Learning Objectives

• Understand why intersection safety countermeasures are critical in reducing fatalities and serious injuries.

• Identify the safety benefits of each safety countermeasure in reducing crashes.

• Case study on roundabouts in Scott County, Minnesota
Principles of Intersection Safety

Ped and Bike Fatalities in USA, 2014 - 2018

Source: NHTSA FARS
Intersection Safety Countermeasures

• Roundabouts
• Backplates with Retroreflective Borders
• Leading Pedestrian Intervals
• Yellow Change Interval
• Reduced Left-Turn Conflict Intersections

Roundabouts

• An effective option for:
  – Managing speed
  – Transitioning traffic from high-speed to low-speed environments.
  - Reducing number and severity of crashes.

Source: https://safety.fhwa.dot.gov/provencountermeasures/
Backplates with Retroreflective Borders

- Improves visibility during:
  - Inclement weather
  - Dusk, dawn and dark conditions
  - During power outages.

Safety Benefit: Up to 15% reduction in total crashes.

Source: https://safety.fhwa.dot.gov/provencountermeasures/
Day vs. Night-time Visibility of Signal Heads without Retroreflective Borders

Factors that Impact Timing Calculation:
- Speed of approaching vehicles
- Driver perception-reaction time
- Vehicle deceleration rates
- Intersection width
- Roadway approach grades

Source: https://safety.fhwa.dot.gov/provencountermeasures/
Yellow Change Interval (YCI)

- Effects of Change Intervals on safety;
  - Studies show an increase in YCI duration to ITE guidelines reduces red-light running by 36% to 50%.
  - Setting change intervals to ITE guidelines reduces total crashes by 8% to 14% and injury crashes by approx. 12%.
  - A possibility of an increase in rear-end crashes when YCI durations are increased.

Source: NCHRP report 731

Reduced Left-Turn Conflict Intersections

- Geometric designs that alter left-turn movements to minimize the potential for angle related crashes.

- There are two highly effective designs;
  - Restricted crossing U-turn (RCUT) intersections
  - Median U-turn (MUT) intersections.
Reduced left-turn conflict intersections

**Restricted Crossing U-turn (RCUT)**

- Modifies the direct left-turn and through movements from cross-street approaches.
- Minor road through and left-turn movements are re-routed to downstream U-turns on major road.
- Treatment of major road movement is optional.

Source: [https://safety.fhwa.dot.gov/provencountermeasures/](https://safety.fhwa.dot.gov/provencountermeasures/)
Reduced left-turn conflict intersections

• **Restricted Crossing U-turn (RCUT)**
  - Suitable for rural, high-speed, four-lane, divided highways or signalized routes.
  - An alternative to signalization or constructing an interchange.
  - Works well when consistently used along a corridor, but also effective at individual intersections.
  - Safety Benefit: Up to 54% reduction in injury and fatal crashes.

Source: [https://safety.fhwa.dot.gov/preventcountermeasures/](https://safety.fhwa.dot.gov/preventcountermeasures/)

Median U-turn (MUT)

• Major road LT is re-routed to downstream U-turns on major road.

• Minor road LT is routed to downstream U-turns on major road.

• Improves Signal phasing/timing advantages at signalized intersections
Reduced left-turn conflict intersections

Median U-turn (MUT)

- Excellent choice for heavily traveled intersections with moderate left-turn volumes.
- Reduces delay, improve travel times, and create more crossing opportunities for pedestrians and bicyclists
  - When implemented at multiple intersections along a corridor
- Safety Benefit: Up to 30% reduction in intersection-related injury crash rate.

Source: https://safety.fhwa.dot.gov/provencountermeasures/

Case study- Scott Co, MN

- Converted a two-way STOP control on CR 2 (ADT=4,300) Intersecting with SH 13 (ADT= 4,650) in Scott County, MN to a Roundabout.
  - PROBLEM: Both rural roads have 55 mph speed limits, with 2 fatal crashes and 50 injury crashes in a 5-yr period.
  - SOLUTION:

  ![Diagram showing reduced conflict points from two-lane standard intersection to two-lane roundabout](https://example.com)

  - 32 Veh Conflict points reduced to 8 Veh Conflict points

Source: FHWA Roundabouts: An informational Guide
Case study - Scott Co, MN

- Crash reduction results were based on a B-A study, periods were approximately 36 and 24 months respectively.

<table>
<thead>
<tr>
<th>Location</th>
<th>Implementation Date</th>
<th>Before</th>
<th>After</th>
<th>Reduction in Crashes per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Highway 13 and County Road 2</td>
<td>August 05</td>
<td>36</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

Resources

- [http://safety.fhwa.dot.gov/provencountermeasures](http://safety.fhwa.dot.gov/provencountermeasures)
1. Roadway approach grades does not impact Yellow Change Interval timing calculation
   1. TRUE
   2. FALSE?
   Correct Answer: FALSE

2. A roundabout can reduce severe crashes by up to
   A. 50%
   B. 60%
   C. 75%
   D. 90%
   Answer: D