NCHRP 17-113 COUNTERMEASURES

Protected/Permissive to Protected-only Left Turn Phasing

INTERSECTIONS

Switching from protected/permissive to protected-only left-turn phasing improves safety by eliminating yield-based turns, reducing conflicts with opposing traffic.

Implementation Strategy

How and Where to Apply

- Use at intersections with high left-turn crash rates, limited sight distance, or complex traffic patterns where permissive turns create safety risks.
- Reprogram traffic signals to remove the permissive phase and allow left turns only during a protected green arrow, ensuring proper signal timing and clearance intervals per MUTCD standards.

Use in a Safe System Approach

Converting to protected-only left-turn phasing supports the SSA by improving road design (Safe Roads) to eliminate risky crossing conflicts, reduce crash severity, and create a more predictable, controlled intersection environment. This also supports safer road user behavior (Safe Road Users) by clarifying turning movements and minimizing decision complexity.

Key Stakeholders

Agency maintenance personnel, DOT, Active road users

Proactive Implementation

Proactive implementation involves reviewing intersections with a history of left-turn crashes or complex traffic patterns. Planners and engineers should use crash data and signal timing records to identify sites where permissive phasing creates safety risks. By converting to protected-only left-turn phases before severe crash patterns emerge, agencies can reduce risky turning conflicts, improve intersection safety, and provide more consistent, predictable operations for all road users.

Countermeasure Overview

Objective: Reduce the frequency and severity of intersection conflicts through geometric design improvements

Strategy: Restrict or eliminate turning maneuvers by signing

Targeted Solution

CONTRIBUTING FACTORS	▪ Misjudgment ▪ Driver indecision with complex signal phasing
TARGET CRASH TYPE	▪ Left turn
ROAD FACILITY TYPE	▪ Not specified
AREA TYPE	▪ All

Safety Linkage

NCHRP 500 Series

Signalized Intersection

AASHTO'S TOWARD ZERO DEATHS

Safer Infrastructure

SAFE SYSTEM APPROACH

Safe Road

SAFE SYSTEM ROADWAY DESIGN

TIER 1
TIER 2
TIER 3
TIER 4

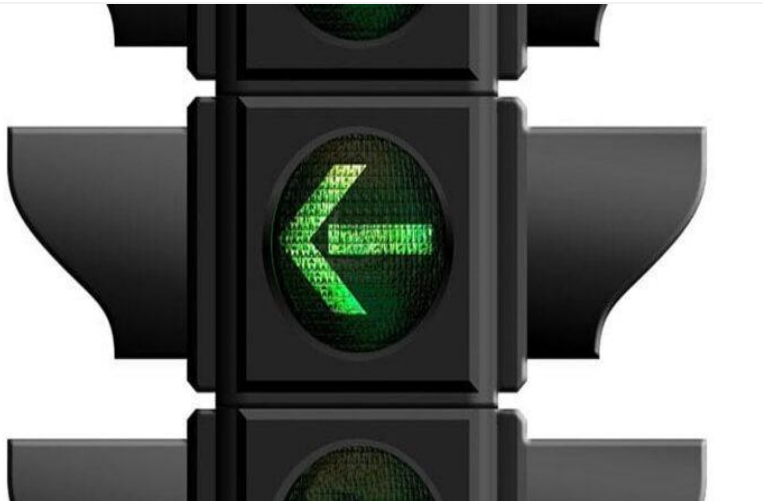
Tier 3

Selected Related Countermeasures

- CM1 Split phasing at intersections
- CM2 Leading pedestrian intervals (LPI)
- CM3 Dedicated left-turn lanes with signalization

Cost: $(Low)

Service Life: 10 years



Protected left turn facing. Source: Driversprep.com

Safety Benefits

100%

Reduce angle crashes across all types of crash severities[1]

[1] CMF ID: 2326

Resources

- FHWA Safety Research