Florida Department of Transportation
Summary of Final Report, WPI# 0510824
September 2000

BICYCLE AND PEDESTRIAN CONSIDERATIONS AT ROUNDABOUTS

PROBLEM STATEMENT

Roundabouts are designed to resolve conflicts between two competing traffic movements. The basic principle is to channel vehicle paths in order to disperse conflicts that concentrate at conventional intersections and resolve them in an appropriate manner. Roundabouts allow continuous flow of traffic while slowing down vehicular speed. Three main differences distinguish roundabouts from traffic circles: yield-at-entry, deflection, and flare. Traffic circles are ideally designed to operate within the geometric constraints of intersections and to cause vehicles to come to a complete stop before entering the circle.

When used appropriately, roundabouts can have a significant, positive effect on safety, decreasing traffic speed by *85%* and reducing accidents. Several studies have shown, however, that unlike motorists, bicyclists do not receive the same safety benefits from utilizing roundabouts. Surveys taken from bicyclists indicated that they found roundabout treatment significantly more stressful to negotiate than other forms of treatment, particularly on roads with heavy traffic. Researchers have found that roundabouts affect bicyclists' choices of routes on regular journeys.

Recently, traffic circles and roundabouts have begun to gain acceptance and popularity throughout the U.S. In South Florida, residents from several cities have requested that roundabouts be implemented on state roads as a traffic calming measure. The safety of bicyclists in roundabouts, however, remains a serious concern. According to the *Design Guide and Evaluation Plan for Modern Roundabouts in Florida*, "no special markings or lanes are generally needed in the roundabouts to accommodate the bicyclists." Studies have indicated, however, that there is an urgent need to investigate the safety and effectiveness of roundabouts with bicyclists as a traffic component, as well as to enhance the roundabout design guidelines to include considerations of safety for bicyclists.

OBJECTIVES

The objectives of this project are to study select roundabout and traffic circles in Districts IV and VI, to evaluate their effectiveness, and to identify hazardous conditions and safety features for the circulation of bicyclists within these facilities. The results will be used to develop an enhanced geometric design of roundabouts, as well as useful guidelines for signage and markings for the safe circulation of bicyclists.

FINDINGS AND CONCLUSIONS

Among the conclusions drawn from this study are the following:

- The introduction of roundabouts leads to a slight reduction in pedestrian casualty accidents, yet increases bicycle casualty accidents.

- Casualty accident rates are reduced by 68% following the installation of roundabouts.

- Roundabouts effectively reduce right-angled accidents by 87%, with a 47% reduction in overall reported accidents.

- Bicycle accident rates at roundabouts are 15 times those of cars, and pedestrian accident rates are equivalent to those of cars.

- Accident studies found that multi-lane roundabouts are more stressful to bicyclists than single-lane roundabouts.

- In comparison, multilane roundabouts are not as safe as single-lane roundabouts, since pedestrians have to cross a larger distance. In most situations, single-lane roundabouts provide a satisfactory level of safety for bicyclists compared to other types of controlled intersections. This is due to the lower speeds of vehicles, as well as fewer conflict points, compared to multi-lane roundabouts or other types of intersections.

- Special provisions for bicyclists are not normally required at roundabouts. Several guidelines recommend the provision of a special bicycle facility in case of high bicycle volume at the ***outer perimeter*** of the roundabout, if space permits.

- The majority of roundabout design guidelines recommend offsetting the pedestrian crossing by one to three car lengths from the yield line of the roundabout. This will allow the motorists that are approaching the roundabout to yield to pedestrians that are crossing the approaches, which will then cause motorists to look for an acceptable gap in order to merge with the circulating flow.

- Crossing provisions are preferable, in association with splitter islands, either as an unmarked crossing place with curb cuts or incorporated into a marked crossing.

- The yield line pavement marking should be aligned with the edge of the splitter island.

- Avoid over signing at roundabout locations to avoid confusion when driving.

- Neither landscaping nor warning and directional signs should obstruct a driver's line of sight at roundabouts.

- When pedestrian and bicycle crossings are added to an approach of a roundabout, all measured indicators show a significant increment to that approach, as well as a variable reduction for the other approaches. Because the location of the crossing is on one approach

only, the vehicles that stop for pedestrians and/or bicycles crossing the approach create a gap that is in turn utilized by the entities at the other locations of the roundabout.

- The introduction of bicycle lanes reduces the average overall times in the roundabout for the vehicles on the north and south approaches, while the overall time for the vehicles on the west and east approaches tends to increase.

Due to the dearth of modern roundabouts in South Florida, several observations were made at traffic circles. Also, the values for average speeds and follow-up time were observed at only one roundabout located in Boca Raton. Thus, further work is recommended to determine precisely the impact of different bicycle and pedestrian treatment at roundabouts.

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