Research Note

April 2009

An Evaluation of Engineering Treatments and Pedestrian and Motorist Behavior on Major Arterials in Washington State

Washington State Department of Transportation

Pedestrian collisions are a concern

Nationally, collisions involving automobiles kill about 5,000 pedestrians and injure over 60,000 pedestrians each year. In Washington State, nearly 400 fatal and serious injury pedestrian traffic collisions occur yearly with an average of 85 pedestrian traffic fatalities. With so many pedestrians dying or being permanently disabled after collisions with vehicles, more information is needed on the causes of these collisions and possible remedies, particularly on higher speed, higher volume arterials where the majority of these pedestrian involved collisions occur.

Front view of median with crosswalk markings—Spanaway

Study locations in Washington State

We examined data to identify a cause

The purpose of this research was first to examine pedestrian and motorist behavior on arterial streets in Washington State and then to determine how these behaviors might change after using various engineering treatments like crosswalks markings, raised medians, in-pavement flashers, signage, stop bars, overhead lighting, and sidewalks. We studied the relationships that occur between pedestrians' travel and traffic signals, transit use, and key destinations like schools and shopping both before and after installing various engineering treatments.

The study examined seven locations on higher speed, higher volume state routes that also serve as urban arterials in the state of Washington including:

- State Route 7 in Spanaway
- State Route 99 in Shoreline
- State Route 99 in Kent
- State Route 2 in Airway Heights
- State Route 2 (3 locations) in Spokane

To supplement the pedestrian-vehicle collision data and learn more about contributing circumstances, additional criteria were evaluated. These included "evasive actions" such as pedestrians running, motorists having to brake unexpectedly to avoid a pedestrian, pedestrians waiting in the center lane to cross, and other behaviors. These unreported, but common occurrences enabled the researchers to gain a better understanding of both pedestrian and motorist behaviors at these locations and the effects that different improvements might have.

Several pedestrian-collision trends emerged

The study concludes that the causes of collisions between automobiles and pedestrians vary and include road conditions, driver and pedestrian behaviors, and other conditions like time of day. While pedestrian/motorist interaction improves with improved visibility (something which can be obtained through better engineering design and the removal of visual clutter), better education and/or enforcement are also needed to achieve significant safety benefits.

Specific findings at each location varied. However, several common trends emerged including:

- Yielding behavior by motorists is influenced by the location of the pedestrian. Motor vehicle yielding seems to be more frequent when the motorist sees the pedestrian standing in the center lane of the roadway or in a median vs. standing on the shoulder or sidewalk.
- Traffic signal cycle length may influence pedestrian crossing location decisions.
- Pedestrians using transit are likely to cross directly to or from a transit stop, whether or not there is a crosswalk at that location.
- More visual clues to the presence of pedestrians on higher speed, higher volume arterials may be beneficial.
- Crosswalk markings seem to cause pedestrians to use a particular crossing location more than installation of median refuge islands alone.

Cont.

- The use of stop bars in advance of pedestrian crossings seems promising for reducing shielding conflicts by improving the ability of the motorist to see the pedestrian around vehicles and other barriers.
- Pedestrians did not seem to gain a false sense of security. Observations of pedestrians indicate that most pedestrians were very cautious about watching for coming traffic when crossing the street. There is no strong evidence that pedestrians acted carelessly because they felt more protected in the marked crosswalks or within the median refuge.

Example of a crosswalk made with colored concrete

Researchers identified low-cost improvements

Only the most cost-effective treatments that will improve conditions for pedestrians should be carried forward through design and implementation, and lower cost improvements should be considered first. Cooperation and coordination among agencies and stakeholders are important and must occur before choosing a preferred solution to ensure the most cost effective improvements. Through coordination, improvements may be less expensive combined into one project, rather than spread over multiple projects. The research supports the following low cost actions and improvements:

- Signing, striping, and advance stop bars are less effective than flashers or signals but also much less expensive and should be considered, as warranted, before and in combination with other measures to channelize pedestrian crossings and improve motor vehicle yielding.
- Education and enforcement are needed in addition to engineering improvements. Motorists, including those who drive as part of their livelihood, need to know and understand their own limitations and those of vehicles and be prepared to take evasive action at all times to avoid collisions. Enforcement should focus on citing noncompliant motorists and pedestrians, as well as providing education in the letter and spirit of the law.
- Small changes such as using different crosswalk marking patterns or materials may reduce maintenance costs and increase visibility.
- Remove visual clutter such as sandwich board signs, business flags, balloons, utility poles from pedestrian areas wherever possible. Remove on-street parking from areas near major pedestrian crossings for improved visibility.

The results will be applied in project scoping

This research will assist WSDOT in identifying the most cost-effective treatments to improve safety for both pedestrians and drivers. WSDOT will apply this research in the recently developed scoping process for stand alone pedestrian improvements and incorporate it into scoping processes for mobility and other improvement projects for motor vehicles as those evolve and are updated. Additionally, WSDOT will consider this research when updating the agency's Design and Traffic Operations Manuals.

Signs at the pedestrian actuation button—Airway Heights

Report Title and WA-RD Number
An Evaluation of Engineering Treatments and Pedestrian and Motorist Behavior on Major Arterials in Washington State
WA-RD 707.1
http://www.wsdot.wa.gov/research/reports/fullreports/707.1.pdf

Funding
$72,000 federal SPR
$18,000 state

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