NCHRP 17-113 COUNTERMEASURES

Urban Signalized With Vertical Approach Deflections

SPEEDING

A "vertical approach deflection" in the context of urban signalized intersections refers to a traffic calming measure that uses physical changes in the road's vertical profile to encourage drivers to slow down.

Implementation Strategy

How and Where to Apply

- Apply at busy urban intersections near schools, transit stops, or downtowns to reduce speeds and enhance pedestrian safety.
- Use during safety upgrades where crashes or speeding are common, ensuring drainage, ADA access, and emergency vehicle compatibility.
- The **FHWA** states that this marking can be used "Recommended for high-pedestrian urban intersections, especially near schools or transit zones, to enforce speed control and prioritize pedestrian safety at signalized locations."

Use in a Safe System Approach

Consistent with the Safe System Approach, vertical approach deflections are recommended at signalized urban intersections with high pedestrian activity such as near schools or transit stops to reduce vehicle speeds, minimize crash severity, and enhance pedestrian safety by creating a more forgiving and speed-managed environment.

Key Stakeholders

State and local transportation agencies, municipal public works departments, utility companies

Proactive Implementation

Proactive implementation of vertical approach deflections at signalized urban intersections supports the Safe System Approach by reducing vehicle speeds before crashes occur. Prioritizing areas with high pedestrian activity—such as school zones and transit corridors—helps prevent severe outcomes, improves yielding behavior, and enhances overall safety for vulnerable road users.

Countermeasure Overview

Objective: Keep vehicles from encroaching into opposite lane.

Strategy: Provide center two-way left-turn lanes for four- and two-lane roads.

Selected Related Countermeasures

- CM1 Raised Crosswalks
- CM2 High-Visibility Crosswalk Markings
- CM3 Signal Timing Adjustments

Cost: High

Service Life: 20 years

Targeted Solution

CONTRIBUTING FACTORS	▪ Failure to recognize traffic signals ▪ Abrupt braking
TARGET CRASH TYPE	▪ Intersection-related
ROAD FACILITY TYPE	▪ N/A
AREA TYPE	▪ Urban

Safety Linkage

NCHRP 500 Series	SAFE SYSTEM APPROACH
Speeding-related Crashes	Safe Speed
AASHTO'S TOWARD ZERO DEATHS	SAFE SYSTEM ROADWAY DESIGN
Safer Infrastructure	Tier 2

TIER 1
TIER 2
TIER 3
TIER 4

Walkways. Source: Bolton & Menk

Safety Benefits

Slows vehicles before intersections, increasing safety for all users.

Resources

- Pedestrian Safety Guide and Countermeasure Selection System, FHWA