PROJECT SUMMARY

Texas Department of Transportation

0-6703: Prevention of Backing Fatalities in Construction Work Zones

Background

Construction, repair, and maintenance work zones are hazardous environments because of the dangerous combination of pedestrian workers and large trucks, bulldozers, rollers, and other moving machinery. All the workers are exposed to moving traffic near the work zone, with the risk of errant vehicles entering the work zone area. The pedestrian workers are exposed to construction vehicle crashes within the work zone. Between 70 and 80 pedestrian construction workers are struck and killed each year by construction vehicles within a work zone. From 1995 to 2002, 844 worker deaths occurred in roadway work zones, 91% of which were related to motor vehicle traffic or construction equipment. Construction-vehicle-related deaths were responsible for more than half of these deaths. Dump trucks accounted for 41% of pedestrian-worker deaths and 52% of these involved dump trucks backing up. Run-overs and back-overs as the leading cause of death for roadway construction workers, with over half occurring when workers were struck by construction vehicles or equipment inside the work zone. Due to this alarming information, TxDOT created this project to update the methods and procedures for preventing backing fatalities in construction work zones.

What the Researchers Did

The research team first conducted a comprehensive literature review on backing fatalities and some of the practices currently used in their prevention. The comprehensive synthesis provided a useful reference for further development of this research. The next task was the identification and analysis of appropriate responses in three main categories: engineering, administrative, and technology controls. To determine what technology controls might be useful in construction work zones, the next task was to identify and review the proximity warning systems (PWS), and develop criteria for identifying and selecting commercially available PWS that could be helpful in preventing backing fatalities in construction work zones. Once these systems were reviewed and specific systems were selected, testing was conducted to find out which of these systems are the most useful in certain scenarios and in the use of the other controls we have selected. Based on the knowledge gained from this research, the research team presented recommendations to TxDOT for the prevention of backing fatalities.

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What They Found

It can be concluded that any single control is insufficient. Training alone will not prevent all incidents because, by nature, construction work zones are potentially hazardous. Hence, engineering controls, such as site planning, need to be in place to make the work zone less hazardous. After reviewing current engineering and administrative controls being used, some methods and policies were found to be outdated and left room for improvement. These involved changes and new policies in engineering controls as well as administrative controls, and are believed to greatly aid in the prevention of backing fatalities if properly executed. However, even with a safer work zone and better training, technology is the last line of defense to ensure the safety of all workers in a work zone. An assessment of the sensor technology systems available for dump trucks and pickups indicates that they should be selected based on these factors: 1) technology, 2) environment, 3) static detection zone, 4) response time (dynamic detection range), 5) false-alarm rate in clear field, 6) cost, 7) installation location, and 8) use of supplemental camera.

Among the four sensor systems tested, the HCS-700 system is recommended for pickup trucks—but this system should be cleaned frequently to maintain detection performance.

For dump trucks, two sensor systems—HighResolution and WorkSight—performed best. Both systems have pros and cons; HighResolution had better performance during the dynamic test, but poor performance in terms of close proximity detection compared to WorkSight. Since no single control is completely effective, it is important to consider grouping the different types of controls for the most effective method of preventing backing fatalities. Developing internal traffic control plans, considering the technology at hand and its capabilities, allows for the most efficient work zone to be developed by incorporating the sensors to best detect workers around the equipment. Integrating technology controls along with site planning and training can greatly reduce the risk of fatal construction incidents caused by backing.

What This Means

As technology improves, there should be a continuous effort to find the most suitable technologies for construction work zones to provide workers with the safest possible work environments. Future implementation into the field should be reviewed to find the most effective way of applying these to the work zone. Efforts to improve training and communication can also make use of the knowledge and insight of more experienced workers who have a better understanding of the work zone; incorporating such experiences will make for a much safer work zone environment.

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