

Request for Research Funding for FY 2025-2026

Project Number (Research Center Use Only): TEO-26-11

Requesting Office	State Traffic Engineering & Operations	Priority: High	11 of 12
--------------------------	--	-----------------------	----------

Proposed Title Customizing Roundabout Safety Performance Functions (SPFs) for Florida

Justification	<p>Roundabouts improve safety by eliminating angle, right-turn, and left-turn crashes that typically occur at signalized and stop-controlled intersections. Roundabouts could also reduce delays and improve traffic flow. Compared to traditional intersections, roundabouts have fewer conflict points and experience fewer fatal and serious injury crashes. As such, roundabouts are increasingly becoming popular in the U.S. Florida ranks #1 in terms of number of roundabouts on all public roads. Currently, Florida has nearly 50 roundabouts on its State Highway System (SHS), with several hundred more on local roads, and this number continues to rise.</p> <p>Transportation agencies are seeking data-driven, statistically reliable methods to evaluate the safety of roundabouts. Safety Performance Functions (SPFs) are required for network screening and planning-level assessment of roundabout safety. The Florida Department of Transportation (FDOT) Intersection Control Evaluation (ICE) procedure provides guidelines for evaluating the safety and operational performance of roundabouts at new or existing intersection locations on the SHS¹. The guidelines require using the Safety Performance for Intersection Control Evaluation (SPICE) tool to conduct the predictive safety analysis of roundabouts. The SPICE tool includes the roundabout SPFs developed as part of the NCHRP Project 17-70². However, the national default models, which constitute the base SPFs, Adjustment Factors (AFs), and calibration factors, were developed using data from several states across the country. Transportation agencies must estimate the calibration factors to account for differences between the jurisdiction and time period for which the predictive models were developed and the jurisdiction and time period to which they are applied. Using uncalibrated models to compare roundabout safety performance to other intersection forms (e.g., signals, two-way stop control) could lead to biased comparisons.</p> <p>On the other hand, the national SPFs from the NCHRP Project 17-70, in some cases, are found to have resulted in counterintuitive crash predictions at roundabouts when compared to conventional signalized intersections. This requires further investigation and necessitates the calibration of the default SPFs from the NCHRP Project 17-70 for Florida conditions. A more robust approach would be to develop Florida-specific SPFs or Crash Modification Functions (CMFs) to accurately analyze the safety performance of roundabouts in the state. Also, since many roundabouts in Florida are constructed in the last decade, the research effort will be extended to estimate Florida-specific CMFs for converting stop-controlled intersections to roundabouts.</p> <p>The main goal of this research effort is to assist the FDOT in analyzing the safety performance of roundabouts. The specific objectives include:</p> <ol style="list-style-type: none"> 1. Estimate <i>calibration factors</i> to calibrate the roundabout SPFs developed as part of the NCHRP Project 17-70 to reflect Florida conditions. 2. Develop <i>Florida-specific simple SPFs</i> for roundabouts considering only the base conditions. 3. Develop <i>Florida-specific full SPFs</i> for roundabouts considering all the available geometric and traffic variables. 4. Develop <i>Florida-specific CMFs</i> for converting stop-controlled intersections to roundabouts. 5. Provide <i>recommendations</i> on the specific SPFs and calibration factors that could be used to analyze roundabouts within the FDOT's SPICE tool.
----------------------	---

¹ FDOT, *FDOT ICE Manual 2025*. 2024; Available from: https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/traffic/trafficservices/studies/ice-materials-2025/fdot-ice-manual-2025_11-15-2024.pdf

² Ferguson, E., Bonneson, J., Rodegerdts, L., Foster, N., Persaud, B., Lyon, C., & Rhoades, D. (2019). Development of Roundabout Crash Prediction Models and Methods (NCHRP Report 888). The National Academies Press. <https://doi.org/10.17226/25360>

	<p>A significant effort of this research will be to collect and process data on roundabouts. Understanding that the ~50 roundabouts on the SHS may not have enough crashes required to calibrate the default nationwide SPFs from the NCHRP Project 17-70, the research team will expand the dataset to include roundabouts on all public roads in Florida. Since the roadway geometric characteristics are generally unavailable for non-SHS roads, extensive data collection effort will be undertaken to manually collect all the required data variables. The analysis will be based on three to five years of crash data extracted from Signal Four Analytics.</p> <p>Depending on the sample size, Florida-specific SPFs will be developed for different types of roundabouts based on context classification. Both simple and full SPFs will be developed, depending on data availability. Statistical goodness-of-fit measures and visual plots will be used to compare the performance of calibrated SPFs, the Florida-specific simple SPFs, and the Florida-specific full SPFs. Florida-specific CMFs for converting stop-controlled intersections to roundabouts will also be estimated. Finally, recommendations on the roundabout SPFs to be included within the FDOT’s SPICE tool will be provided.</p> <p>Note that this research effort is directly related to the <i>Safety</i> pillar of the FDOT Compass. This project will assist FDOT in improving safety at roundabouts. The study results will help perform network screening and planning-level assessment of the safety performance of roundabouts, with the sole aim of reducing the frequency and severity of crashes.</p>		
Impact	<p>FDOT is currently using the default SPFs from the NCHRP Project 17-70 to analyze the safety of roundabouts. Using the default SPFs without calibrating to Florida conditions would either underestimate or overestimate the predicted crashes at roundabouts, potentially resulting in incorrect and biased assessments. This research will help accurately analyze the safety performance of roundabouts in Florida.</p>		
Affected Offices/Districts	<p>State Traffic Engineering and Operations Office; State Safety Office; Roadway Design Office.</p>		
Existing Work	<p>The NCHRP Project 17-70 developed the SPFs and CMFs for roundabouts. However, these models are developed using data from multiple states and not solely from Florida data.</p> <p>“roundabouts + safety + Florida”: 2 results. None of the results focused on roundabout SPFs. “roundabouts + safety performance functions”: 3 results. None of the results are from Florida.</p>		
Keywords Used In Existing Work Search	<p>“roundabouts + safety + Florida” “roundabouts + safety performance functions”</p>		
Related Contracts (Give contract numbers)	<p>None.</p>		
Funding Request	\$180,000	Anticipated Duration	18 months
Project Manager	Dibakar Saha, PhD, PE, PTOE, RSP ₂₁	Contracting Method	Direct contract with Florida International University (PI: Dr. Alluri)
Equipment	Estimated equipment cost (or N/A)	Not Applicable	
Urgency	1	<p>The development of local calibration factors and Florida-specific SPFs for roundabouts is of the most immediate need, especially since the existing SPICE tool uses the default SPFs without calibration. Using the uncalibrated SPFs would either underestimate or overestimate the predicted crashes at roundabouts, potentially resulting in incorrect and biased assessments.</p>	
Implementability	1	<p>The research results will be readily implementable. The research results (i.e., calibration factors and/or the Florida-specific SPFs) will be immediately included within the SPICE tool for immediate adoption.</p>	

Project Benefits (Succinct, complete explanation)

This research effort will assist the FDOT in accurately analyzing the safety performance of roundabouts in the state. The estimated calibration factors and the Florida-specific SPFs will help accurately conduct the predictive safety analysis of roundabouts.

Project Benefits (Select all that apply and explain)	Quantifiable Benefits (units, dollars, etc...if applicable)	Methodology or Data Sources Used to Determine Quantifiable Benefits. If not applicable, please give justification of project benefits
<input type="checkbox"/> Materials Enhancement		
<input type="checkbox"/> Financial Impact		
<input type="checkbox"/> Time Savings		
<input type="checkbox"/> Lives Saved/ Injuries Prevented		Using the estimated calibration factors or the Florida-specific SPFs for roundabouts would help accurately evaluate the safety performance of roundabouts, reducing traffic fatalities and injuries.
<input type="checkbox"/> Other (Explain)		

*Comments should explain and support urgency, financial benefit, and implementability scores