

# Safety Improvements for Horizontal Curves

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# Horizontal Curve Safety

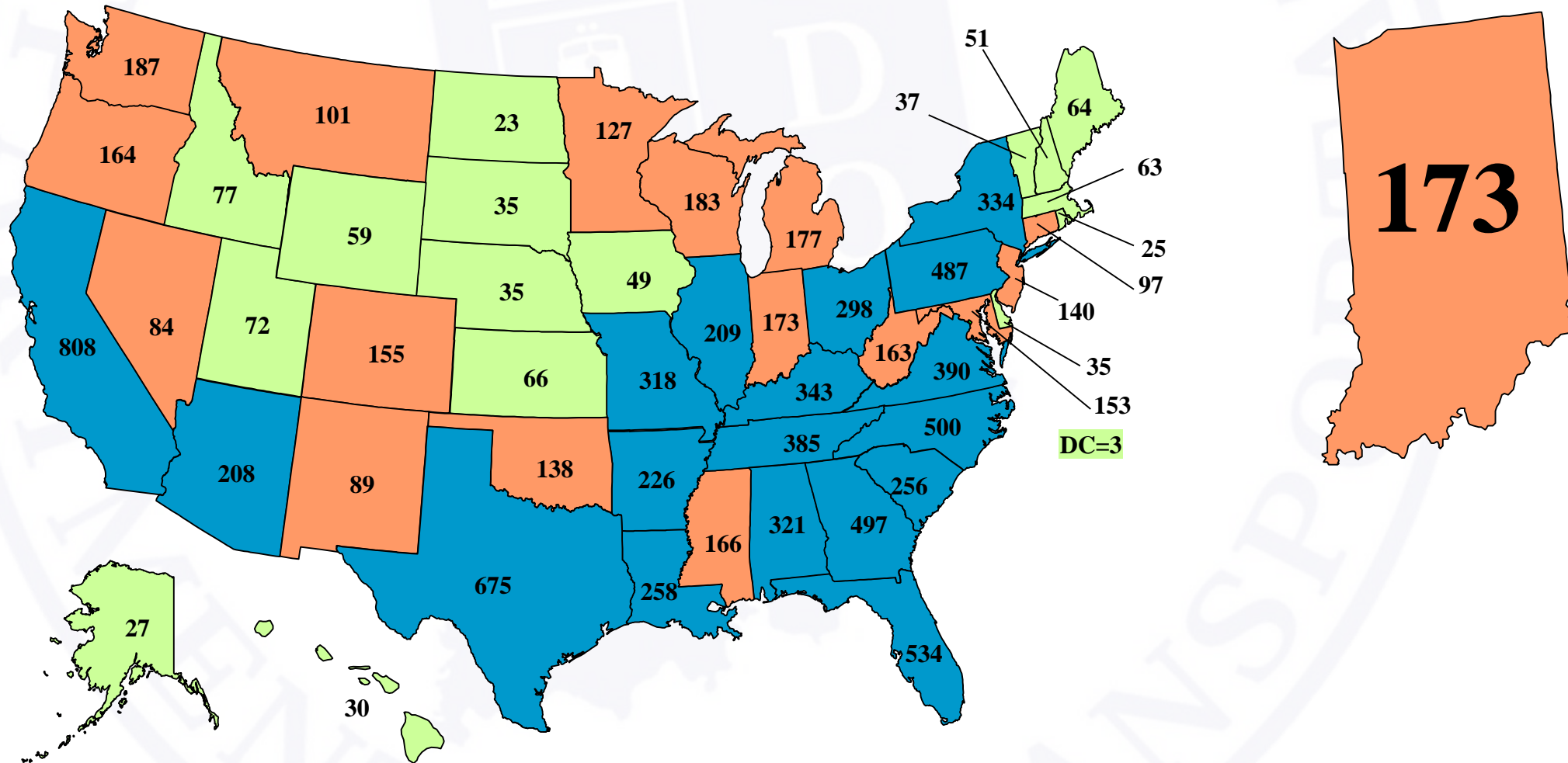
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- Curves are challenging for drivers
  - Crash rates are 3 to 4 times that in tangents
  - Crashes are more severe
    - About 25% of all fatalities happen in curves

# Horizontal Curve Safety

- Fatalities in Horizontal Curves (2006-2008)

~10,000 nationally each year



# Horizontal Curve Safety

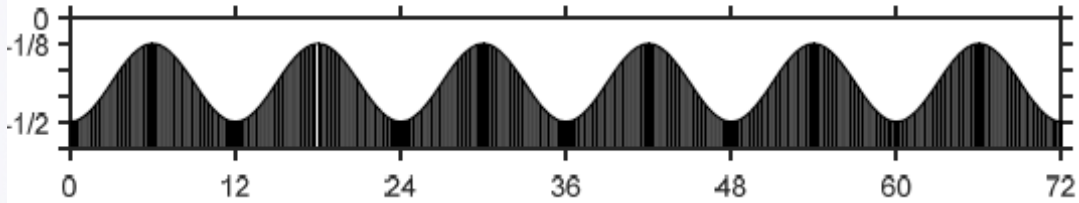
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- Longitudinal Rumble Stripes- 2 lane non-divided highways  
Combination of corrugations and edge line pavement markings



# Horizontal Curve Safety- Rumble Stripes (cont.)

- Issues Addressed: Exterior Noise- bothersome to property owners
  - Revised spec to sinusoidal pattern for asphalt pavements



12" wavelength

What were getting out of the change:

- interior noise level higher
- much lower exterior, 5 to 10 decibels



# Horizontal Curve Safety- Rumble Stripes (cont.)

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- Center line rumbles- lane widths should be at least 10 ft
- Edge line rumbles-
  - Need at least 2' of paved shoulder
  - Gaps should be provided for bicycles (edge lines)  
INDOT specs: 12' gap every 60'
  - May not be advisable if horse drawn vehicle are prevalent

# Horizontal Curve Safety- Rumble Stripes (cont.)

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- INDOT has installed ~ 2000 miles
- Average cost- \$2500 per mile
  - Cost has varied based on the amount being installed
- Safety benefit:
  - ~50% reduction in crashes
  - Run-off the road, head-on, side swipe

# Horizontal Curve Safety

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- Other Mitigation Measures such as
  - Pavement markings
  - Reflectors to delineate guardrail, trees, utility poles
  - Safety Edge
  - High Friction Surface Treatment
  - Signing, MUTCD compliance date is approaching
- See FHWA's website:  
[https://safety.fhwa.dot.gov/roadway\\_dept/countermeasures/horcurves/cmhorcurves/](https://safety.fhwa.dot.gov/roadway_dept/countermeasures/horcurves/cmhorcurves/)
- Crash Modification Factors: <http://www.cmfclearinghouse.org/>



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