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.
- Best suited for intersections with high left-turn volumes or crash history; avoid where added signal phases could create excessive delay or diversion without complementary improvements.

Use in a Safe System Approach

Converting permissive left turns to protected-only phasing supports the Safe Roads element by accommodating human mistakes and vulnerabilities in judgment gaps. Signal control provides redundancy and reinforces that death and serious injuries are unacceptable.

Key Stakeholders

State DOTs, MPOs, traffic engineers, pedestrian advocacy groups, engineering consultants, community associations.

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.

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

Targeted Solution

CONTRIBUTING FACTORS	▪ Misjudgment of safe gaps for turns ▪ Driver indecision with complex signal phasing
TARGET CRASH TYPE	▪ Left turn
ROAD FACILITY TYPE	▪ N/A
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

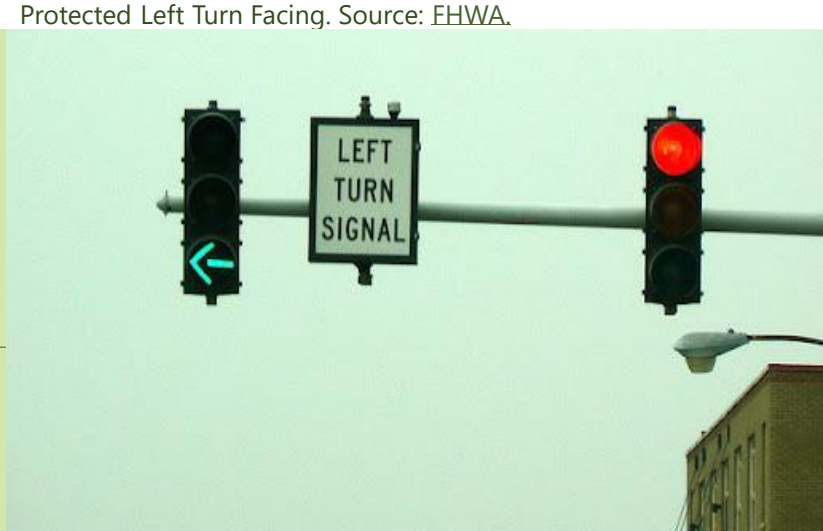
Safety Benefits

76% Reduces left-turn crashes for K, A, B, C severities on urban roads (CMF ID: 11163)

43% Reduces crashes for all types and K, A, B, C severities on urban roads (CMF ID: 10746)

Resources

- Advantages of Protected and Protected/Permissive Left-Turn Phasing



Protected Left Turn Facing. Source: FHWA.