



0-6644: Development of Guidelines for Operationally Effective Raised Medians and the Use of Alternative Movements on Urban Roadways

Background

The development of raised medians is an important access management technique commonly used in urban settings. Currently, there are limited official guidelines available for practitioners in design and implementation of raised medians. In addition, alternative movements, such as right turns followed by U-turns as an alternative to direct left turns, are increasingly used in the urban street to reduce conflicts and to improve safety along arterial roads. However, the current available official guidelines do not list all the available tools for practitioners in determining appropriate solutions to some operational and access issues, which makes engineers hesitant to use alternative geometric treatments. The objective of this research project is to develop guidelines for operationally effective raised medians and the use of alternative movements on urban roadways.

What the Researchers Did

To fulfill this goal, the researchers:

- Reviewed and synthesized national and peer states' practices.
- Conducted a survey of traffic engineers.
- Conducted field studies.
- Analyzed the operational and safety impacts of different design elements of raised medians and representative alternative movements through simulation studies.
- Developed guidelines for effectively implementing raised medians.

- Developed a set of implementation-orientated guidelines regarding the applicability, geometric design, and access management of three typical types of alternative movements, i.e., restricted crossing U-turn (RCUT), median U-turn (MUT), and continuous flow intersection (CFI).

What They Found

The review of prior research and survey of traffic engineers showed that the operational and safety performance of raised medians depends on a wide range of design elements, including median widths, median left-turn lane lengths, placement of median openings, and the use of directional median openings. This research led to following key findings:

- Narrow medians have significant, negative effects on traffic safety. Insufficient median

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Project Completed:
8-31-2012

width that was unable to refuge the whole vehicle may cause crashes between through and turning vehicles at the median openings.

- Placing a median opening within the influence area (e.g., queue length) in advance of a signalized intersection may cause crashes between egress vehicles from the driveway and the through vehicles on the mainline and may cause gridlock problems.
- Use of left-turn lanes shorter than the Texas Department of Transportation (TxDOT) standards at median openings may not result in significant operational and safety problems if it does not cause recurrent left-turn lane overflow.

In addition, the use of alternative movements was investigated based on the literature review, survey of traffic engineers, and field studies. The results of the field study show that the Super Street implemented along US 281 saved approximately 30–40 percent in travel times along US 281 and significantly reduced head-on and rear-end collisions. Prior research indicated that the Michigan U intersection implemented on SH 289/Preston Road at Legacy Drive in Plano reduced the back-up queue by 60 percent and reduced delay by 35 sec/veh. Existing literature reports that alternative movements, e.g., RCUT, MUT, and CFI, can improve intersection operational efficiency and safety if they are properly implemented.

What This Means

Based on the results of this research, the following major recommendations are

provided as part of the guidelines developed in this research:

- Where the right-of-way is available, a minimum median width of 25 ft is recommended that can provide sufficient refuge for at least one left-turn vehicle from side streets/driveways. On a four-lane roadway where a mid-block U-turn is allowed, the minimum median width needs to be determined according to the guidelines developed in this study based on the swept path analysis.
- Openings should be avoided in the functional areas of intersections, especially when traffic conditions (e.g., heavy left-turn egress from driveways) pose operational or safety problems.
- Although the desirable lengths recommended by the TxDOT *Roadway Design Manual* should be used whenever it is practical, use of a median left-turn lane shorter than the TxDOT standards may be allowed only if it does not result in recurrent left-turn lane overflow.

Since alternative movements, e.g., RCUT, MUT, and CFI, have proven records in improving intersection operations and safety, more future applications of these alternative movement designs should be considered in Texas. The developed guidelines regarding the applicability, geometric design, and access management of the three typical types of alternative movements, i.e., RCUT, MUT and CFI, can be used in the future implementations.

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Keyword: Research