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.

- 91,938 People Injured
- 5,526 People Severely Injured
- 1,097 Lives Lost

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

<table>
<thead>
<tr>
<th>Case</th>
<th>Date</th>
<th>Vehicles Involved</th>
<th>Fatalities Resulted</th>
<th>Town</th>
<th>Route</th>
<th>FHE (First Harmful Event)</th>
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<tbody>
<tr>
<td>13-001</td>
<td>1/5/2013</td>
<td>1</td>
<td>1</td>
<td>Jaffrey</td>
<td>Fitzwilliam Road (100 ft North of Scott Pond Road)</td>
<td>Right Side Road Departure</td>
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<tr>
<td>13-002</td>
<td>1/12/2013</td>
<td>1</td>
<td>1</td>
<td>Seabrook</td>
<td>Ledge Road (2000 ft. West of London Lane)</td>
<td>Left Side Road Departure</td>
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<tr>
<td>13-003</td>
<td>1/21/2013</td>
<td>2</td>
<td>1</td>
<td>Plainfield</td>
<td>Route 12A (Near intersection of Freemien Road)</td>
<td>Left Side Road Departure</td>
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<tr>
<td>13-004</td>
<td>1/23/2013</td>
<td>2</td>
<td>1</td>
<td>Bristol</td>
<td>Route 104 1000 ft West of Homestead Restaurant</td>
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<tr>
<td>13-005</td>
<td>1/27/2013</td>
<td>2</td>
<td>4</td>
<td>Hillborough</td>
<td>Route 9 1300 ft East of Route 202</td>
<td>Left Side Road Departure</td>
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<td>13-006</td>
<td>1/26/2013</td>
<td>2</td>
<td>1</td>
<td>N. Haverhill</td>
<td>Route 10 125 ft North of Petticoat Lane</td>
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<tr>
<td>13-007</td>
<td>2/6/2013</td>
<td>2</td>
<td>2</td>
<td>Alton</td>
<td>Route 28 3000 ft North of Quarry Road</td>
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<td>13-009</td>
<td>2/8/2013</td>
<td>1</td>
<td>1</td>
<td>Auburn</td>
<td>Route 28 Bypass 1732 ft North of Rattlesnake Hill Rd</td>
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<tr>
<td>13-009</td>
<td>2/10/2013</td>
<td>1</td>
<td>1</td>
<td>New Ipswich</td>
<td>Route 124 800 ft East of Spindleback Lane</td>
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<td>13-010</td>
<td>2/15/2013</td>
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<td>1</td>
<td>Portsmouth</td>
<td>Interstate 95 Mile Marker 14.2</td>
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<tr>
<td>13-011</td>
<td>2/20/2013</td>
<td>1</td>
<td>1</td>
<td>East Kingston</td>
<td>East Road 1 Mile South of Main Street</td>
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<tr>
<td>13-012</td>
<td>2/23/2013</td>
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<td>1</td>
<td>Durham</td>
<td>Route 4 4000 Feet East of Main Street</td>
<td>Left Side Road Departure</td>
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<tr>
<td>13-013</td>
<td>2/27/2013</td>
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<td>1</td>
<td>Milton</td>
<td>Route 125 1302 White Mt Highway</td>
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<td>13-014</td>
<td>2/27/2013</td>
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<td>1</td>
<td>Gorham</td>
<td>Route 10 1100 ft North of Southern Cascade Flats</td>
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<td>13-015</td>
<td>3/11/2013</td>
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<td>1</td>
<td>Candia</td>
<td>Route 101 300 Feet West of MM 100.2</td>
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<td>3/16/2013</td>
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<td>1</td>
<td>Newmarket</td>
<td>North Main Street near intersection of Bay Road</td>
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<td>13-017</td>
<td>3/10/2013</td>
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<td>Raynold</td>
<td>Chester Road Node 0020 250 ft to Node 0021</td>
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<tr>
<td>13-018</td>
<td>3/24/2013</td>
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<td>1</td>
<td>Meredith</td>
<td>Route 25 (in front of #182)</td>
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<td>13-019</td>
<td>3/30/2013</td>
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<td>1</td>
<td>Manchester</td>
<td>Interstate 293 Exit 4 NB</td>
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<tr>
<td>13-020</td>
<td>4/3/2013</td>
<td>2</td>
<td>1</td>
<td>Milan</td>
<td>Route 110 2500 ft West of York Pond Road</td>
<td>Left Side Road Departure</td>
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<tr>
<td>13-021</td>
<td>4/5/2013</td>
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<td>1</td>
<td>Belmont</td>
<td>Route 106 600 ft South of Stone Road</td>
<td>Left Side Road Departure</td>
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<tr>
<td>13-022</td>
<td>4/7/2013</td>
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<td>1</td>
<td>Claremont</td>
<td>Main Street 800 ft North of North Street</td>
<td>Left Side Road Departure</td>
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<td>13-023</td>
<td>4/14/2013</td>
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<td>1</td>
<td>Jaffrey</td>
<td>Route 202 750 ft North of Childers Woods</td>
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<td>4/14/2013</td>
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<td>1</td>
<td>Farmington</td>
<td>Hometown Road in front of #259</td>
<td>Left Side Road Departure</td>
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<td>4/19/2013</td>
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<td>1</td>
<td>Laconia</td>
<td>Messer Street &amp; Opechees Street</td>
<td>Left Side Road Departure</td>
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<td>13-026</td>
<td>4/20/2013</td>
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<td>2</td>
<td>Amherst</td>
<td>Route 101 &amp; Schoolhouse Road</td>
<td>Left Side Road Departure</td>
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<tr>
<td>13-027</td>
<td>4/24/2013</td>
<td>1</td>
<td>1</td>
<td>Winchester</td>
<td>Fullum Pond Road 1000 ft South Old Chesterfield Rd</td>
<td>Left Side Road Departure</td>
</tr>
</tbody>
</table>

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!!!
Do I think we will EVER reach ZERO?

We cannot control people who make poor decisions or have medical episodes to include 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
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
Design Details

- Centerline
Design Details

• Centerline
Prevents...
Design Details

• Shoulder 12 inches wide

*16 inches wide on Interstates and Divided Highways
Design Details

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

• Shoulders
Design Details

• Shoulders
Prevents...
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
Warns of 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.
Approximate Costs

- Centerline @ $1,200/mile
- Shoulder @ $2,300/mile (both directions)
Evaluation of Safety Effectiveness

Henniker-Hopkinton 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.
NH is a state steeped in tradition, Yankee frugality, and family values.
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


Rumble Strip Standards

www.nh.gov/dot/org/projectdevelopment/highwaydesign/standardplans/index.htm
Questions

Rgrandmaison@dot.state.nh.us