



Roadway Departure Safety (Part 2 of 3)

Edited by Airton G. Kohls and Matt Cate (Source: FHWA Office of Safety)

This article is the second of three articles we will be using in 2019 to highlight resources that can help your agency reduce roadway departure (RwD) crashes, which are defined as crashes that occur after a vehicle crosses an edge line or a center line, or otherwise leaves the traveled way. Roadway departure crashes encompass a variety of crash scenarios, including collisions between vehicles traveling in opposite directions on the same roadway, vehicles striking terrain and drainage features, and collisions with fixed objects such as trees and utility poles.

Here, we will focus on countermeasures to provide for safe recovery of vehicles to the roadway. It is one of the efforts presented on the FHWA's *Strategic Approach & Plan* that also includes strategies to keep vehicles on the roadway and to reduce crash severity.

Countermeasures to Provide for Safe Recovery

Roadway departures account for over half of all fatal crashes. Once vehicles have left the travel lane, providing an opportunity to reenter the travel way safely is a priority. Providing shoulders, safe pavement edges, and clear zones are effective means in which agencies can provide the opportunity for drivers to recover safely.



Safety EdgeSM

The SafetyEdgeSM is a simple but extremely effective solution that can help save lives by allowing drivers who drift off the travel way to return to the road safely. When installed properly, simply consolidating the edge of the pavement to 30-degree shape during the paving process can eliminate the problem of vertical edge drop-off.



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From the Director

This would typically be the spring issue of RoadTalk, but the change of seasons sprang right past us this time. We've been working on a lot of improvements and new activities behind the scenes, and we look forward to sharing those with you soon. Looking back, the spring of 2019 wasn't quite as wet as the end of winter. What we've seen of summer has been a mixed bag with some heat, some more rain, and even a handful of fall-like days in July. The basketball Vols didn't go as far as we hoped in the NCAA tournament, but we had three names called in the NBA draft. I can hardly believe that it is already time to turn our attention to another college football season. I won't even attempt to speculate on the outlook for the football Vols. Recent experience has taught me to hope for the best and prepare for the worst.

We're already seeing some action toward transportation reauthorization in Washington. The Fixing America's Surface Transportation (FAST) Act will remain in effect through the end of federal fiscal year 2020, but that is only 14 months away. At last check the US Senate Environment and Public Works Committee appears ready to move its \$287 billion America's Transportation Infrastructure Act (ATIA) to the floor for consideration by the full Senate. It's too early to make big predictions as to how this may change the way we operate in the coming years, but we will do our best to keep you up to date as the process moves forward.

Here in Tennessee, the Improving Manufacturing, Public Roads and Opportunities for a Vibrant Economy Act, more commonly known as the IMPROVE Act, has been in place for more than two years. At the time of its passage the IMPROVE Act was projected to increase transportation funding for Tennessee cities and counties by more than \$105 million per year. Additionally, 527 (54%) of the total 971 transportation projects specifically linked to passage of the act are for local bridge projects. So far, 14 local bridge projects have been completed, 23 are currently under construction, 7 are in the right of way phase, and 57 are in the preliminary engineering phase. That's a great start toward meeting the state's local infrastructure needs.

Finally, Airton Kohls and I will soon be attending the 2019 Local Technical Assistance Program (LTAP) conference in Stowe, VT. This annual gathering is a chance to meet with our peers from across the country, learn more about what they've been up to over the past year, and hopefully bring home some new ideas that we can put to use here in Tennessee. The LTAP centers will be joined this year by the members of the National Transportation Training Directors, or NTTD. NTTD primarily represents the training leaders of the state departments of transportation, but their members share many interests with the LTAP community. I had an opportunity to attend the 2018 NTTD conference in Chattanooga, and I am excited to see what happens when we bring the full membership of both groups together. You will probably see some of the new information that we pick up in Vermont beginning with the summer issue of RoadTalk.

That's all I have for now. As always, please do not hesitate to give us a call or send an email if there is anything that TTAP can do for you.



Key benefits of the SafetyEdgeSM technology include:

1. Its ability to saves lives by allowing vehicles to safely return to the travel lane and mitigate pavement edge drop-off.
2. An improvement can be seen in pavement durability by reducing edge raveling.
3. Its cost is low, which is attributed to the addition of typically less than 1 percent of the project's total asphalt quantity.

The SafetyEdgeSM shape ensures that tire scrubbing will not occur when the pavement edge is exposed (see Figure 1 below). SafetyEdgeSM can be added to both asphalt and concrete pavement projects. Figure 2 presents a diagram of a newly constructed SafetyEdgeSM. Notice that even if erosion exists on the shoulder material the SafetyEdgeSM provides a smoother recovery to the roadway.

For additional information on the SafetyEdgeSM, please go to: <https://safety.fhwa.dot.gov/safetyEdge/>



Figure 1 – Exposed pavement edge.
Courtesy: Robson Forensic

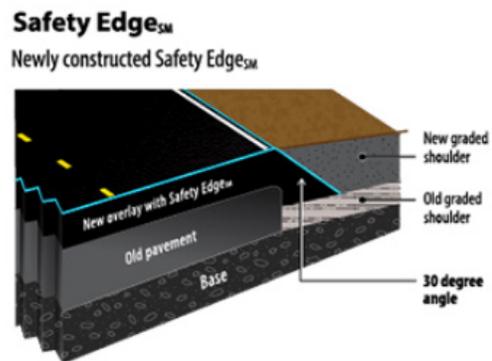


Figure 2 – Safety EdgeSM with new graded shoulder. Courtesy: FHWA

Clear Zones

By creating Clear Zones, roadway agencies can increase the likelihood that a roadway departure results in a safe recovery rather than a crash, and mitigate the severity of crashes that do occur. A Clear Zone is an unobstructed, traversable roadside area that allows a driver to stop safely, or regain control of a vehicle that has left the roadway.



FAQ on Clear Zones

What is the definition of clear zone?

The Roadside Design Guide defines a clear zone as the total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area. The desired minimum width is dependent upon traffic volumes and speeds and on the roadside geometry. Simply stated, it is an unobstructed, relatively flat area beyond the edge of the traveled way that allows a driver to stop safely or regain control of a vehicle that leaves the traveled way. A recoverable slope is a slope on which a motorist may, to a greater or lesser extent, retain or regain control of a vehicle by slowing or stopping. Slopes flatter than 1V:4H are generally considered

recoverable. A non-recoverable slope is a slope which is considered traversable but on which an errant vehicle will continue to the bottom. Embankment slopes between 1V:3H and 1V:4H may be considered traversable but non-recoverable if they are smooth and free of fixed objects. A clear run-out area is the area at

the toe of a non-recoverable slope available for safe use by an errant vehicle. Slopes steeper than 1V:3H are not considered traversable and are not considered part of the clear zone.

Where can I find information on clear zone dimensions?

The current edition of the AASHTO Roadside Design Guide presents information on the latest state-of-the-practice in roadside safety. It presents procedures to determine a recommended minimum clear zone on tangent sections of roadway with variable side slopes and adjustments for horizontal curvature. The AASHTO A Policy on Geometric Design of Highways and Streets (Green Book) enumerates a clear zone value for two functional classes of highway. For local roads and streets, a minimum clear zone of 7 to 10 feet is considered desirable on sections without curb. In the discussion on collectors without curbs, a 10-foot minimum clear zone is recommended. The general discussion on Cross-section Elements also indicates a clear zone of 10 ft. for low-speed rural collectors and rural local roads should be provided.

What is the definition of horizontal clearance?

Horizontal clearance is the lateral offset distance from the edge of the traveled way, shoulder or other designated point to a vertical roadside element. These dimensional values are not calculated, and are not intended to constitute a clear zone. They are intended to provide a roadside environment that is not likely to have an adverse affect on motorists using the roadway. These lateral offsets provide clearance for mirrors on trucks and buses that are in the extreme right lane of a facility and for opening curbside doors of parked vehicles, as two examples.

What are some examples of roadside elements requiring horizontal clearance?

Curbs, walls, barriers, piers, sign and signal supports, mature trees, landscaping items, and power poles are primary examples of the type of features that can affect a driver's speed or lane position if located too close to the roadway edge. Other specific examples can be found in the Cross Section Elements, Local Roads and Streets, Collector Roads and Streets, Rural and Urban Arterials, Freeways, and Intersections chapters of the Green Book. The AASHTO A Policy on Design Standards - Interstate System also contains a discussion on horizontal clearance in the section Horizontal Clearance to Obstructions.

For additional information on clear zones please go to: https://safety.fhwa.dot.gov/roadway_dept/coun-termeasures/safe_recovery/clear_zones/

FHWA Accelerating Safety Activities Programs in Tennessee

By Airton G. Kohls

The University of Tennessee Center for Transportation Research presented a series of five free workshops in Tennessee where participants discussed the use of the Leading Pedestrian Interval (LPI) and the importance of Clearance Intervals at signalized intersections.

Sponsored with a grant from FHWA's Accelerating Safety Activities Program, the workshops were presented in Chattanooga, Johnson City, Franklin, Memphis and Knoxville. A total of 77 people from 30 different government agencies and 11 different consulting firms participated in a collaborative round table discussion on how to improve intersection safety using LPIs and appropriate traffic signal clearance intervals.

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The workshops were structured to instigate discussion by presenting videos of typical problems encountered at signalized intersections. First, the conflicts generated by vehicular traffic and vulnerable road users (pedestrians and bicyclists), promoted a dialogue on human behavioral issues, like the lack of attention to traffic control devices and non-yielding actions. Current research on LPIs informed participants of necessary considerations before and after applications, and videos from deployments in Sevierville and Chattanooga illustrated the Leading Pedestrian Interval concept. Later, the use of the ITE (Institute of Transportation Engineers) formula to calculate traffic signal clearance intervals, as well as detailed parameter recommendations were presented. Overall, the feedback from the presentations were very positive with agencies and consultants being appreciative of the effort and encouraging a similar 3-hour workshop format in the future.

Finally, we would like to recognize Jessica Rich from FHWA Tennessee Division Office, Kenneth Doyle from the city of Chattanooga, Anthony Todd from Johnson City, Adam Moser from the city of Franklin, Randall Tatum from the city of Memphis, Eric Itzel, Bryon Fortner and Joseph Dodgen from the city of Sevierville, Steve Bryan from TDOT and the Tennessee Traffic Signal Users Group (TTSUG) that collaborated to the success of this effort.

Before I go, here are some statistics and recommendations presented on a set of informational cards we prepared for these workshops:



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Sources:
 NCHRP Report 731, "Guidelines for Timing Yellow and All-Red Intervals at Signalized Intersections".
 FHWA and A. C. Fayish and F. Gross, "Safety Effectiveness of Leading Pedestrian Intervals Evaluated by a Before-After Study with Comparison Groups", *Transportation Research Record 2198* (2010).

What is LPI?

A leading pedestrian interval (LPI) gives pedestrians the opportunity to enter an intersection 3-7 seconds before vehicles are given a green indication. This “Advance Walk” indication allows pedestrians to establish a presence in the crosswalk, thereby increasing their visibility to drivers and potentially reducing conflicts with turning vehicles.

Recommendations for LPI implementation:

- Consider historical vehicle-pedestrian crash records, reported visibility issues, reported vehicle non-yielding behavior, and traffic and pedestrian volume;
- Evaluate potential increase in vehicular delay caused by LPI implementation. An LPI should be carefully considered if significant delay or congestion will be introduced;
- Consider implementation of an LPI for the whole day or on a time-of-day basis;
- Consider installing both static and blank-out “NO TURN ON RED” signs or “TURNING VEHICLES YIELD TO PEDESTRIANS” signs to enhance the effectiveness of the implementation;
- Educational and outreach activities also should be considered to allow the public to become familiar with the new LPI implementations;
- Field observations and evaluations are necessary after LPI implementation and adjustments should be applied to maximize LPI safety effectiveness and utilization.

Sources:

P. Ling, Z. Wang, C. Chen, R. Guo, Z. Zhang, “Development of Statewide Guidelines for Implementing Leading Pedestrian Intervals in Florida” – USF Center for Urban Transportation Research (2017).

Participants from:
Chattanooga
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Franklin
Memphis
Knoxville

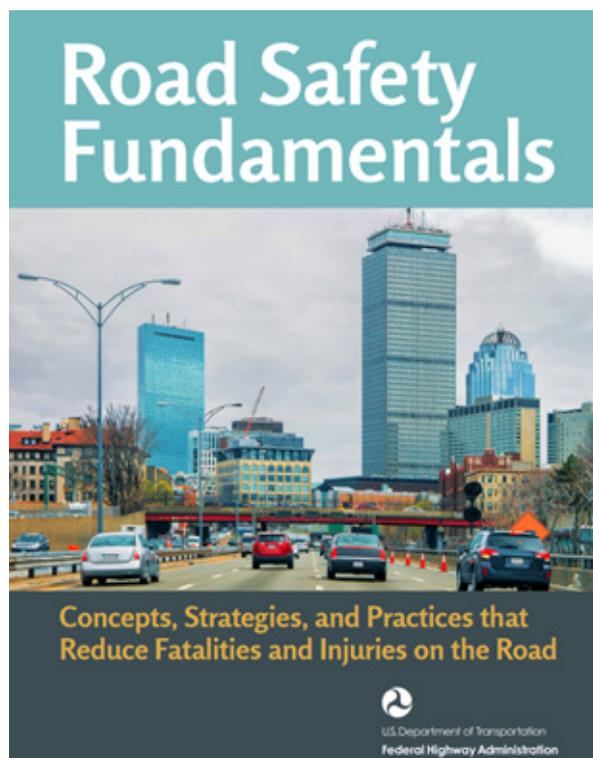


Road Safety Fundamentals

Source: FHWA

Here is a great FHWA resource for local agencies to introduce new hires to Road Safety. You can download it for free at https://rspcb.safety.fhwa.dot.gov/RSF/docs/Road_Safety_Fundamentals.pdf

This book provides an introduction to many of the fundamental concepts of road safety. These concepts cover areas such as the nature of road safety issues, human behavior in the road environment, and identifying and solving road safety problems. The goal of this book is to equip the reader with a broad base of knowledge about road safety. Thus, the focus of the text is in communicating concepts rather than providing instruction in detailed analysis procedures. This book is intended for those whose job addresses some aspect of road safety, particularly in a public agency setting. This is especially relevant for individuals who have been tasked with managing road safety but who do not have formal training in road safety management. In order to show practical applications of each road safety concept, this book contains many examples that demonstrate the concepts in real-world settings. There are 5 different learning units with a total of 16 chapters and several sample exercises: Foundations of Road Safety, Human Behavior and Road Safety, Measuring Safety, Solving Safety Problems and Implementing Road Safety Efforts. As a final note, this book is intended to lay the foundation of road safety knowledge regardless of a particular discipline. Professionals with a background in engineering, planning, public health, law enforcement, and other disciplines will benefit from the concepts presented here.



TTAP Email Communications List

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RoadTalk is a publication of the Tennessee Transportation Assistance Program (TTAP). TTAP is part of a nationwide Local Technical Assistance Program (LTAP) financed jointly by the Federal Highway Administration (FHWA) and Tennessee Department of Transportation (TDOT).

The views, opinions, and recommendations contained within this newsletter are those of the authors and do not necessarily reflect the views of FHWA and TDOT.

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