

## Safety

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**Project Title:**

Evaluation of Proximity Warning Systems for Work Zones

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**Task Manager:**

Larry Baumeister

Transportation Engineer (Electrical)

[larry.baumeister@dot.ca.gov](mailto:larry.baumeister@dot.ca.gov)

## Evaluation of Proximity Warning Systems for Work Zones

To evaluate commercially available Proximity Warning Systems (PWS) and determine if they would improve worker safety in California Department of Transportation (Caltrans) highway work zones.

### WHAT IS THE NEED?

The roadway construction and maintenance operations typically require workers to work in the proximity of construction equipment and continuous traffic, leaving workers exposed to injury and death due to getting hit by construction equipment in the work zones. The dynamic nature and involvement of many assets in work zones lead to work zone complexity, making workers prone to human errors increasing the risk of personal injuries. Accidental collisions often occur in busy or loud working environments when a worker is not aware of a vehicle working nearby. Even though Caltrans maintains high worker safety standards through its operations and equipment standards, there is a need to find ways for further improving highway work zone safety. In recent years, the technological advancements have paved the way for the development of Proximity Warning Systems (PWS) to help improve the safety of workers from collisions within a work zone. A PWS can warn workers in a work zone of impending danger due to their presence relative to the construction equipment or vehicles. Through the use of sensors and smart wearable technologies, the proximity between equipment, workers, and machine operators can be measured in real time. If too close, an audio and visual cue can be implemented to avoid incidents.

### WHAT ARE WE DOING?

This research project plans to evaluate promising commercially available PWS for their benefits including worker safety, reliability, durability, range, response speed, and shortcomings etc., and to determine if their implementation is practical and would improve worker safety in highway work zones.



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Contractor will conduct a market assessment and literature review to identify the most relevant and promising commercially available PWS, followed by procurement of selected PWS in consultation with project panel. The selected PWS will be pilot tested in closed-to-traffic conditions at Caltrans Maintenance Equipment Training Academy (META) to assess the performance of each PWS. Training sessions for Caltrans maintenance staff will be conducted to enable them to independently deploy and operate the selected PWS before deploying them in active work zones. Contractor will collect and analyze data on the pilot testing of PWS. Project panel will review the results of pilot testing and select specific PWS, if any, to be tested in active highway work zones. In consultation with project panel a list of active work zone locations will be identified where the deployment and testing of PWS will occur. Contractor will develop detailed deployment, testing, and data collection plans for each identified active work zone and associated PWS. The contractor will obtain feedback from Caltrans maintenance staff through surveys and collect additional data on the performance of selected PWS. The outcome of this research will be a detailed evaluation of the selected PWS and guidance on the use and implementation of selected PWS.

## WHAT IS OUR GOAL?

The goal of this project is to conduct a detailed evaluation of commercially available PWS, and to provide detailed guidance on the use and implementation of selected PWS in different types of work zone applications depending on the features and capabilities of PWS, nature and type of work, and the size of the work zone.

## WHAT IS THE BENEFIT?

The results of this project will provide guidance for Caltrans maintenance staff to effectively deploy and use PWS to reduce and eliminate incidents, improving overall work zone safety.

## WHAT IS THE PROGRESS TO DATE?

As of May 2025, here is the progress to date:

The project panel has met three times to discuss specifications for procurement. Researchers at Sac State have started the process of procurement for purchasing some of the proximity warning systems for evaluation.