

**Traffic
Operations****MAY 2026****Project Title:** Work Zone Research**Task Number:** 4340**Start Date:** March 4, 2025**Completion Date:** April 30, 2027**Task Manager:**

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DRISI provides solutions and knowledge that improves California's transportation system.

Effect of Using Standardized Work Zone Data to Improve Work Zone Safety

Standardized work zone data will be utilized to reduce crashes involving human-driven and automated vehicles (AVs) by sharing information with connected vehicles (CVs) for improved safety.

WHAT IS THE NEED?

Work zones play a key role in maintaining and upgrading our nation's roadways. Unfortunately, work zone safety continues to be a concern for state transportation agencies across the United States (US), for the safety of motorists who drive through the work zone and for workers who build, repair, and maintain our roadways. According to the national work zone safety data, in 2021, an estimated 106,000 work zone crashes happened across the US, resulting in 42,000 injuries and 956 fatalities. In California, 113 fatal crashes happened with a total of 120 fatalities in 2021. Between 2020 and 2021, work zone fatalities increased by 10.8 percent (see Image 1). In specific, work zone intrusions are a growing concern for the California Department of Transportation (Caltrans) due to their severe impact on the life of workers (see Image 2).

Many transportation agencies face the challenge of how to share work zone activity information with third parties and CVs effectively to improve work zone safety. Since 2019, the US Department of Transportation has funded the Work Zone Data Exchange (WZDx) project. The WZDx project focuses on the voluntary adoption of a basic work zone data specification, which enables Infrastructure Owner Operators (IOOs) to make harmonized work zone data available for third party use. Specifically, the WZDx project aims to get data on work zones into vehicles to help both human drivers and automated driving systems (ADSs) to navigate more safely and efficiently.

In May 2023, the SAE (Society of Automotive Engineers) International published a new road safety message (RSM), and the use of infrastructure-to-vehicle (I2V) communications capabilities defined in other standards, including SAE Standards and the National ITS (Intelligent Transportation

Systems) Architecture, the purpose of the new RSM is to enable road safety application interoperability using I2V communications. The road safety applications include:

- Curve speed warning (CSW)
- Reduced speed zone warning (RSZW)
- Lane closure warning (LCW)
- Dynamic traveler information (DTI)
- Incident information (INC)

WHAT ARE WE DOING?

In this project, we propose using standardized work zone data (i.e., WZDx and RSM) as the countermeasure to reduce work zone intrusion crashes for both human-driven vehicles and AVs. More specifically, we will generate standardized work zone data feeds of active freeway work zones and lane closures, which represents the common work zone scenarios.

We will make the data available to share with CVs through both direct short-range communication (e.g., Cellular Vehicle-to-Everything (C-V2X)) and long-range cellular network communications (i.e., Infrastructure-to-Network (I2N) and Vehicle-to-Network (V2N)). The goal is to evaluate the safety effects before and after the adoption of the standardized work zone data.

WHAT IS OUR GOAL?

The goal of this agreement is to produce a report, which include (1) findings of both human driver and automated vehicle performance in and around the work zones before and after adoption of the standardized work zone data, (2) findings of the safety impact on mitigating the work zone intrusion and protecting safety of the work zone workers when the work zone data and information are disseminated to the vehicles, and (3) feedback and specific recommendations for Caltrans regarding critical information of work zone messages that will

be accurately and sufficiently interpreted by human drivers and AVs.

WHAT IS THE BENEFIT?

The findings of this project will help Caltrans to enhance work zone safety. It will advance the work zone data adoption for the safe and efficient deployment of AVs. It will enable effective coordination of activities and enhanced mobility and safety in and around work zones for both human drivers and AVs. It will lay the groundwork for the state of California to be a national leader in adopting standardized work zone data.

WHAT IS THE PROGRESS TO DATE?

The research team, in coordination with Caltrans, is working to identify automotive industry partners that can adopt standardized work zone data. With support from the Caltrans technical panel, the team has established a collaboration with Toyota's InfoTech Lab and has been holding monthly technical meetings since September 2025 to prepare for integrating the standardized data into Toyota's engineering vehicles. The research team and Toyota signed a Non-Disclosure Agreement (NDA), and together with Caltrans, finalized a Memorandum of Understanding (MOU) in March 2026. The research team is also continuing communication with the Transportation Research Center (TRC) and other potential partners, as well as working with the Contra Costa Transportation Authority (CCTA) to explore applications of standardized work zone data for AV operations along the Interstate 680 (I-680) corridor.

Over the past quarter, the research team has been working closely with TRC to enhance smart barrels and hubs for faster Global Positioning System (GPS) convergence. Multiple rounds of testing have been conducted at the Richmond Field Station (RFS) test track, using its High Definition (HD) map to assess positioning accuracy. Results showed that the devices achieved accuracy within 50 centimeters. During this testing, the research team also successfully tested TRC's Application Programming

Interface (API) for fetching the WZDx formatted data.

While the TRC team is continuously working on enhancing the accuracy, the research team is moving forward with integrating the TRC API into the research team's work zone server.

The research team is also collaborating with Toyota to integrate the standardized work zone data into Toyota's engineering vehicle. In parallel, the team is developing an end to end automated driving system capable of trajectory planning and vehicle control around work zones.

IMAGES

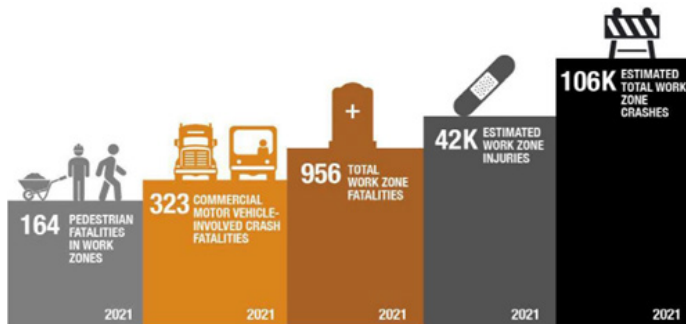


Image 1: 2021 Work Zone Crash Data Summary (Source: National Work-Zone Safety Information Clearinghouse)

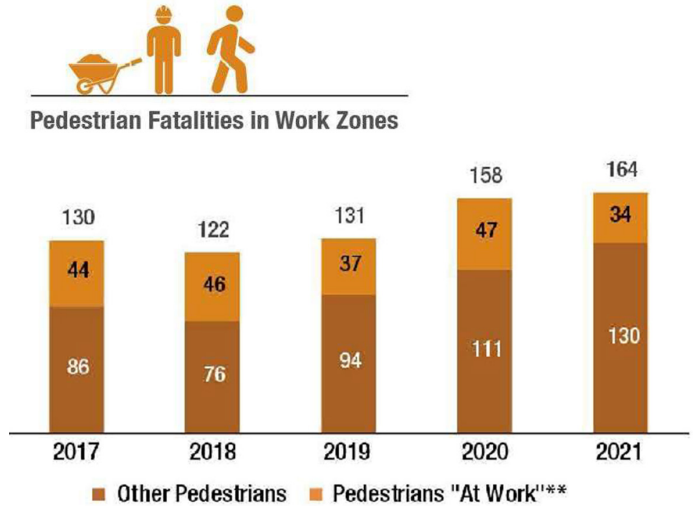


Image 2: Pedestrian Fatalities in Work Zones (Source: National Work-Zone Safety Information Clearinghouse)