



TECHSUMMARY May 2024

State Project No. DOTLT1000376 | LTRC Project No. 22-3SA

Development of Statewide Design Guidelines for Improving Pedestrian Safety on High-Speed Arterials in Louisiana

INTRODUCTION

The increase in pedestrian fatalities in the United States and across the globe is concerning. According to the National Highway Traffic Safety Administration, 42,939 people were killed in traffic crashes in the United States in 2021, including 7,388 pedestrians. Louisiana's pedestrian deaths rose 73.5% from 2015 to 2021, and the state ranks second in the nation in pedestrian fatalities per 100,000 residents. Previous studies have also indicated that as traffic speeds increase, the risk of severe injury or death to the pedestrians involved in crashes increases significantly. Several existing national recommendations provide pedestrian safety guidelines along low-speed highways; however, there are limited guidelines for improving pedestrian safety on high-speed arterials (i.e., roads with speeds of 40 mph or above).

OBJECTIVE

The primary objective of this study was to develop guidelines for improving pedestrian safety on high-speed arterials in Louisiana. Underlying this objective, this study also aimed to:

- Recommend which countermeasures are appropriate to improve pedestrian safety for various roadway characteristics.
- Identify conflicts with existing guidelines that may prevent the implementation of those countermeasures.
- Suggest changes, as necessary, to the relevant Engineering Directives and Standards Manuals (EDSMs) of the DOTD and the Louisiana Revised Statutes (RS).

SCOPE

The project scope included intersections and midblock roadway segments on high-speed arterial roads (i.e., roads with speeds of 40 mph or above) in Louisiana.

METHODOLOGY

To achieve the objectives of this study, researchers employed several approaches, including: reviewing relevant literature; categorizing the roadway network on high-speed arterials; identifying crossing design features; surveying professionals from state Departments of Transportation (DOTs) across the nation to document efforts to improve pedestrian safety on high-speed arterials; developing a matrix of design features for pedestrians' safe movement; examining conflicts with existing DOTD policies and guidelines; and developing a statewide guideline for pedestrian facilities on high-speed arterials.

CONCLUSIONS

Based on the results of this study, the team recommended pedestrian facilities and countermeasures for various roadway characteristics on high-speed arterials. Additionally, they suggested modifications to DOTD's complete streets policy and to the applicable Engineering Directives and Standards Manuals (EDSMs).

First, the team reviewed relevant literature regarding pedestrian safety on high-speed arterials. This literature revealed that states are mandated to conduct a data-driven Vulnerable Road Users (VRU) safety assessment every 5 years. The studies also revealed several critical factors influencing pedestrian safety, including vehicle and driver factors, pedestrians factors, and physical infrastructure factors.

Furthermore, the roadway network of high-speed arterials in Louisiana was categorized, and crossing design features were identified. Utilizing 2017-2021 data for crashes occurring on the state's high-speed arterials, the team found that 1,307 pedestrian-related crashes involved 1,361 pedestrians.

LTRC Report 695

Read online summary or final report:
www.ltrc.lsu.edu/publications.html

PRINCIPAL INVESTIGATOR:

Hany Hassan, Ph.D., P.E.

LTRC CONTACT:

Elisabeta Mitran, Ph.D.

FUNDING:

SPR: TT-Fed/TT-Reg-6

Louisiana Transportation Research Center

4101 Gourrier Ave
Baton Rouge, LA 70808-4443

www.ltrc.lsu.edu

63.4% of these crashes occurred at intersections, with the highest proportion (57.3%) at "Stop/Yield Sign" control intersections. Road segments accounted for another 36.6% of pedestrian-involved crashes, with the most incidents (39.8%) occurring on roads lacking shoulders and sidewalks. 45% of these crashes occurred at a posted speed limit of 45 mph, and 24.33% happened in the dark with no street lights.

Crashes were then categorized by peer groups. This revealed that among intersections, Urbanized 4-legged Signalized Intersections (Z4S) had the most crashes (35.6%). Among unsignalized intersections, Urbanized 3-legged Stop Control (Z3M) had the highest number of pedestrian-involved crashes. Among road segments, the Urbanized 2-lane Undivided (Z2U) category had the most crashes (25.5%).

Additionally, the team conducted an online survey of DOT professionals from 48 states across the United States. Survey results revealed that:

- 81% of states have laws or guidance in place to address and design pedestrian facilities on high-speed arterials.
- 98% of states use the MUTCD, including its State Supplement, as the basis for their agency's policies for designing pedestrian facilities. This is followed by the AASHTO guide, which is used by 81% of states.
- In 33% of states, marked crosswalks at high-speed arterial intersections are common practice; in 8% of states, they are mandatory; and in 27% of states, it is important to consider the specific context of each facility and rely on engineering expertise. Additionally, 12% of states have criteria prohibiting at-grade crosswalks on roads with speed limits over 40 mph.
- 96% of states prioritize pedestrian activity at midblock segments, followed by traffic volume and crash history. 90% of states prioritize pedestrian activity at intersections, followed by traffic volume, geometry, and crash history.
- Regarding pedestrian safety analysis methods, 65% of states use systemic safety analysis for midblock segments, while 42% use High Injury Network (HIN) analysis. For intersections, 60% of states use systemic safety analysis, while 38% use HIN analysis.
- Key contributors to pedestrian-involved crashes include driving errors, pedestrian errors, and insufficient street lighting.
- Pedestrian volume is a crucial factor for pedestrian facility necessity, along with traffic volume, crash history, and roadway geometry.
- Countermeasures on high-speed arterials include sidewalks, shoulders, medians, high visibility crosswalks, road diets, and context-specific measures such as lighting and countdown signals.
- Despite these countermeasures, conflicts with guidelines still exist, posing several challenges, such as prioritizing pedestrian safety, access limitations, posted speed concerns, and legislative restrictions.

Furthermore, the team developed a matrix of suggested design features and countermeasures for safe movement along and across roadways. These included pedestrian safety enhancements for signalized and unsignalized intersections and midblock crossings based on AADT, speed limit, arterial type, and approach legs type. The thorough, research-supported countermeasures were suggested based on priorities. They include High Visibility Crosswalks, ADA Ramps, Pedestrian Crossing Signs, Parking Restrictions, Signal Timing adjustments, Leading Pedestrian Intervals (LPI), Pedestrian Pushbuttons (PPB), Curb Extensions, Reduced Curb Radii, Medians with Curb Cut, and more.

The research team also reviewed policy documents and Louisiana state laws, and they identified potential conflicts regarding recommended design features. EDSM documents showed no conflicts, but they referred to the primary policy manual only. A notable conflict involved the prohibition of marking pedestrian crosswalks on roads with speeds over 40 mph in the absence of additional traffic control treatments such as PHB. The team observed the need for more detailed guidance on treatments such as LPI and PHB, as well as criteria for applying measures such as lane narrowing or reduced curb radii.

RECOMMENDATIONS

Based on the results of this research, the team recommends that Louisiana focus on locations that meet the criteria of the statewide priorities when implementing countermeasures to improve pedestrian safety on high-speed arterials. They also recommend that the state create a comprehensive database that includes an inventory of high-speed arterials and their roadway features (e.g., shoulders/sidewalks, lighting, etc.). This would assist future researchers in better identifying roadway segments and intersections types that are overrepresented in pedestrian-involved crashes, enabling them to select and prioritize effective countermeasures for improving pedestrians safety.

Additionally, based on the findings of all of the project's tasks, the team recommends that future researchers:

- Evaluate the effectiveness of countermeasures after implementation.
- Conduct longitudinal studies to assess the long-term impact of pedestrian safety measures.

The team recommends future studies that continue to evaluate the impact of different factors in Louisiana affecting pedestrian safety once missing information becomes available. Many variables, including types of driver violations, condition of drivers, pedestrian actions, alcohol and drug involvement of both drivers and pedestrians, vehicle movement before crashes, and reasons and movements, have category 'unknown' in existing crash data. The inclusion of this information in the future will further validate the results of this research.