REDUCED CONFLICT U-TURN (RCUT) INTERSECTION

Fact Sheet

OVERVIEW

RCUTs are an innovative intersection design that improves safety by reducing the vehicle conflicts while simplifying the decision process when drivers are approaching an intersection. Intersections are planned points of conflict within a roadway system. Each conflict point includes some level of risk which can lead to crashes. Crossing conflicts between two traffic streams have an increased potential for right-angle crashes which often lead to severe and fatal injuries. Compared to conventional intersections, RCUT intersections include significantly fewer crossing conflicts. Additionally, RCUT's provide more distance between conflict points, which provides drivers more space and time to perceive and react to potential safety issues. **Figure 1** below is an image of a rural unsignalized RCUT.

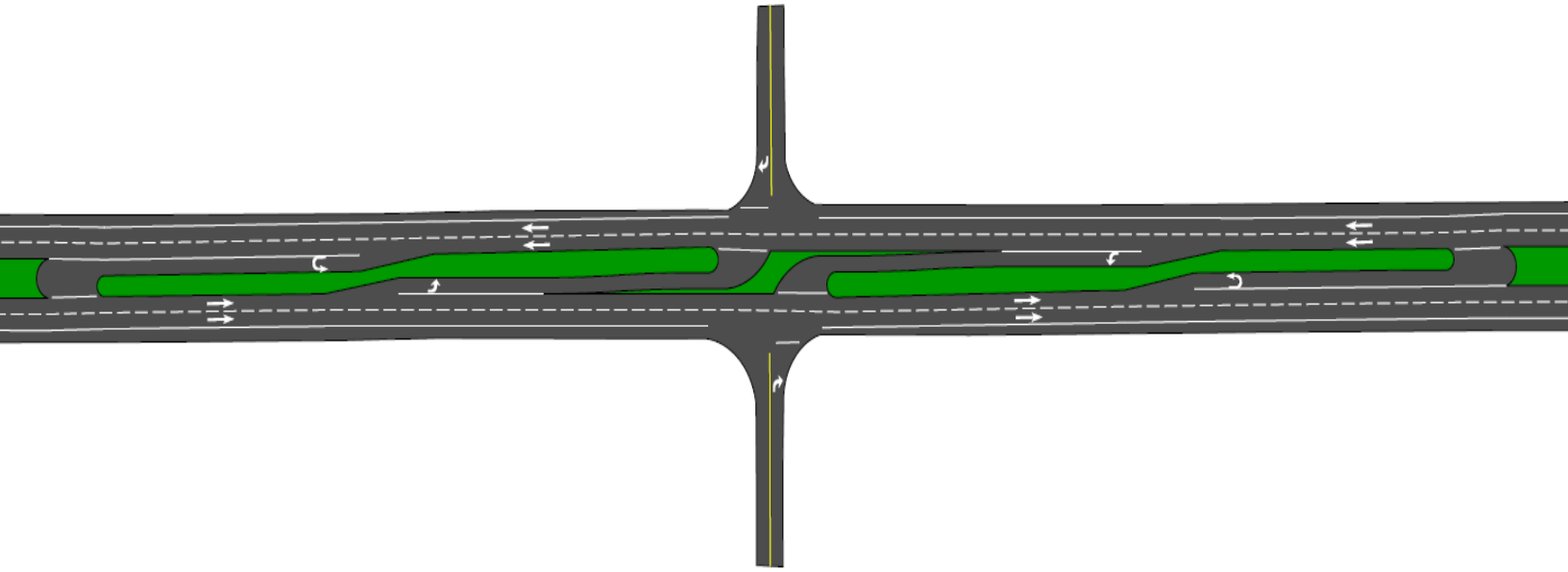


Figure 1. R-CUT Intersection Concept

What do we need to know?

Benefits

- Reduce conflicts
- Reduce severity of crashes
- Reduce all crashes up to 87%*
- Reduce fatal crashes up to 100%*
- Reduce travel time

Considerations

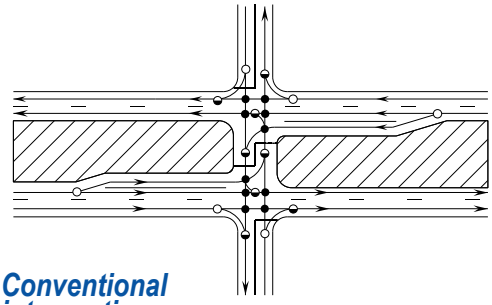
- Evaluate weaving when setting the distance to the U-turns.
- Evaluate gaps to assess need for acceleration lanes or
- signalization.
- Evaluate the need for raised medians.
- Engage with public on how to drive.

**Source: FHWA Proven Safety Countermeasure: Reduce Left-Turn Conflict Intersections*

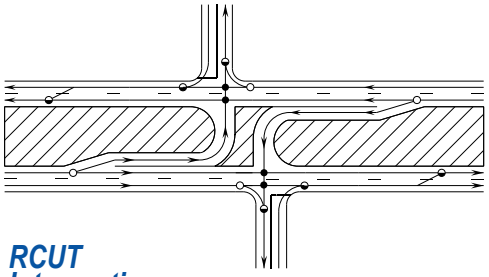
CONFLICT

Figure 2 contains images of a conventional intersection and a RCUT intersection along with various options for the U-turn portion. RCUT's require a downstream U-turn movement to accommodate through and leftturn movements from the lower traffic volume sidestreets. Generally, there are four types of U-turns based on the width of the median and the roadway design vehicle. **Figure 2** includes a diagram with a comparison of conflict points for each type. When a driver approaches a conventional four-legged intersection to make a left-turn, at least two different directions of traveling vehicles must be assessed while making a turn. The driver must assess the opposing direction traffic and the crossing traffic. With an RCUT, the driver only needs to consider one direction of traveling vehicles at a time, such as the opposing direction vehicles for left-turns. Depending on the U-turn type, they will have a variation of diverge, merge, or additional crossings.

Figure 2. RCUT Conflcit Point Comparison with Table

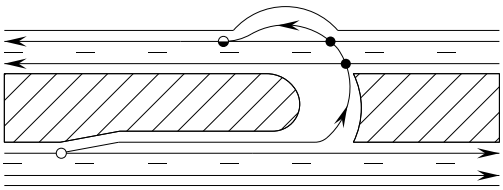


Conventional intersection

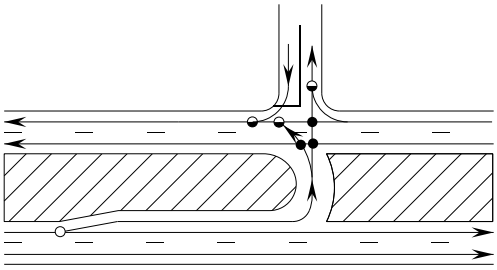


RCUT Intersection

Median area
Crossing
Merging
Diverging
Traffic Flow



Option A - Narrow Median
Requires outside shoulder windening, or loon



Option B - U-Turn at Intersection
Align it with an existing side street adds flexibility to the placement

Conflict	INTERSECTION		RCUT DOWNSTREAM U-TURN OPTION	
	Traditional	RCUT	A	B
◯ Diverging	6	4	1	1
◓ Merging	8	6	1	2/1
● Crossing	10	4	2	1/2

DESIGN

The geometry of a RCUT intersection introduces unique design elements that are not typically present at a conventional intersection. The following items should be considered during design:

Intersection Geometry RCUT's may have three or four approaches. Channelization of turning movements with raised medians, pavement marking, and striping will provide guidance through the intersection, improve traffic flow and reduce unsafe, prohibited turning movements. See **Figures 4-6** for sample intersection layouts and channelization. Ensure there is sufficient intersection sight distance for all turning movements.

Intersection Capacity Generally, RCUT's are not effective at intersections of two major arterials. **Figure 3** shows conditions where unsignalized and signalized RCUT's may be feasible. For non-signalized or unprotected turning movements, verify there are sufficient gaps in apposing traffic movements at the RCUT and the downstream U-turn. Account for larger gaps needed for the project design vehicle (assume WB-67 unless determined otherwise).

U-turn Placement & Design The placement of a downstream U-turn movement needs to consider the intersection control, sightlines, roadway geometry, and vehicle dynamics. If there is a free-right movement from a minor approach, the spacing between the RCUT and the U-turn must account for acceleration, weaving across mainlane traffic, deceleration, and U-turn storage. See the TxDOT RDM Tables 3-12 and 3-13 for required distances. Weaving analysis is recommended for congested conditions. For signalized or stop controlled right turns from a minor approach, the distance between the RCUT and the U-turn may be reduced, if there are sufficient gaps to cross mainlane traffic. The opening for a U-turn may be placed across from a minor approach right turn. This configuration may significantly reduce intersection delay and diversion distance of minor street thru and left turn movements. If the U-turn must be located along a vertical grade, place the median crossover where the opposing traffic is on the uphill grade when possible. When considering Option D (see Table 2), evaluate the likelihood of conflicting movements between U-turns and right turns. This option is for low-volume cross-streets and locations that may be considered for traffic signals.

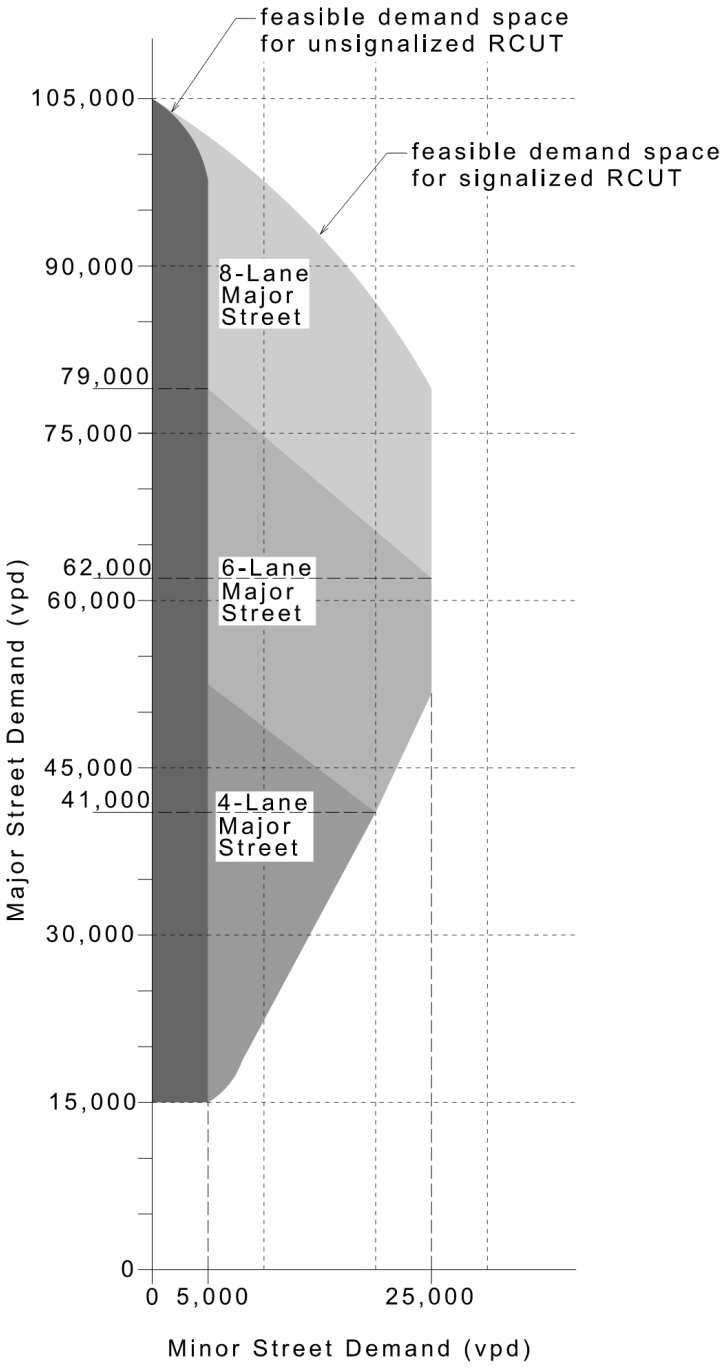


Figure 3. RCUT Traffic Demand Diagram
Source: RCUT Informational Guide, FHWA 8-2014

Texas RCUT Intersection Examples:

Signalized
- Bandera Rd at FM1560 (SAT)
- US281 at Mvustang Vista and Casey Rd (SAT)

Unsignalized
- US59 around Queens Row St (LFK)
- SH21 at FM60 (BRY)

SIGNING & STRIPING

Signing for RCUT's may vary by classification of the main route and crossroad as well as spacing between the intersection and downstream U-turns. Typically standard signs are used. Supplemental guide signs are recommended when minor leg approaches are on an arterial. See **Figures 4-6** for RCUT and U-turn signing examples.

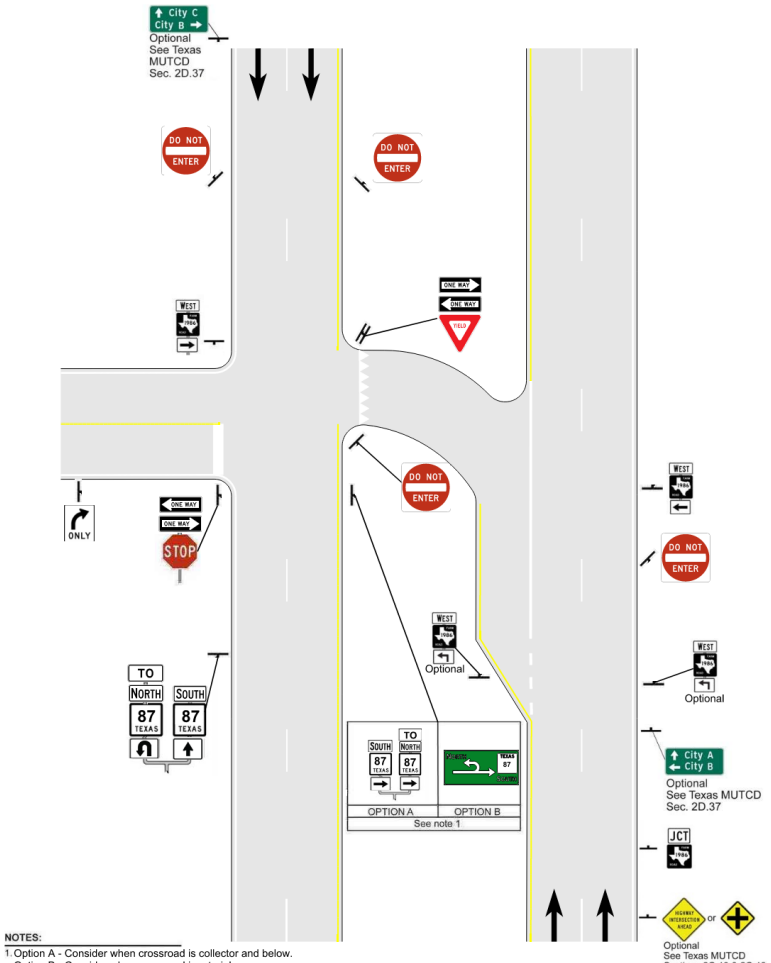
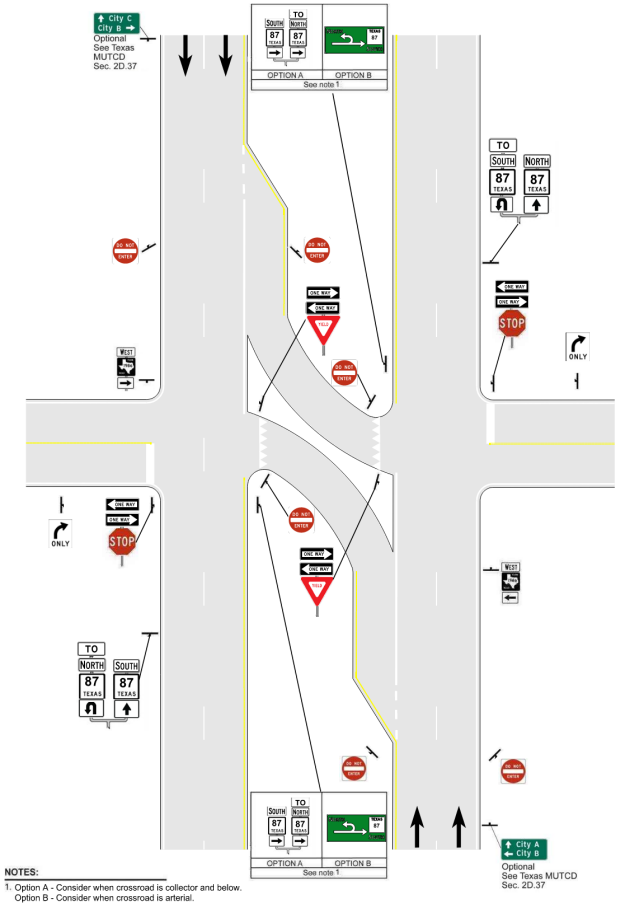


Figure 4. 3-Leg RCUT Signing



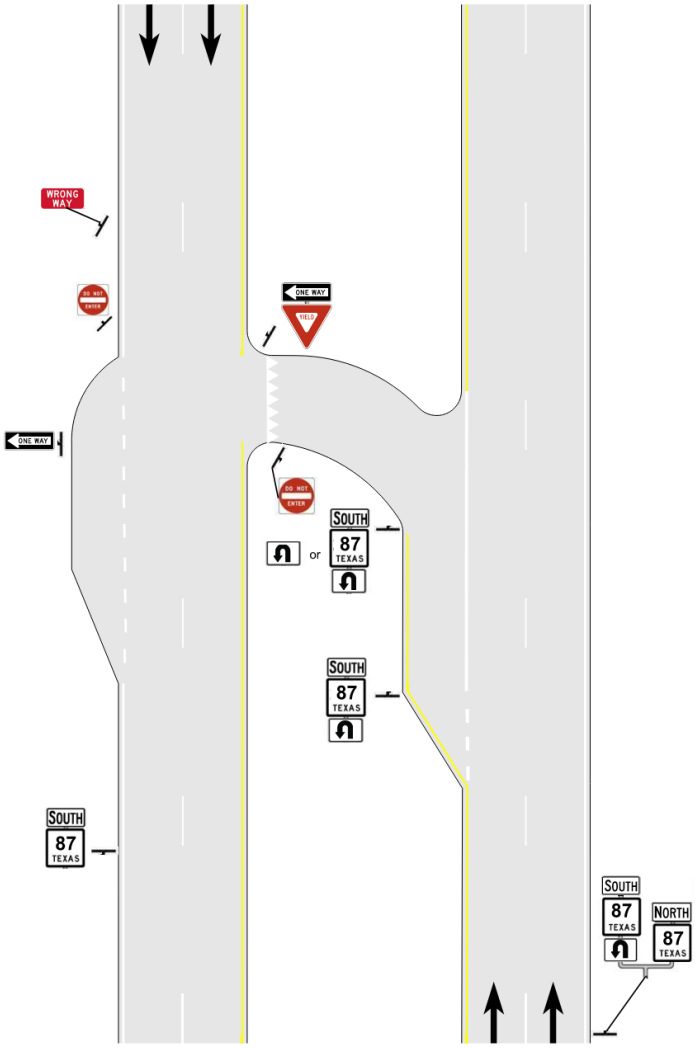


Figure 6. Downstream U-Turn Signing