ATSSA

CIRCLE OF INNOVATION

2025 Summary Report

Developed by the American Traffic Safety Services Association

Innovation & Technical Services Team

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Introduction to the Circle of Innovation

The American Traffic Safety Services Association (ATSSA) 2025 Annual Convention & Traffic Expo featured numerous innovations aimed at improving roadway safety. One of the largest exchanges of information occurred during the Circle of Innovation (COI). This one-hour session involved more than 200 participants and featured input from several public agency practitioners plus a moderated exchange of information using advanced polling technology. Several discussion sessions took place, enhanced by closed- and open-ended electronic polling utilizing smartphones. ATSSA framed these discussions based on a pre-meeting survey that identified the most pressing topics from anticipated attendees. While the focus was on public sector input, manufacturers and suppliers also attended the session to help foster innovation and find solutions to real-world challenges encountered by practitioners.

The following sections highlight the innovations, discussion topics and the results from audience polling on priority topics and challenges. Areas with highlighted text include a link to the resource referenced to provide additional information and opportunity for investigation.

Innovative Use of All Way Stop Control

The New Hampshire Department of Transportation (NHDOT) sought innovative ways to improve safety at two-way stop controlled rural intersections with a history of crashes, including high-speed angle crashes. Some two-way stop controlled intersections that do not meet traffic signal or multi-way stop control warrants from the Manual on Uniform Traffic Control Devices (MUTCD) and do not qualify for a capital improvement project still experience safety challenges in such locations throughout the state. While the MUTCD Section 2B.06 notes that "YIELD or STOP signs shall not be used for speed control," NHDOT found that the all way stop intersection control seems to combat these issues, and, as an added benefit, serves to reduce traffic speeds through these areas of potential conflict.

Figure 1. All-Way Stop Control Intersection in New Hampshire

The North Carolina DOT (NCDOT) implements all way stop control (AWSC) at existing two-way stop controlled intersections with high severity frontal impact crashes. NCDOT evaluated several deployments and found that the traffic engineering improvement has a median cost of approximately $20,000 and a benefit-cost ratio of 83:1 based on an

evaluation of 36 locations using before and after crash data. The NCDOT study included a diverse group of four-leg intersections converted to AWSC in urban, suburban and rural areas and also compared some locations with overhead or sign-mounted flashing beacons. NCDOT also found these locations experienced 26 fatal and serious injury crashes before the countermeasure but experienced no fatal or serious injury crashes after implementation.

Agencies may also program capital improvement projects to alleviate crash risks at intersections. However, the larger cost for these improvements and necessary warrants may inhibit an agency's ability to convert the intersection type. Circular intersections, also known as roundabouts, are one technique for improving safety at a traditional intersection. A single-lane roundabout reduces conflict points from 32 to 8 by eliminating left-turn and straight-through crossing movements, replacing them with lower-speed merge and diverge maneuvers that significantly reduce crash likelihood and severity. Due to the construction costs, practitioners also use mini roundabouts and modular roundabouts. A mini roundabout is a small-scale version of a traditional roundabout that allows larger vehicles to traverse the roundabout using a truck apron on the edge of the central island and/or shoulder corners. A modular roundabout uses prefabricated elements with modules attached directly to the pavement surface to form a roundabout.

Other agencies noted treatments for similar issues using transverse thermoplastic rumble strips and flashing lights on signs. The Crash Modification Factors (CMF) Clearinghouse includes 35 CMFs associated with transverse rumble strips on stop controlled approaches in rural areas under the roadway rumble strips category. In this context, the use of transverse rumble strips reduced all crash types (fatal, serious and minor injuries) from 25.5% to 21.5%. There are also 21 CMFs for flashing beacons at AWSC intersections. In particular, results from "Safety Evaluation of Flashing Beacons at STOP-Controlled Intersections" (results from North and South Carolina) showed that the use of flashing beacons at AWSC intersections reduced angle crashes by 13% and injury and fatal crashes by 10%. The Idaho Transportation Department (ITD) uses stop beacons and Light Emitting Diode (LED) lights in the border of signs to draw attention to the devices. There are two CMFs listed on the Clearinghouse for replacing a standard stop sign with flashing LED stop sign (the same CMF of 0.59 for each). Massachusetts DOT (MassDOT) uses rural intersection conflict warning systems near high schools where traffic signals are not warranted.

Other types of countermeasures noted by participants during polling included:

- Various types of rumble strips including grooved versions
- Stop signs with flashing lights
- Narrow lanes and striping strategies
- Speed humps

Red Light Running Challenges and Solutions

The next discussion focused on red light running challenges and solutions. Publication FHWA-HRT-17-077, entitled "Safety Evaluation of Red Light Indicator Lights at Intersections," provides results of an evaluation of auxiliary lights mounted on signal heads, mast arms or poles that allow police officers to observe red light running at a location downstream of the intersection. The Red Light Indicator Light (RLIL) is intended to reduce the frequency of crashes that result from drivers that continue illegally through the red light. RLILs allow police to better detect the instant when the signal changed to red.

The results of this study noted crash reductions for most crash types. In addition, researchers developed CMFs for the RLIL as noted below. A CMF is used to compute the expected number of crashes after implementation of a countermeasure such as the RLIL. With a CMF of less than 1.0, crashes would be expected to decrease because of the countermeasure.

- Disobeyed signal crashes – CMF of 0.71
- Total crashes – CMF of 0.94
- Fatal and injury crashes – CMF of 0.86
- Right angle crashes – CMF of 0.91
- Left turn crashes – CMF of 0.60
- Benefit/cost ratio – 92:1 for four legged intersections

Another example noted by participants is the use of a leading pedestrian interval (LPI) at signalized intersections to combat safety issues with right turning traffic and the need to yield to pedestrians. As defined by the Federal Highway Administration (FHWA), a LPI gives pedestrians the opportunity to enter the crosswalk at an intersection from 3 to 7 seconds before vehicles are given a green indication. Pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn right or left. The use of LPIs can reduce crashes by 13%, based on a recent FHWA publication on the topic. Representatives from both MassDOT and NHDOT noted use of this practice.

Other types of intersection safety strategies noted by participants during polling included:

- Increased change and clearance intervals
- High visibility backplates on signals
- Red light running cameras
- Advance warning for the intersection
- "No right turn on red" signs

Secondary Closures in Work Zones

Secondary closures are areas within an already-closed workspace that include additional devices to ensure traffic is physically prevented from entering the area. In the past, agencies may have tested or used arrestor nets as one solution to protect against errant vehicles. However, vehicle intrusion devices are no longer referenced in the MUTCD and limited guidance exists on their use and effectiveness.

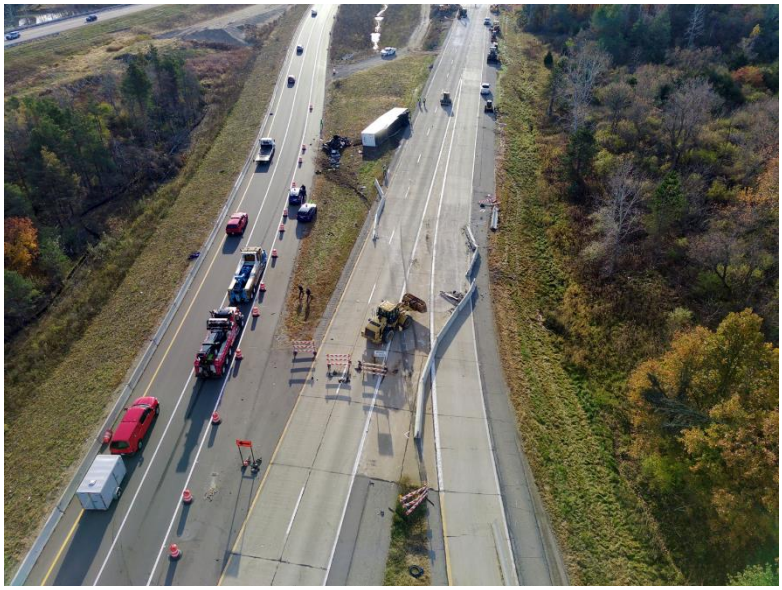


Figure 2. Secondary Closure Incident in Michigan

An incident could occur in these situations because of a gap between temporary and permanent barrier sections or where Type 3 Barricades are used to close an area to traffic. States are continuously evaluating options and methods to prevent what might otherwise end with a severe injury or fatal incident at these closed workspace locations, especially where speeds are high. In one work zone that consisted of a crossover on a limited access highway, Michigan DOT required the contractor to place a concrete barrier inside the closure behind the Type 3 Barricades to protect downstream bridge work. A semi-truck entered the closed area and struck the secondary closure (concrete barrier) but did not pose a risk to workers and the incident did not cause serious injuries to the semi-truck driver.

Secondary closures for projects with shorter duration compared with long-term stationary projects may use positive protection features to improve safety. For example, some people taking part in COI noted the need for lightweight, portable solutions for short-term projects. A representative from Maryland made reference to the Maryland State Highway Administration Policy for the Use of Temporary Traffic Barrier in Work Zones, which addresses the use of secondary closures on bridge and tunnel projects where intrusion issues exist. To ensure greater awareness as motorists approach a queue ahead of the workspace, the Tennessee DOT (TDOT) implemented a "Protect the Queue (PTQ)" program using a special provision that requires two advance warning vehicles that move with the queue as it builds. One of these protective vehicles always remains one-half mile in advance of the back of the queue.

Other examples of secondary closure related countermeasures from polling included:

- Police presence
- Barriers and protective vehicles with attenuators
- Virtual rumble strips and other types of rumble strips
- Intrusion devices

Positive Protection and the Updated FHWA Rule

In addition to secondary closures and their relationship to positive protection devices, the COI group discussed current trends in general protective features for projects. As requirements change, agencies noted interest in innovative devices to provide positive protection in a feasible manner based on project type, duration and location.

FHWA recently updated the Temporary Traffic Control Devices Rule (Subpart K) that notes that "at a minimum, agencies shall use positive protection devices in work zones with high anticipated operating speeds that provide workers no means of escape from motorized traffic intruding into the workspace unless an engineering study determines otherwise." Participating agencies noted several practices in use to determine when positive protection is warranted (i.e., an engineering study example). For example, Delaware DOT (DelDOT) issued a Design Guidance Memorandum that requires positive protection on projects that are:

- Two weeks or longer in duration, and either:
    - Posted speeds are 45 mph or greater, or
    - The operation occurs within a travel lane or shoulder or is within 10 feet of the edge of a travel lane.

In addition, ITD uses a spreadsheet tool (which downloads via the link) to evaluate project characteristics such as annual average daily traffic (AADT), the distance between traffic and workers, and crash cost potential if no protection is provided. Virginia DOT (VDOT) uses an analytical process for evaluating potential risks of vehicle intrusions. California DOT (Caltrans) uses a rating system that evaluates a total score based on several criteria. The NCDOT uses a process that relies on drop-off conditions and other hazards and is based on elements from the AASHTO Roadside Design Guide. Agencies may also evaluate the costs associated with use and compare the potential benefits when determining whether to use positive protection devices in judgment-based situations.

The FHWA Rule states that agency processes, procedures or guidance shall address the use of positive protection devices. The Rule also notes that agencies shall update their policy for the use of positive protection devices no later than Dec. 31, 2025. States may request a variance from FHWA on a project-by-project basis, such as for those that are in the later stages of development near the compliance deadline. As agencies implement the

FHWA Rule they may also establish an internal review process to gather input on positive protection policies and needs.

Agency responses were mixed overall on the existence of guidelines or policies on use of an engineering study to justify use of positive protection devices.

Speed Management

Speed management strategies take on a variety of forms and applications. For work zones, speed trailers and post-mounted electronic signs can either provide feedback to motorists on their actual speed, set the work zone posted speed limit, or vary the work zone posted speed limit based on the actual conditions of the project. Vendors have several options for these types of systems, and the devices must meet the requirements of the MUTCD.

A few practices are noteworthy from the COI discussion. VDOT is using digital speed limit signs that can be connected to a traffic operations center and remotely controlled. One challenge with the devices is determining if it is better for the contractor to control the speed limit or whether DOT control from a remote location is practical. The Colorado DOT (CDOT) is using a variable speed limit system during active construction on Interstate 25 and uses the system for heavier off-peak traffic periods such as during special events.

VDOT is implementing speed safety camera systems in work zones to help reduce speeding through active construction areas. The Maryland Department of Transportation State Highway Administration (MDOT SHA) has used speed safety cameras in high speed locations for several years. FHWA published a "Speed Safety Camera Program Planning and Operations Guide" that provides best practices in planning and operation of these devices, which can complement traditional enforcement techniques.

Digital posted speed limit sign trailers may also be used in work zones for speed limit reductions during active work hours, such as when work occurs only at night. Daytime non-work zone speed limits can then be set back to the original posted speed limit for the roadway. This practice can assist with speed management during nighttime paving operations, for example, where temporary traffic control is removed, and normal daytime conditions resume each day. These devices can also be part of the connected work zone, linked to a central server with information sent out through third party traveler information applications.

Another COI participant noted that Advanced Driver Assistance Systems (ADAS) are unable to discern LED lights as they work to adjust speeds in vehicles automatically. Research is ongoing to evaluate forward-looking camera compatibility with these types of devices for speed management.

Artificial Intelligence in Transportation

ATSSA recently produced "Driving Transportation Safety Forward with AI," which highlights several applications of artificial intelligence (AI) use for solving transportation challenges. As noted in the evaluation results from the COI session, some agencies are implementing AI but nearly all agencies are investigating or considering appropriate ways to apply AI to common transportation challenges. As a practitioner resource, a recent National Cooperative Highway Research Program (NCHRP) study documented the typical transportation focus areas for state-sponsored projects that involve AI. The following figure summarizes all responses from the poll on use or planned use of AI.

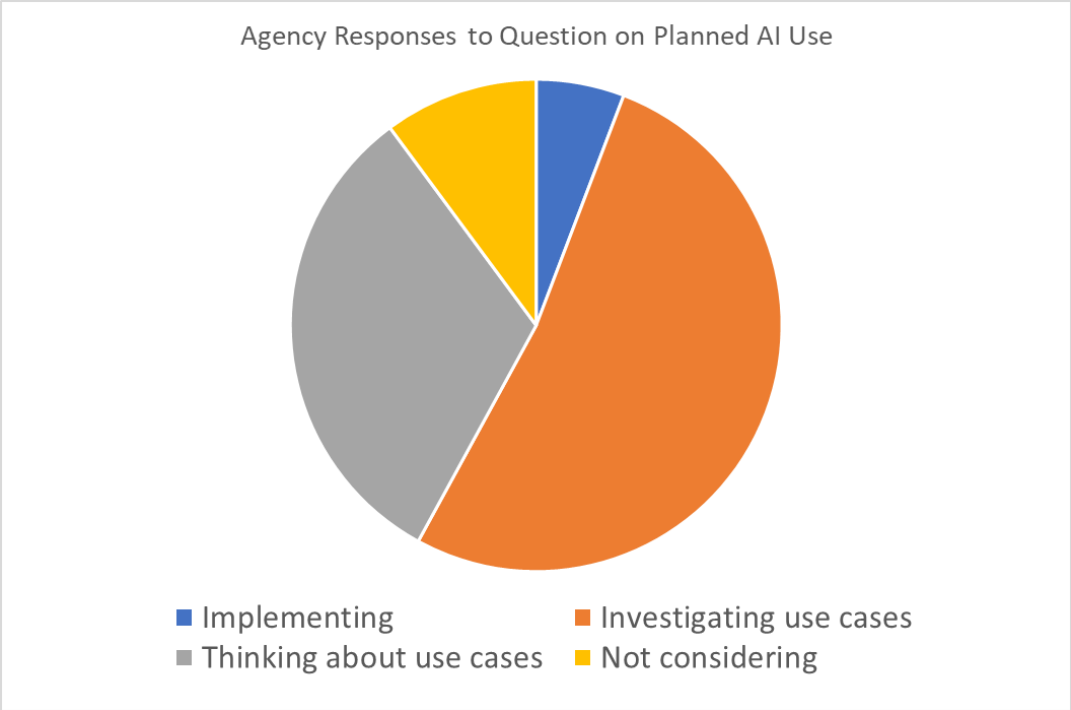


Figure 3. Agency Responses on Planned AI Use

Portable Traffic Signals and Related Technologies

The last topic discussed at COI addressed ATSSA's development of a resource under the FHWA Work Zone Safety Grant Program that highlights uses of portable traffic signals (PTS), automated flagger assistance devices (AFAD) and residential driveway temporary signals (RDTS). The newest technology is the RDTS, which received interim FHWA approval in January 2025. The RDTS uses solid yellow arrows, flashing yellow arrows, and a circular red indication along with regulatory signs to control traffic on side streets within larger sections of one-lane, two-way mainline work zones. The devices are connected to PTS at both ends of the one-lane, two-way mainline constriction.

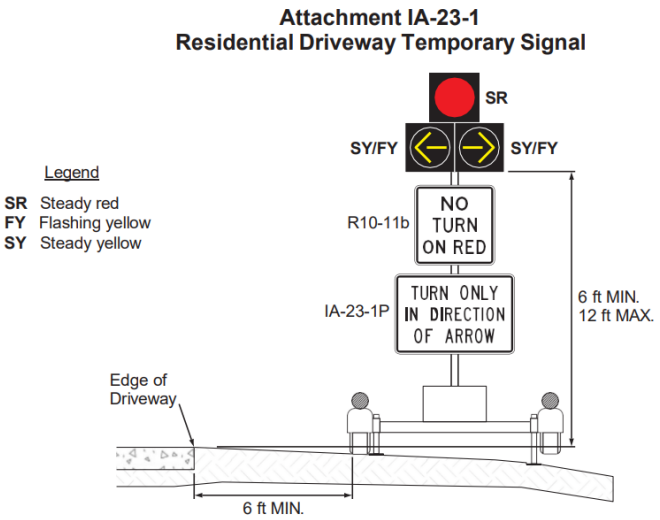
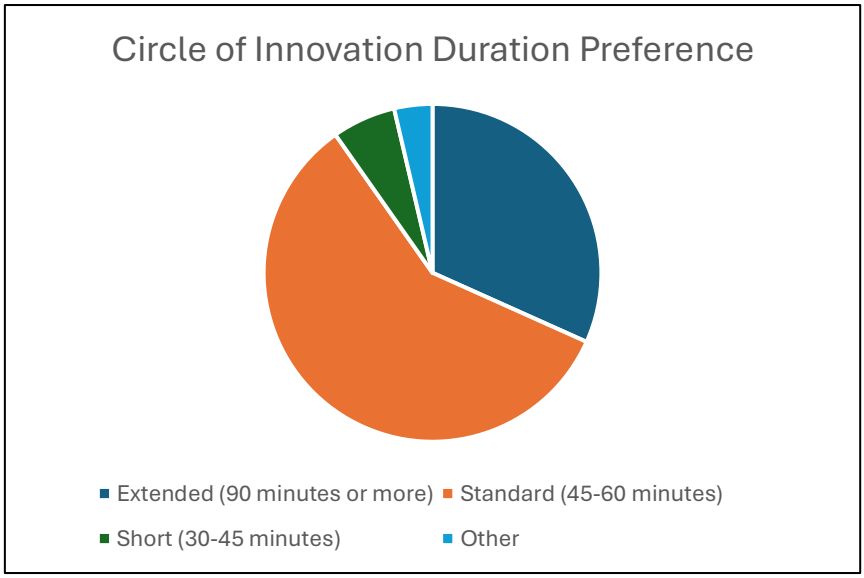


Figure 4. FHWA Interim Approval RDTS Layout

Summary

ATSSA's 2025 Circle of Innovation provided a one-hour session where public sector agencies shared innovative practices and technologies that can improve roadway safety. The discussions covered intersection safety, speed management, artificial intelligence and work zone examples such as policies for the use of positive protection devices. Smartphone polling captured detailed information from practitioners in the group that will help guide future discussions and further the implementation of these innovations.

Evaluations showed that participants found the session to be valuable and a good use of time. As shown in the figure to the right, most participants (59%) noted a preference for the standard timeframe of 45-60 minutes for the event. Participants also provided feedback via the questions noted below.



Evaluation Question	Average Rating*
How would you rate your overall experience at the Circle of Innovation?	4.4
Was the Circle of Innovation relevant to your interests and professional needs?	4.3
How would you rate the importance of the Circle of Innovation to your overall experience at the ATSSA Convention & Traffic Expo?	4.5

*Rating scale: 1 to 5, with 1 being lowest and 5 being highest

The format met the expectations of the audience and the polling technology was well received by participants. Polling allowed respondents to access Quick Response (QR) codes using smartphones and provide input into topic-specific survey questions.

ATSSA used open-ended questions to allow participants to add keywords or phrases to indicate topics of interest along with the closed-ended ratings questions. Some of the results for those topics suggested for further investigation include:

- Worker safety, personal protective equipment and overall safety culture
- New products and technologies for pavement markings
- Intelligent Transportation Systems and connected work zones

The Circle of Innovation assisted with several key needs in the industry, including the need to:

- Highlight emerging technologies and trends in roadway safety, including insights into potential impacts, challenges and opportunities
- Highlight potential training content on such emerging technologies and trends
- Evaluate the best format for information sharing and idea generation so current trends can be assessed in various venues

For future sessions, ATSSA can consider other techniques for gathering input and grouping participants for open-ended responses. For example, participants may be broken out by topic area of expertise and with limited access to certain poll questions. This may allow for better display of results in real-time and may more easily narrow the key topics of interest by focus area.

ATSSA may also refine the Circle of Innovation format to include video demonstrations of devices and strategies and allow participants to rate those strategies. A recent format for an event hosted by the Florida Department of Transportation (FDOT) included a panel of DOT and private sector judges that assessed a range of cutting-edge work zone safety solutions that included information technology, physical hardware and smart technologies. The topics included connected workers and automated speed limits, crowd-sourced data for work zone analysis, gamification to combat distracted driving, work zone intrusion alert

systems and barrier systems and sound panels. Similar topics would likely be of interest to the audience for the ATSSA Circle of Innovation in the future.

ATSSA will continue to facilitate the exchange of information and determine how best to create products that meet the needs of practitioners interested in investigating emerging technologies for use in advancing roadway safety.

Appendix – Circle of Innovation Presentation Slides

Welcome

2025 Circle of Innovation

9am to 10am

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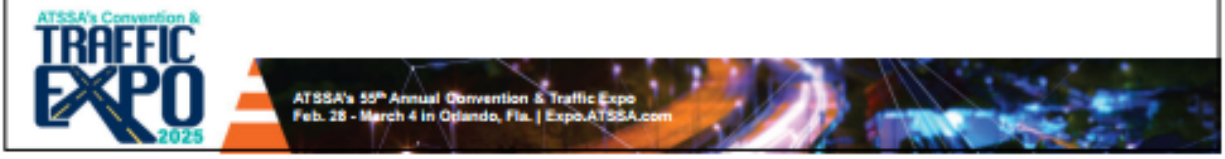
Topics and Times

- Rules of Engagement
- ATSSA Events:
  - Traffic Control Device Student Challenge
  - New Products Rollout
  - Innovation Award Winner video
  - Work Zone Safety Device Demonstration

Remaining time

Lightning Round, **As time permits**

- Intersection Safety
- Work Zone Safety
- Artificial Intelligence



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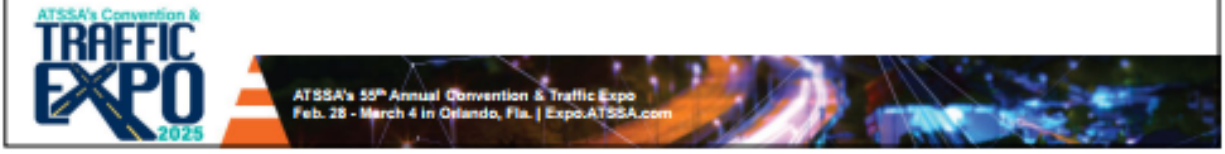
Room Rules/Event Information cont…

- Public transportation officials are allowed to present ideas
- Private sector participants are in "listen only mode"
- Please clearly state your name and affiliated agency
- Hear challenges and solutions from public transportation officials
- Top items from the survey are considered for future case studies, webinars, training classes, and ideas for ATSSA manufacturers, suppliers and/or contractors in audience today
- Stick around after the event to network



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Traffic Control Device Student Challenge

- Theme: "Innovative Traffic Control Device Solutions to Improve Roadway Worker Safety."
- First Place: **Florida International University** - Hellen Shita, "Use of Rectangular Rapid-Flashing Beacons (RRFBs) in Improving Worker Safety."
- Second Place: **North Carolina State University** – Seth Wilder, "DrumSense: An Intelligent Platform to Enhance Work Zone Safety and Data Collection."
- Third Place: **University of Connecticut** - Sepehr Golrokh Amin, Prakash Ranjan, Quinn Packer, Haimanti Bala, and Manmohan Joshi, "Multi-Tiered Traffic Control and Safety System for Construction Zones Using Temporary Asphalt Text, Lidar, and Work Zone Intrusion Monitoring."

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Innovation Award

- Congratulations to HAAS Alert for winning the Innovation Award
- Please check out all the NPRO entries on the show floor and on our website

Discover the future of NEW PRODUCTS ROLLOUT Roadway Safety Innovations

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Innovation Award Winner

- Product: Safety Cloud by HAAS Alert (digital messaging)
- Company: HAAS Alert
- Booth Number: 631
- Name: Tom Parbs

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Safety Cloud by HAAS Alert (digital messaging)

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Follow-up survey - which topics are most important to you and your agency in 2025?

203 responses

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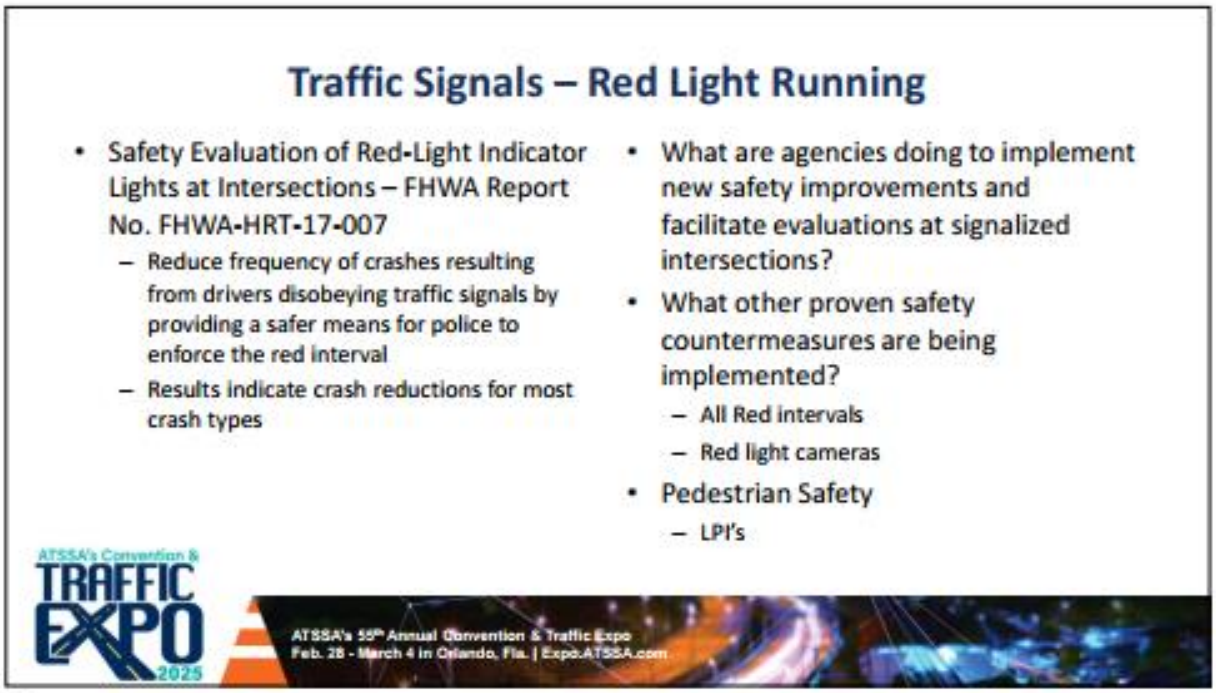
All Way Stop Control - what other low-cost intersection solutions/applications are working?

133 responses



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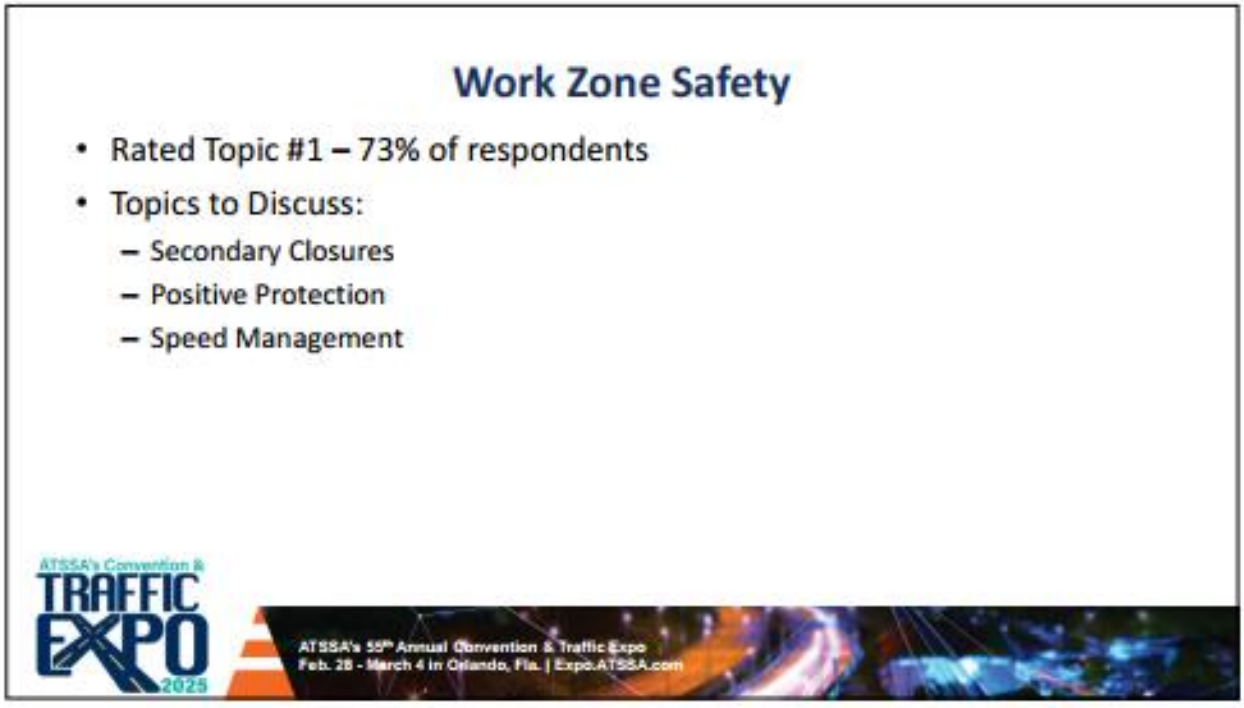
Signalized Intersection Safety - what is your state using with success?

113 responses



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Secondary Closures

- Identified through survey
  - –Chris Brookes, Michigan example
    - Vehicle behind barrier wall
    - See following photos

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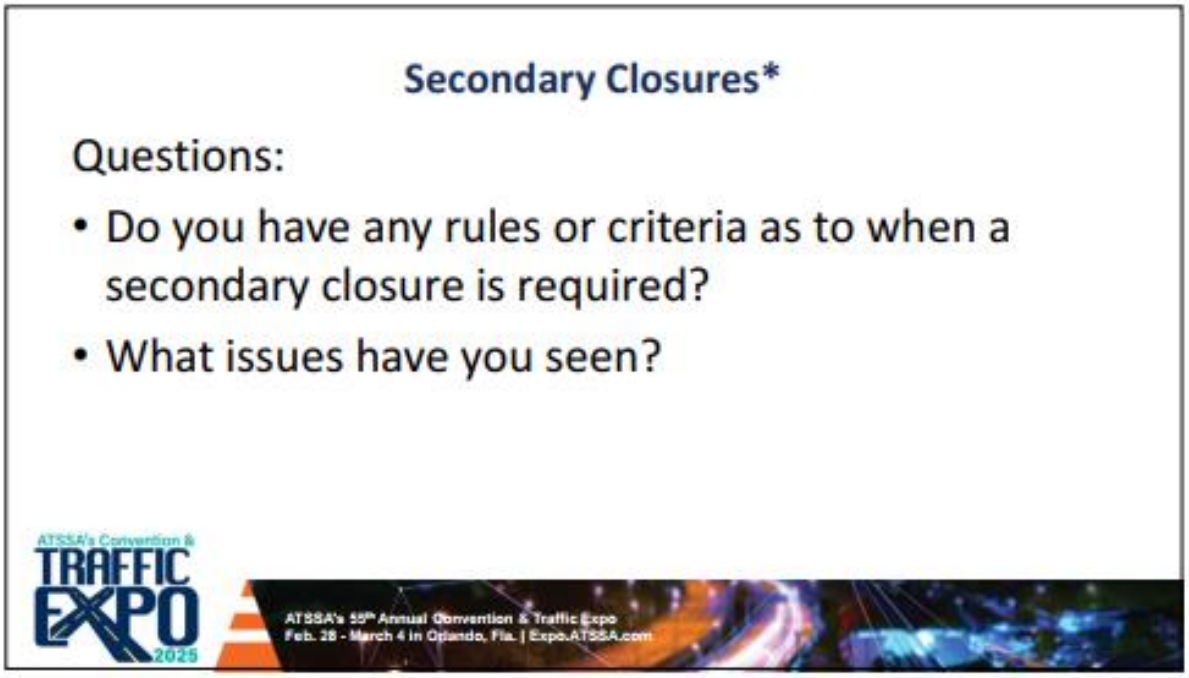
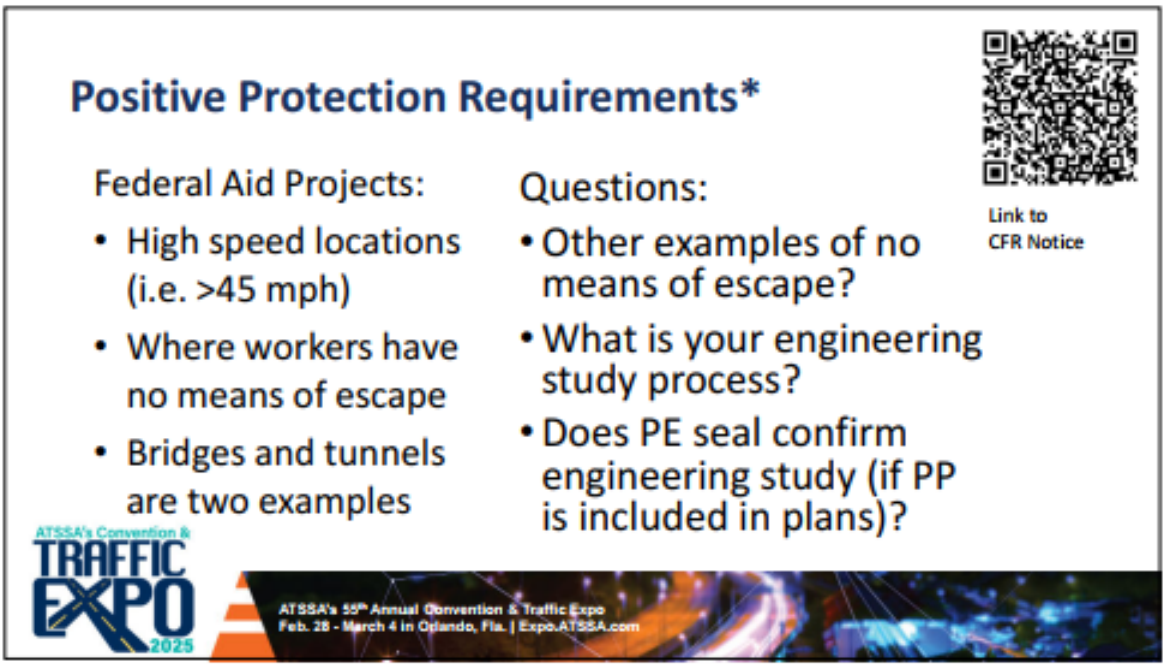


WZ Secondary Closures - what solutions are working in your agency to prevent these types of crashes?

104 responses



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WZ Positive Protection - does your agency have guidelines for an engineering study? Type your state abbreviation.

28 responses

25

WZ Speed Management - which of these solutions are you using with success?

90 responses


AI – A top investment priority in Transportation Worldwide
AI is the top investment priority
AI easily tops the charts of planned investments for the next one to two years, with almost half (49%) saying it's a spending priority, followed by cybersecurity (39%) and robotics and automation (32%).
AI (44%) is expected to be one of the three most impactful emerging technologies in industrial networking over the next five years, followed by cybersecurity solutions (39%) and digital transformation (38%).
For complete Report: https://www.itsinternational.com/news/cisco-releases-international-transportation-networking-report?account_id=2235106
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Driving Transportation Safety Forward with AI
Case Studies on the Application of Artificial Intelligence in Transportation
Innovation & Technical Services
ATSSA releases case studies on transportation and artificial intelligence
Sponsored by ATSSA and co-authored by Eric Perry, P.E. ATSSA Director of Innovation and Technical Services, and Tim Luttrell, P.E., these studies highlight how artificial intelligence can enhance roadway safety.
SCAN TO DOWNLOAD

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Summary

Example Case	AI Technologies Used	Realized/Anticipated Benefits
Hawaii DOT	AI supported resilience, climate and safety analysis platforms	• Predictive modeling that justifies decisions and supports funding requests to lawmakers • Eliminates fatal crashes and fatal incidents • Automated human resources applications, including processing communications and calls • Verifies that employee training requirements are met
Iowa DOT	Deep learning-driven video intelligence/ AI powered video content analysis	• Faster, more efficient incident verification and response • Proactive predictions when incidents are most likely to occur
Pavement Marking Condition Assessments Using AI	Custom object detection algorithms applied to high resolution aerial imagery	• Enhanced efficiency in processing aerial imagery to drive AI technologies • Greater compliance with pavement marking standards • Efficiency through automated processes for generating maintenance and improvement programs
Research by The Ohio State University	AI powered video content analysis/ existing bus camera data	• Automated analysis of video data across an existing network for vehicle count summaries • Cost-effective data sources using existing bus security camera footage for AI analysis

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Artificial Intelligence*

Last year we discussed

- Traffic incident management
- Forecast prediction model
- Pavement marking condition assessment

What have you done?

- Implementing?
- Investigating uses?
- Thinking about use cases?
- Not considering?

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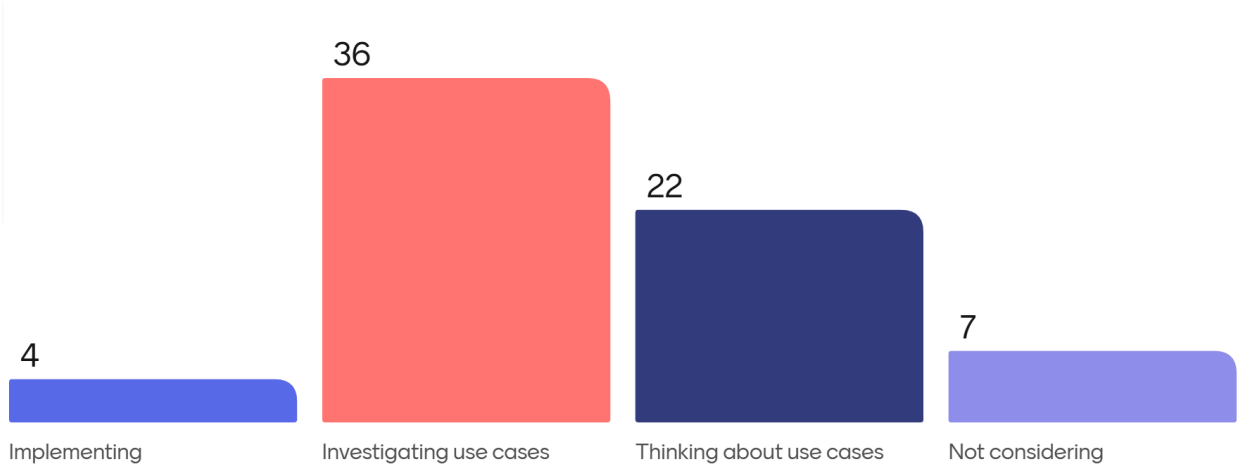
Artificial Intelligence - where does your agency fall in the implementation of AI solutions?



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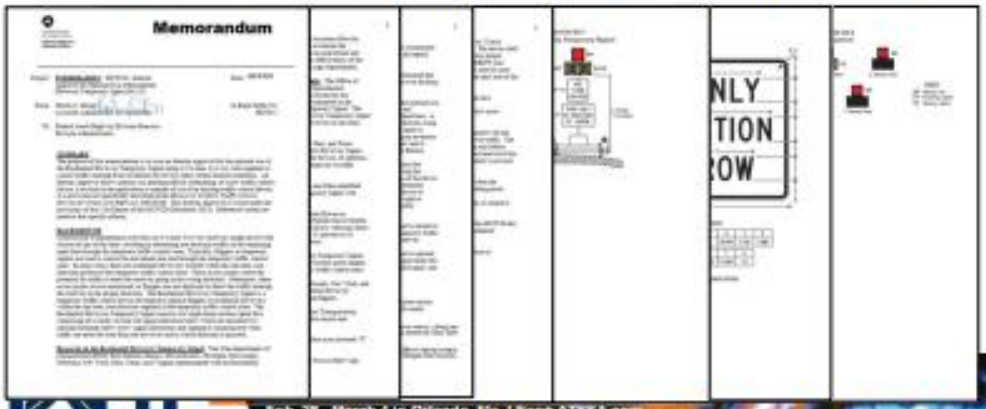
Interim Approval – 23

Link to ATSSA Blog on IA-23

- On 1/8/25, FHWA signed Interim Approval 23
- Residential Driveway Temporary Signal – previously know as DAD



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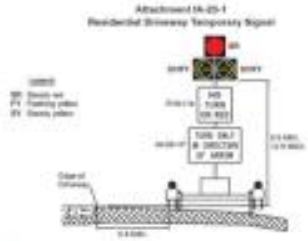
Residential Driveway Temporary Signal

- No more dad jokes
- Been in the works for over 10 years
- Another tool in the toolbox



- Has your agency used this in an experimental fashion?
  - If so, what was your experience?
- How many agencies plan to use this device in the future?

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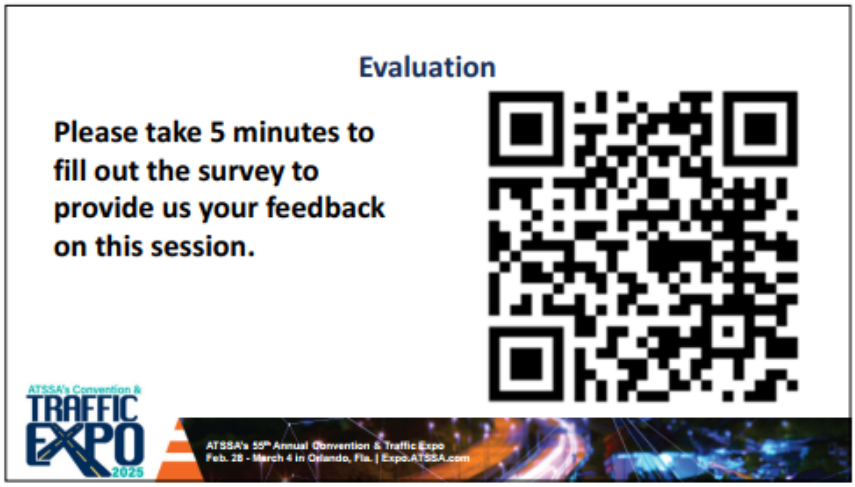
Evaluation
Please take 5 minutes to fill out the survey to provide us your feedback on this session.
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Thank You
Questions?
Eric.Perry@atssa.com

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For more information contact ATSSA at 540-368-1701 or innovation@atssa.com.