Pedestrian Safety Systems

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Photo: Courtesy of Natalie Villwock-Witte, WTI

Description: The purpose of intelligent transportation system (ITS) technologies to support pedestrian safety are to provide feedback to the pedestrians and to increase the awareness of motorists regarding the presence of pedestrians.
Some ITS pedestrian safety systems include:

- Illuminated walk signal push buttons,
- Automated pedestrian detection systems for traffic signals,
- Flashing crosswalk lights,
- Countdown signals,
- Pedestrian hybrid beacon (a.k.a. High intensity Activated crossWalK (HAWK)),
- Road lighting technology,
- Variable speed limit (VSL) systems (see #TM2),
- ITS No Turn on Red Signs, and
- Red light enforcement cameras.

Rural Transportation Critical Needs

- ☑ Crash Countermeasures
- ☐ Emergency Services
- ☑ Operations & Maintenance
- ☐ Rural Transit & Mobility
- ☐ Surface Transportation & Weather
- ☑ Tourism & Travel Information
- ☑ Traffic Management

Issues Addressed

- ☐ Road Geometry Warning
- ☐ Highway-Rail Crossing Warning
- ☑ Intersection Collision Warning
- ☑ Pedestrian Safety
- ☐ Bicycle Warning
- ☐ Animal Warning
- ☑ Collision Avoidance
- ☑ Collision Notification
- ☐ Weather Warning

Strategies Achieved

- ☑ Road User
- ☑ Road
- ☑ Vehicle
- ☑ Safety Culture
- ☑ Engineering
- ☐ Emergency Response
- ☑ Enforcement
- ☑ Education

Applicability

- While many of the pedestrian safety systems discussed above are commonly used in urban environments, there are no studies to date that suggest that they cannot be applied in rural environments, particularly in small urban environments. Furthermore, as more rail-to-trail and other regional and cross-country trails are developed, which often run through rural areas, there will be a need to provide motorists with the expectation of a bicyclist or pedestrian crossing. Another example where pedestrian safety systems may be applicable in a rural context are when a state highway transitions to a main street in a small urban or rural town. Crashes can occur when a drivers "expectations" are violated (they do not expect a pedestrian to be present, they do not expect the curve to be as sharp as it is, they do not expect slick roads, etc.). Many of the pedestrian safety systems are designed to warn drivers that they should expect the presence of a pedestrian and to provide pedestrians with the feedback that they will be served in the transportation system (e.g. a call will be put into the signal system to provide them with the walk signal). Pedestrian safety systems are relatively inexpensive, especially when installed with broader changes (e.g. when installing a signal).

Partnerships

- Applications benefit from collaboration among numerous agencies, which may include:
  - Departments of transportation (local, state, federal)
  - Tribal nations

Key Components

- Light-emitting diode (LED) light within the push button
- A pedestrian and traffic signal that allow a countdown/ display numbers
- Automated pedestrian detection
  - Detection system which communicates real-time with the traffic controller.
  - Algorithm determining presence of a pedestrian
- Flashing crosswalk lights
  - In-pavement lighting
  - Power source
  - Automated or pedestrian-activated detection
- Road lighting technology
  - Power source (solar or traditional)
  - Either passive or active activation of the road lights
  - Lights
- ITS No Turn on Red Lights
  - An ITS sign with the capability to display "No Turn on Red"
  - A controller that allows for the "No Turn on Red" display to be programmed in when it is desirable for it to be displayed.
- Red light enforcement cameras

Useful Tip

When performing any road modifications or improvements, consider how pedestrian safety systems or strategies can be integrated into the larger project for significant savings and a better pedestrian transportation network.

Implementation Considerations (Pro)
•ITS "No Turn on Red" signs assist with providing right-of-way to pedestrians, thereby reducing vehicle/pedestrian conflicts. •Automated pedestrian detection systems can remove calls when they are no longer needed or put in a call for a pedestrian who presses the button. •Red light enforcement cameras help to address a significant safety issue for vulnerable road users. •Flashing crosswalk lights bring conspicuity to pedestrians. •Illuminated pedestrian push buttons show pedestrians that their call was received. •Countdown signals provide a pedestrian with information on the amount of time left to cross an intersection. •Animated eyes encourage pedestrians to consider potential conflicts with vehicles. •Countdown signal can have positive benefits for motorists, if motorists see they have plenty of time before the signal is going to change, they will not speed up and ruch through the light.

Implementation Considerations (Con)
•Automatic pedestrian detection systems can have false positives and false negatives. •Red light enforcement cameras are often perceived by the public as revenue generators or "big brother" oversight, rather than safety systems. •ITS "No Turn on Red" signs may increase vehicle travel time. •Countdown signals may encourage motorists to speed through an intersection (if they are aware of their purpose). •No study has directly proven a correlation between the use of animated eyes and a reduction in pedestrian-vehicle crashes. •Snow plows may damage some of the pedestrian provisions.

Opportunities for Future Expansion

- Vehicle to pedestrian (V2P) – on-going research is investigating V2P and pedestrian to infrastructure (P2I) technologies that help to reduce or eliminate pedestrian crashes. More generally, this means that technology in vehicles will help to detect pedestrians.
- Vehicle technology in the future, like soft bumpers and hoods, and pedestrian airbags, are anticipated to assist with reducing the severity of injuries to a pedestrian if a pedestrian/vehicle crash occurs.

Additional Resources

- *Pedestrian Safety – Report to Congress*, found here: http://safety.fhwa.dot.gov/ped_bike/legis_guide/rpts_cngs/pedrpt_0808/
- *Other Measures; 48. ITS Technologies, Pedestrian & Bicycle Safety,* found here: http://safety.fhwa.dot.gov/saferjourney1/library/countermeasures/48.htm
- *A Review of ITS-Based Pedestrian Injury Countermeasures*, found here: http://escholarship.org/uc/item/9h03t6t7
- *Ulster County, Non-Motorized Transportation Plan*, found here: http://ulstercountyny.gov/sites/default/files/documents/its_applications.pdf
- *Pedestrian Safety Engineering and ITS-Based Countermeasures Program for Reducing Pedestrian Fatalities, Injury Conflicts, and Other Surrogate Measures of Final System Impact Report*, found here: http://safety.fhwa.dot.gov/ped_bike/tools_solve/ped_scdproj/sys_impact_rpt/sys_impact_rpt.pdf

Examples of Implementation

- **Lummi Nation Haxton Way Pedestrian Path and Lighting Project**

The Lummi Nation created a pedestrian path with low-emitting diode (LED) lighting to address safety concerns of bicyclists and pedestrians that travel along a roadway that experiences heavy truck traffic. There are light sensors that brighten when the pedestrian approaches, and go back to a dimmer state once the pedestrian has passed. Each light is solar powered. The project was designed to minimally impact the wetlands by using solar power instead of power that would have had to be trenched through them.

- **Pedestrian Hybrid Beacon; University of Colorado, Boulder**

Within Boulder, Colorado, a pedestrian hybrid beacon assists pedestrians and bicyclists with crossing the roadway.

- **Pedestrian Countdown Signals; Pinellas County, Florida**

To address a high crash rate, an action plan was created for Pinellas County, Florida. Among other pedestrian safety treatments, Pinellas County implemented countdown signals.

Cost Range

(Cost/financial information, where noted, is based on 2016 dollars (unless otherwise specified). Cost/financial information is estimated, and will vary based on size and scope of project, number of units, etc. In general, capital costs include initial purchase costs of hardware, software, and other required equipment. Maintenance and operations costs include staff time to operate, monitor and maintain systems; data collection; system upgrades; evaluation; etc.)

Capital Costs: The total capital cost for this tool is low (Less than $50,000). As an example, an illuminated crosswalk was installed in Boulder, Colorado, with costs ranging from $10,900 to $21,800.

Operations Costs: The operations and maintenance costs for this tool are anticipated to be low (Less than $50,000). Costs for maintenance and power (if not solar powered) may be needed.

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