

# Speed Management Action Plan

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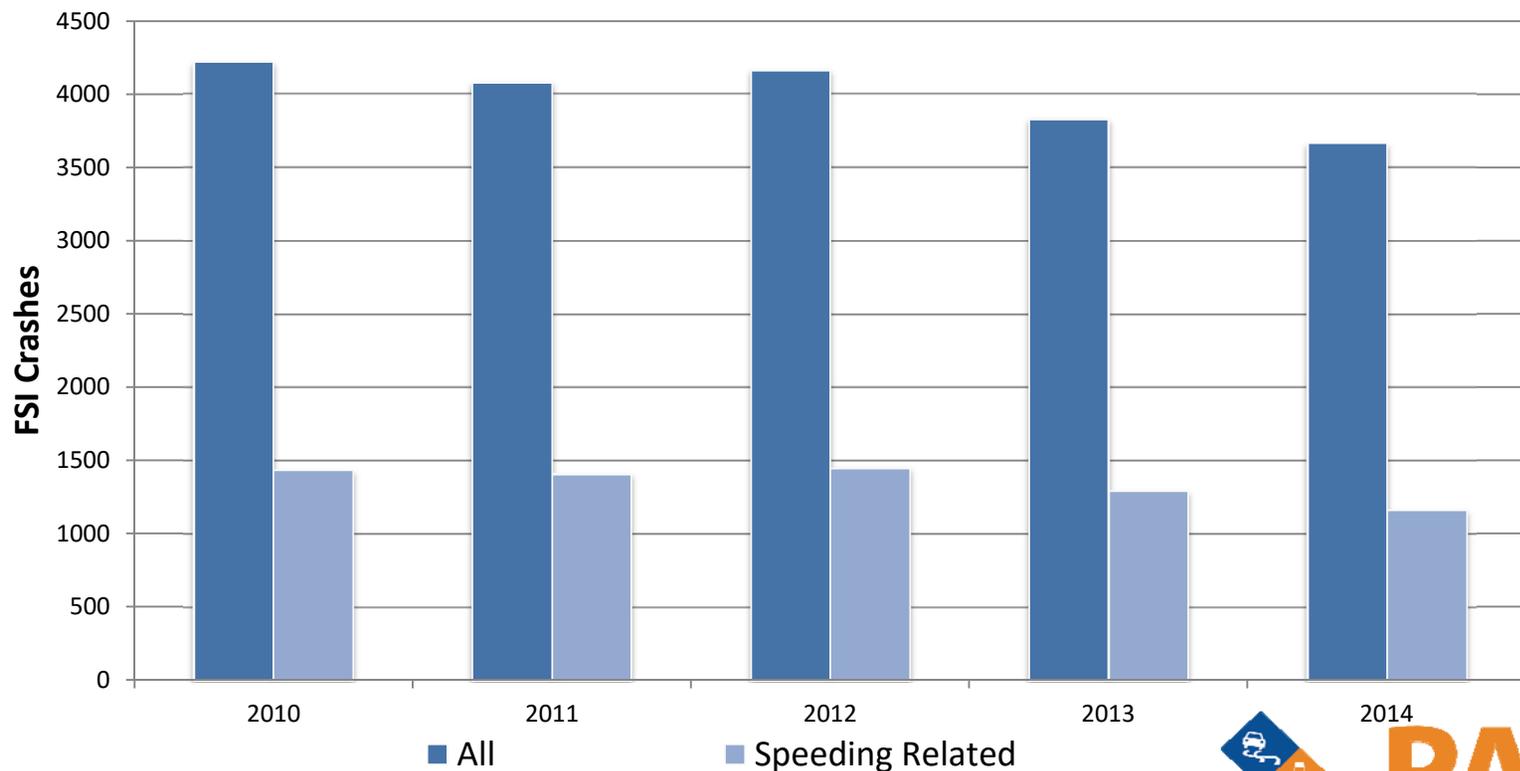
# Problem Identification

- Speeding is a cross-cutting issue
- Speeding is key factor in many safety areas
- Roadway departure, intersection, and pedestrian/bicycle focus areas great potential to reduce SM fatalities



# Problem Identification

Speeding-related FSI crashes account for **34%** of all FSI crashes in Pennsylvania



# Problem Identification

## **Pennsylvania Quick Facts:**

The States with the most speeding-related traffic fatalities in 2014 were:

- Texas (1,284),
- California (991), and
- Pennsylvania (509).

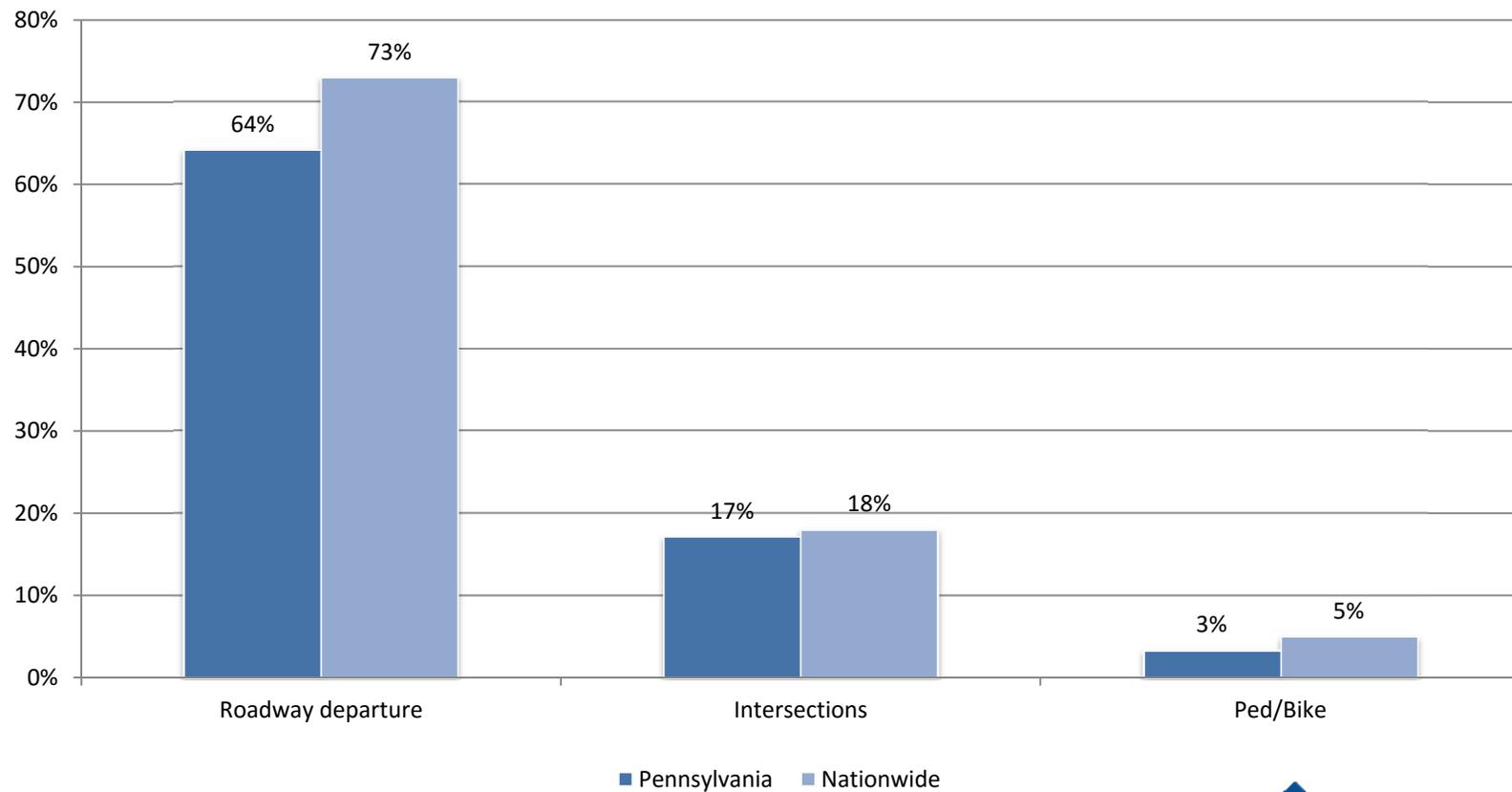
The States with the highest percentage of traffic fatalities that were speeding-related in 2014 were:

- District of Columbia (52%),
- New Hampshire (49%), and
- Pennsylvania (43%).



# Problem Identification

Percent Speeding-related FSI Crashes grouped by Focus Area



# Problem Identification

## Speeding and Roadway Departure

### By Speed Limit

- Of speed-related FSI roadway departure crashes where speed limit is known:
  - 56 percent occurred on roadways posted less than 50 mph.
  - 27 percent occurred on roadways posted at 50 - 55 mph.

### By Horizontal Alignment

- 56% of all speeding related FSI RwD crashes occurred at curves.



# Problem Identification

## Speeding and Intersections

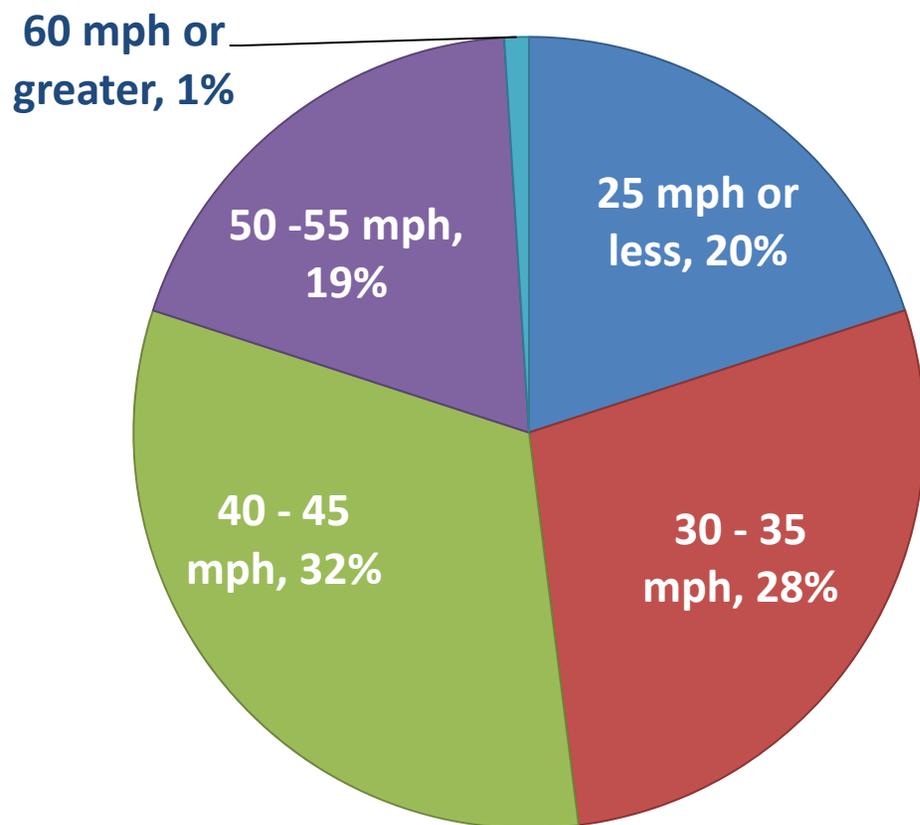
### Pennsylvania Quick Facts:

- 20 percent of speeding-related FSI crashes are considered intersection crashes.
- 50 percent of speeding-related FSI intersection crashes occur in rural areas.
- Speed-related FSI intersection crashes occurred at the following traffic control types:
  - Stop-control – 26 percent
  - Signalized – 27 percent
  - None – 44 percent
- Most common speed-related FSI intersection crash types:
  - 34 percent – angle
  - 33 percent – non-vehicle collision
  - 12 percent – front-to-rear (rear end)



# Problem Identification

## Speeding and Intersections

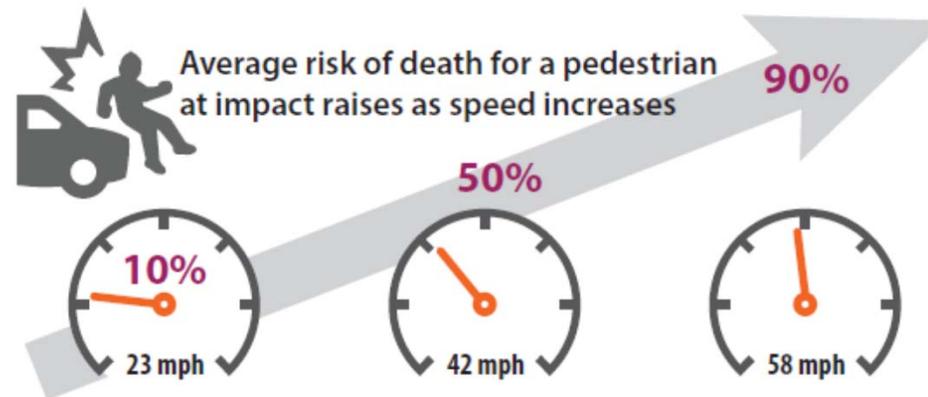


## FSI Intersection Crashes by Speed Limit

# Problem Identification

## Speeding and Pedestrians & Bicycles

- Although overall percentage of speeding-related pedestrian fatalities is low → travel speed at impact influences pedestrian crash severity



# Problem Identification

## Speeding and Pedestrians & Bicycles

### Pennsylvania Quick Facts:

- 8 percent of speed-related FSI crashes are considered are pedestrian/bicycle crashes.
- 65 percent of speeding-related FSI intersection crashes occur in urban areas.
- 75 percent of FSI pedestrian/bicycle speed-related crashes occurred at non-intersection locations.



# Appropriate Speed Limits

## Pennsylvania State Code 067

- Engineering and Traffic Studies Not Required
  - Speed Limit should be within 5 mph of 85<sup>th</sup> percentile speed
  - Can be reduced by up to 10 mph
    - Stopping sight distance
    - Majority of Crashes are related to excessive speeds
- Variable Speed Limits

## PennDOT Traffic Engineering Manual

- Advisory Speeds and Work Zones



# Appropriate Speed Limits

- Use USLIMITS2
- Develop Outreach
- Conduct Education



#### NEW FEATURES AND ENHANCEMENTS

- **New Look** – Pages have been updated to provide a simple, clean look.
- **Help** – A help link on each page points back to the User Guide, documentation on the decision rules, and other useful information.
- **Local Storage** – Users now have full control over where projects are saved.
- **No Account or Log-In Needed** – Project files can now easily be shared with co-workers and decisionmakers without having to reveal user names and passwords.
- **Crash Data** – USLIMITS2 can work with total crashes or only injury crashes.
- **Additional Choice for Route Type** – Users can select "one way" streets as an option for road sections in fully developed areas.
- **Updated Reports** – Reports now include start and end locations for speed zones and other project information.



#### Background

Speeding is a major factor in motor vehicle crashes on local roads, arterials, and freeways. Exceeding the posted speed limit or driving too fast for conditions contributes to more than 30 percent of all highway fatalities in the United States annually. Setting appropriate speed limits is an essential element of highway safety. A rationally determined speed limit is one that is safe, considered appropriate by most drivers, and enforceable. USLIMITS2 provides a fact-based set of decision rules to determine an appropriate speed limit for a specific roadway segment.

USLIMITS2 is a user-friendly and logical web-based tool designed to help practitioners set credible, consistent, and enforceable speed limits. USLIMITS2 is applicable to all types of roads ranging from local roads and residential streets to freeways. The tool's accessibility and broad applicability make it an important resource in any transportation practitioner's toolbox.

#### How Does USLIMITS2 Work?

Using the basic information entered by the user, USLIMITS2 runs proven algorithms to develop a recommended speed limit. Inputs include:

- Type of surrounding development (e.g., rural, fully developed);
- Access points (e.g., the number of driveways, intersections, and traffic signals);
- Road function/area type;
- Road characteristics (e.g., divided or undivided, number of lanes, annual average daily traffic (AADT), roadside hazards, and section length);
- Freeway characteristics (e.g., number of interchanges, section length, and AADT);
- Existing vehicle operating speeds (50th and 85th percentile);
- Pedestrian activity;
- Crash history; and
- Special conditions (e.g., adverse alignment, transition zones, and parking).



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# Speed Management



Roadway  
Departure



Intersection



Pedestrian/  
Bicyclists

SPEED MANAGEMENT

# Roadway Departure Countermeasures

- Ensure speed limits and advisory speeds are set appropriately by completing an engineering speed study
- Create a plan to systematically review speed limits
- Analyze crash data to determine corridors where large numbers of speeding-related roadway departure crashes are occurring and provide this information to law enforcement and engineers



# Roadway Departure Countermeasures

- Flattening side slopes on rural 2-lane roads

Photo courtesy of Richard Retting



- Adding or increasing superelevation



# Roadway Departure Countermeasures

- Widen lanes can provide a safety benefit on rural undivided roads



- Relocating fixed objects further from the roadside

# Roadway Departure Countermeasures

- High-intensity curve warning signs increase driver awareness of approaching changes in alignment



# Roadway Departure Countermeasures

- Reflective signs, guardrail reflectors, and raised pavement markers (RPMs) provide positive guidance for drivers unaware/uncertain of horizontal curvature at night



Photo courtesy of Richard Retting

# Roadway Departure Countermeasures

Photo courtesy of Richard Retting

- Supplemental pavement markings can reinforce sign messages
- Shown to reduce vehicle speeds



Photo courtesy of Virginia DOT



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# Roadway Departure Countermeasures

- Dynamic or ITS signs
- Rumble Strips
- High Friction Surface Treatment



Photo courtesy of Richard Retting

# Enforcement

Countermeasure	Effectiveness	Cost	Use	Time
Automated Enforcement	*****	\$\$\$ <sup>1</sup>	Medium	Medium
High Visibility Enforcement	**	\$\$\$	Low <sup>2</sup>	Medium
Other Enforcement Methods	**	Varies	Unknown	Varies



Photos courtesy of Richard Retting

- <sup>1</sup> Can be covered by income from citations
- <sup>2</sup> For aggressive driving, but use of short-term, high visibility enforcement campaigns for speeding is more widespread

NHTSA Countermeasures That Work, 2015



# High Visibility Enforcement

- Ensure public sees high levels of enforcement activity
- Tell the public why the law is being enforced
- Show the public what is being enforced



# Enforcement



# Social Norming



# Intersection Crashes Countermeasures

- **Improve visibility or conspicuity of intersection**
- Ensure sight distance is adequate, clear sight distance triangles, install advance signing, or enhance striping.
- For signalized intersections, install backplates or reflectorized backplates; use mast arms instead of span-wire.
- For unsignalized intersections, install larger and/or more reflective signing.

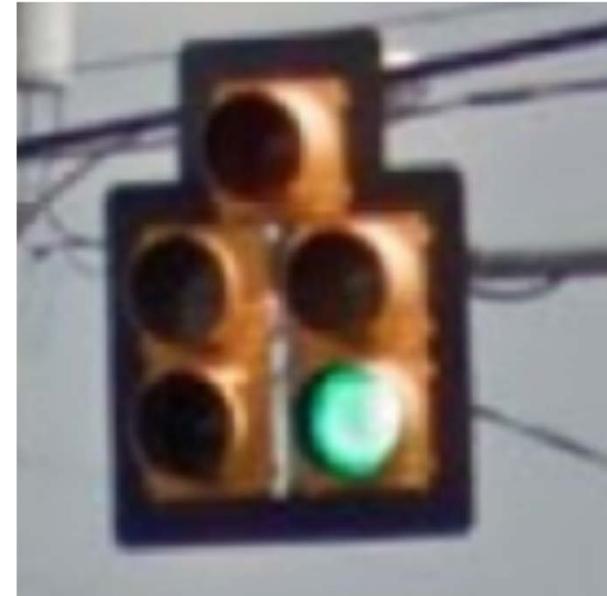


# Intersection Crashes Countermeasures

- **Traffic calming**
- Incorporate traffic calming measures at intersections along arterials, such as:
  - Constructing roundabouts or mini roundabouts
  - Applying lane narrowing techniques (using striping or a combination of striping and rumble strips)
  - Creating median islands

# Intersection Crashes Countermeasures

- **Signal timing**
- Create a plan to systematically review signal timings at intersections
- Ensure yellow and all-red clearance intervals are appropriate for the speed limit and the intersection geometry
- Coordinate signals on arterials to promote progression and a uniform speed



# Intersection Crashes Countermeasures

- **Dilemma zone protection measures**
- On high-speed roads install advance detection sensor equipment that adjusts the start time of the yellow-signal either earlier or later based on observed vehicle locations and speeds
- Install advance warning signs that notify drivers of the need to stop at an upcoming signalized intersection



# Intersection Crashes Countermeasures

- Construct roundabouts in place of signalized and stop-controlled intersections
  - 75% reduction in injury crashes
  - 90% reduction in fatal crashes



Photo courtesy of Richard Retting

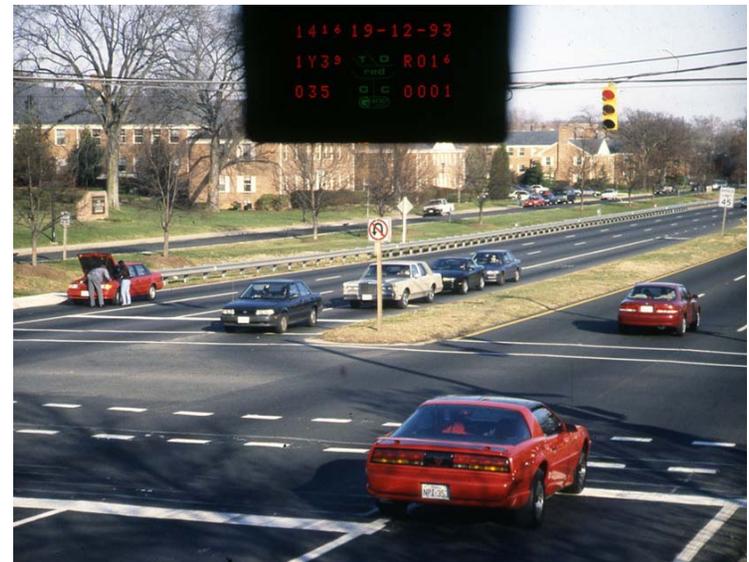
# Intersection Crashes Countermeasures

- Rural Areas
  - Transverse rumble strips are placed across the travel lane to supplement signing and alert drivers of the need to reduce speed as they approach an intersection
  - High friction surface treatments
  - Rural ITS solutions such as intersection collision warning systems (ICWS), speed feedback signs, speed activated warning or speed limit reminder signs, or other signs or beacons that notify the side street or major street vehicle of an approaching vehicle



# Intersection Crashes Countermeasures

- **Enforcement**
- Determine specific arterial corridors with a high speeding-related intersection crash history
- Red-signal automated enforcement



# Pedestrian Crashes Countermeasures

- Increased intensity of roadway lighting:
  - Improve driver visibility of pedestrians at night, when more than half of all fatal pedestrian crashes occur
  - Significantly reduce nighttime pedestrian crashes



Photo courtesy of Richard Retting

# Pedestrian Crashes Countermeasures

- Refuge islands
  - Allow pedestrians to cross in two stages, simplifying the crossing task; especially helpful for pedestrians with slower walking speeds
  - Pedestrian crash rates are significantly lower on multilane roads with refuge islands



Photo courtesy of Ken Sides

# Pedestrian & Bicycle Crashes Countermeasures

- **Road Diets**
- Reduce speeding as well as allow a more pedestrian- and bicycle-friendly design by reallocating space for bicycle lanes, sidewalks, pedestrian refuge islands, etc.



Photo courtesy of Richard Retting

# Pedestrian & Bicycle Crashes Countermeasures

- Traffic Calming
  - Speed humps
  - Curb extensions
  - Narrow lanes
  - Chicanes
  - Traffic circles and roundabouts



Photo courtesy of Richard Retting

# Pedestrian Crashes Countermeasures

- Rectangular rapid flash beacons (RRFB)



# Pedestrian Crashes Countermeasures

- Pedestrian hybrid beacon



# Any Questions?

[http://safety.fhwa.dot.gov/speedmgt/ref\\_mats/](http://safety.fhwa.dot.gov/speedmgt/ref_mats/)

## SPEED MANAGEMENT COUNTERMEASURES

More than Just Speed Humps

U.S. Department of Transportation  
Federal Highway Administration

**SETTING SPEED LIMITS**

Setting speed limits that are safe, consistent, and reasonable is the first step in speed management and is important in order to protect all roadway users. Transportation practitioners employ a variety of strategies to manage speeds on roadways, and speed limits are an integral part of this. However, simply lowering the speed limit on a particular stretch of roadway does not always lower the actual speed at which most people drive on that roadway. Therefore, transportation agencies often install speed management countermeasures in order to get drivers to slow down.

**WHAT DO SPEED MANAGEMENT COUNTERMEASURES LOOK LIKE?**

Some speed management countermeasures are familiar to drivers and have been used for many years. Others are relatively new. All provide great safety and speed management benefits, and may offer operations and cost-savings benefits as well. Some examples include:

- Speed Humps.** Generally located on residential streets or other low-speed roads, these raised pavement structures force motorists to slow down to a safe speed. Studies show speed humps can be effective at reducing speeds by nearly 10 mph.<sup>1</sup> (See page 2 to learn the difference between speed humps and speed bumps.)
- Speed Feedback Signs.** These portable, interactive signs display a vehicle's current speed to remind the driver to slow down and obey the posted speed limit. Research shows these types of signs have been effective at reducing speeds by 5 mph.<sup>2</sup>
- Enhanced Curve Delineation.** By improving striping or signing along horizontal curves, motorists are more aware of the road's curvature and are more likely to slow down to a speed that matches the curve's perceived severity. Depending on the type and combination of delineation countermeasures chosen, studies show speeds can be reduced by nearly 10 mph.<sup>3</sup>
- Roundabouts.** This type of circular intersection is very effective at safely moving traffic through an intersection and can have significant traffic calming effects. Features such as channelized approaches, a center island, and circular design encourage lower speeds. Studies have shown roundabouts can lower speeds by as much as 15 to 20 mph<sup>4</sup> and reduce severe crashes by nearly 80 percent.<sup>5</sup>
- Road Diets.** The most common Road Diet converts a four-lane undivided roadway to a three-lane roadway consisting of two through lanes and a center two-way left-turn lane. Studies show that Road Diets, when implemented in appropriate contexts, can lower the 85th percentile speeds and greatly reduce the number of motorists speeding excessively.<sup>6</sup>

**COUNTERMEASURE:**  
Any intentional, long-term alteration to the roadway or its environment that causes changes in motorists' driving behavior.

1. FHWA, "A Desktop Reference of Potential Effectiveness in Reducing Speed," July 2014. Available at: [https://safety.fhwa.dot.gov/speedmgt/ref\\_mats/countermeasures/desktopreference.pdf](https://safety.fhwa.dot.gov/speedmgt/ref_mats/countermeasures/desktopreference.pdf)  
2. FHWA, "Proven Safety Countermeasures: Roundabouts," FHWA-SA-13-001 (Washington, DC: 2012). Available at: [https://safety.fhwa.dot.gov/speedmgt/ref\\_mats/countermeasures/roundabouts.pdf](https://safety.fhwa.dot.gov/speedmgt/ref_mats/countermeasures/roundabouts.pdf)  
3. FHWA, "Road Diet Information Guide," FHWA-SA-14-028. Available at: [https://safety.fhwa.dot.gov/speedmgt/ref\\_mats/guide/](https://safety.fhwa.dot.gov/speedmgt/ref_mats/guide/)

## SPEED LIMIT Basics

U.S. Department of Transportation  
Federal Highway Administration

**SPEED LIMITS**

Speed limits frame expectations for drivers and other roadway users. Properly set speed limits provide a safe, consistent, and reasonable speed to protect drivers, pedestrians, and bicyclists along the roadway. At the same time, speed limits can be a source of frustration and confusion; for example, not all drivers like to travel at the same speed, and some people may not understand why the speed limit changes on a particular road. In addition, community residents often have concerns that traffic is moving too fast through their neighborhoods. Understanding the engineering principles and processes used to set speed limits and learning the terminology used to describe them are the first steps in reducing drivers' frustration or confusion and encouraging compliance.

**TYPES OF SPEED LIMITS**

**STATUTORY SPEED LIMITS**

Statutory speed limits are established by State legislatures for specific types of roads (e.g., Interstates, rural highways, urban streets) and can vary from State to State. They are enforceable by law and are applicable even if the speed limit sign is not posted. Examples of statutory speed limits include:

- > 25 mph in residential or school districts,
- > 55 mph on rural highways, and
- > 70 mph on rural Interstate highways.

**POSTED SPEED LIMIT**

Posted speed limits (sometimes called regulatory speed limits) are those that are sign-posted along the road and are enforceable by law. A posted speed limit could be the same as the statutory speed set by the State legislature, or it could be established by a city, county, or State transportation agency as an adjustment to the statutory speed limit. Some cities and counties will establish a blanket speed limit for roads in their jurisdictions. Those limits are generally posted at the city limits or county lines. The posted speed limit can differ from the statutory speed limit; in these cases, the posted speed limit is determined using an engineering speed study and takes priority over the established statutory speed limit.

**"SPECIAL CONDITIONS" SPEED LIMITS**

**School zone speed limits** are used in specific locations during the hours when children are going to and from school. Most States use a school zone speed limit of 15 to 25 mph in urban and suburban areas.

**Work zone speed limits** are set as part of the work zone's traffic control plan, which is used to help facilitate safe and efficient movement of traffic through a work zone. Factors that influence work zone speed limits can include:

- > The posted speed limit when the work zone is not present,
- > The location of the work zone and works in relation to traffic, and
- > The type of traffic control (e.g., cones, barrels, concrete barriers), and
- > The complexity of the work zone (e.g., lane shifts, narrowed lanes).

**Variable speed limits** are displayed on changeable message signs (CMS) at locations where roadway conditions regularly require speeds to reduce more than 10 mph below the posted speed limit. These instances typically occur due to weather conditions, congestion, traffic incidents, and/or work zones.

**Advisory speeds** are a non-regulatory speed posted for a small portion or isolated section of a roadway (e.g., a sharp curve, an exit ramp) to inform a driver of a safe driving speed. They are set using an engineering speed study and in accordance with guidance in the Manual on Uniform Traffic Control Devices (MUTCD).

