

**ZERO** IS OUR GOAL  
A SAFE SYSTEM IS HOW WE GET THERE

# Safe System Approach and Speed Management

Nicole Oneyear  
Iowa Division of FHWA



U.S. Department  
of Transportation  
**Federal Highway  
Administration**



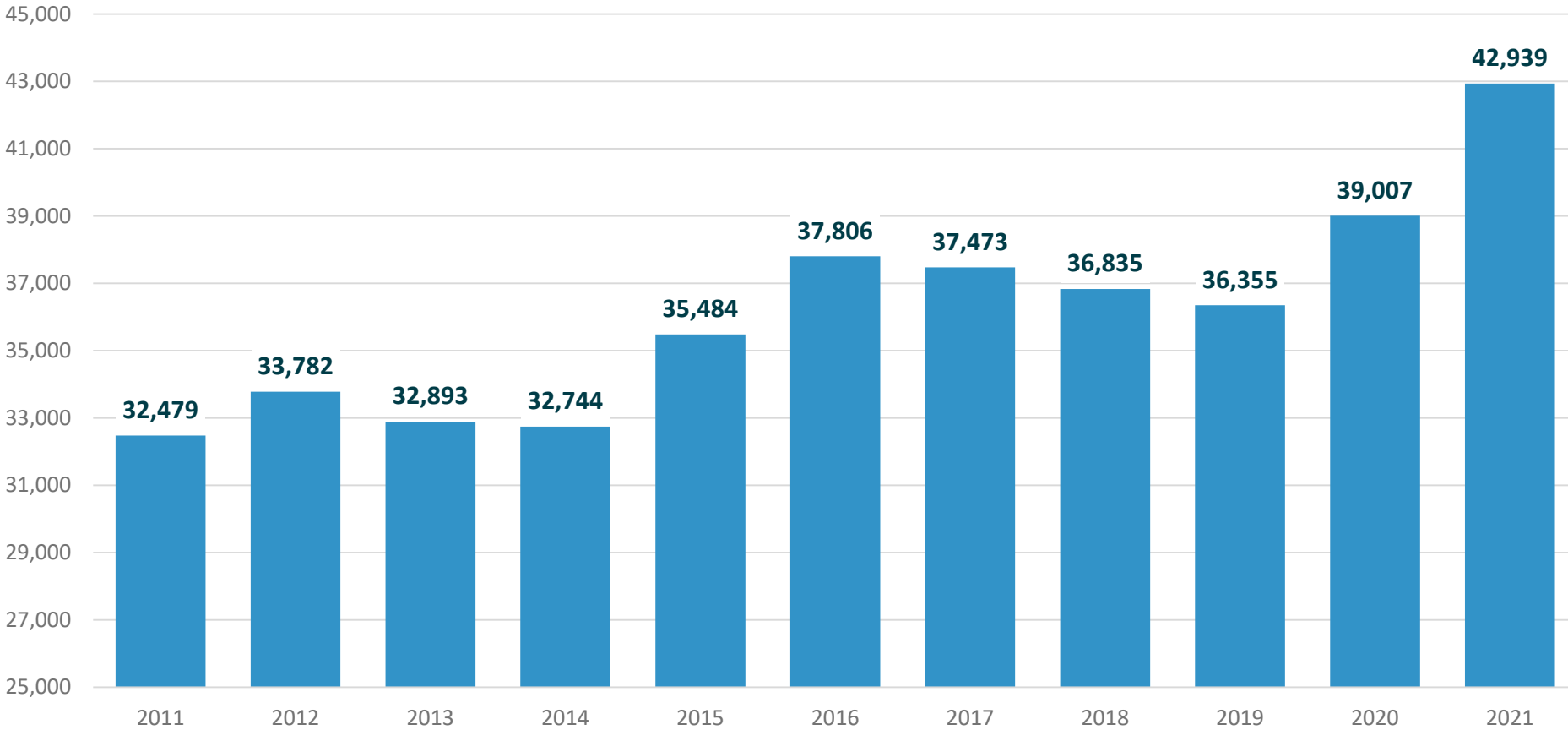


# Disclaimer

Except for any statutes or regulations cited, the contents of this presentation do not have the force and effect of law and are not meant to bind the States or the public in any way. This presentation is intended only to provide information regarding existing requirements under the law or agency policies.

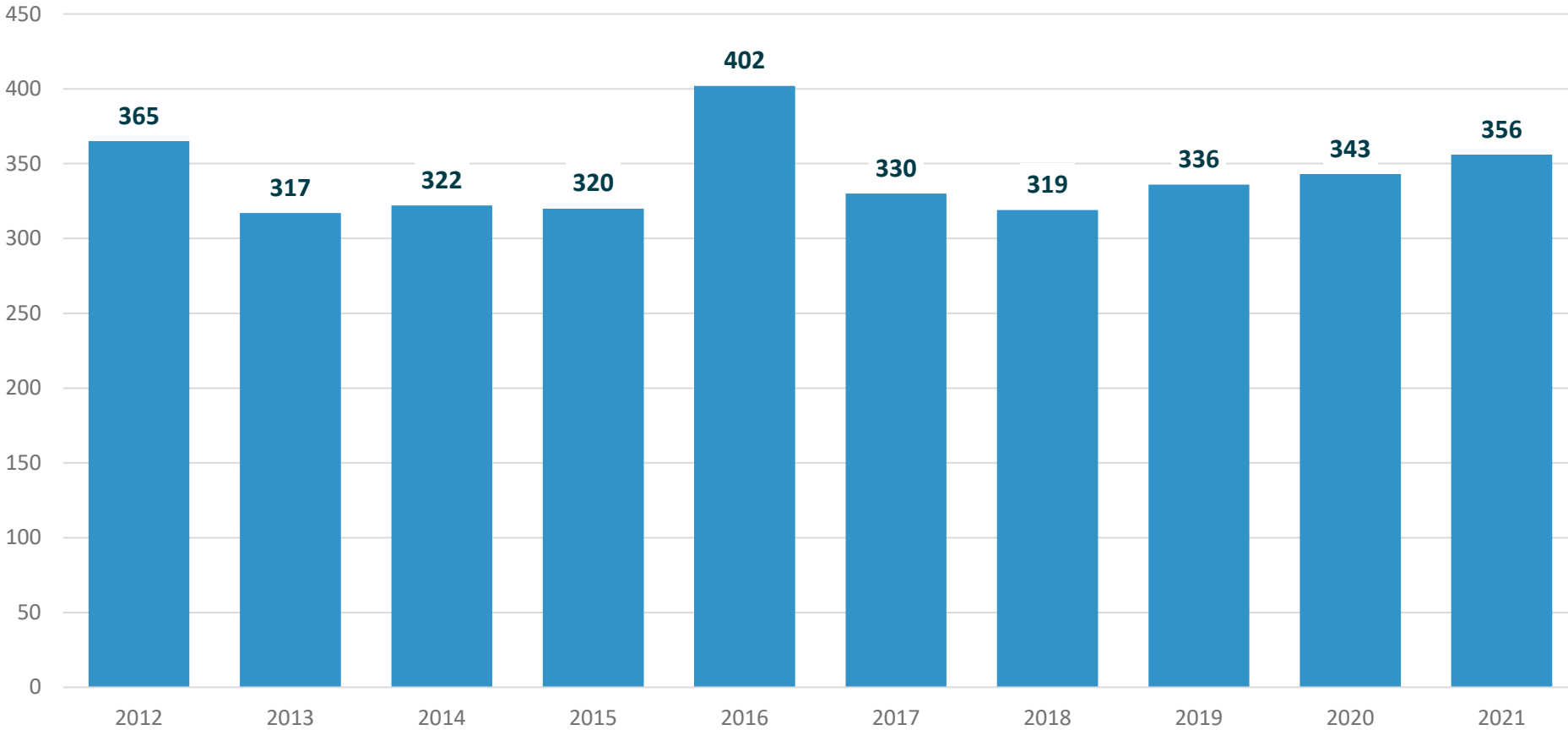
Note: Unless otherwise indicated, FHWA is the source for all images in the presentation.

# Thousands of lives are lost each year



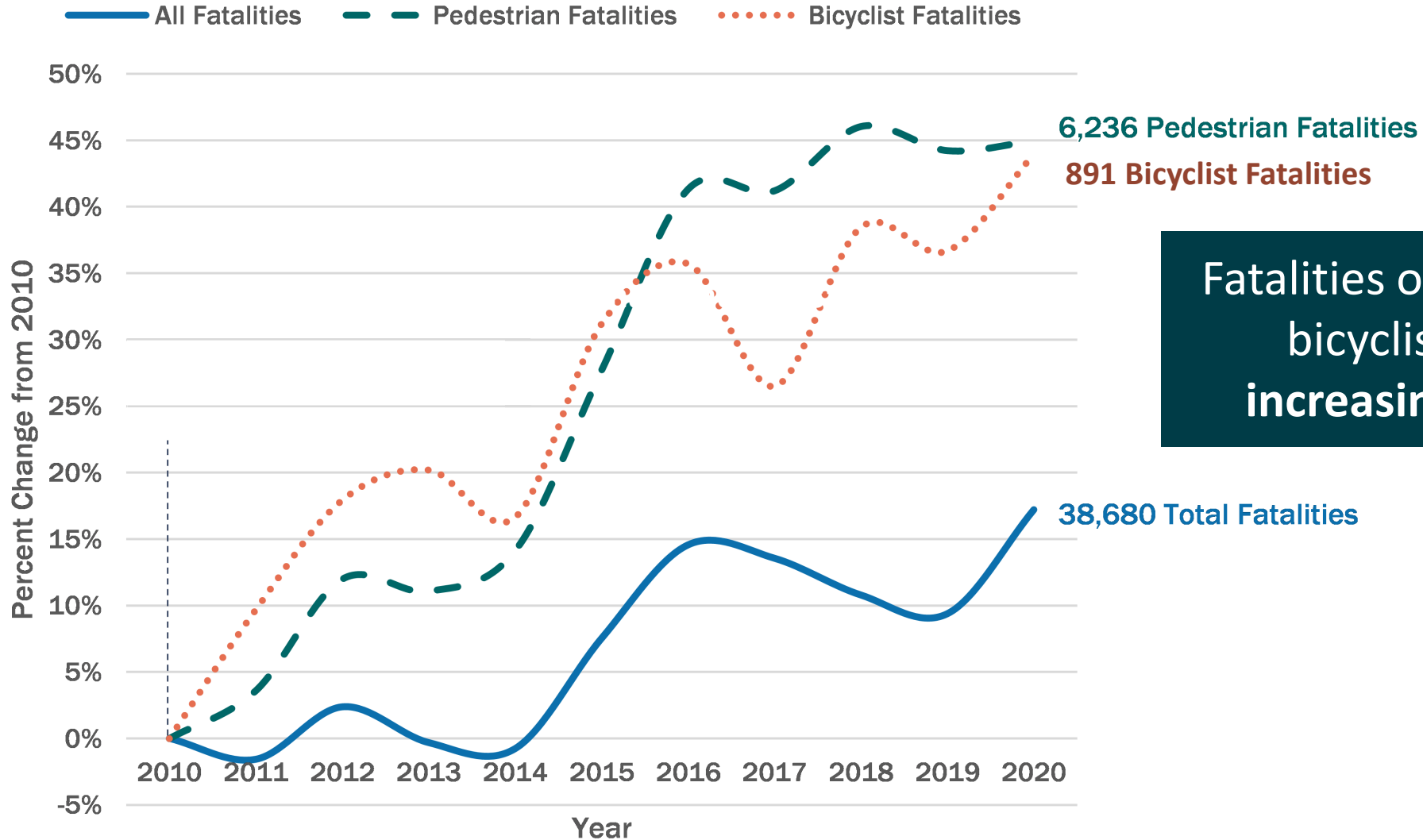
Total US Traffic Fatalities  
2012-2021

# Thousands of lives are lost each year



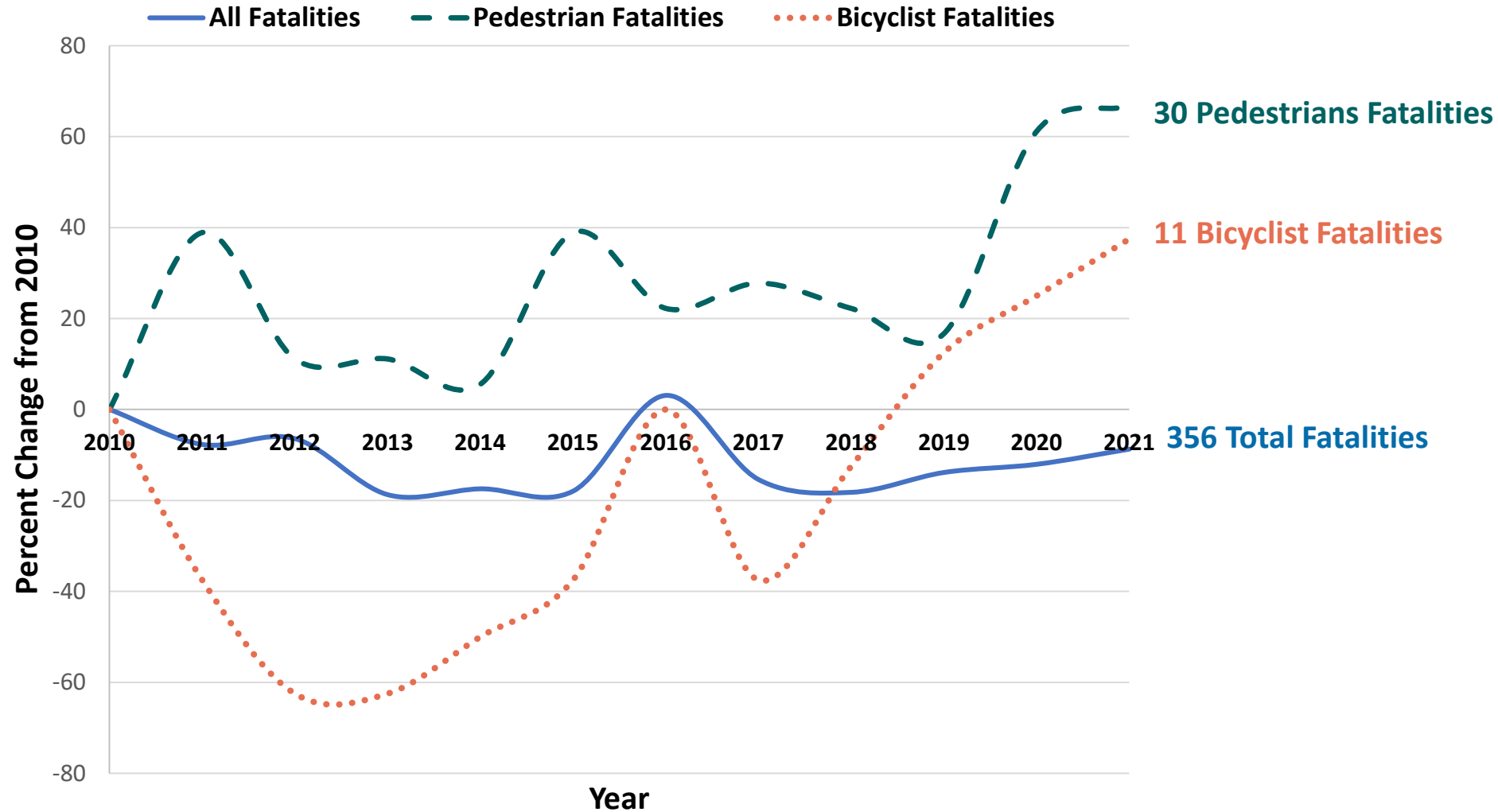
**Total Iowa  
Traffic  
Fatalities  
2012-2021**

# We have a national roadway safety problem



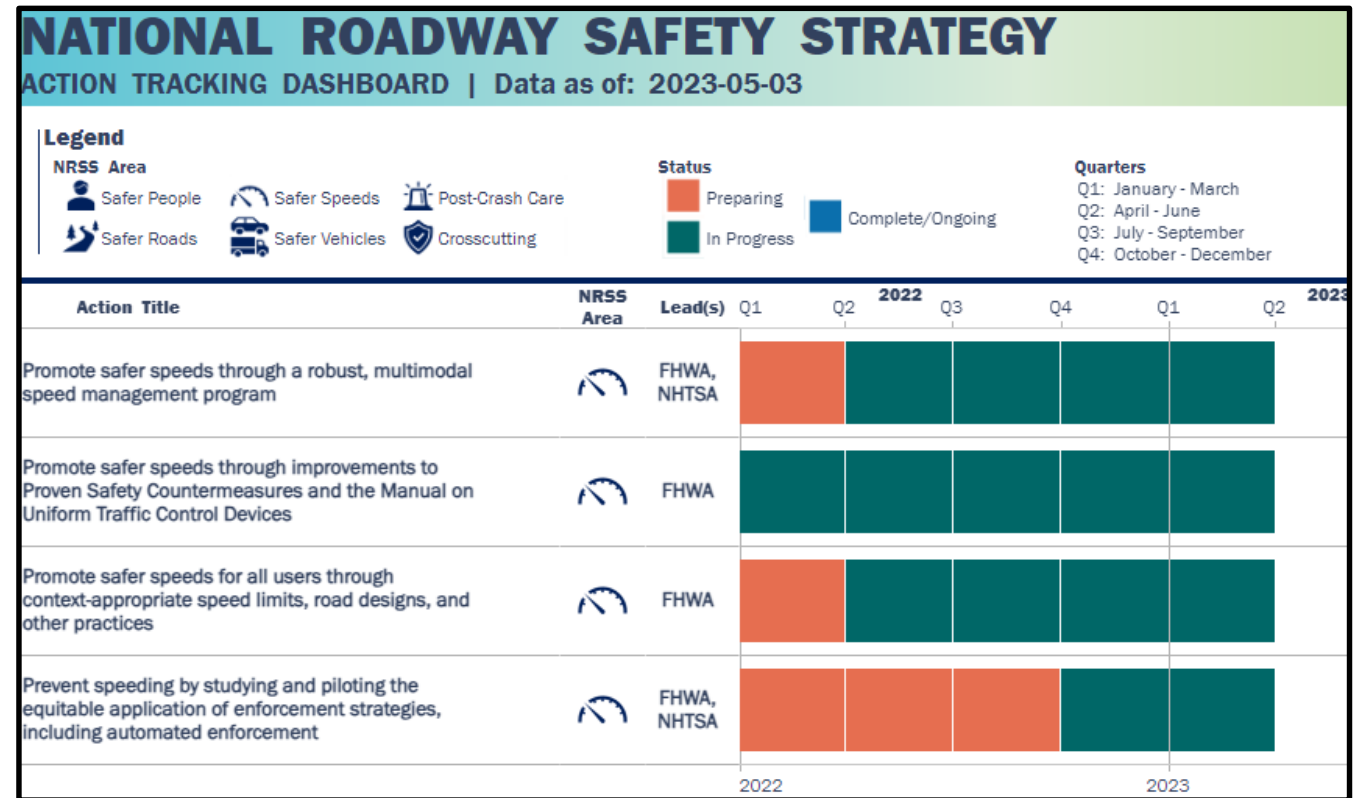
Fatalities of pedestrians and bicyclists have been increasing even greater

# We have an Iowa roadway safety problem



# Background

- ✓ Speeding-related traffic crashes killed 12,330 people in 2021 and was a contributing factor in 29 percent of all traffic fatalities.
- ✓ Higher speeds result in greater impact at the time of a crash, which leads to more severe injuries and fatalities. This is especially concerning for vulnerable road users (VRUs).
- ✓ The FHWA has adopted the Safe System Approach, with Safe Speeds as one of its fundamental pillars.
- ✓ Safer Speeds is a major component in USDOT's new National Roadway Safety Strategy (NRSS).



Source: FHWA

# A new paradigm

The Safe System approach aims to eliminate fatal and serious injuries for all road users by:

**Accommodating human mistakes**

**PARADIGM SHIFT** ||

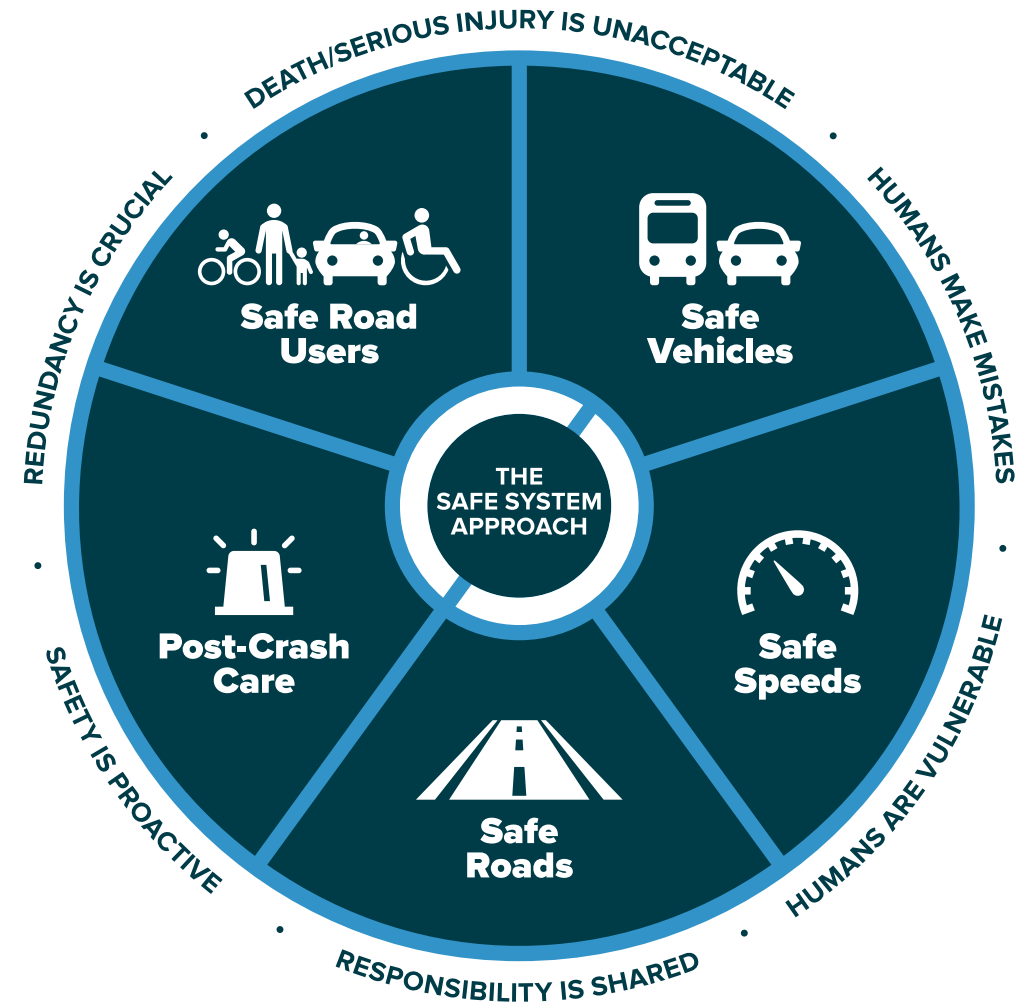


**Keeping impacts on the human body at tolerable levels**



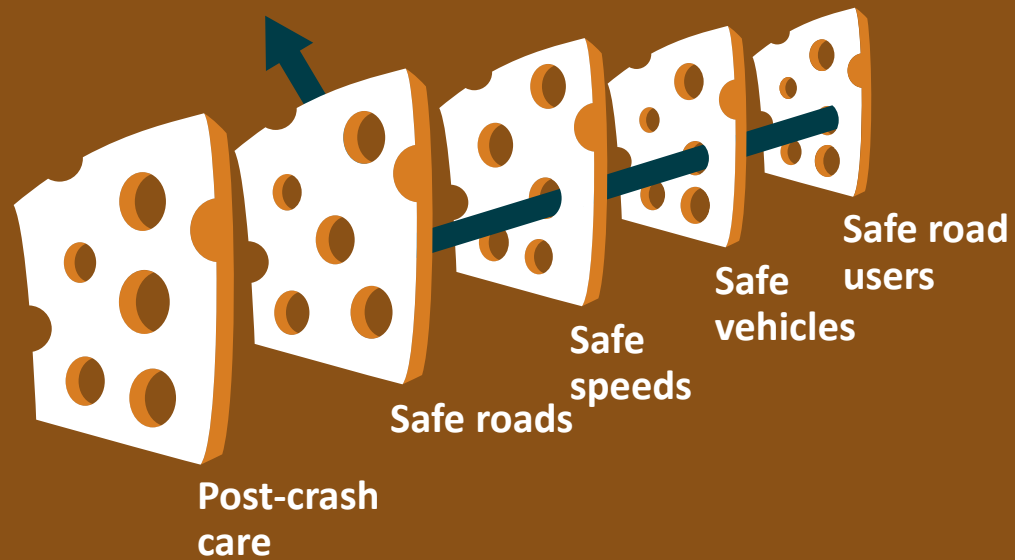
# Safe System Approach

The Safe System Approach is a paradigm shift in how we approach safe mobility

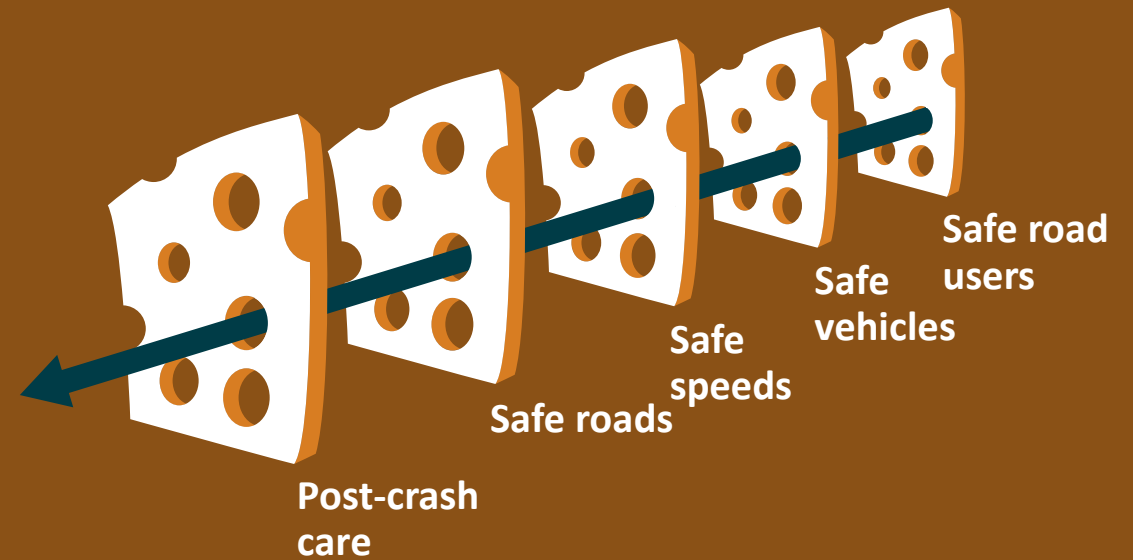


# The 5 safe system elements create redundancy

The “Swiss Cheese Model” of redundancy creates layers of protection

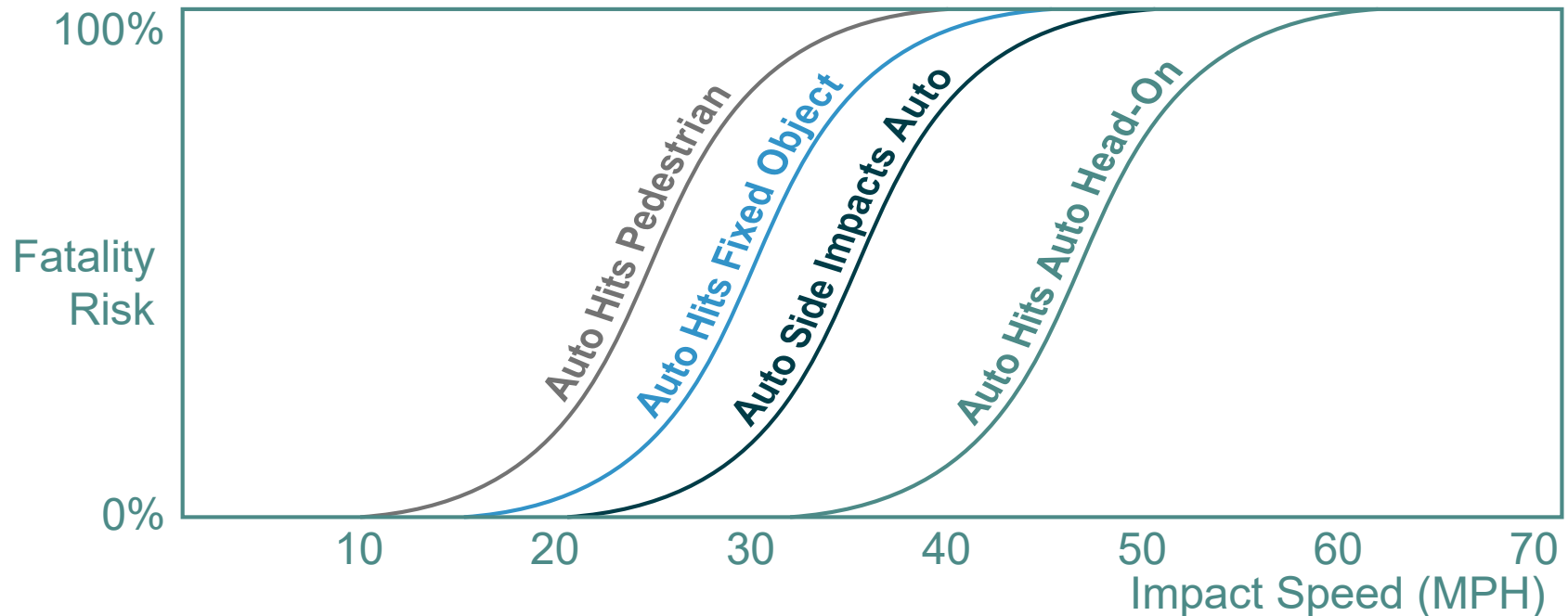


Death and serious injuries only happen when all layers fail

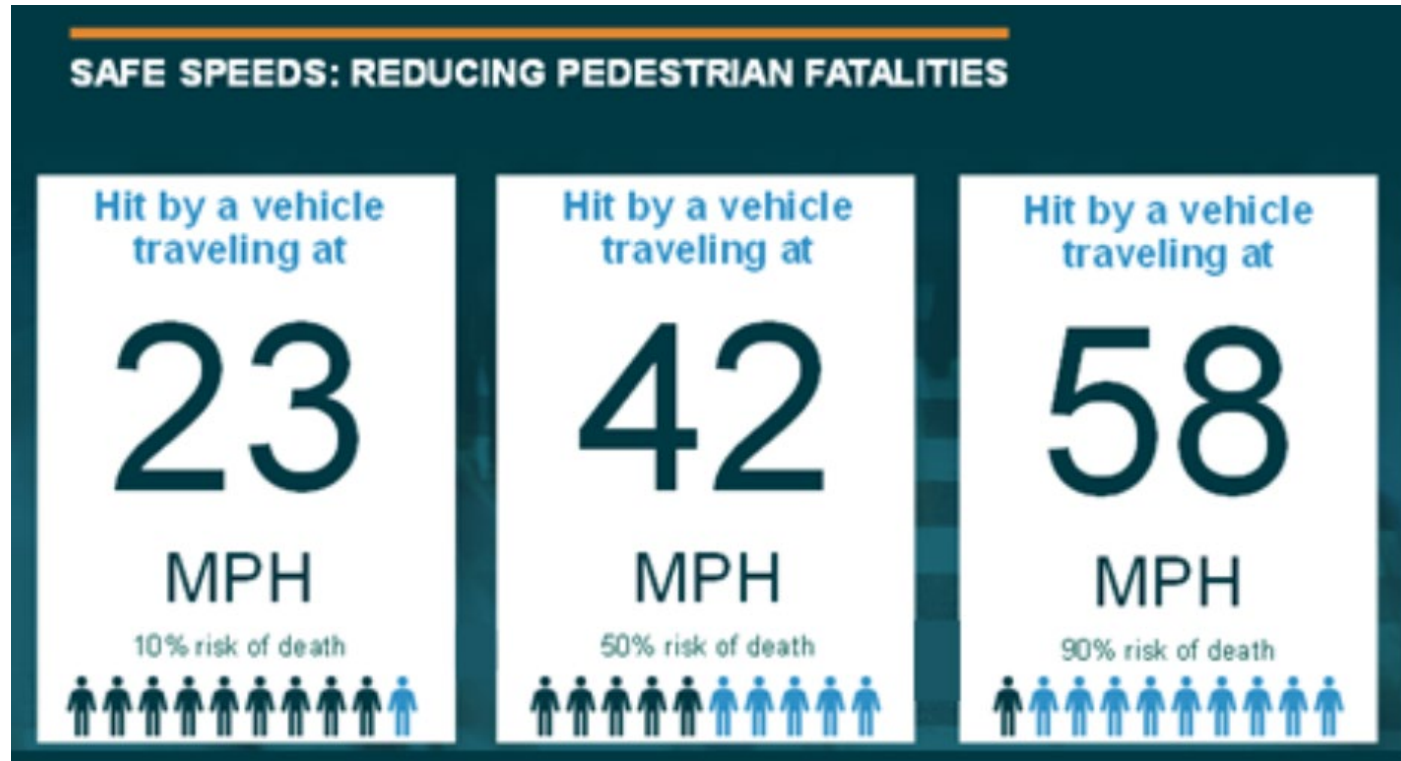


# Safe Speeds: Fatality Risks

- ✓ Speed  $u$  → Kinetic Energy  $\frac{1}{2} mu^2$  → Crash Outcome
- ✓ Speed directly affects a driver's ability to react.



# Safe Speeds: Fatality Risks for Pedestrians



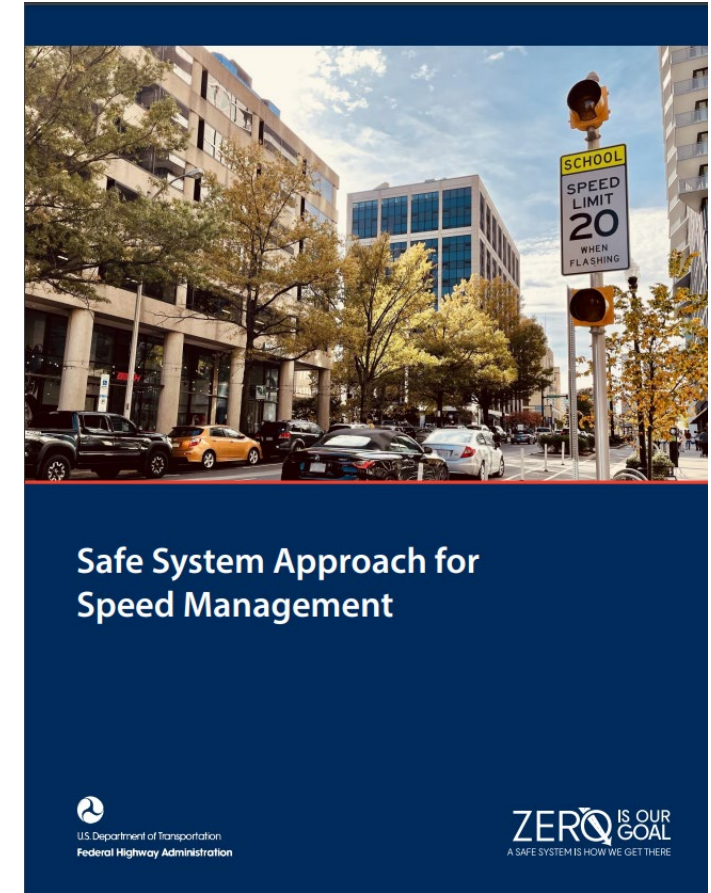
Source: Image by FHWA based on AAA Study

*"AAA Foundation for Traffic Safety, Impact Speed and a Pedestrian's Risk of Severe Injury or Death (Washington, DC: 2011)"*

# Safe System Approach to Speed Management



- ✓ A comprehensive resource for practitioners interested in implementing a Speed Management program using the Safe System Approach.
- ✓ Helps practitioners understand the impacts of speed on traffic safety and explore linkages between speed management and the Safe System Approach.
- ✓ Introduces a five-tiered Safe System Approach for Speed Management Framework.
- ✓ Includes noteworthy practices to highlight successful deployments.



Source: FHWA

# Safe System Approach for Speed Management

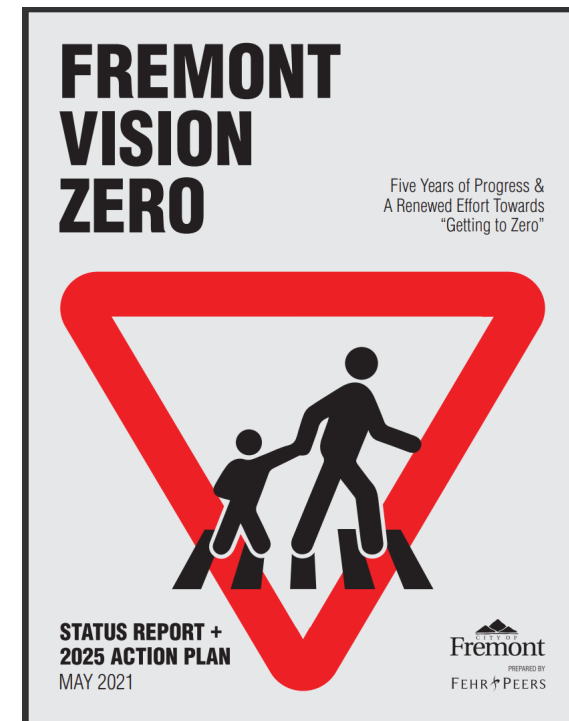
- ✓ High-level framework constructed from
  - a range of different case studies
  - informed by the research literature
- ✓ Applicable to State and local agencies
  - Acknowledges differences in roles/responsibilities
- ✓ Specific Case Studies have been highlighted for each stage
- ✓ Agencies may be at different stages of implementation and may need to revisit earlier or later stages of the process as they evaluate their speed and safety outcomes



# Establishing a Vision and Building Consensus for Speed Management

Transportation agencies seeking to establish a new Safe System aligned speed management program need to:

- Identify potential policy/legislative/institutional barriers in place
- Leverage community support; building consensus
- Determine scope of speed management activities
- Embed Safe System Approach into organizational policies
- Adopt a strategic framework



Source: City of Fremont

# Collecting and Analyzing Speed and Safety Data

A Safe System aligned speed management program should be data-informed:

- ✓ Dispel myths and negative perceptions
- ✓ Gain public buy-in/Public education campaigns
- ✓ Provide concrete benefits of speed management
- ✓ Noted limitations with crash reports
- ✓ Collect data for entire network including speed data



**CRASH DATA**



**SPEED DATA**



# Proactively Prioritizing Locations for Speed Management



- Safety analysis should be **proactive**
- **Systemic** network screening and diagnosis of speeding related crashes
- **Prioritization** can be based on
  - Equity
  - Desired activity/placemaking
  - Modal hierarchy

# Selecting Speed Management Countermeasures

- Objective to set speed limits that are consistent with the roadway context and safe for all users
  - Determine appropriate speeds to match target speeds
  - Inform the public about speed management benefits
  - Identify and implement roadway redesign or behavioral treatments to support speed limit changes
- Numerous Speed Management Resources
  - USLIMITS2, NACTO City Limits, NCHRP Report 966, FHWA Road Diet Guide, FHWA Self-Enforcing Roadways Report, FHWA Speed Safety Cameras, etc.

Street and limits:		Street									
Advisory		Statutory									
Speed	10 mph	≤15	≤20	≤25	≤30	≤35	≤40	≤45	≤50		
PED	Shared roadway			5' sidewalk 100% one side	Sidewalk both sides; curb or swale; 8' separation	>8' separation both sides NCHRP 562 crossings: 20/Hr.	>12' separation both sides	Impermeable separation barrier			
BIKE	Shared roadway			≤ 5' bike lane	6' - 7' bike lane	Minimum 2' separation from autos	Permeable barrier	Impermeable separation barrier			
AUTO	Gravel roadway	≤ 9' travel lanes	10' travel lanes, greenway	10' travel lanes		≤ 11' travel lanes; Angle crash mitigations	Permeable center barrier; Roadside object setback or shielding		Impermeable center barrier		

PBOT Decision Matrix

Source: PBOT

**Table 5. Probability of fatality or serious injury corresponding to different crash types.**

<b>Crash Type</b>	<b>Driver Speeds Corresponding to 10% Fatal Injury Risk and 10% Serious Injury Risk</b>
Pedestrian/vehicle crash <sup>i</sup>	20 mph for fatality 10 mph for serious injury
Side impact vehicle/vehicle crash (typically at intersections) <sup>i</sup>	30 mph for fatality 20 mph for serious injury
Head-on vehicle/vehicle crash (typically without median barriers) <sup>i</sup>	30–45 mph for fatality 20 mph for serious injury
Rear-end vehicle/vehicle crash <sup>i</sup>	35–70 mph for fatality 35 mph for serious injury
Motorcycle crash <sup>ii</sup>	19 mph for fatality

i = synthesized by Washington Injury Minimization and Speed Management Policy and Guidelines Workgroup, 2020.

ii = reported as biomechanical tolerance in Gaca and Pazdan 2017; see also Fildes, Langford, Andrea, and Scully 2005.

Table 6. FDOT Design Manual target speeds and speed management techniques.

Area Type	Context Classification	Target Speed (mph)	Strategies
Rural	C1-Natural (natural or wilderness lands)	55–70	N/A: Speed Management Strategies are not used on high-speed roadways
Rural	C2-Rural sparsely settled)	55–70	N/A: Speed Management Strategies are not used on high-speed roadways
Rural	C2T-Rural Town (small concentrations of developed areas surround by natural areas)	40–45	Roundabout, Lane Narrowing, Horizontal Deflection, Speed Feedback Signs, Rectangular Rapid Flashing Beacons (RRFB) and Pedestrian Hybrid Beacons (PHB)
		35	Techniques for 40–45 mph, plus On- street Parking, Street Trees, Short Blocks, Islands at Crossings, Road Diet, Bulb-outs, Terminated Vista
		30	Techniques for 35–45 mph, plus Chicanes, Islands in curved sections
		≤ 25	Techniques for 30–45 mph, plus Vertical Deflection
Suburban	C3R-Suburban (mostly residential within large blocks), C3C-Suburban Commercial (mostly non-residential)	50–55	Project-specific
		40–45	Roundabout, Lane Narrowing, Horizontal Deflection, Speed Feedback Signs, RRFB and PHB

Source: FDOT. (2022). FDOT Design Manual: Development and Processes. Tallahassee, FL: Florida Department of Transportation

# Safe Speed: Treatments that Minimize Injuries



# Speed Management Related Proven Safety Countermeasures

## Speed Management



Appropriate Speed Limits for All Road Users



Speed Safety Cameras



Variable Speed Limits



Road Diets (Roadway Configuration)



Enhanced Delineation for Horizontal Curves

# Ongoing Monitoring, Evaluation, and Adjustment



- Cyclical nature of proposed framework requires continued monitoring and improvement.
- Monitor outcomes of implemented projects; safety performance can change over time; speeding patterns may also migrate.
- Measure progress against long range safety plans (SHSPs).
- Plans should be iterative and may be incremental in nature (especially for high-cost infrastructure plans).
- Speed enforcement is often vital to establishing driver compliance with target speeds.

# Want to Learn More

## FHWA Safe Systems Approach for Speed Management



### Safe System Approach for Speed Management



[https://highways.dot.gov/sites/fhwa.dot.gov/files/Safe\\_System\\_Approach\\_for\\_Speed\\_Management.pdf](https://highways.dot.gov/sites/fhwa.dot.gov/files/Safe_System_Approach_for_Speed_Management.pdf)

## Free NHI Designing and Operating Roadways for Safe Speeds

ab=0&key=safe%20speed&sf=0&course\_no=380128

Find NHI Materials

Pay an Invoice

Search for a Course

Search for courses

Email Updates

Get the latest NHI training news.

Email Address

Sign Up

Connect with us

Find Training

Browse Upcoming Sessions

Search for courses based on delivery type, program area, or topic below, or find upcoming trainings in your state or territory. For more information on trainings from the National Highway Institute, contact us.

SEARCH FOR COURSES | 10 SEARCH FOR SCHEDULED SESSIONS | QUICK SEARCH | DOWNLOAD CATALOG

Return to Search Results | Show Search Criteria

JUMP TO: Course Information | Outcomes | Target Audience

### Course Description

*Designing and Operating Roadways for Safe Speeds*

PROGRAM AREA: Highway Safety | Print Friendly Page

COURSE NUMBER: FHWA-NHI-380128

Web-based Training (WBT)

Calendar Year	Length	CEU	Price
2023	10 Hours	0 Units	\$0 Per Participant

Add To Cart

TRAINING LEVEL: Basic

**COURSE DESCRIPTION:**

Safe speeds for the safety of all roadway users. The Designing and Operating Roadways for Safe Speeds incorporates the Safe System approach as well as by geometric design, speed limit setting procedures, traffic control device design and operation, enforcement methods, and education.

The Web-based Training (WBT) demonstrates the importance of considering all road users at each stage of design and operations to encourage safe speeds and proactively address safety issues. It will emphasize the concept that all participants in the transportation system must do their part to realize a truly Safe System. The training provides an overview of the role's designers, operators, and maintenance staff play in establishing safer roadways. It is designed to be both a comprehensive self-paced course and serve as a prerequisite for an Instructor Led Training (ILT). Together these courses are part of FHWA's strategy for markedly reversing the upward trend of speeding-related fatalities and serious injuries.

You may request Resource Center staff to provide an Instructor Led Training (ILT) which builds upon and uses concepts and knowledge gained from the WBT. Please reach out to [timothy.taylor@dot.gov](mailto:timothy.taylor@dot.gov) for details. The ILT, Designing and Operating Streets and Roads for Safe Speeds, is an in-person, one day practitioner level course designed to bring together the use of target speed, engineering studies, speed reduction countermeasures and applicable geometric features which yield a desirable and safe speed limit for all users.

[https://www.nhi.fhwa.dot.gov/course-search?tab=0&key=designing%20and%20operating&sf=0&course\\_no=380128](https://www.nhi.fhwa.dot.gov/course-search?tab=0&key=designing%20and%20operating&sf=0&course_no=380128)

## FHWA Speed Management Website



[Home](#) / [Safety](#) / [Speed Management Safety](#)

Speed Management Safety

USLIMITS2

Facts & Statistics

Engineering Speed Limits

Traffic Calming ePrimer

Ongoing Research

Reference Materials

Related Web Site Links

### Speed Management

Speeding - traveling too fast for conditions or exceeding the posted speed limit - is a contributing factor in 29 percent of all fatalities. In 2021, the fatalities on our Nation's roadways, of which 12,330 were speed-related, represents an increase of 8 percent from 11,428 speed-related fatalities in 2020. Speeding is a safety concern on all roads and for all road users. Much of the public concern about speeding has been focused on interstate highways. In 2021, only 13 percent (1,637) of speed-related fatalities occurred on interstate highways. The remaining 10,700 speed-related fatalities occurred on non-interstate roadways. FHWA is the lead agency for speeding-related research, education, and enforcement.

Last updated: Friday, August 4, 2023

<https://highways.dot.gov/safety/speed-management>





Nicole Oneyear  
Safety and Operations Specialist  
FHWA Iowa Division  
515-233-7330  
Nicole.oneyear@dot.gov

**ZERO** IS OUR  
GOAL  
A SAFE SYSTEM IS HOW WE GET THERE