Safety Effect of Roundabout Conversions in the United States: Empirical Bayes Observational Before-After Study

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Abstract

Modern roundabouts are designed to control traffic flow at intersections without the use of stop signs or traffic signals. U.S. experience with modern roundabouts is rather limited to date, but in recent years there has been growing interest in their potential benefits and a relatively large increase in roundabout construction. This interest has created a need for data regarding the safety effect of roundabouts. Changes in motor vehicle crashes following conversion of 23 intersections from stop sign and traffic signal control to modern roundabouts are evaluated. The settings, located in seven states, are a mix of urban, suburban, and rural environments with the urban sample consisting of both single-lane and multilane designs and the rural sample consisting of only single-lane designs. A before-after study was conducted using the empirical Bayes procedure, which accounts for regression to the mean and traffic volume changes that usually accompany conversion of intersections to roundabouts. For the 23 intersections combined, this procedure estimated highly significant reductions of 40 percent for all crash severities combined and 80 percent for all injury crashes. Reductions in the numbers of fatal and incapacitating injury crashes were estimated to be about 90 percent. In general, the results are consistent with numerous international studies and suggest that roundabout installation should be strongly promoted as an effective safety treatment for intersections. Because the empirical Bayes approach is relatively new in safety analysis, the potential of this methodology in the evaluation of safety measures is demonstrated.

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Exhibit G: Roundabout Safety References and related research and technical material

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FHWA Accelerating Roundabout Implementation in the United States, 2015

Useful links:

- https://safety.fhwa.dot.gov/intersection/innovative/roundabouts/
- Accelerating Roundabout Implementation in the United States (Seven Volume Series) (FHWA, 2015)
    - Volume I – Evaluation of Rectangular Rapid-Flashing Beacons (RRFB) at Multilane Roundabouts – Final Report [PDF]
    - Volume II – Assessment of Roundabout Capacity Models for the Highway Capacity Manual – Final Report [PDF]
    - Volume III – Assessment of the Environmental Characteristics of Roundabouts – Final Report [PDF]
    - Volume IV – Review of Fatal and Severe Injury Crashes at Roundabouts – Final Report [PDF]
    - Volume V – Evaluation of Geometric Parameters that Affect Truck Maneuvering and Stability – Final Report [PDF]
    - Volume VI – Investigation of Crosswalk Design and Driver Behaviors – Final Report [PDF]
    - Volume VII – Human Factor Assessment of Traffic Control Device Effectiveness – Final Report [PDF]
- Evaluating the Performance of Corridors with Roundabouts (published as NCHRP Report 772) (2014) Report [PDF] – Appendices B-J [PDF] – Appendix K [PDF] – Appendices L-O [PDF] – Overview Presentation [PPT]
- Kansas Roundabout Guide, Second Edition (A Companion to NCHRP Report 672) (Kansas, 2014) [PDF]
- Implementation, Driver Behavior and Simulation: Issues Related to Roundabouts in Northern New England (Vermont, 2014) [PDF]
- Roundabouts and Access Management (Florida, 2014) [PDF]
- Effect of Signing and Lane Markings on the Safety of a Two-Lane Roundabout (Minnesota, 2014) [PDF]
- Information/Education Synthesis on Roundabouts (Montana, 2013) [PDF]
- Best Practices for Roundabouts on State Highways (Indiana, 2013) [PDF]
- Wisconsin Roundabout Guide (Wisconsin, 2013) [PDF]
- Statewide Roundabout Operations Monitoring and Evaluation (Wisconsin, 2013) [HTML]
- Developing Safety Performance Measures for Roundabout Applications in the State of Oregon (Oregon, 2013) [PDF]
- Accommodating Oversize/Overweight (OSOW) Vehicles at Roundabouts (Kansas, 2013) [PDF]
- Investigation of Pedestrian/Bicycle Risk in Minnesota Roundabout Crossings (Minnesota, 2012) [PDF]
- Demonstration of Roundabout Lighting Based on the Ecoluminance Approach (New York, 2012) [PDF]
- Joint Roundabout Truck Study (Minnesota/Wisconsin, 2012) [PDF]
- A Study of the Impact of Roundabouts on Traffic Flows and Business (Kansas, 2012) [PDF]
- Texas Roundabout Guidelines (Texas, 2011) [PDF]
- Evaluating the Performance and Safety Effectiveness of Roundabouts (Michigan, 2011) [PDF]
- Improving Drivers' Ability to Safely and Effectively Use Roundabouts: Educating the Public to Negotiate Roundabouts Final Report (Michigan, 2011) [PDF]
- Roundabouts in the United States (published as NCHRP Report 572) (2007) Report [PDF] – Appendices [PDF]
- Lane Restriction Signing and Markings for Double Lane Roundabouts (Multistate Pooled Fund Study, 2007) [PDF]
- Operational Performance of Kansas Roundabouts (Kansas, 2004) [PDF]
- Modern Roundabout Practice in the United States (published as NCHRP Synthesis 264) (1998) [PDF]