Proven Safety Countermeasures – Safety Benefits at a Lower Cost

Small roadway improvements can make a significant difference in preventing crashes and protecting road users. Across Connecticut, communities are implementing proven, low-cost safety countermeasures that deliver measurable safety benefits without requiring major roadway reconstruction. While the roundabouts we discussed in last month's *Safety Matters* article often receive attention for their effectiveness, many other affordable solutions can dramatically improve safety on local roads and can be implemented today.

Enhanced Delineation for Horizontal Curves

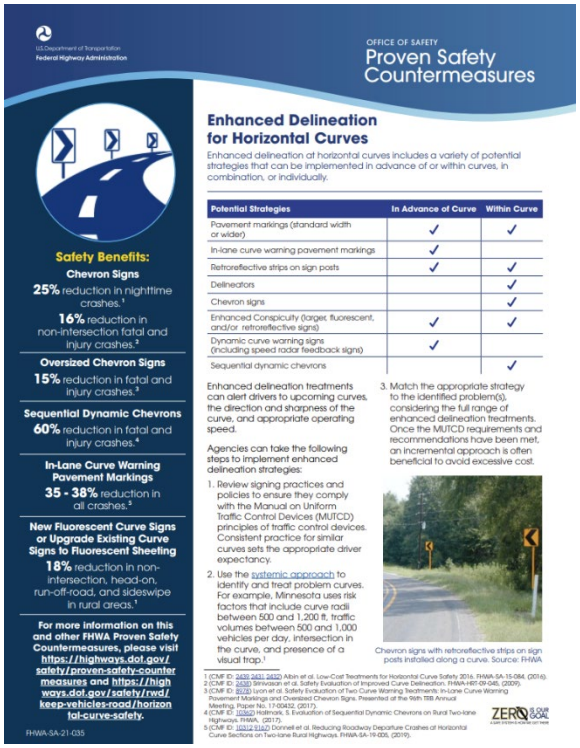
Roadway departure crashes remain one of the leading causes of fatal and serious injuries on Connecticut roadways. Many of these crashes occur when drivers fail to recognize or properly navigate a curve ahead. Fortunately, relatively inexpensive treatments can significantly improve driver awareness and reduce the risk of crashes.

Proven Improvements

- Chevron Alignment Signs
- Retroreflective Signpost Strips
- Curve Ahead Warning Pavement Markings
- Enhanced Nighttime Visibility

These treatments help drivers:

- Recognize curves sooner
- Understand the curve direction
- Adjust speeds appropriately
- Navigate safely during nighttime and adverse weather conditions


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Proven Safety Countermeasures

Enhanced Delineation for Horizontal Curves

Enhanced delineation at horizontal curves includes a variety of potential strategies that can be implemented in advance of or within curves, in combination, or individually.

Potential Strategies	In Advance of Curve	Within Curve
Pavement markings (standard width or wider)	✓	✓
In-lane curve warning pavement markings	✓	
Retroreflective strips on sign posts	✓	✓
Delineators		✓
Chevron signs		✓
Enhanced Conspicuity (larger, fluorescent, and/or retroreflective signs)	✓	✓
Dynamic curve warning signs (including speed radar feedback signs)	✓	
Sequential dynamic chevrons		✓

Enhanced delineation treatments can alert drivers to upcoming curves, the direction and sharpness of the curve, and appropriate operating speed.

Agencies can take the following steps to implement enhanced delineation strategies:

1. Review signing practices and policies to ensure they comply with the Manual on Uniform Traffic Control Devices (MUTCD) principles of traffic control devices. Consistent practice for similar curves sets the appropriate driver expectancy.
2. Use the systemic approach to identify and treat problem curves. For example, Minnesota uses risk factors that include curve radii between 500 and 1,200 ft, traffic volumes between 500 and 1,000 vehicles per day, intersection in the curve, and presence of a visual trap.[1]
3. Match the appropriate strategy to the identified problem(s), considering the full range of enhanced delineation treatments. Once the MUTCD requirements and recommendations have been met, an incremental approach is often beneficial to avoid excessive cost.

Chevron signs with retroreflective strips on sign posts installed along a curve. Source: FHWA

Safety Benefits:

Chevron Signs
25% reduction in nighttime crashes.[1]
16% reduction in non-intersection fatal and injury crashes.[2]

Oversized Chevron Signs
15% reduction in fatal and injury crashes.[3]

Sequential Dynamic Chevrons
60% reduction in fatal and injury crashes.[4]

In-Lane Curve Warning Pavement Markings
35 - 38% reduction in all crashes.[5]

New Fluorescent Curve Signs or Upgrade Existing Curve Signs to Fluorescent Sheeting
18% reduction in non-intersection, head-on, run-off-road, and sideswipe in rural areas.[1]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://highways.dot.gov/safety/proven-safety-countermeasures and https://highways.dot.gov/safety/rwd/keep-vehicles-road/horizontal-curve-safety.

FHWA-SA-21-035

1 (CMF ID: 3439, 3431, 3432) Albin et al. Low-Cost Treatments for Horizontal Curve Safety 2016. FHWA-SA-15-084. (2016).
2 (CMF ID: 3430) Srinivasan et al. Safety Evaluation of Improved Curve Delineation. FHWA-HRT-09-045. (2009).
3 (CMF ID: 9078) Lyon et al. Safety Evaluation of Two Curve Warning Treatments: In-Lane Curve Warning Pavement Markings and Oversized Chevron Signs. Presented at the 96th TRB Annual Meeting. Paper No. 17-00452. (2017).
4 (CMF ID: 10363) Hallmark, S. Evaluation of Sequential Dynamic Chevrons on Rural Two-lane Highways. FHWA. (2017).
5 (CMF ID: 10312, 9167) Donnell et al. Reducing Roadway Departure Crashes at Horizontal Curve Sections on Two-lane Rural Highways. FHWA-SA-19-026. (2019).

ZERO FATALITIES GOAL

Success Story: Kozley Road in Tolland, CT

Before



LARGE CURVE WITH LIMITED VISUAL GUIDANCE

After



CHEVRON SIGNS AND ENHANCED DELINEATION

Result: Improved driver guidance, especially during nighttime conditions, with a low-cost safety investment.

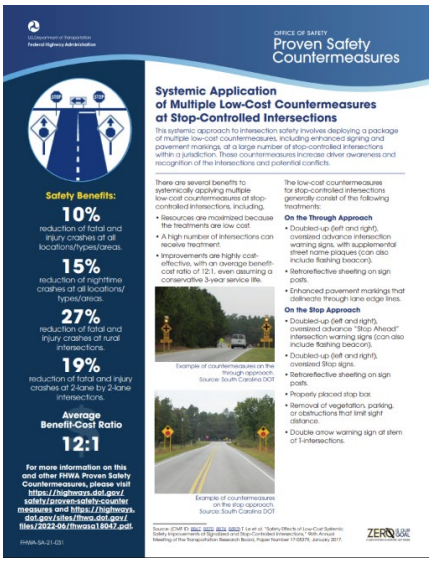
Improving Safety at Stop-Controlled Intersections

Multiple Low-Cost Countermeasures Working Together

Many crashes and near misses occur because drivers fail to recognize an upcoming stop condition. Rather than relying on a single treatment, we've learned that combining several low-cost countermeasures can maximize driver awareness and prevent crashes.

Recommended Enhancements

Advanced Warning	At the Intersection
Stop Ahead Signs	Double Stop Signs
Additional Sign Placement	Retroreflective Post Strips
Flashing Beacons	Highly Visible Stop Bar
Vegetation Management	Improved Sign Visibility



Why It Works

These enhancements:

- Increase sign visibility
- Improve driver expectancy
- Reduce missed stop conditions
- Help prevent severe angle crashes
- Improve nighttime recognition and compliance

Quick Safety Wins for Any Community

Many of these improvements can be:

- Installed quickly
- Implemented systemically
- Applied at multiple locations
- Completed with limited budgets
- Maintained using existing staff

Key Takeaways

Not every safety improvement requires a major construction project. Enhanced curve delineation and upgraded stop-controlled intersections demonstrate how relatively modest investments can generate substantial safety benefits for all road users. Connecticut communities can improve safety today by implementing these proven, low-cost countermeasures where they are needed most. To learn more about these countermeasures and many more, please visit FHWA's Proven Safety Countermeasure webpage.

References:

1. FHWA Proven Safety Countermeasures
2. FHWA Enhanced Delineation for Horizontal Curves
3. FHWA Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections

For more information and assistance with local road safety in your community, contact Jason Hughes, Safety Technical Associate, at jason.hughes@uconn.edu or Shawn Barry, Safety Technical Associate, at shawn.barry@uconn.edu.

Training & Technical Assistance Center
CT TRANSPORTATION INSTITUTE
UNIVERSITY OF CONNECTICUT
T2Center.uconn.edu

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