Summary: Results are compiled from the databases named above. Links are provided for full-text, if applicable, or to the full record citation. I completed my searches using the following terminology: dynamic, “no right turn on red,” “right turn on red,” “no turn on red,” “no right turn.” Results are categorized as most or least relevant below.

Most Relevant Results

Knodler, Michael; Noyce, David A; Casola, Elizabeth; Santiago, Kelvin R; Bill, Andrea R; Chitturi, Madhav V. Driving Simulator Evaluation of Red Arrows and Flashing Yellow Arrows in Right-Turn Applications. Safety Research Using Simulation University Transportation Center (SaferSim); Office of the Assistant Secretary for Research and Technology, 2017, 35p
https://trid.trb.org/view/1508292
Abstract: The flashing yellow arrow (FYA) for right-turn applications and a dynamic no-turn-on-red sign were evaluated using a computer-based static survey evaluation to determine whether drivers grasp the message of the devices. The study evaluated the results from 200 respondents based on the existing passive green and red phase conditions, the proposed right FYA, and a dynamic no-turn-on-red sign. Results indicate that drivers have a strong comprehension of the FYA and dynamic no-turn-on-red messages. There was a significant statistical difference in responses in terms of the increase in the response designating the action of yielding as approaching the intersection from the existing condition to the FYA. As part of a field-based evaluation, vehicle-pedestrian interactions were documented on sites with and without an FYA indication on the right turn as well as on a site with an FYA indication on the right turn. Documentation of the interactions was achieved using a frame-by-frame analysis of video recordings from the sites. A model explaining the deviation of a driver from an expected right-turn behavior as a result of the presence of a pedestrian was created. The model takes into consideration the position of a pedestrian within the crosswalk as well as the presence of an FYA indication on the right turn. The feasibility of creating the model demonstrates the possibility of assessing the quality of a future driving simulator experiment on the application of FYA for right turns.

Guo, Yanyong; Liu, Pan; Wu, Yao; Chen, Jingxu. Evaluating How Right-Turn Treatments Affect Right-Turn-on-Red Conflicts at Signalized Intersections. Journal of Transportation Safety & Security, Volume 12, Issue 3, 2020, pp 419-440
https://trid.trb.org/view/1694930
Abstract: The primary objective of the study is to evaluate the impacts of right-turn treatments on right-turn-on-red (RTOR) conflicts at signalized intersections. Data were collected at 20 signalized intersections in Kunming, China. Three thousand, seven hundred and forty-six RTOR conflicts from five types of right-turn treatments were identified for analysis. Traffic conflict rates were compared among different types of right-turn treatments. The results showed that type 4 right-turn treatment (with raised channelized island and acceleration lane on the cross-street) has the lowest conflict rate, followed by the type 2 right-turn treatment (with painted channelized island and acceleration lane on the cross-street). Traffic conflict models were developed to investigate factors related to the RTOR conflicts frequency using full Bayesian estimation. Three types of models were developed and compared, including the fixed-parameter, the random-effect, and the random-parameter conflict models. The results showed that the random-parameter model
outperformed the fixed-parameter model and the random-effect model. Further results from the traffic conflict model showed that the conflicting traffic volume, right-turn treatment type, right-turn radius and yield control sign for right-turn movement significantly affect the RTOR conflicts frequency. The elasticity results showed that the conflict frequency can be reduced by 15.03%, 28.4%, 18.53%, and 23.37% by type 1, type 2, type 3, and type 4 right-turn treatments, respectively.

Lin, Pei-Sung; Kourtellis, Achilleas; Wang, Zhenyu; Chen, Cong; Rangaswamy, Rakesh; Jackman, Jason. Understanding Interactions between Drivers and Pedestrian Features at Signalized Intersections – Phase 3. University of South Florida, Tampa; Florida Department of Transportation, 2019, 118p
https://trid.trb.org/view/1698056

Abstract: This Phase 3 project aimed to implement and evaluate selected countermeasures recommended from the Phase 2 project via pilot studies in Florida to support future successful statewide implementation. The pedestrian signs being evaluated for this project included (1) “Stop Here on Red” (R10-6, R10-6a et.), (2) “No Turn on Red,” (R10-11, R10-11a et.) (3) “Turning Vehicles Yield to Pedestrians,” (R10-15) and (4) “Right on Red Arrow after Stop” (R10-17a), or “Right on Red after Stop.” Static and blank-out signs were implemented in the seven Florida Department of Transportation (FDOT) Districts. The overall results indicated that three pedestrian feature signs—“Right on Red after Stop,” “Turning Vehicles Yield to Pedestrians,” and “Stop Here on Red”—showed large increases of driver compliance after their implementation when compared to those before implementation. The increases of driver compliance after the implementation of “Right Turn on Red after Stop” signs for right-turning vehicles, “Stop Here on Red,” signs, and “Turning Vehicles Yield to Pedestrians” blank-out signs were all statistically significant at a confidence level of 95%. The implementation of dual blank-out signs “No Turn on Red” and “Turning Vehicles Yield to Pedestrians” showed that they can effectively improve safety by an increase in driver compliance and reduce unnecessary vehicle delay at signalized intersections by remaining blank when not needed. Researchers further demonstrated that combined pedestrian signage implementation and education outreach can achieve the highest driver compliance among four different treatments in the pilot implementations. The research result showed that the implementation of pedestrian feature signs alone can improve driver compliance considerably, and additional education outreach effort can further increase driver compliance. This research report also provides recommendations and guidelines to FDOT, other state DOTs, and local agencies on how to effectively implement the four major pedestrian feature signs in this study, and conduct education outreach of the signage to significantly increase driver compliance and improve pedestrian safety.

https://trid.trb.org/view/1513308

Description: Right-turn-on-red (RTOR) is permitted as an effective approach to reduce delay at signalized intersections, especially where there is a high volume of right-turn movements. The conflicting intersection movements of motorized and non-motorized users constitute a critical issue that affects both signal operation and safety. A method is needed to estimate the RTOR flow volume and its effect on delays because current RTOR estimates are not reliable for planning- or operational-level applications. Gaps in the Highway Capacity Manual (HCM) method include:
(1) The lack of guidance on whether RTOR should be implemented or not.
(2) The current signal timing model that does not adequately reflect the true operational effects of RTOR.
(3) No volume estimation model for right-turn delay. The suggested default value for right-turn volume on red is 0 vehicles/hour, due to the difficulty in estimating it without the support of field data. This conservative estimate may lead to inaccurate performance estimations.
(4) The pedestrian method that does not consider RTOR flow rate as an input nor does the existing RTOR guidance adequately consider non-motorized users.
As a result, agencies throughout the country have applied different RTOR techniques, which may lead to confusion. The development of an HCM method, therefore, will provide guidance on RTOR implementation, and the research findings will assist agencies and practitioners by providing a consolidated body of knowledge on RTOR analysis.

The objectives of this research are to (1) evaluate methods for evaluating right-turn-on-red (RTOR) at signalized intersections (right-turn configurations including shared, single, and dual right-turn lanes); (2) develop methods and tools that consider all modes and inform planning and operational decisions; and (3) provide potential modifications to standard references in the Highway Capacity Manual (HCM), NCHRP Report 812: Traffic Signal Manual, and the Manual on Uniform Traffic Control Devices (MUTCD).

Despite the widespread acknowledgement of these problems, and the growing use of bicycles in metropolitan areas, transportation engineers and planners still lack definitive guidance on which types of intersection designs and operational treatments have the greatest safety benefits for pedestrians and bicyclists, nor the most appropriate situation in which each should be applied. Engineering judgment will still be needed in many cases, but better guidance for applying typical and innovative intersection design treatments will help improve pedestrian and bicycle safety.

The objective of this research is to develop guidance for transportation practitioners to improve pedestrian and bicycle safety at intersections through design and operational treatments that (1) identifies and evaluates current practices, and emerging technologies and trends, in the U.S. and internationally; (2) describes current best practices for measuring the effectiveness of such intersection treatments; (3) evaluates safety outcomes of specific intersection treatments using quantitative measures; and (4) identifies and ranks strategies, processes, and relationships that could accelerate the adoption of improved pedestrian and bicycle intersection design and operational treatments.

The approaches to evaluate pedestrian and bicycle treatments can be separate, but implementation of the treatments should be coordinated.

Least Relevant Results
Cunningham, Chris; Pyo, Kihyun; Baek, Juwoon; Byrom, Elizabeth; Warchol, Shannon. Guidelines for Implementation of Right Turn Flashing Yellow Arrows and Leading Pedestrian Intervals. North Carolina State University, Raleigh; North Carolina Department of Transportation; Federal Highway Administration, 2020, 40p
https://trid.trb.org/view/1753487

Abstract: North Carolina has been a leader in implementation of flashing yellow arrows (FYA) for left turning permissive movements. The public acceptance of such devices has resulted in the implementation of FYA for right turns (RTs) at intersections with high pedestrian volumes. In addition to this, there are existing sites where Leading Pedestrian Intervals (LPI) have been deployed. LPIs allow pedestrians to enter the street before concurrent vehicular movements are given a green indication. This report provides data from 10 RT FYA and 14 LPI stand-alone treatment locations across NC. No data were able to be captured at sites with the combination of both treatments at the time of closing the project. Data were only collected at sites following installation as there were no new installations to capture before and after data. For this reason, the project was closed early as nearby sites posed problems to capture surrogate data to represent the before data condition. Even so, the data captured from both stand-alone treatments following construction offer some potential insights. On first glance, LPI’s seem to provide better yielding to pedestrians compared to RT FYA’s, with yield rates of 84% compared to 49%, respectively. However, as this study indicates, there may be inherent flaws when comparing the yield rates based on location and staged versus naturalistic crossings. Second, although sample sizes were relatively small, there appeared to be no difference in yield rates when comparing single and dual lane configurations where multiple-threat situations may present dangerous conflicts. Last, observations from the field indicated that most conflicts and violations were the result of vehicles turning right-turn-on-red. As such, the research team believes the use of “blank out” signs in lieu of static signage could help encourage more yielding to pedestrians when the push button is activated. However, given the limited studies of such signs, they should be studied carefully to determine the effectiveness of the additional treatment.
Kothuri, Sirisha; Smaglik, Edward; Kading, Andrew; Schrope, Andrew; Aguilar, Christopher; Gil, William; White, Kelly. Addressing Bicycle-Vehicle Conflicts with Alternate Signal Control Strategies. Portland State University; Northern Arizona University; National Institute for Transportation and Communities; Transportation Research and Education Center; Office of the Assistant Secretary for Research and Technology, 2018, 107p
https://trid.trb.org/view/1512996

Abstract: There is nationwide interest in supporting sustainable and active transportation modes such as bicycling and walking due to the many benefits associated with them, including reduced congestion, lower emissions and improved health. Although the number of bicyclists is increasing, safety remains a top concern. In urban areas, a common crash type involving bicycles at intersections is the “right hook” where a right-turning vehicle collides with a through bicyclist. While geometric treatments and pavement markings have been studied, there is a lack of research on signal timing treatments to address right-hook bicycle-vehicle conflicts. This study analyzed the operational impacts of traditional concurrent phasing, leading bike intervals (LBI), split leading bike intervals, and exclusive bike phasing in a microsimulation environment, and explored the safety impacts of traditional concurrent phasing, leading bike intervals, split leading bike intervals, and mixing zones using video-based conflict analysis. The microsimulation analysis revealed increased delays due to LBI, split LBI and exclusive bike phasing for the affected motor vehicle phases compared to traditional concurrent phasing. Using post-encroachment time (PET), a surrogate safety measure, conflicts between turning vehicles and bicyclists were investigated. While the split LBI treatment was useful in mitigating conflicts during the lead interval, the risk for bicyclists is shifted to the stale green portion of the phase. No correlations were found between the frequency of conflicts and elapsed time since green. With the mixing zone treatment, significant confusion was exhibited by both cyclists and drivers, with respect to the correct action to be taken. These observations also revealed that a significant percentage of the vehicles merged into the mixing zone at the very last second, thus adding to the confusion. This study provides broad-based recommendations on the appropriate treatment to be implemented to reduce right-hook conflicts.

https://trid.trb.org/view/1364347

Description: More than 4,000 pedestrians and 700 bicyclists were killed in collisions with motor vehicles in the United States in 2012. Improving pedestrian and bicycle facilities at intersections is clearly a critical safety need. Pedestrian crashes often occur at intersections involving automobiles turning left and striking pedestrians in the far crosswalk, or automobiles turning right and striking pedestrians in the near or far crosswalk. This includes situations where drivers are allowed to make a right turn on red. Of particular concern for bicyclist safety at intersections is the conflict between bicyclists traveling straight and automobiles from the opposite direction turning left across the path of bicyclists. In addition, there are often conflicts between bicyclists traveling straight and automobiles from the same direction turning right across the path of bicyclists. A third common type of bicycle crash involves motorists emerging from side streets and not yielding to through-moving bicyclists.