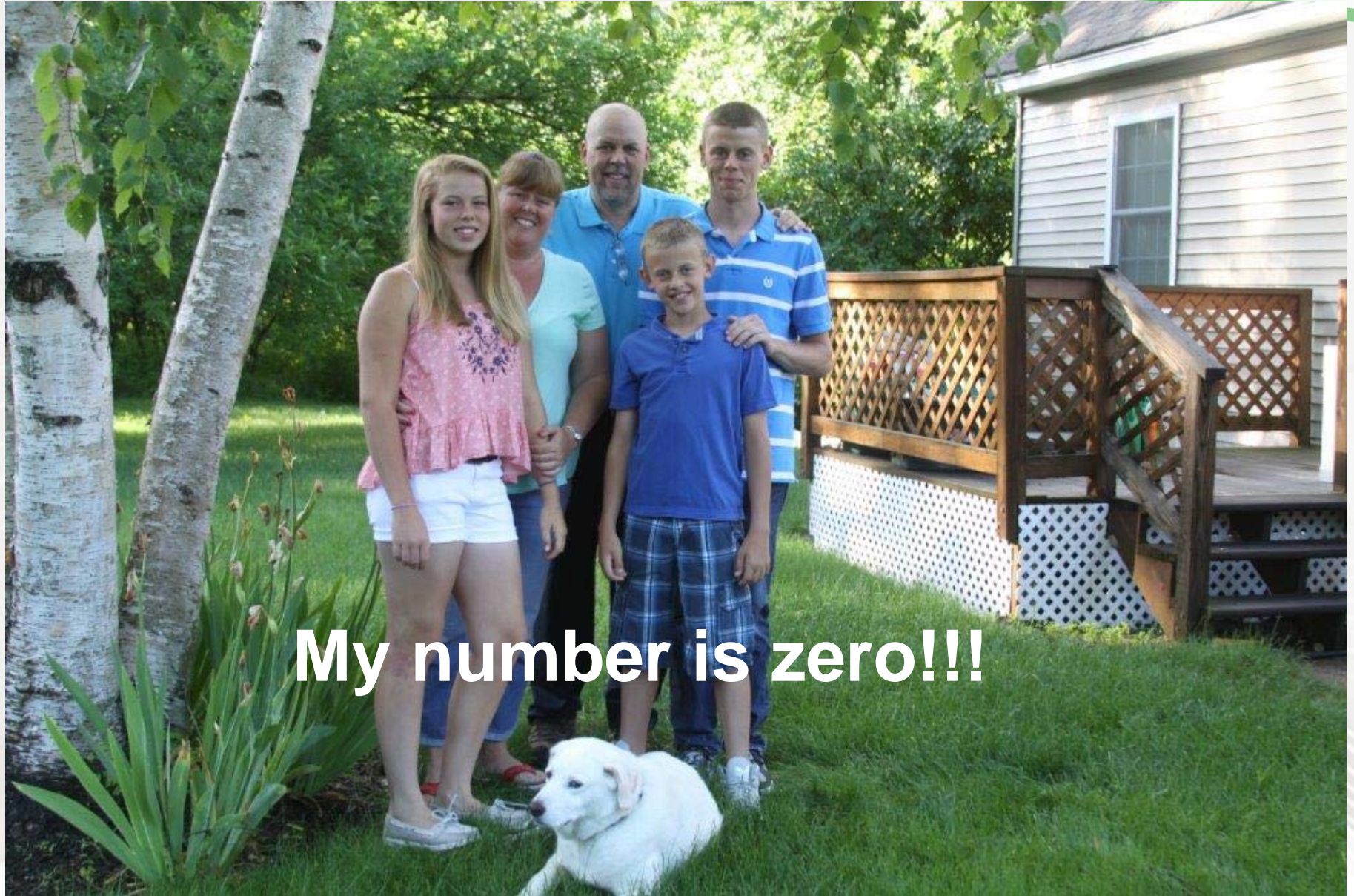
81% of Fatal Crashes Involved Drivers Crossing the Centerline

96% of Fatal Crashes are considered Run-Off-The-Road by FHWA criteria.

# Zero Is The Only Number We Can All Live With

How many people are killed  
on America's roads?

Courtesy: State of Nevada



**My number is zero!!!**



We cannot control people who  
But that doesn't mean we  
Do I think we will EVER reach  
Shouldn't do everything we can to  
ZERO?  
medical episodes to include  
prevent what is preventable  
attempted suicide...

# What does it sound like when rumble strips are driven on?





# What does it sound like when rumble strips are driven on?

Passenger car driving over rumble strips

(First from outside the vehicle then inside then outside again)

[Car.m4a](#)

Commercial truck driving over rumble strips

(First from outside the vehicle then inside then outside again)

[Commercial Truck.m4a](#)

Courtesy FHWA Safety website

# Established NHDOT Guidelines

- Developed in 2008
  - In response to public comments about installation practices
  - Combined effort:  
Highway Design,  
Construction, Traffic,  
Highway Maintenance,  
Rail & Transit, FHWA,  
and Environment
  - Guidelines reevaluated in 2013 to allow a systemic approach to roadway selection and installation



# These Conditions Must Apply...

- Highway segment has a speed limit of ~~40~~ 50 MPH or greater with limited or controlled access.
  - Highway segment should have a minimum 28 feet of pavement 4' wide shoulders
  - ~~• Highway segment has a crash history (crossing the centerline), greater than the State average.~~
  - ~~• ADT should be greater than 5000 vpd~~
  - Existing Pavement must be in good condition so that the installation of CRS will not cause future pavement delamination.
  - Minimum depth of the existing wearing course should be 1-1/4 inches
  - Any highways that do not meet all of the above conditions will require an engineering analysis and Chief Engineer Approval.
  - A public informational meeting will be held and concurrence from the local officials should be obtained.
- ❖ Guidelines were revised by the NHDOT and the Federal Highway Administration in 2013 to broaden the number of roads eligible for rumble strip installation.

# Currently in place in NH...

- Shoulders
  - Interstates and Turnpikes
  - US202/NH9 – Henniker & Hopkinton
  - NH 101 – Auburn to Exit 10 in Exeter
  - NH 125 – Plaistow to Rochester
- Centerline
  - US202/NH9 – Henniker & Hopkinton – 12 miles
  - NH 16 – Rochester to Ossipee – 30 miles
  - NH 101 – Milford & Amherst – 10 miles
  - NH 111 – Hudson to Hampstead - 20 miles
  - NH 125 – Plaistow to Rochester – 35 miles

# Currently in place in NH...





- Transverse
  - NH 101 – Peterborough
    - Long high speed (55MPH) downgrade to roundabout
  - NH 153 – Effingham
    - Problem approach to mainline NH 25
  - I-95 Exit 2 – North Hampton
    - Long high speed (65MPH) exit ramp to Toll Plaza
  - I-89 Exit 5 – Hopkinton
    - High speed (65MPH) left exit to rural 2 lane facility

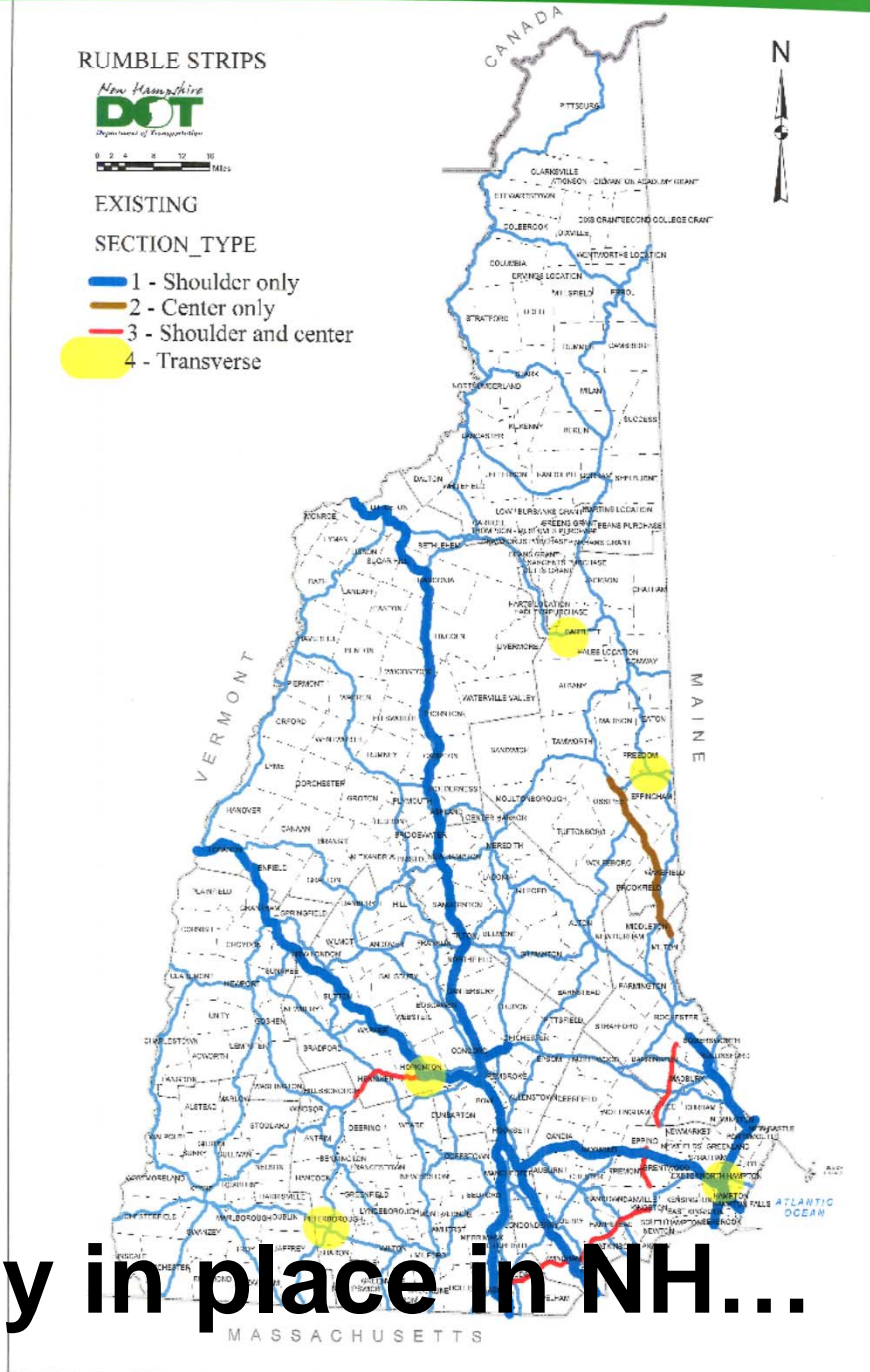
RUMBLE STRIPS



EXISTING

SECTION\_TYPE

-  1 - Shoulder only
-  2 - Center only
-  3 - Shoulder and center
-  4 - Transverse



**Currently in place in NH...**

# Proposed for this year...

- NH 3A - Plymouth
- NH 9 – Chesterfield, Keene, Sullivan, Nelson, Stoddard, Hillsborough, Antrim, and Concord
- NH 12 - Keene
- NH 28 – Pembroke, Epsom, Chichester, Pittsfield, Barnstead, Alton, and Ossipee
- NH 102 – Hudson, Londonderry, Chester, and Raymond
- NH 103 – Newbury, Bradford, and Warner
- US 4 – Salisbury, Boscawen, Canterbury, Chichester, Epsom, Northwood, Nottingham, Barrington, Lee, Durham, and Dover

# Why install rumble strips/stripes?



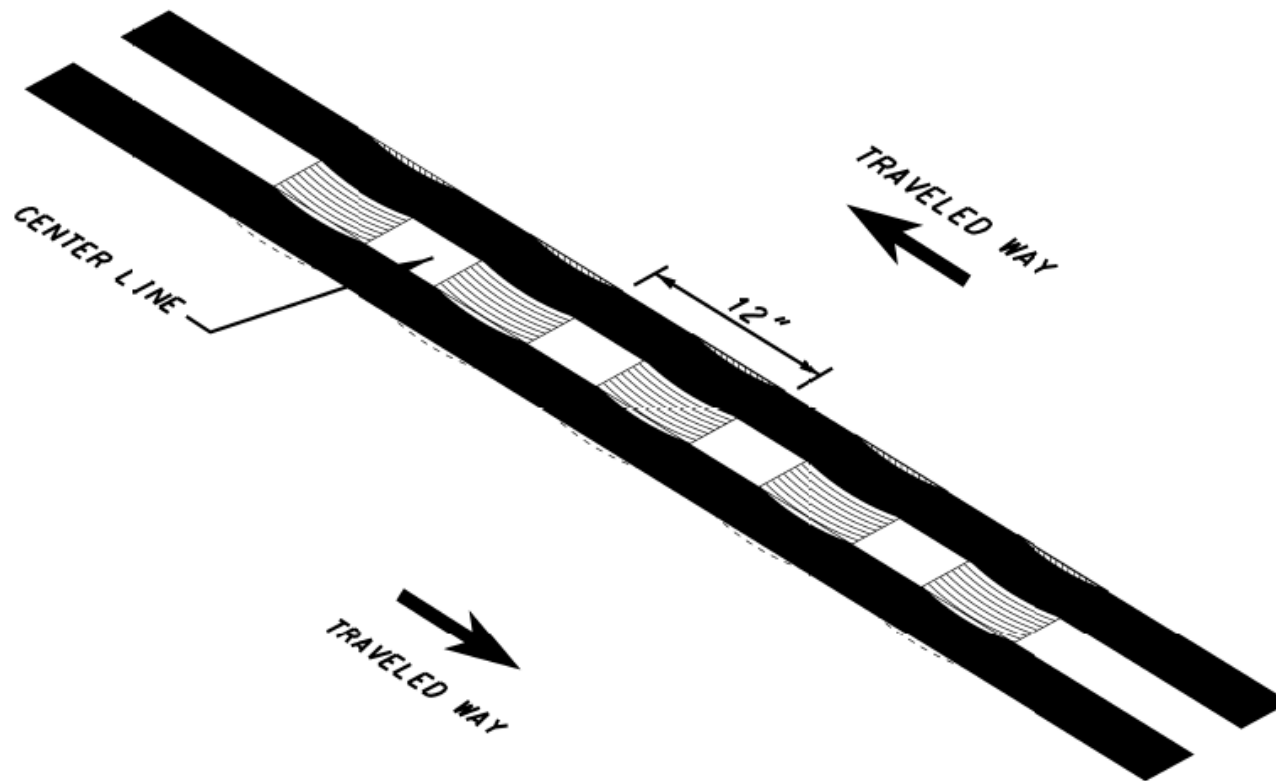


# Why install rumble strips/stripes?



# Design Details

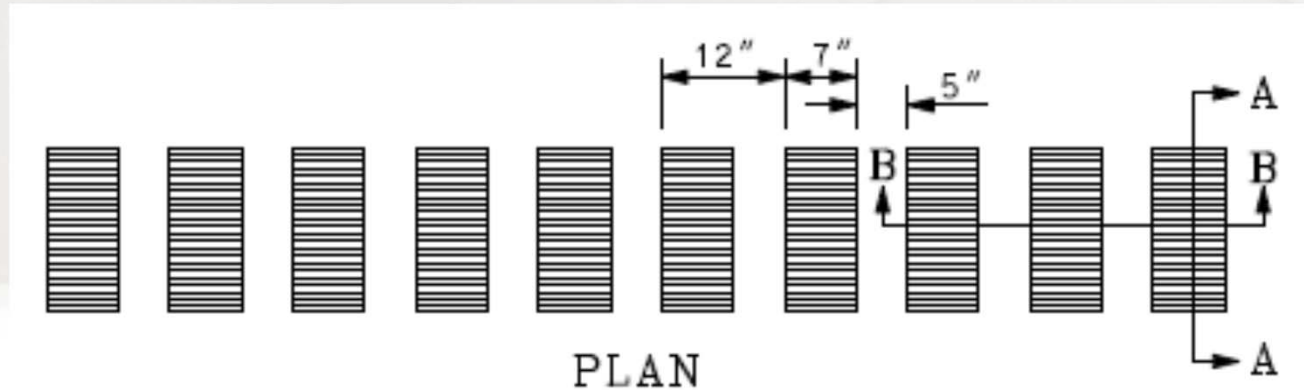
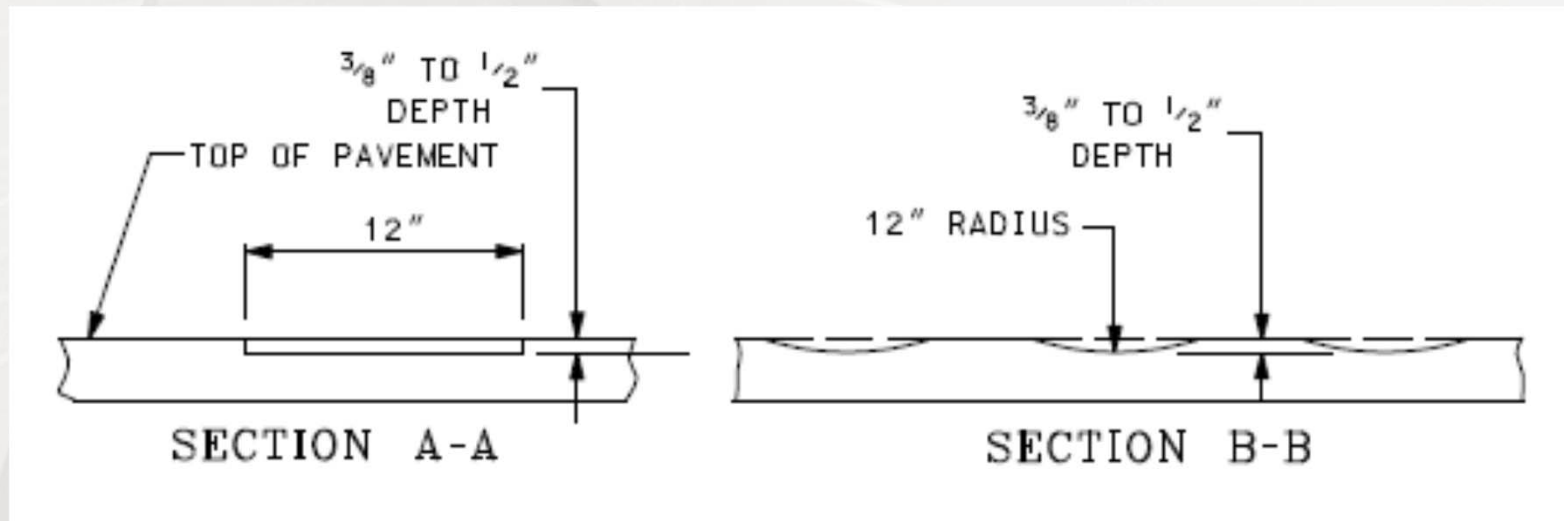
- Centerline 12 inches wide



*TYPICAL CENTERLINE  
INSTALLATION DETAIL*

# Design Details

- Centerline

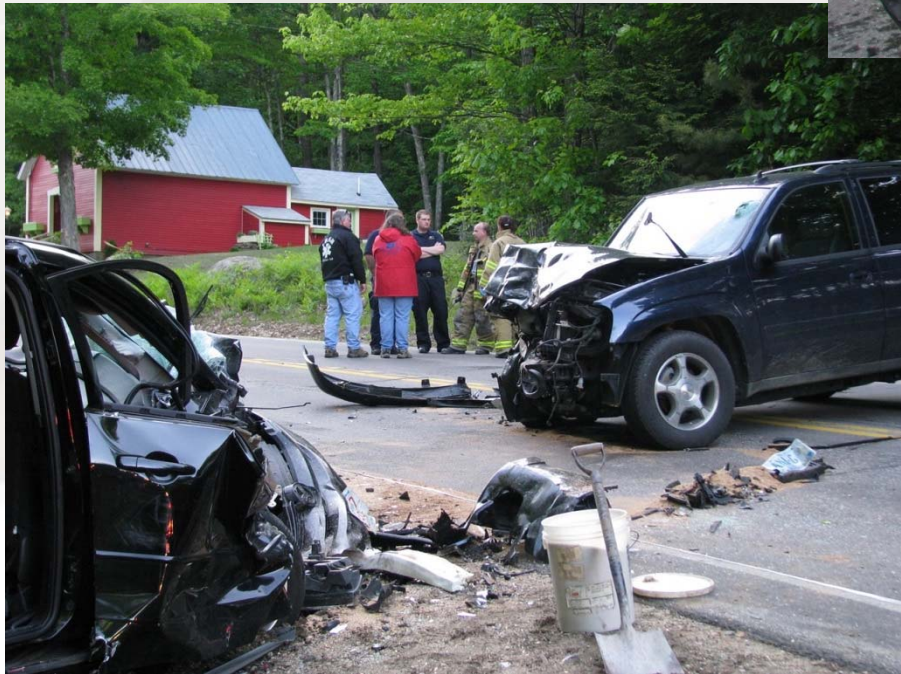


# Design Details

- Centerline

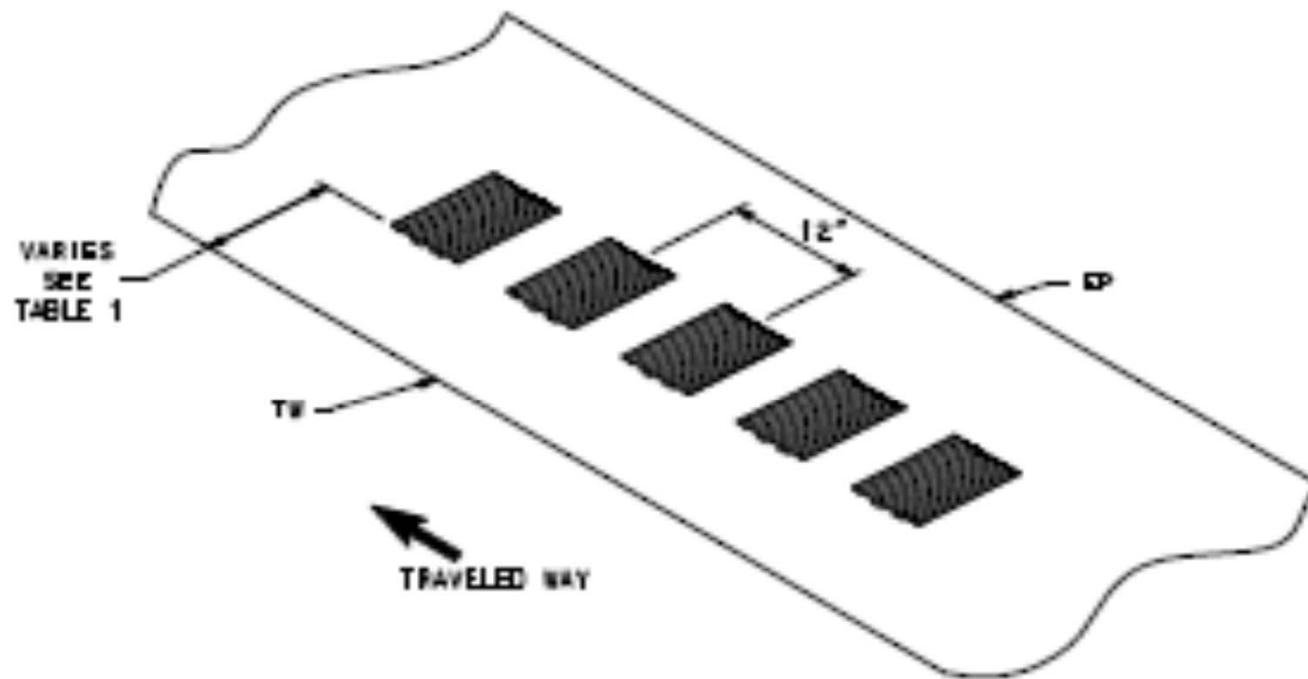


# Prevents...



# Design Details

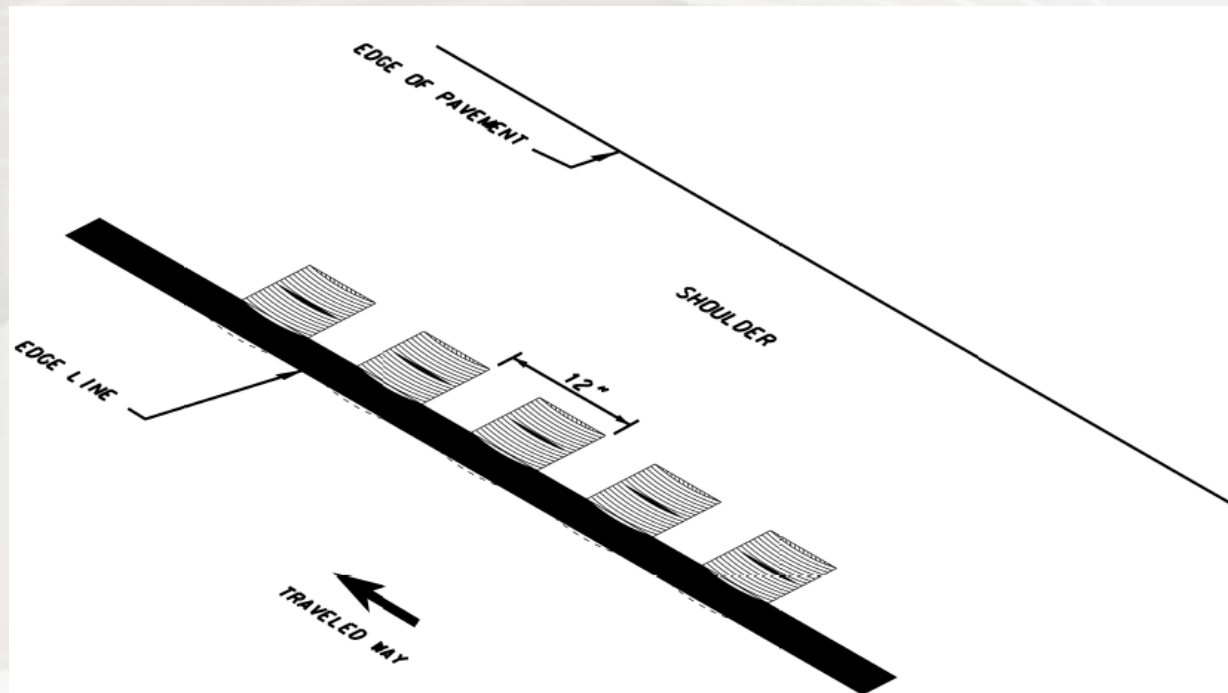
- Shoulder 12 inches wide
- \*16 inches wide on Interstates and Divided Highways



**TYPICAL SHOULDER INSTALLATION  
RIGHT SHOULDER DETAIL**

# Design Details

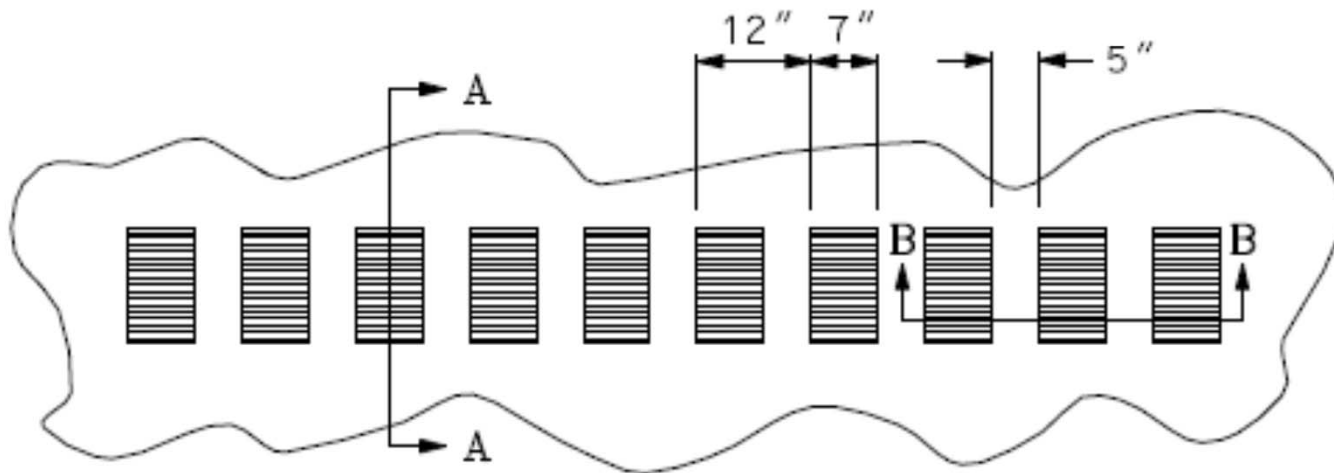
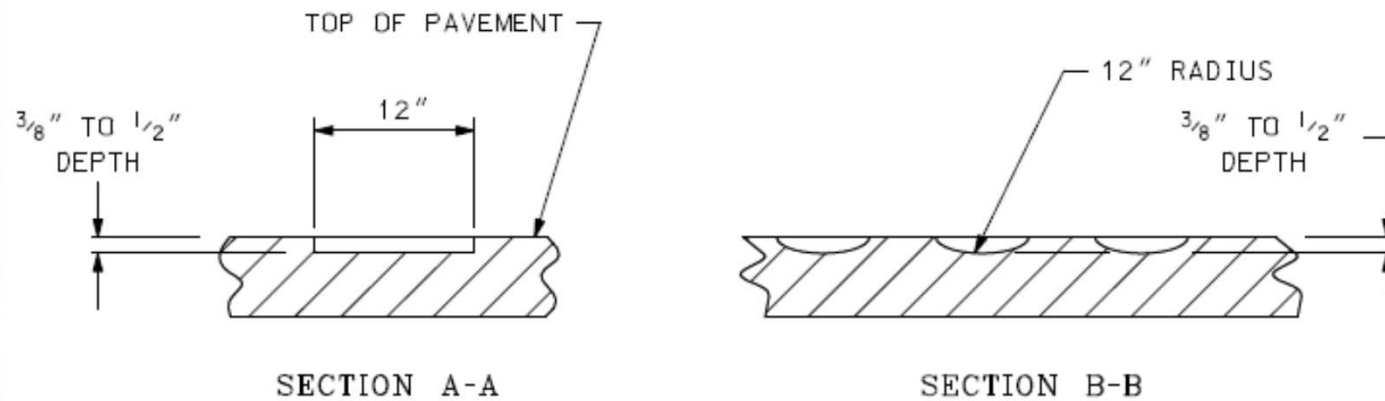
- Edge line Rumble Stripes will begin ON the white lane line and the remainder will be within the shoulder



TYPICAL SHOULDER  
RUMBLE STRIPE  
INSTALLATION DETAIL

# Design Details

- Shoulders



PLAN



# Design Details

- Shoulders



# Prevents...



**sorry wrong picture!**

# Prevents... ROR



60%  
OF ALL ROAD  
DEATHS AND SERIOUS  
INJURIES ARE SINGLE  
VEHICLE RUN OFF  
ROAD CRASHES

# Benefits to Rumble “Stripes”

- Improved nighttime visibility
- Increased retro-reflectivity under wet road conditions
- Increased longevity of the pavement markings
- Inclement weather navigational aid









# Follow Me?





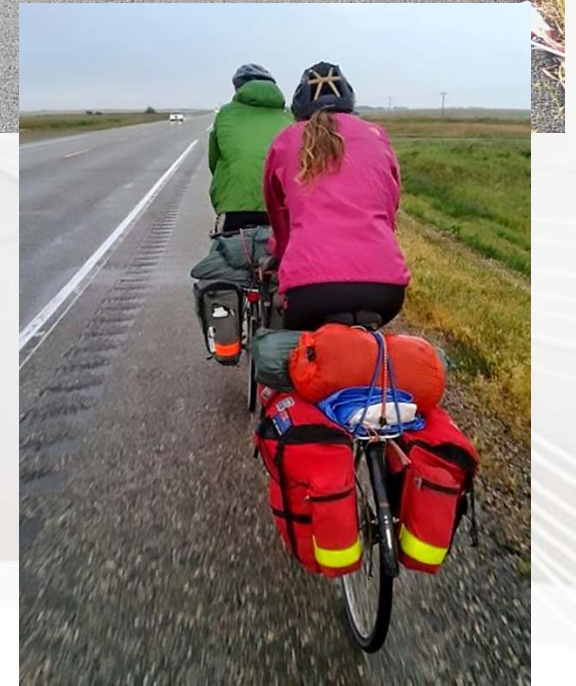
# How about Me?



I think not...



# Some advance warning for pedestrians and cyclists

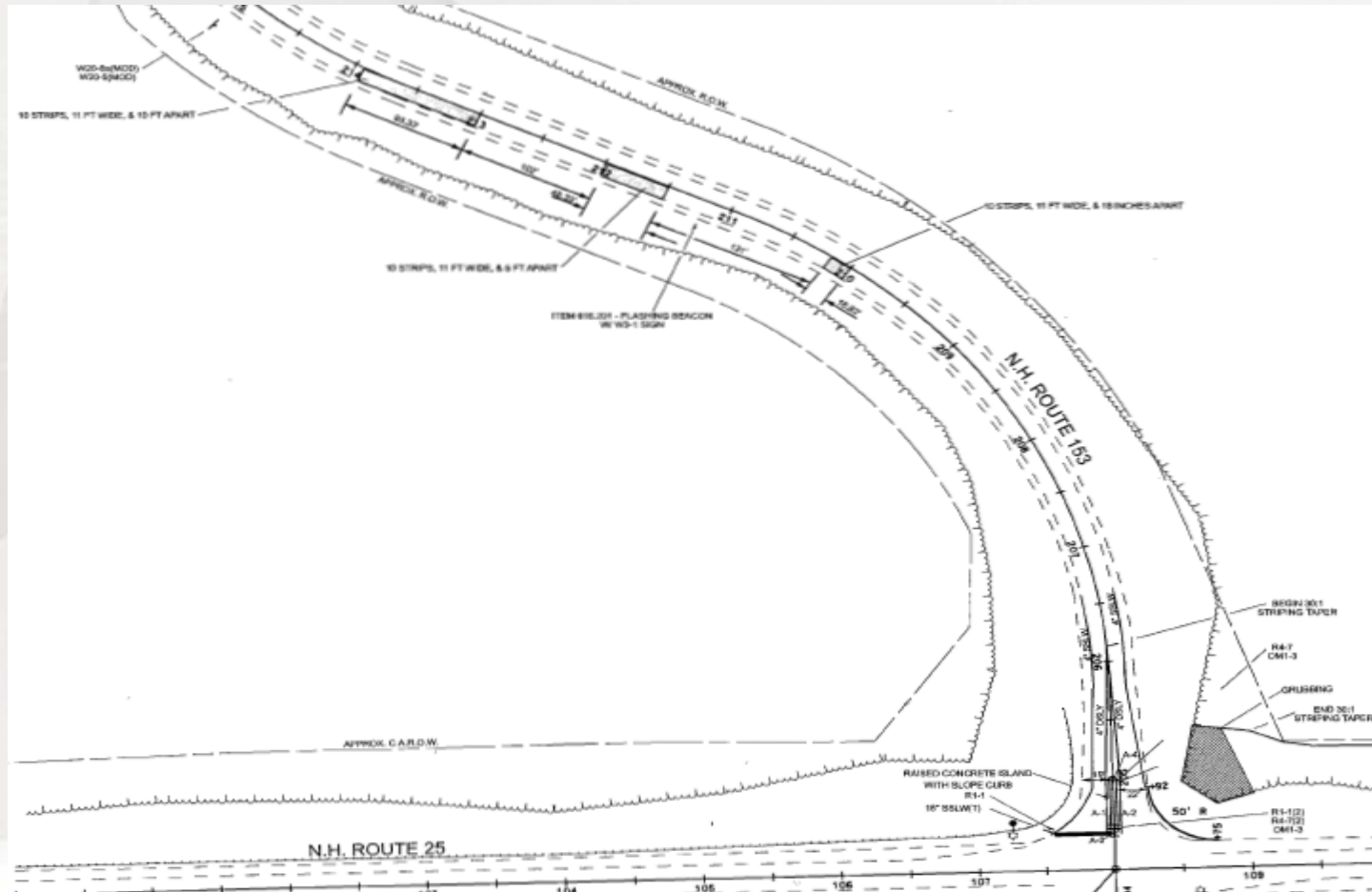


To prevent this...



# Design Details

- Transverse







**How do you think the public would react?**

# Design Details

- Transverse







Stopped conditions



Speed reductions



Likelihood of stopped traffic

**WHAT IT SAYS**

RIGHT LANE  
CLOSED  
AHEAD

**WHAT PEOPLE READ**

RIGHT LANE  
"MIGHT" BE CLOSED  
AHEAD. SO JUST STAY  
IN YOUR LANE AND MERGE AT  
THE LAST SECOND  
IF YOU HAVE  
TO.

Reinvented by TrueStory for iFunny :)

ifunny.mobi

# Approximate Costs

- Centerline @ \$1,200/mile
- Shoulder @ \$2,300/mile (both directions)



# Evaluation of Safety Effectiveness

Henniker-Hopkinton15278. US 202 from the bridge over Rush Road in Henniker to western most point of Exit 5 in Hopkinton. These numbers are approximate as they only include locatable crashes within Safety Analyst data set.

Total cost (rumble strips only): \$30,000 (2008)

Before period: 2004-2007

After period: 2009-2013

Percent change in crash frequency:

- Total Crashes: -33.16%
- Fatal and Injury: -46.05%
- Fatal and Severe: -100.00%
  
- Overall Benefit-Cost Ratio: 169.18 (We hope for 1.0 or higher!)

## Personal Note

My nephew was involved in a head-on collision with another vehicle in 2013. He and all other parties survived...



In my professional opinion, rumble strips could have prevented this.

*Welcome*

*Bienvenue*



New Hampshire

*"Live Free or Die"*

# NHDOT is not a Trailblazer



Not that kind of Trailblazer...

# However...

- Shoulder Rumble “Stripes” have been installed on NH Route 125 from Plaistow to Brentwood.
- A shallower depth rumble strip is proposed this year for a section of NH Route 16 in Madison.

**More to come so stay tuned!!!**



# Thank You

## Rumble Strip Installation Guidelines

*[www.nh.gov/dot/org/projectdevelopment/highwaydesign/documents/2013\\_11\\_01\\_milled\\_rumble\\_strips.pdf](http://www.nh.gov/dot/org/projectdevelopment/highwaydesign/documents/2013_11_01_milled_rumble_strips.pdf)*

## Rumble Strip Standards

*[www.nh.gov/dot/org/projectdevelopment/highwaydesign/standardplans/index.htm](http://www.nh.gov/dot/org/projectdevelopment/highwaydesign/standardplans/index.htm)*

# Questions



[Rgrandmaison@dot.state.nh.us](mailto:Rgrandmaison@dot.state.nh.us)