NATIONAL ACADEMIES
Sciences Engineering Medicine

NHCRP Project 20-102(28) Resource Guide

Building Stakeholder Support for Connected and Automated Vehicles in Work Zones

This section provides background on connected and automated vehicles (CAVs) to help department of transportation administrators as these vehicles are increasingly deployed in work zones. Stakeholder support is very important to the success of these deployments, particularly engaging stakeholders around specific projects and understanding the need for specific technologies throughout the lifecycle of a work zone.

Why Stakeholder Engagement Matters

Stakeholders play a significant role in the deployment of CAVs in work zones.

Identifying CAV-related Technologies – Agency stakeholders can identify CAV-related technologies to benefit specific work zones:

- Smart navigation and advanced warning systems
- Reduced speed or work zone warnings
- Work zone traveler information systems
- And many others

Identifying Potential Challenges – Stakeholders may identify factors that could disrupt CAVs functioning within work zones:

- Non-standard signs
- Unclearly marked travel lanes and/or pavement markings
- Non-standard retro-reflective devises
- Improperly spaced devices.

Educating Others – To ensure smooth deployment, stakeholders can educate others on the benefits of these technologies:

- Policymakers and managers who authorize and allocate CAV-related technologies
- Front-line employees who deploy work zone-related applications

Ensuring Success – In educating others, stakeholders can make the case for funding these technologies. Once authorized, stakeholders can ensure the successful implementation and deployment by troubleshooting challenges.

When Stakeholder Engagement Matters

Stakeholder support is necessary throughout the life cycle of a work zone project.

Before Deployment – Stakeholder support helps gain and maintain political and financial buy-in for the project effort.

Engaged stakeholders also promote quality education for the workers responsible for the technologies in the field. Agency administrators should ensure contracts for projects containing CAV elements include relevant language in the Work Zone Traffic Control plan. When novel technologies and applications are used, appropriate training should be provided regarding installation, use, maintenance, etc.

During & After Deployment – Stakeholder engagement can provide opportunities for shared learning both within a single agency and across agencies as subsequent projects are undertaken. Leveraging peer-to-peer learning opportunities and industry best practices can help stakeholders avoid challenges encountered by others.

Identifying Technical and Financial Resources

This section is designed provide information regarding technical and financial support that may be used to offset the costs of infrastructure or supporting labor.

Finding Technical Support

While the deployment of CAVs in workzones may seem daunting, several resources exist which provide opportunities for DOT administrators to learn from and leverage the experiences of others. These resources include the **Work Zone Safety Information Clearinghouse**, the **Work Zone Data Exchange**, and the **Cooperative Automated Transportation (CAT) Coalition**. These peer exchanges of information can facilitate successful deployments by providing a rich source of lessons learned and best practices.

Work Zone Safety Information Clearinghouse

The **National Work Zone Safety Information Clearinghouse** is a project of the American Road and Transportation Builders Association in cooperation with the U.S. Federal Highway Administration and Texas A&M Transportation Institute. The Clearinghouse provides work zone data, training, an overview of work zone devices – including lists of approved products as well as manuals for assessing safety hardware implementation, summaries of laws, standards, and policies, and listings of events and resources for raising public awareness.

- https://workzonesafety.org/
- https://ops.fhwa.dot.gov/wz/wzdx/index.htm#wzdxspec
- https://transportationops.org/CATCoalition

Work Zone Data Exchange Specifications

Up-to-date information about dynamic conditions occurring on roads – such as construction events – can help ADS and humans navigate safely and efficiently. Many infrastructure owners and operators maintain data on work zone activity. However, a lack of common data standards and convening mechanisms makes it difficult and costly for third parties – including original equipment manufacturers (OEMs) and navigation applications – to access and use these data across various jurisdictions.

The **Work Zone Data Exchange Specifications** enables IOOs to make harmonized work zone data available for third-party use.

In January 2021, the USDOT Federal Highway Administration funded demonstration grants in 13 states, example projects include:

- Updates to the 511 SF Bay to generate WZDx data feeds
- The use of an autonomous truck mounted attenuator to provide a real-time data feed for the work zone in which the attenuator is used
- The demonstration of smart arrow board technology to provide validated and granular information for WZDx data feeds statewide

CAT Coalition

The **CAT Coalition** is a partnership of the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), and the Intelligent Transportation Society of America (ITSA). Coalition members include representatives from IOOs, original equipment manufacturers (OEMs), technology and service providers, and internet of things (IOT) suppliers. Among the resources and opportunities presented by the CAT Coalition in a clearinghouse of CAT Policy Frameworks and Policy Statements. Example statements include state-specific CAV roadmaps and business plans.

Additionally, an IOO/OEM Forum was created as a working group to allow individuals representing both IOOs and OEMs to work on tasks and discuss the needed data exchanges between vehicles and the infrastructure. As part of this effort, the forum has provided webinars, including one on the Work Zone Software Toolchain which was developed by the Crash Avoidance Metrics Partnership (CAMP) LLC in collaboration with FHWA.

- https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/02/updated-fact-sheet-bipartisan-infrastructure-investment-and-jobs-act/
- https://transportationops.org/CATCoalition

Identifying Financial Support

Several sources of federal funding exist. It is likely that the recently passed bipartisan **Infrastructure Investment and Jobs Act** will include funding for CAVs and/or work zone applications. Of particular interest, the Act includes approximately $550 billion in new funding for roads, bridges and more. A Fiscal Year 2022 Notice of **Funding Opportunity for Safe Streets and Roads** has been posted.

Other sources of funding may include the **Accelerated Innovation Deployment Demonstration Program** and the **State Transportation Innovation Council (STIC) Incentive Program**. The Accelerated Innovation Deployment Demonstration Program provides funding for to accelerate implementation and adoption. The STIC Incentive Program provides technical assistance and funds (up to $100,000 per STIC per year) for purposes of standardizing innovative practices in a state transportation agency or other public sector STIC stakeholder.

- https://www.grants.gov/web/grants/view-opportunity.html?oppId=340385
- https://www.fhwa.dot.gov/innovation/stic/
- https://www.fhwa.dot.gov/clas/ltap/aid_demonstration_grants.aspx

Reducing Regulatory Uncertainty

This section provides an overview of the applicable work zone-related national standards, specifications, and initiatives that may be relevant to the deployment of connected and automated vehicles in work zones. A list of the relevant specifications and standards and the corresponding purpose is provided in the table.

List of Specifications/Standards and Corresponding Description

Specifications/Standards	Description
Federal and State Laws and Policies	A repository of federal and state-specific laws and guidelines maintained by the **National Work Zone Safety Information Clearinghouse**
Dedicated Short Range Communication (DSRC) Systems Engineering Process Guidance for SAE J2945/X Documents and Common Design Concepts **SAE J2945_201712**	Specification of message and exchange between vehicle to infrastructure (V2I)
Message Sets for Advanced Traveler Information System (ATIS) (Stabilized June 2019) **SAE J2354_201906**	Standardization of messages for Advanced Traveler Information Systems
V2X Communication Message Set Dictionary **SAE J2735_202007**	Standardization of message set, and data elements for vehicle-to-everything (V2X) communications systems and DSRC
Connected Infrastructure – Roadside Equipment **NEMA TS 10-2020**	Standards for agencies and operators for procurement and deployment of Connected Vehicle (CV) Roadside Units (RSU)
Work Zone Data Exchange (**WZDx**)	Specifications for harmonized work zone data provided by infrastructure owners and operators (IOOs) for safer and more efficient travel on public roads
Virtual Open Innovation Collaborative Environment for Safety (**VOICES**)	Establishes a virtual collaboration platform for the research and testing of prototype cooperative driving automation applications

- https://workzonesafety.org/laws-standards-policies/
- https://www.sae.org/standards/content/j2945_201712/
- https://www.sae.org/standards/content/j2354_201906
- https://www.sae.org/standards/content/j2735_202007
- https://www.nema.org/standards/view/connected-vehicle-infrastructure-roadside-equipment
- https://www.transportation.gov/av/data/wzdx
- https://www.transportation.gov/hasscoe/voices

Additional Resources

Understanding the Technologies:

A PowerPoint presentation providing an overview of CAV and infrastructure-based technologies and how these technologies may improve work zone safety. Additionally, the presentation provides infrastructure-based solutions that can be either technology or non-technology-based that an agency can implement to facilitate CAV technologies.

A Framework for Assessing Benefits and Costs:

A PowerPoint presentation providing a framework for conducting benefit/cost assessments. Specifically, it provides a tool for use in the assessment of benefits, costs, and challenges for selected work zone CAV applications. Further, it will help practitioners to better understand the challenges, limitations, and data availability for CAV benefit-cost analyses (BCAs).

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