

National Symposium on Work Zones and Large Trucks

Summary Report

Jacksonville, Florida
April 13, 2015



U.S. Department of Transportation
Federal Highway Administration



U.S. Department of Transportation
**Federal Motor Carrier Safety
Administration**



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SYMPOSIUM SUMMARY

Background

The National Symposium on Work Zones and Large Trucks was held as a one-day event at the Hyatt Regency Jacksonville Riverfront Hotel in Jacksonville, Florida, on April 13, 2015. The objective of the symposium was to exchange experiences and identify solutions to further improve large truck safety and mobility in and around work zones. Attendees included a total of 90 practitioners representing State departments of transportation (DOT), the Federal Highway Administration (FHWA), the Federal Motor Carrier Safety Administration (FMCSA), the National Highway Traffic Safety Administration (NHTSA), the Commercial Vehicle Safety Alliance (CVSA), the American Association of State Highway and Transportation Officials (AASHTO), law enforcement agencies, academia, and industry. The symposium consisted of:

- An opening session where a panel of principals introduced the stakeholders and key challenges,
- A frame the day/issues discussion,
- A highway environment session focused on work zone design and technology applications,
- A vehicle session focused on the dynamics of navigating a work zone,
- A driver session that included discussion of challenges for truck drivers, and
- A closing session that documented the key items for an implementation plan document.

Opening Session

FHWA Associate Administrator for Operations Jeffrey Lindley began the opening session discussing FHWA's six core values and the importance of maximizing our collective ability to address serious problems through teamwork and relationships. Mr. Lindley discussed the ongoing work that FHWA is doing to reduce work zone fatalities, including the Every Day Counts (EDC), Smarter Work Zones, and Toward Zero Deaths initiatives, as well as its involvement in National Work Zone Awareness Week activities.

FMCSA Assistant Administrator and Chief Safety Officer Jack Van Steenburg then discussed FMCSA's mission to save lives by reducing crashes, injuries, and fatalities involving commercial motor vehicle (CMV) transportation, and how this mission relates to the objective of the symposium. Mr. Van Steenburg discussed a number of statistical analyses on work zone injuries and fatalities, and the role driver behaviors, particularly distracted driving and speeding, contribute to these crashes.

John W. Marshall, NHTSA Director of Office of Safety Programs, discussed NHTSA's mission and challenges and solutions for vehicle occupants. Mr. Marshall outlined key statistics, such as the fact that 90 fatalities per day occur on average on our highways and cited a statistical study showed that nearly all of these (94 percent) are due to human behavior.

CVSA Executive Director Stephen Keppler discussed the partnership among enforcement, education, engineering, and emergency medical services (EMS) that must converge to improve work zone safety. Mr. Keppler discussed the unique challenges that present themselves with large trucks that are exacerbated by work zones, such as increased need for safe stopping distance and extended blind spots over what the average vehicle may require or experience.

AASHTO Senior Program Manager for Freight Chris Smith offered his perspective of this symposium from the freight/intermodal angle. Mr. Smith discussed the corridor management approach that State DOTs/AASHTO use for work zones. Observing trends in movement across State borders, they can see networks where the heaviest amount of freight is moving. States are looking at managing those loads along corridor based design.

Key points that came out of the opening session are as follows:

- Need to work with enforcement on key decisions in consultation with the DOT engineer on the work zone site.
- Maximizing work zone safety is a key component to FHWA's safety goal of zero deaths.
- Work zones present a unique challenge: Enforcement, Education, Engineering, and EMS all converge in work zone safety.

Frame the Day / Frame the Issues

Earl Hardy with FMCSA and Paul Pisano with FHWA framed the day and the issues to be discussed. Mr. Hardy reinforced the importance of input from this symposium in order for any changes to be made. Mr. Pisano discussed the very specific goals that FHWA has for the EDC Smarter Work Zones Initiative in the upcoming years. FHWA also needs input in order to know what is working well and where there is opportunity for improvement.

Key points that came out of the frame the day session are as follows:

- FHWA is looking at connected vehicle technology and how it can be used to inform drivers of work zone related hazards.
- Law enforcement needs to be part of the project team throughout the entire work zone planning, design, and implementation process.
- Research and development is being conducted by FHWA to look at decision making processes of drivers to help target the messages that should be provided.

Highway Environment Session

The highway environment session began with a presentation by Neil Boudreau, Massachusetts Department of Transportation Director of Traffic and Safety and State Traffic Engineer. Mr. Boudreau discussed traffic control devices that are being used in Massachusetts and in other States, including truck mounted attenuators, signing for ingress/egress points, temporary rumble strips, and advance warning signs for narrow lanes. Mr. Boudreau also stressed the importance in avoiding speed differentials in work zones and the need to follow the Manual on Uniform

Traffic Control Devices (MUTCD) requirements. In addition, he discussed how back-of-queue advance warning systems can improve safety by informing motorists as well as truck drivers.

Robert Brydia with the Texas A&M Transportation Institute discussed the work he has led on the I-35 Traveler Information System deployed during a construction project under contract to the Texas Department of Transportation. Mr. Brydia leads the team conceiving, designing, developing, implementing, operating, and maintaining the next generation real-time traveler information system across 200 directional miles of Interstate 35 in central Texas. Mr. Brydia shared that one of the biggest challenges is matching the toolbox of capabilities that you have to the situation that you have on the roadway using the various technologies that exist.

Key points that came out of the highway session are as follows:

- The goal of Work Zone Intelligent Transportation Systems (ITS) is to provide the right information to the right people at the right time to improve driving decisions, behaviors, and outcomes.
- It is very important to track performance and know how all your technologies are functioning.
- Commercial trucking groups should be included in early work zone planning. Ask them specifically what they need and get that information into the dispatch center.
- Theoretically every State should be inspecting work zones regularly throughout the State. Maryland is doing a great job with specification enforcement of work zones. They will shut down a job, for example, if the flaggers don't have the right paperwork.
- More research is needed on various dynamic lane merge systems. There was a comment that for right lane closures, dynamic lane merge works very well, but for left lane closures it can cause a lot of delays.

Vehicle Session

The vehicle session was led by Steve Smith and Chris Flanigan with FMCSA. They discussed the many different scenarios in which large trucks can be involved in work zone crashes. They also discussed how Commercial Mobile Radio Services (CMRS), Roadside Equipment, and the in-cab receiver and interface could potentially be used as existing technology solutions to give advance warning of work zones to truck drivers in order to heighten their awareness. Data issues with these potential solutions are still being identified, thus alternative solutions still need to be examined.

Key points that came out of the vehicle session are as follows:

- Messaging and communication need to be consistent around the country. Everyone should be on the same platform using uniform, standardized messages.
- There are many current research efforts to look at roadside technology. If research could merge this with the in-vehicle technology, then a uniform message set could be developed and existing messages enhanced.

- There is a need to look into the human factors side to determine what kind of alert would be most effective. Also need to be sure to always consider potential distracted driving issues.
- The goal is to not add devices into the cab, but rather utilize what is already in there, such as CB radios and smart phones.

Driver Session

Mr. Herschel Evans of America's Road Team gave a presentation on challenges from the truck driver perspective to start the session on driver challenges. Mr. Evans has been a professional truck driver for 28 years and has accumulated over 1.3 million accident-free miles. Mr. Evans discussed the numerous ways information can be sent to drivers, including email blasts, State DOT website updates, 511 traveler information systems, changeable message signs, mobile technology, local news, and satellite radio stations. He also discussed the importance to drivers of knowing when work zones are going to be active.

Captain Keith Gaston with the Florida Highway Patrol then discussed enforcement challenges in work zones, specifically with large trucks. Florida Highway Patrol tries to perform the majority of its enforcement activities before entering the vicinity of the work space beyond the transition area. They have had a lot of issues with driver compliance with the Move Over Law, which is part of why they try to enforce upstream of the transition area or work space. In instances where drivers do have to be pulled over within active work zone locations, they often ask the drivers to relocate to safer locations after gathering the initial driver information.

The following are the key points that came out of the driver session:

- Uniformity among work zone layouts is beneficial to drivers so that they know what to expect.
- Truck drivers will benefit from notifications about work zones slightly farther in advance than may be required, ideally a minimum of 2 miles, so that they do not have to make decisions at the last minute.
- Providing specific information on which lane truckers should use gives them time to safely merge into that lane and for other traffic to safely maneuver around them.
- Holding frequent construction progress safety meetings between law enforcement and State DOT is important for larger work zones.
- Pre-planning for projects to improve mobility during the projects can also help improve safety.
- There is an opportunity to get involved in driving schools and also in commercial licensing classes to teach the importance of safe work zone driving.

Closing Session and Next Steps

The symposium wrapped up with an overview of the key points that were brought up throughout the day. These key points and the discussion surrounding them are what framed the work plan capturing potential actions that can be taken as work zone programs move forward.

Meeting materials, presentations, and additional resources can be accessed at: https://www.workzonesafety.org/news_events/wz_conferences/2015/wz_large_trucks_symposium.

Proposed Work Plan

This template is designed to capture the high value actions that the Federal government can lead that will achieve the outcomes desired. Other agencies and organizations (e.g., AASHTO, CVSA) are encouraged to lead their own activities in addition to being engaged in these.

Focus Area 1: Develop Best Practices for Integration of Law Enforcement and Commercial Trucking Experts into Work Zone Planning, Design and Implementation

Activity	Description
1.1	Identify best practices for enhancement of work zone and large truck safety through optimal use of law enforcement and commercial trucking resources, assets, and personnel.
1.1.1	<i>Determine and deploy best practices guidance for the law enforcement community re: issues and actions related to work zones and large truck safety. Draw attention to presence officer functions in addition to enforcement officer functions.</i>
1.1.2	<i>Develop and disseminate best practices guidance for commercial trucking industry, as well as enhancements to training and licensure (i.e., Commercial Driver’s License (CDL) courses).</i>
1.1.3	<i>Create and employ best practices guidance for agency/contractor construction/work zone safety personnel re: integrating law enforcement and commercial trucking experts into work zone decision-making and implementation processes</i>

Focus Area 2: Review and Promote Best Practices in State DOT Engineering and Design for Large Trucks in Work Zones

Activity	Description
2.1	Work with agencies to promote the use of work zone safety devices and strategies such as truck mounted attenuators, large truck ingress/egress signs and alert systems, and temporary/portable rumble strips.
2.1.1	<i>“Inventory” design strategies that enhance work zone guidance for large trucks. Examples include increased taper lengths and increased buffer space to allow for longer safe stopping sight distance for large trucks (possibly alerting two miles in advance), portable changeable message signs far upstream information to alert and prevent back-of-queue incidents, notification of narrow lanes, enforcement friendly temporary traffic control designs with enhanced law enforcement coordination, and merge strategies.</i>

Focus Area 2: Review and Promote Best Practices in State DOT Engineering and Design for Large Trucks in Work Zones (cont'd)

Activity	Description
2.1	<i>Work with agencies to promote the use of work zone safety devices and strategies such as truck mounted attenuators, large truck ingress/egress signs and alert systems, and temporary/portable rumble strips.</i>
2.1.2	<i>Publish practical guidance that helps agencies and contractors choose the right “toolkit” of options for common settings, such as technology applications, message signs at the appropriate height for large trucks, truck-only lanes, enhanced project information for commercial trucking groups (through direct communications and media sources), and passenger-vehicle-only detour routes, and delineation considerations (softer angles, less abrupt lane shifts, variables in braking distances, etc.).</i>
2.1.3	<i>Develop a checklist of recommended work zone safety devices (ingress/egress signs, temporary rumble strips, CMRS, etc., as well as popular approaches/applications for commercial broadcast radios and smart phones)</i>
2.1.4	<i>Create a checklist of recommended low tech/low cost work zone routing and safety outreach options for freight companies (with two-way communication on needs) and drivers of large trucks including email blasts, State DOT websites, 511 traveler information systems, changeable message signs, mobile technology, and partnerships with service providers, local news and satellite radio stations.</i>
2.1.5	<i>Produce more extensive training and publicise the availability of the training to increase consistency in best practices.</i>
2.1.6	<i>Analyze truck crash data in work zones and promote key solutions</i>

Focus Area 3: Develop Incident Response Enhancements and Recommendations

Activity	Description
3.1	Identify key opportunities for enhancement of work zone and large truck safety through optimal practices by incident management and emergency medical response personnel.
3.1.1	<i>Engage the incident management community to develop and deploy best practices guidance for work zone and large truck safety.</i>
3.1.2	<i>Develop and deploy best practices guidance for engaging incident management community at the work zone planning stage.</i>
3.1.3	<i>Involve the emergency medical response community in developing and deploying best practices guidance for work zone and large truck safety.</i>

Focus Area 4: Identify and Promote Innovative Technology and Enhancements

Activity	Description
4.1	Determine new and emerging technology solutions (back of queue advance warning systems, next generation real-time traveler information systems, roadside/connected vehicle/vehicle-to-infrastructure options, and onboard equipment options) applicable to work zone and large truck safety.
4.1.1	<i>“Inventory” available high tech options to enhance work zone guidance for large trucks (including adaption of intrusion alerts developed for worker safety so that signal/message can also flow outward for work zone to vehicle communications)</i>
4.1.2	<i>Create applications guidance, including methods for tracking technology performance.</i>

Focus Area 5: Identify and Promote Related Research

Activity	Description
5.1	Identify and collect key research efforts that inform or impact work zone and large truck safety.
5.2	Ascertain additional research needs (such as guidance on dynamic lane merge systems (including right lane/left lane differences); work zone congestion alerts for large trucks; MUTCD compliance, etc.) and conduct research to address them.

Focus Area 6: Identify/Analyze Human Factors Findings and Conduct Additional Research

Activity	Description
6.1	Conduct literature review of human factors findings relative to drivers of large trucks and key dangers such as distracted driving and speed, as well as effective alerts. Evaluate how to best use devices that are already present in the cab, such as CB radios.
6.2	Analyze literature and promote to stakeholders key relevant findings.
6.3	Develop and conduct human factors research on effective strategies to reduce distracted driving and speed for drivers of large trucks, as well as on work zone alert methods, to augment existing findings.

Focus Area 7: Identify and Establish Framework for Ongoing Actions on Work Zones and Large Truck Safety

Activity	Description
7.1	Create stakeholder or other group to spur collaboration on a work zone and large truck safety initiative.
7.1.1	<i>Form a working group with representation from key stakeholder audiences to develop a framework for an initiative.</i>
7.1.2	<i>Outline best practices and steps to establish a viable initiative.</i>
7.1.3	<i>Conduct needs analysis to determine stakeholder resources and needs relative to advancing the initiative.</i>
7.2	Establish a group to focus on driver education (commercial and non-commercial) principles (3-second rule, driving around large trucks, CDL enhancements, etc.)

Focus Area 8: Develop Communications/Outreach Strategy and Plan

Activity	Description
8.1	Develop a Communications and Outreach Plan to support high value actions identified at Symposium. Include goals, strategy, target audiences, messages, tools, work plan and timeline. [Also consider the unique positioning of this issue in terms of the intersection of Enforcement, Engineering, Education and EMS as part of key concepts for the plan.]
8.1.1	<i>Identify a working group with representatives of key audiences (trucking industry, law enforcement, academia, state and federal government, etc.) to develop plan. Consider including key FHWA or other representatives involved in complementary work zone and trucking safety communications efforts.</i>
8.1.2	<i>Develop plan (consider content management strategies to repurpose existing material to meet program and communications plans/needs).</i>
8.1.3	<i>Add implementation tasking to Work Plan and Timeline, as indicated by the plan.</i>
8.1.4	<i>Develop content/tools identified in the plan, considering innovative outreach methods, case studies (for example, I-81 and I-35 projects), etc., considering how and where each audience prefers to get information.</i>

APPENDIX A. AGENDA

Time	Session Description	Speakers/Facilitators
8:00 am	Registration	Monica Worth , Leidos Symposium Facilitator
8:30 am	Opening Session – panel of principals	Martha Kapitanov , FHWA Jeff Lindley , FHWA Jack Van Steenburg , FMCSA John Marshall , NHTSA Steve Keppler , CVSA Chris Smith , AASHTO
9:30 am	Frame the Day / Frame the Issues	Paul Pisano , FHWA Earl Hardy , FMCSA
10:00 – 10:15 am	Break	
10:15 – 11:30 am	Highway Environment Session (discuss the challenges with respect to work zones)	Neil Boudreau , MassDOT Robert Brydia , TTI
11:30 am – 1:00 pm	Lunch (on your own)	
1:00 – 2:15 pm	Vehicle Session (discuss the challenges with respect to large trucks)	Steve Smith , FMCSA Chris Flanigan , FMCSA
2:15 – 2:30 pm	Break	
2:30 – 3:45 pm	Driver Session (discuss the challenges with respect to drivers)	Herschel Evans , America’s Road Team Captain Keith Gaston , Florida Highway Patrol
3:45 pm	Closing Session and Next Steps (report out on each of the 3 previous sessions by the facilitator)	Monica Worth and Cara O’Donnell , Leidos

APPENDIX B. ATTENDEE LIST

Wisconsin DOT	Iowa DOT Motor Vehicle Enforcement
AASHTO	Jefferson County Colorado
Alachua County Sheriff's Office	Kansas DOT
Alaska Department of Transportation and Public Facilities	Kentucky Transportation Cabinet
America's Road Team	Landstar
American Trucking Association	Leidos
Arkansas HTD	Massachusetts DOT
ARTBA	MCO Transport, Inc.
ATSSA	Michigan State Police
California Construction Trucking Association	Mississippi DOT
California Highway Patrol	Montana DOT
Carolina Casualty Insurance Group	Nassau County Sheriff's Office
Connecticut DOT	NATC
CVSA	NHTSA
Delaware DOT	North Carolina DOT
Drivewyze	NTSB
Eastern Lift Truck Company	Oak Ridge National Laboratory
Federal Express	Oldcastle
FHWA	Omnitracs – XRS
FHWA Florida Division	Orange County Sheriff's Office
Florida DOT	PA Turnpike/Michael Baker Jr., Inc.
Florida Highway Patrol	Puerto Rico DOT
FMCSA	Ranger Construction
Fort Worth Texas Police Department	St. Augustine Beach Police Department
Georgia DOT	Tennessee DOT
Grapevine Texas Police Department	Tennessee Highway Patrol
Help Inc.	Texas A&M Transportation Institute
iCone Products	Texas DOT
Illinois DOT	University of Alabama
Innovative Software Engineering	University of North Florida
	Virginia DOT
	Washington DOT

APPENDIX C. FULL MEETING NOTES

Opening Session

Jeffrey A. Lindley, Associate Administrator for Operations, FHWA

- FHWA has 6 core values, one of which is collaboration. As engineers, if there is a problem, we want to fix it, but we also need to figure out who needs to help us, who else we should get input from.
- That's what today is about: maximizing collective ability to address serious problem through teamwork and relationships.
- FHWA very serious about work zone safety, particularly safety impacts of work zones and large trucks. Our safety goal is zero deaths and maximizing work zone safety is key component of that.
- Out of the 579 work zone fatalities in 2013, 186 involved large trucks. We can't get to zero unless we focus on contributors to all fatalities. 186 is a manageable number. There was a meeting held 18 months ago on this topic that FHWA, FMCSA, NHTSA participated in.
- First, we decided to hold this symposium to draw key stakeholders to help us develop ideas for projects, opportunities, materials, things we can do. Capture and publish that input in a report available in June. We need your participation, help, and guidance.
- Second, working with ARTBA under a safety grant to develop traffic control guidance by fall with companion training by end of year.
- Third, we have a Smarter Work Zones initiative under Every Day Counts.
- Fourth, we are currently working on updating best practice guidelines regarding oversized truck issues, to develop a national certification process, and to develop a framework for consistency at state level, training will be available this summer.
- Fifth, for the past two years FMCSA has partnered with FHWA on National Work Zone Awareness Week activities. This year's theme is Expect the Unexpected, which emphasizes the importance of being aware – worker, driver, pedestrian: expect the unexpected. Workers and families were able to share their experiences at the kickoff event, which was a very powerful testimony.
- This is not everything that we're working on, but we want to continue to work with partners on this panel, at federal level, and all of you.

Jack Van Steenburg, Assistant Administrator and Chief Safety Officer, FMCSA

- Work zones can be found everywhere, because they are needed.
- Our conversation builds off the meeting we had 18 months ago and others that we've had since.
- It is great to see NHTSA colleague here.

- We need to work with enforcement on key decisions in consultation with the DOT engineer on the site. I had no idea that 25% of work zone fatalities, consistently on regular basis, involved a large truck.
- “Only 579” total deaths: we can isolate and eliminate these crashes toward our vision of zero deaths.
- As a parent, father, brother, sister: anyone ever driven through a work zone. Next time you drive through a work zone, look behind you, left, right, think about where you’re going to go if someone comes up on you behind you. Think about that.
- We partner with AASHTO and ATSSA as experts out there, as well as Steve Keppler at CVSA. We see too many of this type of crashes every day.
- Recent example: March 21, 2015, passenger vehicle slowed down and was rear ended by truck, second large truck slowed, hit by second car, another large truck hit them – 5 people killed in one SUV.
- How do we slow the trucks down? How do we fix that? 80,000 lbs. crashing in a work zone will cause damage, personal injury, too often fatalities. How to slow them down? Technology, analysis of where they occur and what time of day. Vendors need to step up to the plate and tell us.
- Active work zone, congestion, somehow a signal gets transmitted from that work zone to a truck to say “slow down” – we have technology that can do that.
- Improving safety, preventing deaths, is FMCSA’s primary mission.

John W. Marshall, Director, Office of Safety Programs, NHTSA

- NHTSA’s mission is to save lives, prevent injuries, crashes. This is in line with our mission today.
- To help frame today’s discussion: 32,719 people tragically killed on highways in traffic crashes. That’s 90 every day.
- NHTSA’s Center for Statistics and Analysis released a study showing 94% were human behavior related – intoxication, under influence of drugs, distracted or drowsy.
- Every 52 minutes, someone is killed from intoxicated driving. Under the influence of drugs: proportion of drug positive nighttime and weekend drivers show drug use: 16 to 20%. 8.6% to 12.6% under influence of THC.
- Almost 10% of all fatal crashes involve distracted driving (including texting).
- The current estimates of fatal crashes involving drowsy driving is anywhere from 2-20% are caused by this.
- Speeding certainly impacts safety in work zones. 9,213 fatal crashes in 2014 were speed related. It is also not always captured by report as a “main” cause, so we suspect it is higher.
- These behaviors impact work zone safety and when the driver is driving a large truck, the greater impact and severity is obvious.

- Working with ICP, NSA, Governor's Highway Safety Association, and FMCSA among others, Move Over Laws.
- Need help getting word out. trafficsafetymarketing.gov for public awareness materials for downloadable media materials. Related to Expect the Unexpected. Most recent report shows that 70% are not aware of the Move Over laws. Fines may help: "It's not only the right thing to do, it's the law." is a message.
- Some good news, while one traffic fatality is one too many, we are helping to bring some numbers down. DUI related crashes are down 20% since 2003, seatbelt up and over past 10 years, reduction in fatalities. We're having an impact. This is not the time to let up.

Stephen A. Keppler, Executive Director, CVSA

- We're here to work today. One of CVSA's values is teamwork. It's about solving problems and working together. We can benefit a lot from great relationships.
- Work Zones present a unique challenge: Enforcement, Education, Engineering and EMS – all converge in work zone safety. Can't do it without partnership.
- On day to day basis, the challenges include stopping distance (exacerbated by work zone), no zones/blind spots in and around trucks, and other unique challenges that present themselves with large trucks.
- With one in four fatalities due to large trucks, and data driven situation today, we need to develop the technology to help.

Chris Smith, Sr. Program Manager for Freight, AASHTO

- Taking this from slightly different perspective to frame conversation today. I look at this from the freight, intermodal perspective.
- Seeing statistics rise, but freight in general is growing, economy is coming back. States and Federal government, as well as projects, are thinking about that.
- We need to look at these from an operational, project standard that will help us deal with growth of freight moving forward. I am proud of the work done by the AASHTO Standing Committees on related topics.
- Recognizing growth of freight, Congress in MAP 21 identified goals/provisions to assist States in directing resources. This includes more opportunity to flex money, which equates to states looking at how they can do that, which will also create action that we must deal with, sometimes as a challenge.
- As more and more states and federal government prioritize these things, and more freight goes onto highways, there will be impacts. Those of us in Washington are working together on this. Visit workzonesafety.org. Also SHRP 2 rolled out very good tools for work in the fields. Look at R11 in particular, the WISE tool.
- The final point is freight transportation policy and operational context. We look at work zones from a corridor management approach. Seeing trends in movement across state borders, we see networks in which we can see where the heaviest amount of freight is

moving. States are looking at managing those loads along corridor based design (example – I-95 corridor coalition).

- TXDOT managed 14 individual projects as one continuous work zone. That sort of predictability and communication is critical. Projects are going to increase this year and moving forward.
- What we hope to see today is learning best practices, understanding safety dynamics.

Frame the Day/Issues Session

Earl Hardy, FMCSA

- If you have an idea, bring it forward today so that we can try to frame the future of where we need to go.
- You can't ticket your way out of a problem – if you just keep ticketing, you won't truly solve the problem.
- It's crucial for us to have this input in order to make a change.

Paul Pisano, FHWA

- FHWA has very specific goals for smarter work zones in the next couple years.
- Looking at CV technology and how to inform drivers of WZ related hazards.
- FHWA has very strong partnerships with State DOTs.
- Have put out R&D money to look at decision making processes of drivers to help target the messages that they provide.
- Want to know what's working – what they are doing well and where there is opportunity for improvement.
- Law enforcement needs to be part of the project team.

Neil Boudreau, MassDOT

- Activity area is anywhere where work is happening – often includes the buffer zone which is meant to protect the workers.
- Have some new WZ safety TCDs:
 - o Truck mounted attenuators – protects lane that is closed by having this on the back of the truck even if people ignore or miss the rest of the warnings
 - o Signing for egress points – Trucks Entering Highway
 - o Temporary rumble strips
 - o Notification of narrow lanes – have started actually giving detailed information about how wide the lane is
- Want to do everything we can to avoid speed differentials.
- Need to give information as far in advance as possible so that trucks can divert their route if they need or desire.
- Consider truck only routes when feasible.

- Back of queue warning system.
- Dynamic merge system – get all different vehicle types to work together to merge in the most effective way possible.
- Best practices for large trucks – working on improving outreach, communication, and incident response.

Robert Brydia, TTI

- Goal of WZ ITS is to provide the right information to the right people at the right time to improve driving decisions, behaviors, and outcomes.
- Challenge is to match the toolbox of capabilities that you have to the situation that you have on the roadway using the various technologies that are out there.
- Can't just put technology on a roadway and expect it to work properly all the time.
 - o Very important to track performance and know how all your technologies are functioning.
- 62% of people have changed plans based on advanced warning information provided on I-35.

Discussion

- (Calvin Calhoun) Any thoughts to elevated position on truck drivers not being able to see signs low to the ground?
 - o (Neil) Any permit construction projects will have signs at the standard height that is sufficient for truck drivers. Could improve maintenance operations because they don't always use the elevated signs.
 - o Should bring this up at National Committee on Uniform Traffic Control Devices.
 - o Have looked at differences in retroreflectivity by using different angles. There is a decrease, but haven't found it to be large enough to be concerned
 - o For overnight operations, often the proper stands aren't used to raise the signs
 - o Need to enforce using the stands that get the signs properly elevated off the ground, but are honestly usually more concerned that they're clean and set up properly.
- (Dahir Egal) For very large projects, do you consider incident management involving large trucks during the planning phase? Also do roadway designers really understand the needs of large trucks?
 - o (Neil) Their office reviews every single TMP that goes through their state, but it's a smaller state. They are very cognizant to make sure all of these things are looked at even for smaller projects.
- (Paul Kelly) Has anyone experimented with separating truck traffic from passenger vehicles? Virginia had a project on I-81 with similar percentages to the Texas I-35 site particularly at night, and they have issues with incident management.

- Texas: There aren't very many roads that parallel I-35, which makes detours difficult. There is a frontage road that can be used for smaller incidents. In significant incidents, they have to change the detour routes to add new ones because the original ones get so overwhelmed. Starting to publish a text and map so that everyone gets the same updates for detour routes automatically updated.
- (John McGregor) Back of queue events are VERY BAD in their state – contributed to a very large percentage of fatalities. Working on early merge for trucks and late merge for other vehicles.
 - (Bob) They are trying some different approaches in Texas, but haven't heard of them using this. They are trying dynamic late merge.
 - (Neil) Haven't used any dynamic merge yet.
 - Trying to avoid the trucks enforcing or policing themselves miles in advance when warnings of the work zone first pop up.
 - (Neil) Would be helpful if they tried to collect some data comparing the different options.
- (CO) Who regulates TCPs as far as if everything is set up properly?
 - (Neil) We have 11 highway safety inspectors that are always visiting both permanent and temporary work zones, including maintenance jobs. Their job is to enforce safety and mobility. Also teach refresher courses every winter to all construction staff. Write up a report every time a work zone is inspected.
 - Doesn't seem like this happens in CO, because they don't seem to find issues with work zones until they're in court because of an incident.
 - Theoretically every state should be inspecting work zones regularly throughout the state.
- (Said El Said) For right lane closures, dynamic late merge works very well, but for left lane closures they experience a lot of delays.
 - (Bob) Haven't experienced it yet, so cannot comment.
- How can we prevent bridge strikes in work zones such as the one on I-35 in Texas on 3/27/15?
 - Working with trucking associations and getting that information out, and try to do it as early on as you can.
 - Have had similar situations in Florida where people aren't paying attention. Would like to see some kind of sensors on the back of the vehicles because they've had issues with dump truck drivers driving without the back closed.
 - (Bob) We decided early on that commercial trucking is a very important influence group, so they reach out to all of these organizations to get input on what they're doing. Make commercial trucking groups a part of their early planning. Ask them specifically what they need and get that information into the dispatch center.

- (Bob) In terms of autonomous vehicles, there are many projects and trials related to truck platooning, but not sure to what level they're looking at responses to vehicle operations based on the information coming in.
 - Haven't heard anyone looking at truck height with autonomous vehicles.
- A lot has to do with the engineering phase of highway maintenance with the milling. Trucks are all going to run at 13 feet 6 inches tall, so there needs to be a higher minimum bridge height nationwide.
- (Joe Barry) Bob mentioned in cab notifications with I-35 project, can you elaborate?
 - (Bob) Will have more information in a year when they get more into it. Just in the starting phase now of this effort with FRATIS.
- (Roger Wentz) Maryland is doing a great job with specification enforcement of work zones. Will shut down a job even if the flaggers don't have the right paperwork.
- (Paul) How much does trucking community rely on traveler information systems from State DOTs or 511, as opposed to Waze or other private sector systems?
 - (Marshall Evans) Google maps and Waze are very handy for traveling long distance runs. Have to be careful with the distracted driving aspect, but they are very handy. It would be beneficial if DOT systems could communicate with those apps. The truck drivers already have the phones, so it would be good to have everything on the same device.

Vehicle Session

Steve Smith and Chris Flanigan, FMCSA

- Large trucks can be involved in work zone crashes in many different scenarios.
- Two potential technology solutions to give an advance warning to drivers are Commercial Mobile Radio Services (CMRS) and Roadside Equipment/In-cab receiver and interface.
 - Giving an advance warning to drivers, often miles in advance heightens awareness.
- Data issues are being identified and alternative solutions need to continue to be examined.

Discussion

- (ATSSA) Happy with the results so far and FMCSA's work in making sure the system works.
- (Neil) Federal Communications Commission (FCC) needs to identify a platform if they are going to go down the V2V/V2I road. Have the data open source so people can develop an app if they want to. We need to do this with communication too. No one is doing this yet, so we should look into it. Messaging and communication needs to be consistent around the whole country. Everyone needs to be on the same platform.

- (Roger) Have you considered the message being on the same medium? To make sure the message is exactly the same. Are there barriers to that?
 - o Looking into ways to standardize messages so that there is some uniformity across roadways.
 - o What FMCSA is looking into is the same thing as everyone else. They're not the solution so much as the facilitator. They're not developing it, just moving forward to help understand what's being developed.
 - o Consortium is a great resource to do quick reaction research to understand things like the variability issue. Would need to come with a lot of input from the outside.
- (Tom TRB) They have been discussing if there is some kind of common format of what the minimum amount of data is that would be required. There is not one technology that is going to solve everything.
 - o CMRS solution is tweaking something that's already there rather than putting something new in its place.
 - o There are many current research efforts to look at roadside technology. If research could merge this with the in-vehicle technology, then a uniform message set would be even more important.
- Spent a half day at WZ conference on how to prevent WZ intrusions and how to warn the workers. Talking about something similar here, only difference is the direction of the signal. Same system could likely do multiple types of alerts. The research on the workers is pretty far along, so we could benefit by working with that.
 - o There is a lot of research going on in the CV field. This would be a NHTSA oriented exercise. Have to structure the vehicle communications similarly regardless of the direction of the signal.
- VA has had problems with standardized messages on message boards, so they set up a series of standards based on their typicals. Bluetooth could be a possibility here – have you looked into that at all?
 - o (Chris) Anything they've looked into is something that someone else is already doing; they are not trying anything new. It could be beneficial to have a brainstorming session with different people that work on this.
- All of the technology that we have been talking about is already available; it's just a matter of funneling it into the proper uses.
- Also need to look into the human factors side to determine what kind of alert would be most effective.
- (Calvin Calhoun) if you also had the option of going through CB with words, have you thought about bilingual necessities?
 - o FMCSA is just trying not to limit it. In cab driver alerts can be a light, sound, seat vibration, etc. There are many different solutions.
 - o From CMRS vendor standpoint. They have done some work with translating messages. The question is not what the technology can do, but how far we can go

before we have to worry about distracted driving issue. Text to speech can be done easily.

- Would the alert systems you described eventually be able to provide alerts for congestion caused by other incidents?
 - o Yes, as long as information can be transmitted to a central system, then there are many possibilities of what can be done
 - o Important with all of this to make sure the work zone is identified ahead of time. This is the responsibility of the states and construction crews. Solutions are very broad and scalable once there's a lot of data available
 - o (Joe Barry) CMRS provider that FMCSA is sponsoring is located in Iowa. The messages provided to the driver are colors, shapes, and audio. There is a lot of interest in Iowa to pilot a solution in their state, but it comes down to a funding question. Need to get some industry participation to get the data provided in a ubiquitous way to test it in multiple ways on multiple systems. Their goal is to not add devices into the cab, but rather utilize what is already in there (CBs and smartphones)
 - Funding is what is required from vendor standpoint because they will continue to sell products even without these improvements
- Understand that FMCSA's main focus in this effort is to reduce crashes involving commercial vehicles; however, do you believe the potential solutions will be viable for use in passenger cars?
 - o Similarly to many cases with the technology solutions we look at, the technology is there as is the idea of what is needed. It's really just a matter of pulling together the right people to get it figured out.
 - o Right now, there is equipment that can be utilized, and also there are vendors that are really trying to go down the road to find a solution that is viable with the current equipment.
- (Kristi) The problem isn't that the work zones pop up and surprise drivers, it's that drivers aren't paying attention to all of the warning signs. As we talk about solutions, make sure they tie back to the real problem of the drivers, not the perceived problems.

Driver Session

Herschel Evans, America's Road Team

- Getting the information to drivers can be done in a multiple ways – email blasts, DOT websites, 511 systems, message boards, mobile technology, and partnerships with services, local news and satellite radio stations.
- Don't think that CB radios are a reliable source of communication for these alerts.

- Knowing which days and nights that certain work zones are active would be very helpful. The more advanced the warning, the more likely the driver is to be in the mindset of knowing and not having to deal with it at the last minute.
- Knowing which lane they should be in gives them time to safely merge into that lane, and for other traffic to safely merge around them. 2 miles should be a minimum for this.
- Posting a fatality count really humanizes it for other drivers and makes it more meaningful, impactful, and memorable.
- Enforcement – “Only two ways people can learn something are by being the example or seeing the example.”
- Truck only lanes can be beneficial for drivers because they don’t have to worry about other drivers swerving around them and stopping quickly.
- Long heavy trucks require softer angles and less abrupt lane shifts.
- Uniformity among work zone layouts is beneficial to drivers so that they know what to expect.

Keith Gaston, Florida Highway Patrol

- There are both planned work zones and unplanned incidents such as traffic incidents.
- Speeding in construction zones in Florida results in a very high fine. They try to do the majority of the enforcement before they enter the active part of the work zone. Also have “Operation Hard Hat” enforcement where they enforce within the active work zone.
- Have construction progress safety meetings frequently with the larger work zones.
- Florida has Bluetooth sensors on the road that detect stopped traffic and redirects their cameras accordingly.
- Fairly high percentage (40%) of trucks do not have very good brakes, so the stopping distance estimates are often really even longer than what is provided in the brochure.

Discussion

- (Steve McGinley) Move over law – they’ve been having some crash issues in advance warning area where commercial vehicles almost always move over and passengers don’t always. Has there been any training on pulling drivers over in the advanced warning area before a lane closure?
 - o (Keith) Have a lot of problems with the move over law. Try to enforce well before those areas. When they do have to pull a driver over in those areas, will often ask the driver to relocate to a safer location after getting their initial information
 - o In Florida and Georgia, you can stay in the lane if moving over is more dangerous, but need to slow to 20 mph below the speed limit.
- In MA years ago, they went into driving schools and talked to students about driving around large trucks. There is a lot of opportunity for us to get involved in driving schools

and also in CDL classes. Could expand the brochure into a PPT to be used in these classes.

- NHTSA is working with local agencies to get messaging out to local partners at a reasonably low cost, so maybe the move over law would be a good use of this opportunity.
- Talked about a lot of safety options today, but not as much about mobility. When you're working with work zones and designing TMPs, really need to look at mobility. Pre-planning for projects to improve mobility during the projects can also help a lot with safety.
- Education is a big part of the picture. Often parents don't know the critical things such as the 3 second rule, so they cannot be helpful to their children. Some kind of continuing education would be beneficial. AAA has driver education programs, so there may be some existing products we could use or model
- DOT has training program they have to go through, so why doesn't everyone need to do this?
- Good to know these tools exist. A big part of our role here is to utilize existing resources and determine how to pull them together, keeping them as simple as possible. Need to also consider proper media for the proper audience.