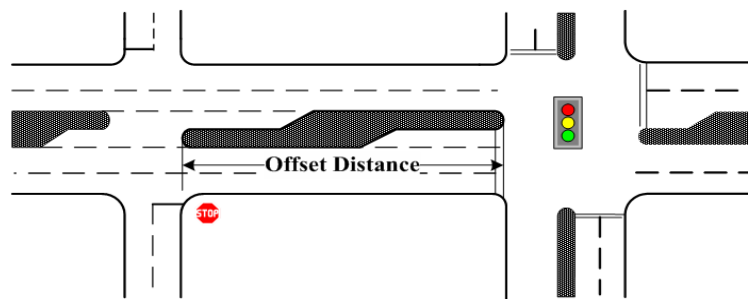


DETERMINATION OF THE OFFSET DISTANCE BETWEEN DRIVEWAY EXITS AND DOWNSTREAM U-TURN LOCATIONS FOR VEHICLES MAKING RIGHT TURNS FOLLOWED BY U-TURNS

PROBLEM STATEMENT

Florida increasingly uses restrictive medians and directional median openings on multi-lane highways to manage left turn egress maneuvers from driveways and side streets. By installing non-traversable medians and replacing full median openings with directional median openings at various locations, Florida prohibits direct left-turn exits onto some major arterials; hence, **Direct Left-Turn (DLT)** egress maneuvers from driveways or side streets are replaced by **Right Turn Followed by a U-Turn (RTUT)** maneuvers at downstream median openings or signalized intersections.

Several studies have been conducted to evaluate the safety and operational effects of using U-turns as alternatives to direct left-turns, but none have focused on the impacts of the offset distance (see diagram below) between driveway exits and downstream U-turn locations.



The offset distance is an important consideration for a driver deciding whether to make a RTUT or a DLT. A very short offset distance may lead to operational and safety characteristics somewhat similar to DLTs, and so discourage drivers from making RTUTs. On the other hand, an offset distance that is too great may result in a longer travel time and, thus, discourage drivers from making RTUTs. Thus, it would seem that the safety and operational performance of vehicles making RTUTs are highly correlated with the offset distance between the subject driveway and the downstream median opening or signalized intersection.

OBJECTIVES

The purpose of this research was to evaluate how the offset distance between driveway exits and downstream median openings or signalized intersections impacts traffic operational and safety performance. The primary objective is to determine optimum offset distances to facilitate driver use of RTUTs, specifically investigating (1) traffic operational performance, based on the evaluation of vehicle travel time at various offset distances, and (2) safety performance, based on the evaluation of traffic conflicts and crash data.

FINDINGS AND CONCLUSIONS

This study evaluated how the offset distance between driveway exits and downstream median openings or signalized intersections impacts the safety and operational performance of vehicles making right-turns followed by U-turns. The focus of this research was on urban or suburban multi-lane divided arterials. Researchers studied the impacts of offset distance under four different scenarios: 4-lane divided roadways accommodating U-turns at median openings, 4-lane divided roadways accommodating U-turns at signalized intersections, 6 or more-lane divided roadways accommodating U-turns at median openings, and 6 or more-lane divided roadways accommodating U-turns at signalized intersections.

To investigate traffic operational performance, researchers evaluated vehicle travel time at various offset distances, and to investigate safety performance, they evaluated traffic conflicts and crash data. Roadway segments with different offset distances between driveway exits and downstream U-turn locations were selected to conduct the performance analysis. Field measurements were taken at 68 selected sites in the Tampa Bay area using video cameras and other traffic data measurement systems. The relationships between offset distances, traffic operational performance, and traffic conflicts were developed based on the field data.

Researchers investigated the crash history of 192 roadway segments, developing and applying statistical models to determine the relationship between offset distance and crash rate. Researchers found that the crash and conflict rates at weaving sections decrease as the offset distances between driveway exits and downstream U-turn locations increase. The cumulative curves were plotted for the crash and conflict rates of all sample sites. The 50th percentile values of the crash and conflict rates were run through regression models developed in the study to determine the critical values of offset distance for vehicles making RTUTs under different roadway conditions. The underlying expectation is that the roadway segment with offset distance less than the critical value will have a crash rate greater than the average level.

The minimum offset distance recommended by this study was shown in the following table:

U-turn Location	Number of Lanes	Offset Distance (ft)
Median Opening	4	400
	6 or more	500
Signalized Intersection	4	550
	6 or more	750

BENEFITS

This project resulted in the development of guidelines for designing optimal offset distances for vehicles making RTUTs (as an alternative to DLTs from a driveway onto the arterial). Design based on these guidelines has the potential to reduce traffic conflicts between the vehicles making RTUTs and through vehicles.

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