NCHRP 17-113 COUNTERMEASURES

PEDESTRIANS AND BICYCLISTS

Bicycle Signals

It uses pavement-embedded sensors to detect cyclists and display a countdown timer, providing a clear, bicycle-specific green phase reducing conflicts.

Implementation Strategy

How and Where to Apply

- Use at intersections with high bicycle volumes, turning vehicle conflicts, or complex geometry, especially where standard signals fail to address cyclist safety needs.
- Prioritize areas with protected bike lanes, schools, transit hubs, or commercial zones to reduce cyclist delay, increase compliance, and improve predictability.
- Best suited for busy urban intersections with heavy bike traffic, where sensors and timers reduce cyclist-vehicle conflicts and improve safety. Avoid where low-traffic rural or suburban areas with few cyclists, as sensors and signals add unnecessary costs and complexity.

Use in a Safe System Approach

Bicycle signals with sensors and timers support the Safe Roads pillar of the Safe System Approach. They reduce cyclist-vehicle conflicts by managing traffic flow, addressing human errors and vulnerabilities to prevent crashes and injuries.

Key Stakeholders

State and local transportation agencies, urban planners and traffic engineers, cyclists and bicycle advocacy groups, local government and elected officials.

Proactive Implementation

Proactive implementation involves integrating cyclist-specific phases and detection systems during intersection upgrades or new projects before crashes occur. This includes automated detection (e.g., inductive loops or cameras), optimized signal timing, and clear signal visibility, guided by cyclist movement data and aligned with broader initiatives like Vision Zero and Complete Streets programs.

Countermeasure Overview

Objective: Reduce bicycle crashes at intersections.

Strategy: Improve signal timing and detection.

Cost: $$$ (Moderate to High)

Service Life: 10 years

Selected Related Countermeasures

- CM1 Protected Intersection
- CM2 Convert Traditional or Flush Buffered Bike Lane to SBL with Flexi-posts
- CM3 Intersection Conflict Warning Systems

Targeted Solution

CONTRIBUTING FACTORS	▪ Failure to yield ▪ Lack of prioritization for bicycles
TARGET CRASH TYPE	▪ Failure to yield
ROAD FACILITY TYPE	▪ N/A
AREA TYPE	▪ Urban

Safety Linkage

NCHRP 500 Series

Pedestrians and Bicyclists

AASHTO'S TOWARD ZERO DEATHS

Safer Vulnerable Users

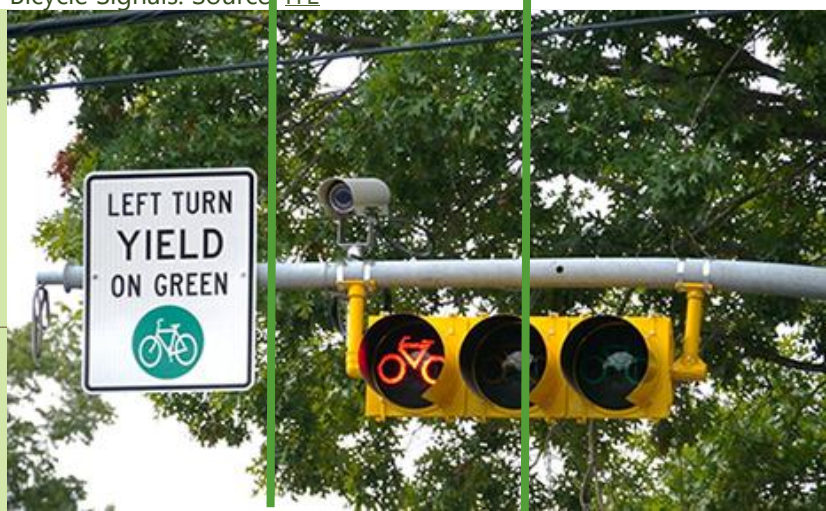
SAFE SYSTEM APPROACH

Safe Road Users

SAFE SYSTEM ROADWAY DESIGN

TIER 1
TIER 2
TIER 3
TIER 4

Tier 3



Bicycle Signals. Source: ITE

Safety Benefits

Provides separate signal phases for cyclists, reducing conflicts with vehicles.

Resources

- The Dutch Approach to Bicycle Mobility, FHWA, 2017
- Safe System Approach, FHWA