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Project Title:
Support for Challenge Area “Work Zone”

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Task Manager:
Bradley Mizuno
Transportation Engineer (Electrical)
bradley.mizuno@dot.ca.gov

Support for Challenge Area “Work Zone”

This proposed research is to address the California Strategic Highway Safety Plan (SHSP) 2015-2019 two Work Zone Challenge Areas. These areas are to “Apply Advanced Technology to Improve Work Zone Safety” and “Improve Work Zone Data Collection and Analysis”.

WHAT IS THE NEED?

The California Strategic Highway Safety Plan (SHSP) 2015-2019 is considered as “the statewide, coordinated safety plan that provides a comprehensive framework for reducing highway fatalities and severe injuries on all public roads.” There are many stakeholders, including Caltrans, who are dedicated to meeting the objectives of SHSP. A significant component of the SHSP is that “the plan must be data-driven.” This indicates that quantifiable, safety-related metrics must be a key component in identifying areas of concern and then used to develop potential solutions.

The Challenge Areas in the updated plan (the 2015-2019 version) include the following: Roadway Departure, Intersections, Interchanges, and Other Roadway Access, Work Zones, Alcohol and Drug Impairment, Occupant Protection, Speeding and Aggressive Driving, Distracted Driving, Driver Licensing, Pedestrians, Bicycling, Young Drivers, Aging Road Users, Motorcycles, Commercial Vehicles, Emergency Medical Services

In the State of California, work zone collisions accounted for 1.7 percent of all traffic fatalities and severe injuries in 2012. The SHSP’s Work Zone Challenge Area (WZCA) is charged with the task of reducing fatalities and serious injuries due to work zone related traffic collisions as well as improving the safety of work zones. The WZCA is an important component of California’s SHSP.

The WZCA team has identified four strategies to meet its goals as follows:

1. Evaluate and promote strategies for best work zone practices.
2. Improve safe driving through work zones with education and



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- enforcement.
3. Apply advanced technology to improve work zone safety.
 4. Improve work zone data collection and analysis.

This proposed effort is for AHMCT’s support of the actions and activities assigned to the WZCA team. AHMCT has been identified by the WZCA team to support its activities especially as it relates to strategies 3 and 4 listed above. In the past, AHMCT research team has worked with the Challenge Area teams and has been identified by the WZCA team as potentially being the lead on some aspects of strategies 3 and 4. Under this task, AHMCT will primarily be providing support through data derived answers to questions posed by the WZCA, as well providing raw and filtered data as requested by the WZCA.

WHAT WAS OUR GOAL?

To assist in decreasing collisions occurring in a construction or repair zone as well as improve worker safety. This was accomplished by completing the two strategies identified below.

- Review work zone best practices from other states through a comprehensive literature search and produce a report.
- Develop a method to calculate work zone crashes per number of miles of Caltrans construction work zone on State maintained roadways and consider using as an ongoing performance measure.

WHAT DID WE DO?

The research provided support for WZCA in providing the lead in certain aspects of Strategies 3 “Apply advanced technology to enhance work zone safety” and 4 “Improve work zone data collection and analysis”.

In relationship to Strategy 3, Action 3.1 “Review work zone best practices from other states through a comprehensive literature search and produce a report”, AHMCT’s role was reviewing the existing literature and available technologies along with documenting the best practices that have been used by other State Departments of Transportations (DoTs). The literature review was not limited to public sector current practices only. Any experience or knowledge gained through “in the field application” that may be of interest to the WZCA team, was included.

In relationship to Strategy 4, Action 4.1 “Develop a method to calculate work zone crashes per number of miles of Caltrans construction work zone on State maintained roadways and consider using as an ongoing performance measure”, AHMCT evaluated and studied existing data collection systems such as PeMS, SWITRS, TASAS, and AHMCT’s own Work Zone Injury Database. More specifically AHMCT used established mechanisms to capture dynamic data output from PeMS that included lane closure information along with other potentially useful PeMS data. AHMCT used databases associated with Traffic Collision Reports such as TASAS and SWITRS to capture more collision content and attributes and evaluated methods of improving such systems.

Additionally, AHMCT supported the WZCA team by being an active participant in activities, meetings, and brainstorming efforts.

WHAT WAS THE OUTCOME?

The literature review revealed that the use of Intelligent Transportation Systems (ITS) improves work zone safety while assisting in speed, traffic, and incident management, by providing methods such as queue warning systems, variable speed limits, and dynamic merging systems.

The technology review indicated innovations in using autonomous driving and driver assistance technologies, advanced truck mounted attenuators, smart cones and barrels, automatic means for work zone notifications, and the use of wearable technology to alert roadway workers. In addition, the literature and technology review indicated the use of unique public communication methods such as audio warning messages with smart phones or use of active, as well as emotional, driver warning systems.

Data collection and analysis of work zone related accidents from 2010 to 2015 indicated an increasing trend in the percentage of work zone accidents as compared to the total number of collisions on California highways.

The researchers found that collisions near work zones were less severe and that there were more Property Damage Only (PDO) crashes in work zones as compared to all collisions. The fatalities were likely due to mostly night-time construction where alcohol is, probably, stronger factor affecting drivers. Furthermore, analysis of the data indicated that sideswipe and rear end accidents were much more common near work zones due to distractions and sudden changes in traffic speeds. Improper driving and unsafe speed were among the most causal factors in work zone accidents.

The following recommendations are made based on the results of this study:

- If the percentage of work zone collisions continues along the same trend as from 2010 to 2015, then it is recommended to have additional research and development efforts in areas that can impact work zone safety.
- Since Improper Driving and Unsafe speeds are two major factors in work zone collisions, additional research and development efforts aimed at influencing driver behaviors is recommended.
- In this study an example process was used to link traffic collisions data (i.e. TASAS) with

Caltrans’ Lane Closure System (LCS) data. More research and/or development work is recommended to link these two databases. By doing so, each collision identified with an active lane closure will have access to the LCS data. The ability to link lane closure data with traffic collisions on state highways can provide a new level of information on work zone collision analysis.

- In order to objectively evaluate work zone collision frequency, an objective measure of exposure to road work is needed. An objective measure of exposure can be developed by normalizing exposure based on length of time or total distance of closure. More research is recommended for developing such a measure of exposure.
- More research and analysis is recommended to identify collisions in work zone regions such as the advanced and transition regions. It will be useful to determine if serious injuries and fatalities occur in any one region type.

WHAT IS THE BENEFIT?

This research assists Caltrans in identifying advanced technologies to enhance work zone safety and improve work zone data collection and analysis. The outcome of this research will benefit Caltrans by assisting in the California Strategic Highway Safety Plan 2015-2019.

IMAGE

Year	# Work Zone Collisions	Total # Collisions	% of Work Zone Collisions per Year
2010	3545	155768	2.28%
2011	4032	152267	2.65%
2012	5008	149288	3.35%
2013	5873	152426	3.85%
2014	6563	153994	4.26%
2015	7458	166604	4.48%