

HIGHWAY WORK ZONE TRAFFIC INCIDENT MANAGEMENT (WZ-TIM)

Training for Law Enforcement and Other First Responders

Webinar Logistics

- FHWA Work Zone Safety Grant Initiative
- Today's session will consist of 1.5 hour presentation with .5 hours for question and answer
- Pre and post test conduct and applications
- Webinar evaluation form
- A recorded version of this training will be made available.

Introduction



Dave Pichette

- Safety and Security Specialist – Lakeside Engineers
- Retired Captain Wisconsin State Patrol – 30-year Career
- Graduate FBI National Academy
- Nationally-recognized Incident Command System instructor
- FEMA Master Exercise Practitioner
- FHWA SHRP 2 Trainer



Dave Collins

Safety and Security
Director
Lakeside Engineers



Todd Peterson

Transportation Specialist
*Federal Highway
Administration*



Andrea Bill

Traffic Safety Engineering
Research Program Manager
*University of Wisconsin -
Madison*

Training Package Content

- Sample invitations (e-mail and MS Word)
- Training slides (PowerPoint and PDF)
- Instructor notes
- Pre-test, post-test, and course evaluation form
- PDF versions of WZ-TIM Handbook and WZ-TIM tri-fold brochures

Learning Objectives

Upon completion of this class, participants will be able to:

- Recognize the main differences between Work Zone Traffic Incident Management (WZ-TIM) and TIM in ordinary situations.
- Be able to compare and contrast the WZ-TIM roles and responsibilities of first responders, transportation agency staff, and the contractor.
- Be able to describe several strategies for improving work zone incident prevention and response.
- Be familiar with the advantages and disadvantages of contractor involvement in work zone incident management.



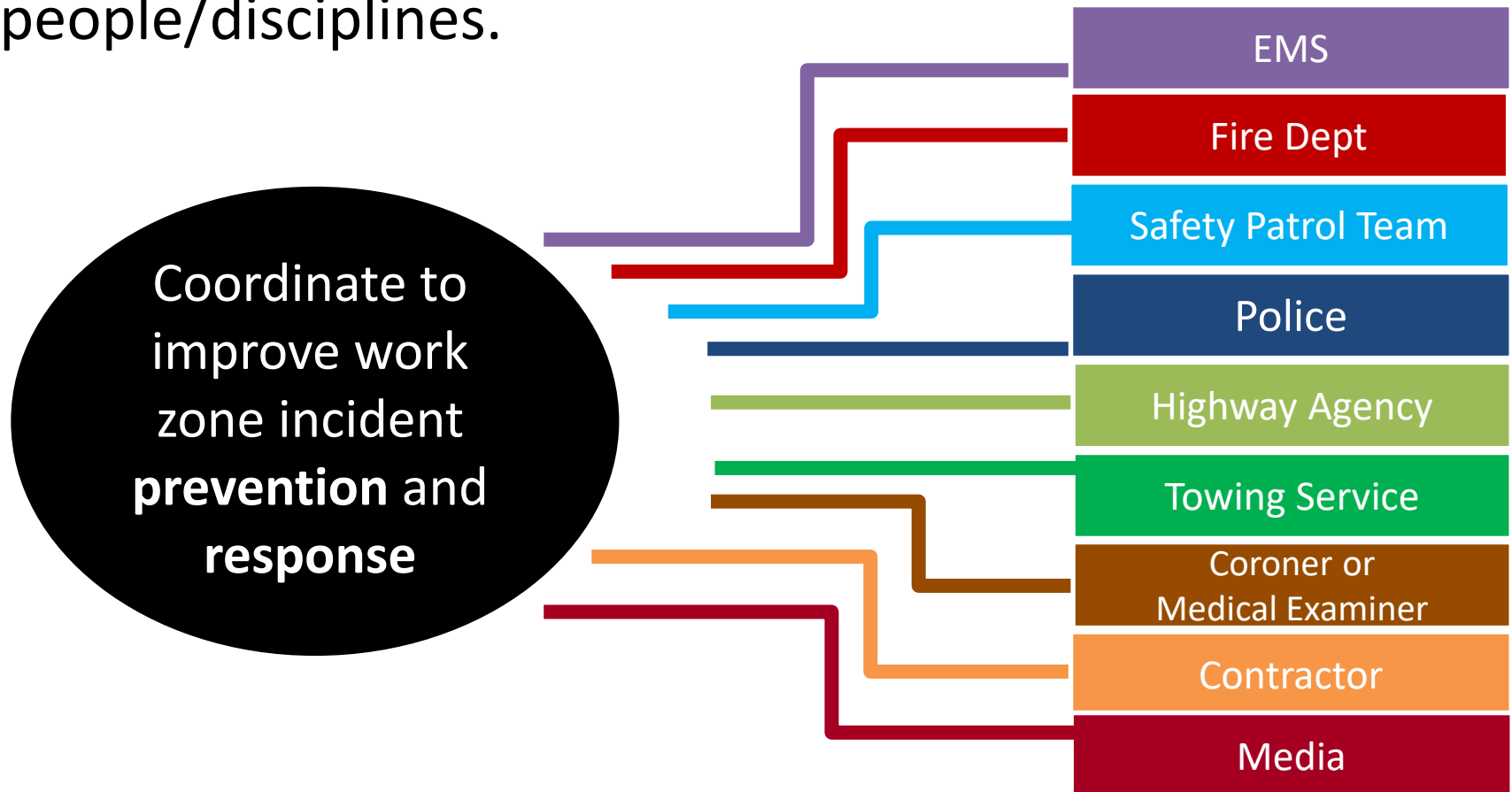
Today's Agenda

- Introduction and Background
- Preventive and Protection Measures
- WZ-TIM Elements and Concepts
- Implementing the WZ-TIM Process
- Notable Examples of Work Zone Incident Management Practices
- Case Studies
- Reference Materials



Course Introduction

Dealing with a crash or other traffic incident occurring in a work zone requires the combined skills of many people/disciplines.



We're In This Together

All work zone partners have shared responsibility to prepare for potential work zone crashes by:

- 1** Arranging the work zone to minimize the chances of a crash
- 2** Making efforts to ensure that crash severity and crash consequences are minimized
- 3** Being ready to respond quickly and efficiently if a crash occurs

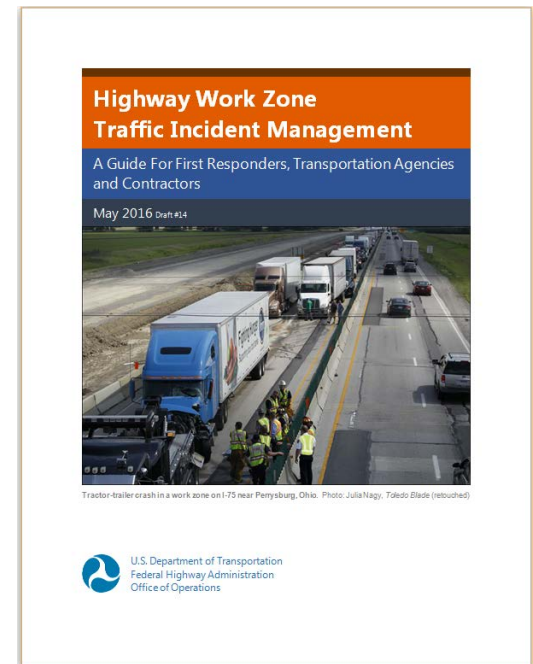
What goes wrong?

- 1. Lack of Communication** among work zone actors
- 2. Lack of Planning and Coordination** of traffic control responsibilities
- 3. Inadequate Training** of law enforcement personnel (LEO) in traffic control procedures within highway work zones



Course Background

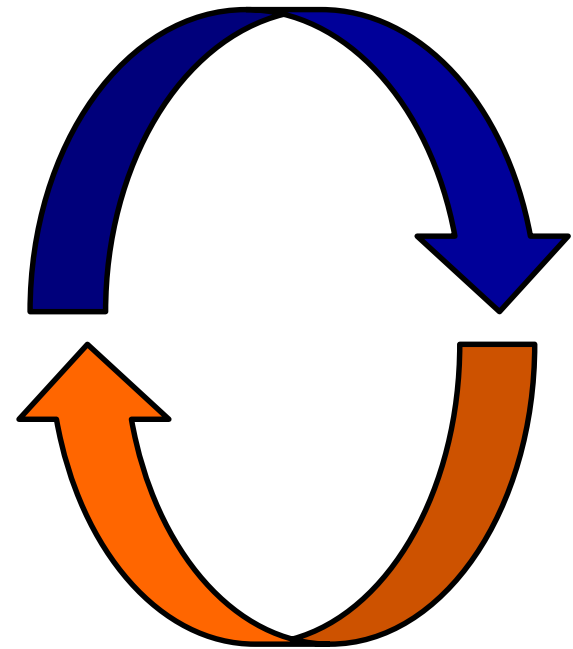
- Based on *Highway Work Zone Traffic Incident Management: A Guide for First Responders, Transportation Agencies and Contractors*.
- Incorporates principles from the *Toward Zero Deaths* national strategy on highway safety.
- Incorporates *Safe System* approach to highway safety management.
- Incorporates material from the SHRP2 Traffic Incident Management Responder Training Program



Course Background

- 2004: Federal Work Zone Safety & Mobility Rule established to help manage traffic and safety issues on federally-funded highway projects.
- 2007: Deadline for state Departments of Transportation (DOTs) to establish a work zone planning process – producing a Transportation Management Plan (TMP).
- 2016: TMP process generally considered “best practice” for all significant projects, regardless of funding.

Work Zone Crashes



Work Zone Congestion

Why Do TMPs?

- TMP helps agency, contractor and first responders prepare for traffic issues unique to each site/project.
- TMP process has been successful in:
 - Improving travel conditions
 - Creating a better safety environment
 - Reducing complaints from the public.



Formal Definition of “Work Zone”

“An area of a highway with construction, maintenance, or utility work activities...typically marked by signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first warning sign...or strobe lights on a vehicle to the END ROAD WORK sign or the last temporary traffic control (TTC) device.”

Source: 2009 Manual on Uniform Traffic Control Devices



Photo: [Anthony Citrano/WikiMeida Commons](#)

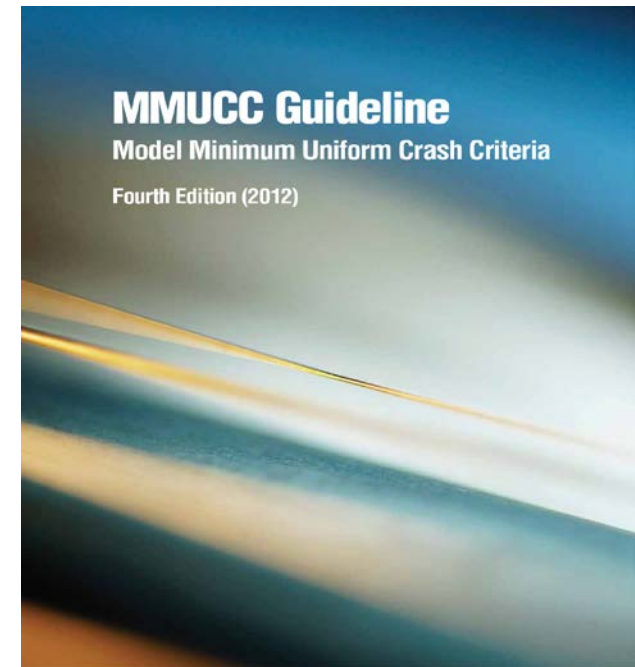


Photo: [Anonymous/WikiMeida Commons](#)

What is a “work zone crash”?

As defined by the Model Minimum Uniform Crash Criteria (MMUCC) standards, a WZ crash:

- *Is any crash that occurs in or is related to a construction, maintenance, or utility work zone, whether or not workers were actually present at the time of the crash*
- *Also includes any crash involving motor vehicles slowed or stopped because of a work zone, even if the first harmful event occurred before the first warning sign*

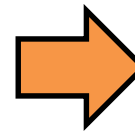


Work Zone Characteristics

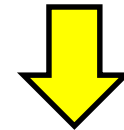


Competing Road Space Demands

- Lane and shoulder closures
- Narrow lanes
- Obstacles near live lanes
- Reduced visibility



More collision risk than under ordinary conditions.

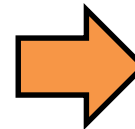


More crashes than usual per vehicle-mile traveled.



Complicated Driving Environment

- Driver comprehension / distraction
- Congestion
- Regular traffic mixing with slow-moving work vehicles



More hazards than under ordinary conditions.

Expect the Unexpected

Traffic crashes

- Within work zone
- In traffic queue leading to work zone

Worker illnesses and injuries

Construction-related mishaps, e.g.:

- Equipment tip-over
- Embankment or trench collapse
- Fire at construction site



Today we are mainly focusing on how these issues affect traffic management.

US Highway Safety: 2016 Results

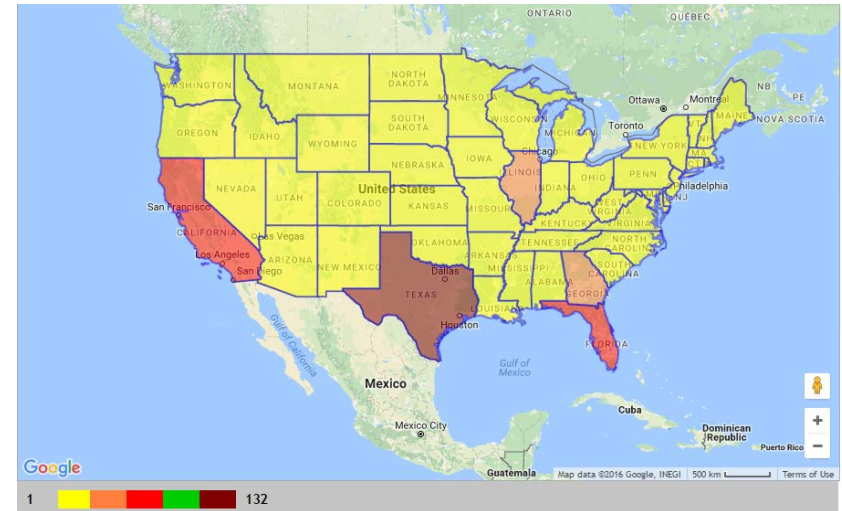
Roadways in general:

- 34,439 crashes killed 37,461 people
- 2.4 million injuries (2015)

Work Zones specifically (2015):

- 642 crashes killed 700 people
- Every US state had at least one fatal crash in a work zone
- 62 fatal work zone crashes involved a child 12 or under

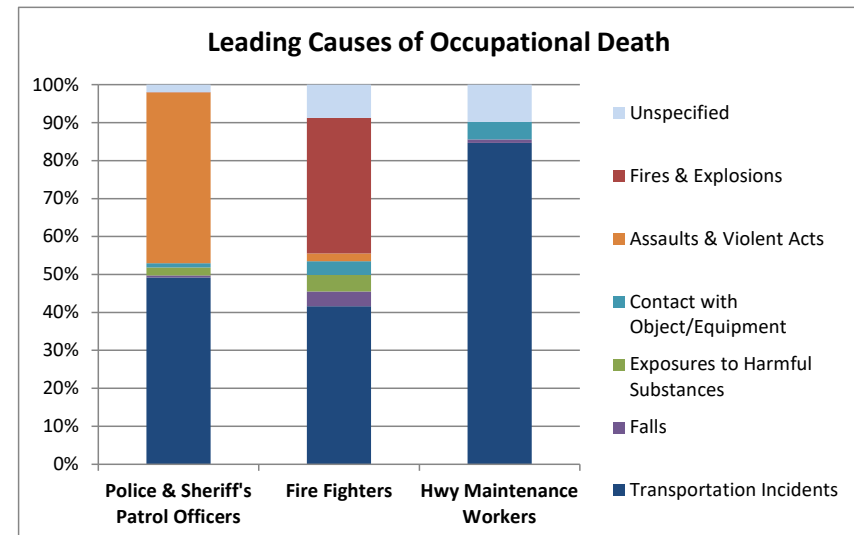
Source: NHTSA



First Responder Safety

- More on-duty police officers killed in traffic crashes than by bullets
- More firefighters killed by motor vehicles than by fires and explosions
- Tow truck operators and EMS personnel also at high risk of being struck by traffic

Source: Bureau of Labor Statistics



Unique WZ Challenges

Work Zone Traffic Incident Management (WZ-TIM) differs from TIM on ordinary roadways in several ways:

- **Difficult access** to work zone incidents
 - Barrier walls
 - Torn up road surfaces
- **Limited space:** lane restrictions
- **Traffic congestion:** back-ups / queues
- **Many organizations** to coordinate:
 - First responders (police, fire, EMS, towing)
 - Agency traffic operations center
 - Contractor personnel
 - Agency construction management personnel



Incident Prevention: What Can First Responders Do?

- **Awareness** of Transportation Management Plan (TMP) development and pre-construction incident management planning, and participate when the opportunity is present.
 - **Identify** threats to responder safety.
 - **Develop** a Plan of Action for work zone incident management.
- **Stay informed** about lane/ramp closures and “back door” ways to access the work zone.
- **Notify** highway agency or contractor if you observe a problem.
 - Situations that encourage illegal/risky road user behavior.
 - Missing traffic control devices.
 - Improper work practices.
- **Set a positive example** by complying with work zone traffic laws, on- and off-duty.

CASE EXAMPLES

Case Study: Emergency Response Through Work Zone

- Wisconsin Sheriff's Deputy
- Sheriff's deputy is responding during hours of darkness, at high speed, to an emergency call
- Enters a low traffic work zone that had been recently been altered
- Deputy's vehicle strikes a gravel pile that was blocking much of both traffic lanes
- Crash results in fatal injuries to the deputy



ROAD CLOSED
TO
THRU TRAFFIC

SPEED
LIMIT
45

ENTERING
NEENAH
ADDRESSING
SYSTEM



TRUCK
ROUTE



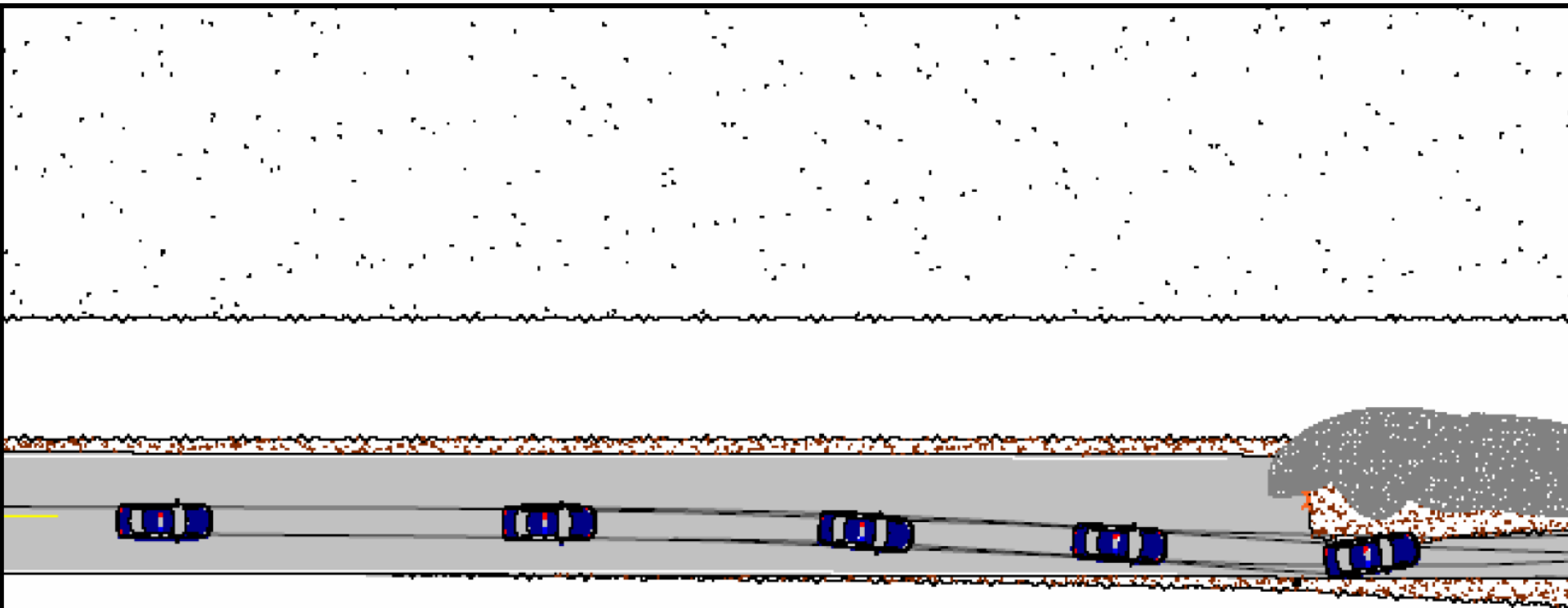
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Collision Sequence



Case Study

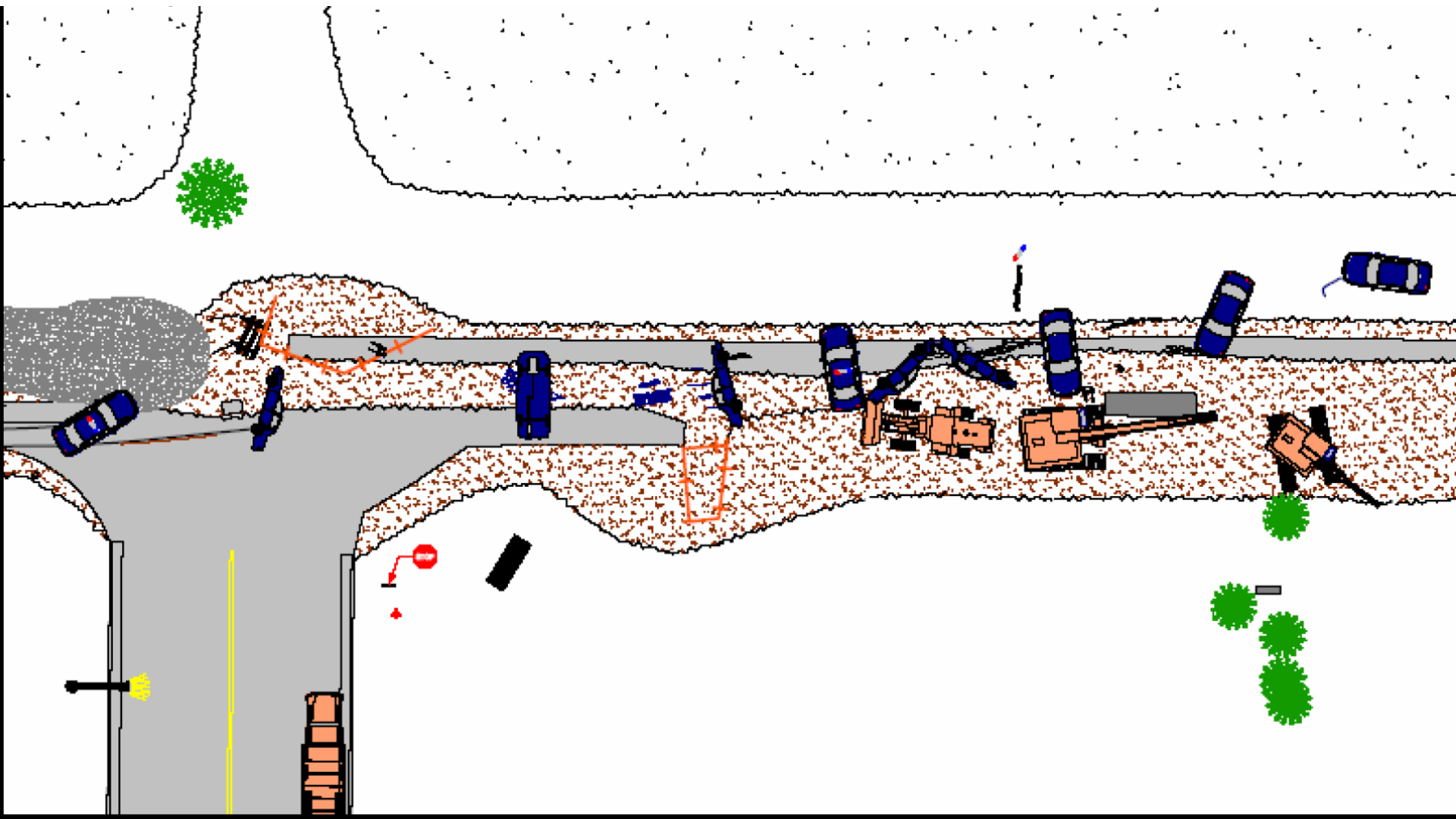
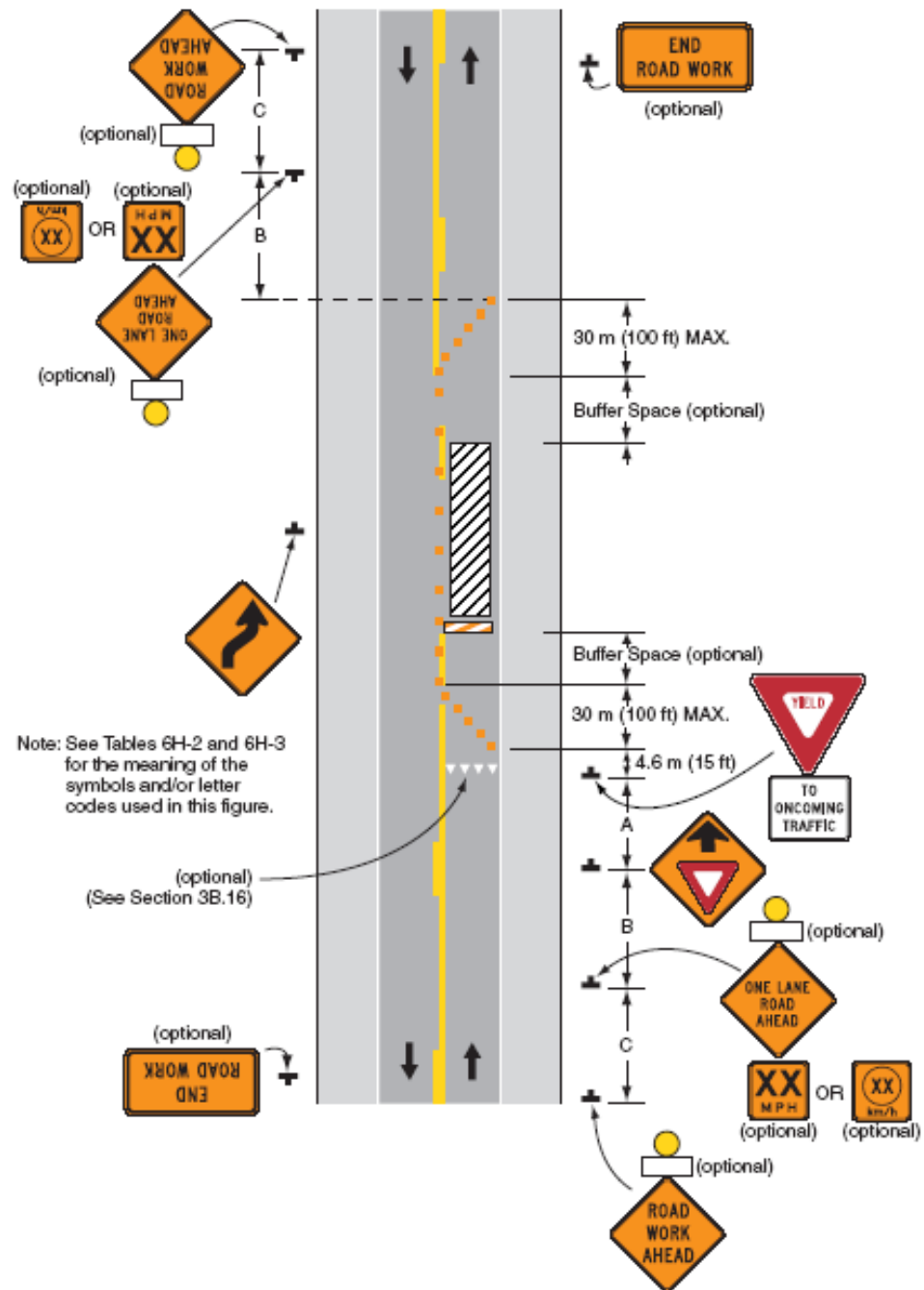




Figure 6H-11. Lane Closure on Two-Lane Road with Low Traffic Volumes

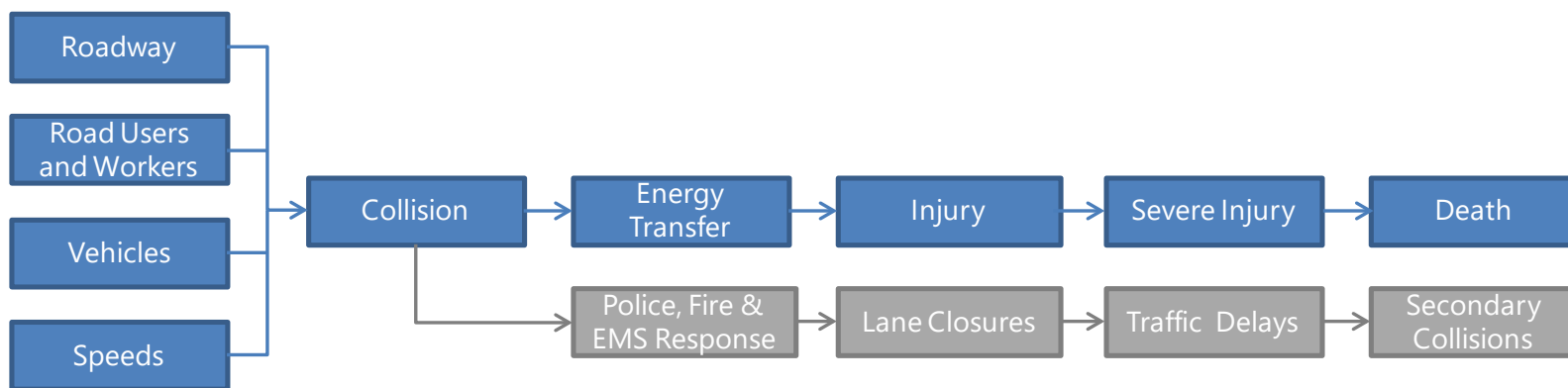
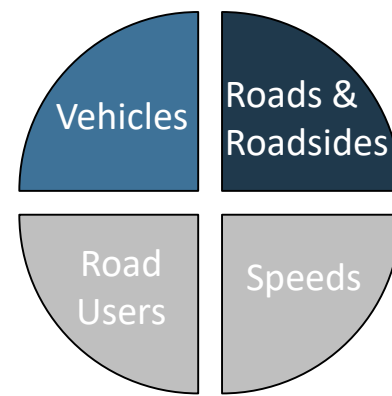


Lessons Learned

- Lack of coordination between the municipality and the signing contractor
- Signing and lighting of the work zone were not in conformity with the MUTCD requirements
- Signs were not properly secured and were moved by high winds which limited their effectiveness
- Signs at the gravel pile were defective and of inferior quality
- Little coordination with law enforcement regarding work zone dynamics and changing conditions

Making the Work Zone a “Safe System”

- Traffic crashes usually involve a chain of events: *Mistakes – Mishaps – Behaviors*
- The goal: Break the chain before a mistake turns into a serious incident, or at least reduce the severity of the outcome



Trauma Chain for a Work Zone Fatality

Traditional Approach: The 3, 4 or 5E's

“Every road safety problem can be solved by applying the 3Es”

Engineering • Education • Enforcement

Emergency Medical Services • Everyone

- Developed circa 1915 and promoted by auto industry
- Works best for issues that involve a relatively small number of agencies and stakeholders
- Can be difficult to apply to problems that cut across disciplines or agency boundaries

Example of Difficulties with 3Es Approach

Single-vehicle run-off-the-road crashes involving fatigued drivers.

Roadway reconstruct
very expensive

Difficult to enforce

Public outreach
effectiveness limited

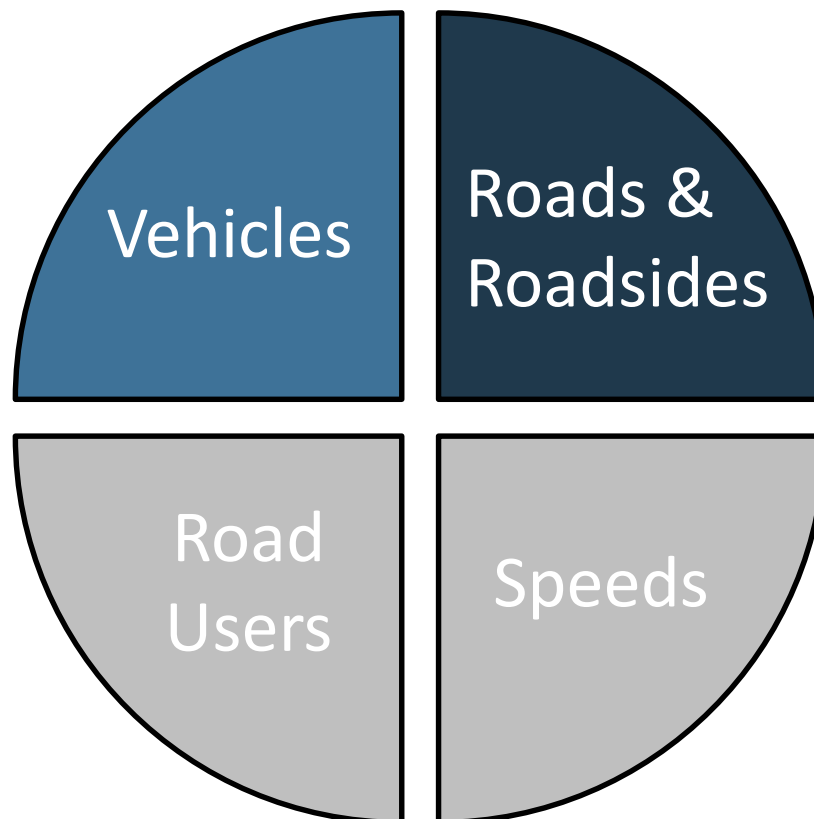


Photo:

/WikiMedia Commons

Elements of a Safe System

Developed in 2008 by safety experts from 28 countries



Based on scientific analysis of factors that cause crashes

US represented by NHTSA, FHWA and FMCSA

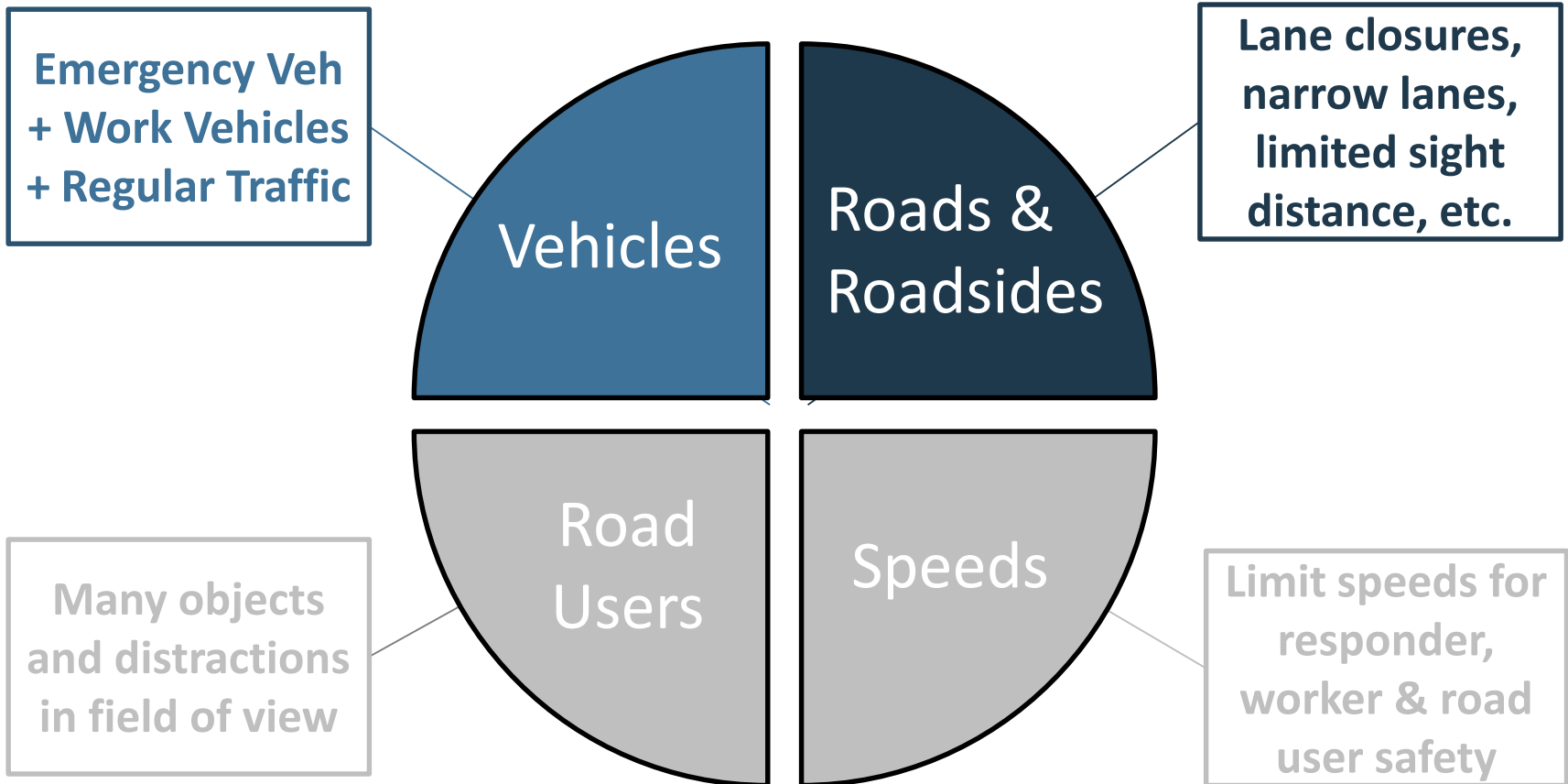
Grounded in work by Dr. William Haddon, first NHTSA director

If one element of the system fails, other elements help minimize the consequences of failure.

Safe System Principles

- Human bodies don't withstand crash forces well.
- Instead of trying to eliminate all crashes, the focus is on preventing crashes from resulting in death and serious injury.
- Although some crashes involve an element of misbehavior, many are due to simple mistakes such as momentary inattention.
- System designers and system users must share responsibility for managing crash forces to a level that doesn't result in death or serious injury.
- Strengthen all parts of the system: roads and roadsides, speeds, vehicles, and users

The Safe System in Work Zone Incidents



Weakened performance of some elements needs to be compensated to maintain overall safety.

The Human Factor



Law Enforcement Strategies

*Stay in
Communication*

Be Visible

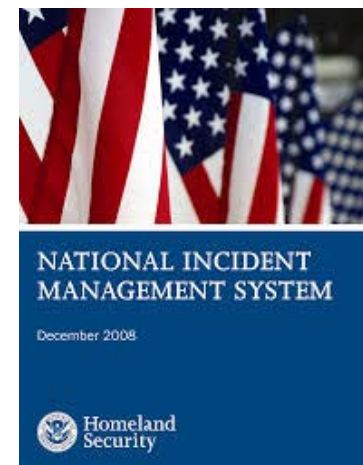
Be Alert

*Drive
Through*

*Monitor traffic
control
compliance*

Work Zone Plan of Action

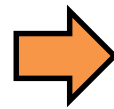
1. Liaison attends pre-construction meetings
2. Pre-planning special circumstances
3. Training/exercising WZ operations and safety
4. Implement National Incident Management System (NIMS) principles
5. On-going evaluation of the WZ environment



Getting to the Incident Site



Congestion caused by incidents often hampers response and recovery



Potential Solution Examples

- Gates in temporary barriers
- Gated "back-door" access to work sites
- Temporary access from overpasses or side roads
- Emergency response vehicles suitable for off-road driving

Emergency Access Identification

Motivation for the Change

- Freeway-to-freeway interchange reconstruction in Wisconsin
- Multiple access points
- Worker medical emergency
- Treatment delayed because EMS arrived at wrong vertical level

What Was Done

- Support fire and EMS response by developing system for identifying work area access points
- Unique identifier for each access
- Distinct from exit numbers and mile markers
- Also simplifies construction deliveries



Pre-Construction Meetings

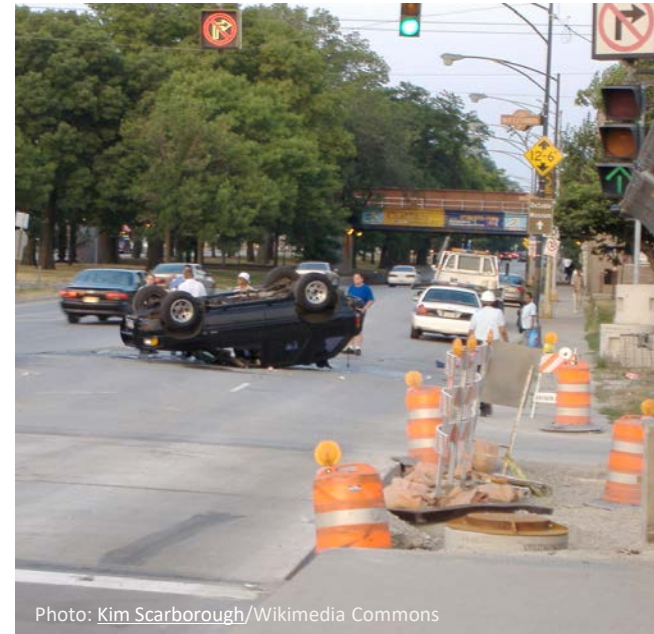
Everyone involved with the project discusses:

1. Roles and Responsibilities
2. Construction Details
3. Procedures & Schedules
4. Decisions that must be made
5. Questions that have not been answered



Pre-Project Agenda

- **Determine** jurisdictions/agencies affected by the project
- **Identify** access locations and plan alternate routes
- **Evaluate** impacts on existing incident response methods and equipment
- **Confirm** physical accommodations for incident management. Confirm access for larger response vehicles (fire trucks, towing, etc....)



Emergency Management Accommodation Examples



- Emergency parking pullouts (safe space when there is no shoulder)
- Changeable signs (hinged or electronic)
- Traffic control storage caches (traffic cones, drums, signs, etc.)
- Triage areas and landing zones (especially remote/rugged sites)

Incident Prevention: Essential Roles of First Responders

- **Secure** and protect the scene
- **Aid** crash victims
- **Coordinate** the response
- **Protect** the back-of-queue to prevent secondary collisions
- **Manage** traffic and re-route if necessary
- **Ask** for contractor equipment and manpower if it will help expedite response and recovery



Pre-Project Agenda



- **Discuss and agree** on project expectations and objectives
- **Clarify** incident management roles and responsibilities of agencies, construction managers, contractors, and subcontractors
- **Review/update** communication protocols, coordination procedures, inter-agency memos, mutual aid agreements, contracts, etc.

Pre-Project Agenda

- **Prepare** contact lists (including contractor Point of Contact) for routine updates and emergencies
- **Distribute** anticipated project timeline
- **Agree** to periodic evaluations of work zone effectiveness
- **Conduct** training/tabletop exercises to practice and clarify incident management procedures



Photo: Iowa DOT

Tactical Pre-Planning

- Pre-planning incident response tactics helps avoid secondary incidents.
 - For example, a plan can be established to close upstream ramps to limit incoming traffic volume.
- Up-front consideration should be given for how tactics will change depending on traffic conditions

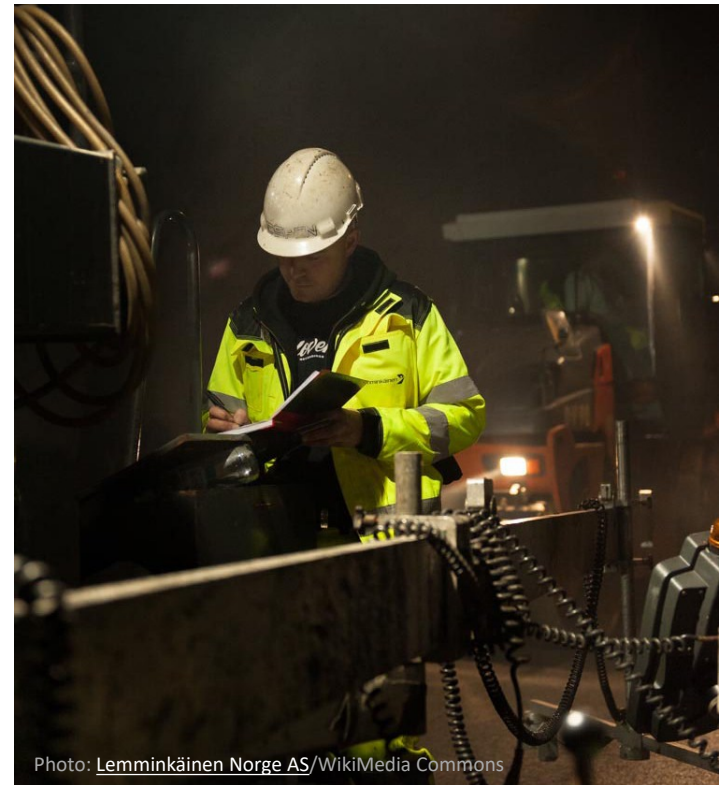


Photo: Virginia DOT

What is the process for ramp gate deployment in your area?

Matching Response to Site Conditions

- Scene access is an important consideration for incident planning and response management
- Pre-planned detours or alternate routes can be helpful in managing incidents
- Develop effective, dynamic media/social media strategies
- Determine how motor carrier traffic (trucks) will be managed during an incident



Matching Response to Site Conditions

- Pre-determine:
 - Who has authority to decide when to divert traffic to alternate routes
 - Who is authorized to discontinue use of alternative routes when the situation improves
 - What criteria will be used to make these decisions
- **If the work site is complicated, it may be necessary to prepare step-by-step deployment instructions in advance**
- Utilize pre-incident exercises



What are some examples of complex/critical work zone locations?

Commercial Motor Vehicle Strategies



Traffic Control

- FHWA's *Manual on Uniform Traffic Control Devices* (MUTCD) establishes national standards for traffic control devices, such as signs, lights and traffic cones
- Chapter 6 of the MUTCD includes recommended layouts for work zone traffic control and incident management
- Can be downloaded free of charge at <http://mutcd.fhwa.dot.gov>
- Printed copies available from online booksellers



Work Zone Traffic Control Equipment

- Vests
- Signs
- Portable Changeable Message Signs (PCMS)
- Barricades
- Cones
- Drums
- Vertical Panels
- Flexible tubular markers
- Arrow panels
- Concrete barriers
- Lighting
- Striping/skip lines
- Attenuators



Responder Apparel

- High-visibility garments help assure that first responders are seen by drivers.
- Apparel must meet standards set by the American National Standards Institute (ANSI).
- Many states require the use of both vests and high-visibility pants at night .
- ANSI standards allow the use of both orange and yellow-green.



MUTCD Signage Colors



Orange:
Construction



Fluorescent Pink:
Incident Management

Using Contractor's Traffic Control Devices

- Sometimes, drums and other devices already on site are repositioned to expedite incident traffic management.
- Make sure traffic is not directed into impassable areas.
- When incident is cleared, check with contractor to see whether traffic control should be put back in its previous location.



Photo: [Andrew Bossi/WikiMedia Commons](#)

Secondary Crashes

- “Secondary crash” is a second (or subsequent) crash that occurs at the incident scene or in a traffic queue resulting from the original incident.
- About **18%** of freeway fatalities are the result of secondary crashes.
- Most common scenario: traffic is backed up and a fast-moving vehicle strikes a slowed or stopped vehicle at the back of the queue.
- Less likely to occur if warning is provided at least $\frac{1}{4}$ mile in advance of the slowed traffic.



Secondary Crashes



Back-of-Queue Protection Methods



Roll-Up Fabric Signs

- Pro: Easy to set up and remove
- Con: Small, may need to reposition as queue changes

Electronic Signs

- Pro: Large, conspicuous, can change the message
- Con: Queues move, signs don't. Expensive. Not crash-tested.



Law Enforcement Vehicle

- Pro: Can move as queue grows/shrinks
- Con: Officer not available for other duties



Contractor-Supplied Vehicle

- Pro: Can move as queue grows/shrinks
- Con: Requires special contractual provisions, response time possibly slower than law enforcement



Emergency Vehicle Lighting

- Lights needed while emergency vehicles travel to incident site.
- Multiple lights, colors and flash patterns can dazzle and distract drivers when several contractor and first responder vehicles assemble in the same area.
- MUTCD recommends reducing flashing lights on emergency vehicles to the essential few after arrival at the scene (Section 6I.05).



Floodlighting



- Human eyes cannot adjust to bright and dim light at the same time.
- Lighting experts call the excessive contrast “glare.”
- Drivers can be temporarily blinded by glare from floodlights.
- Older drivers are the most affected.
- *Aim work lights (and emergency vehicle headlights) away from traffic.*

Incident Complexity Levels

Traffic incident and response levels can be organized into three categories, based on expected duration and complexity:

- **Minor** – Expected duration *less than 30 minutes*
- **Intermediate** – Expected duration *30 minutes to two hours*
- **Major** – Expected duration *more than two hours*



Photo: Pennsylvania DOT

Incident Command System (ICS)

- A systematic tool for command, control and coordination of emergency response.
- Efficiently use personnel, facilities, equipment and communications by integration within a *common organizational structure*.
- Applied from the time an incident occurs until the need for management and operations no longer exists .
- Should be used for *every* traffic incident in a work zone, regardless of complexity or duration.

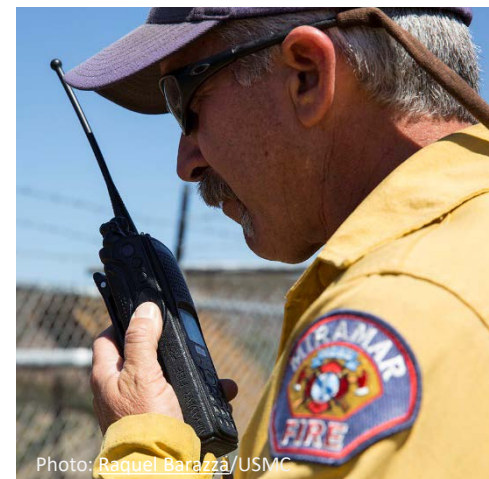


Photo: Raquel Barazza/USMC

Incident Command Principles



Establish command/unified command



Chain of command



Management by objective



Safety is paramount



Common terminology

Safety Culture in Organizations

1. **Pathological:** The organization thwarts changes that improve safety, even when the need is obvious and the payoff is rapid.
2. **Reactive:** Changes accepted only in response to a significant incident/threat.
3. **Calculative:** Potential improvements considered systematically as part of cost control and risk management.
4. **Proactive:** Organization actively searches for ways to improve performance and reduce risks.
5. **Generative:** Safety is an integral part of everything the organization does.

Measuring Success



Three generally accepted performance measures for gauging TIM effectiveness:

- **Roadway Clearance Time** – Interval between first awareness of an incident by a responding agency (detection, notification, or verification) and first confirmation that all lanes are available for traffic flow
- **Incident Clearance Time** – Interval between first awareness of an incident and time the last responder leaves the scene
- **Secondary Incidents** – Number of additional unplanned incidents that occur at the scene (or in the traffic queue approaching the scene) after the original incident is reported

Post-Incident Review – Major Incidents

- Post-incident information sharing contributes to long-term improvement in roadway safety.
- Each major incident is an opportunity to:
 - **Review** how effectively response was handled.
 - **Inform** roadway agency and contractor about work zone conditions that potentially contributed to the incident.
 - **Consider** what can be done to achieve higher levels of safety and efficiency in the future.
- **Works best when the discussion is open and candid.**

What went well?



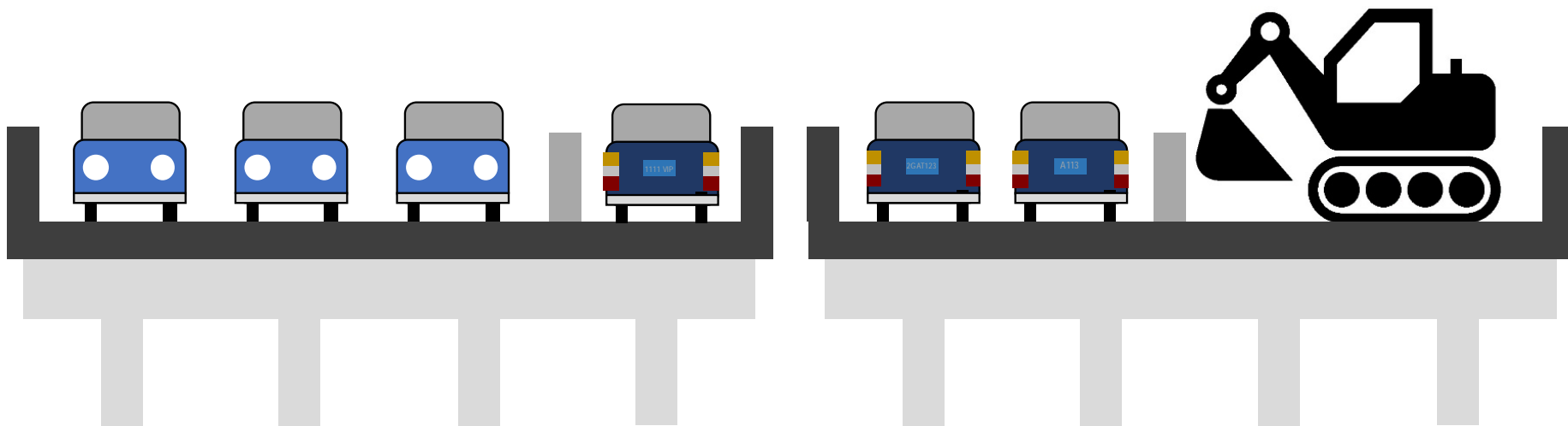
Photo: [Michael Rieger/FEMA](#)

What can we improve?

Why are post-incident reviews so important?

CASE EXAMPLES

Case Study: Complex Urban Work Zone



Yahara River Bridge Re-Decking
Madison, Wisconsin (June 2013)

Case Study: Complex Urban Work Zone







US 12/18 @_MONONA DR

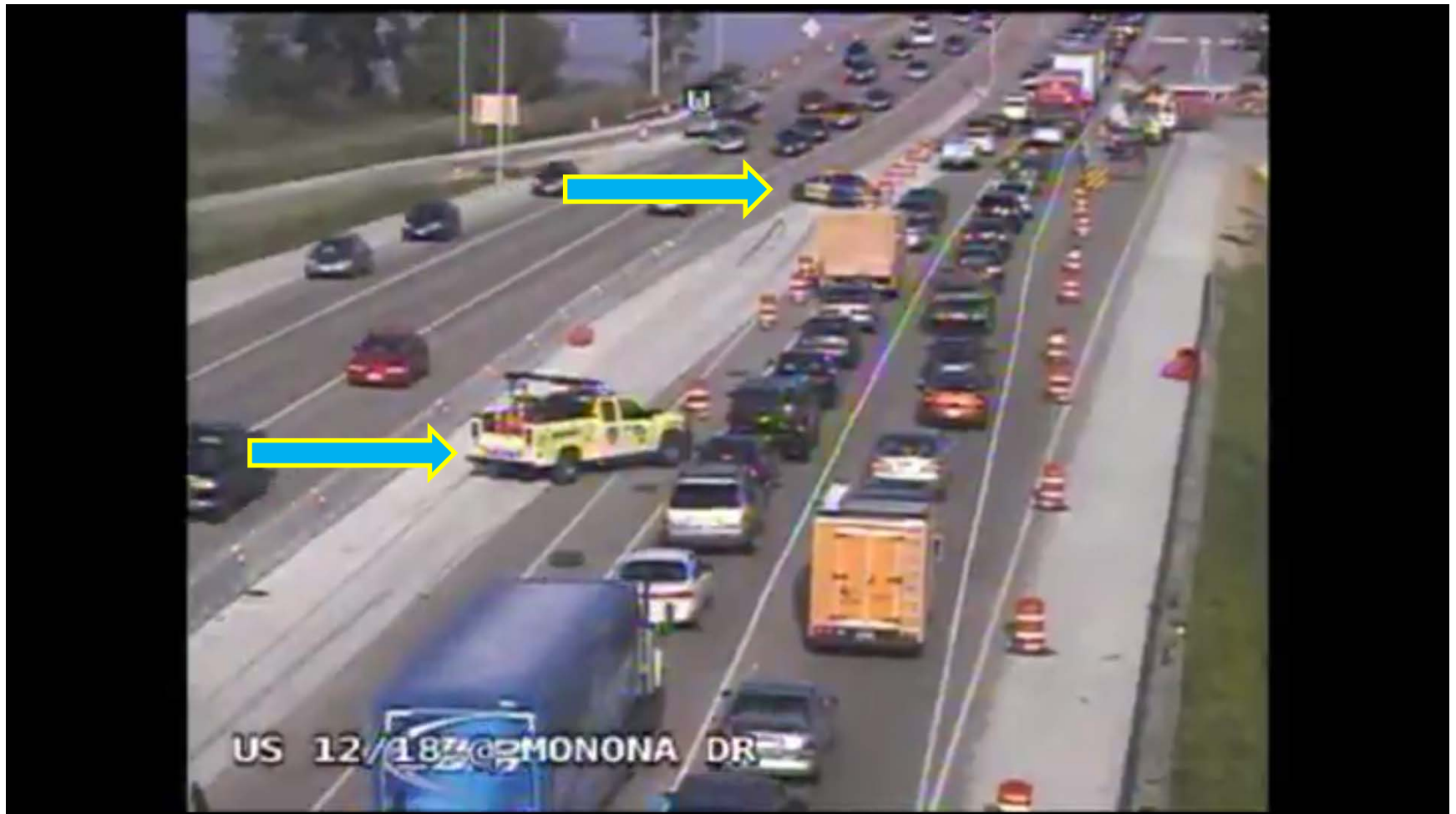
Video





US12/18 @ SOUTH TOWNE DR

Lane 1 is Closed by Service Patrol and Local LE



Towing and Recovery



All Lanes Open



Lesson Learned

- All partners participated in pre-construction meetings
- Law enforcement and towing were assigned primary responsibility for the work zone
- Changing work zone conditions were discussed with partners
- Response was coordinated between law enforcement, towing and freeway service patrol, contractors and the traffic operations center
- Back of queue warning and protection strategies were implemented
- After action reviews were conducted to discuss lessons learned

FOR YOU TO DISCUSS



Should contractors be involved in incident management?

Pro

- Typically, the contractor is already on scene
- Some contractor personnel have experience as fire/EMS volunteers
- Contractor assets such as traffic control drums and lifting equipment might be useful for incident response

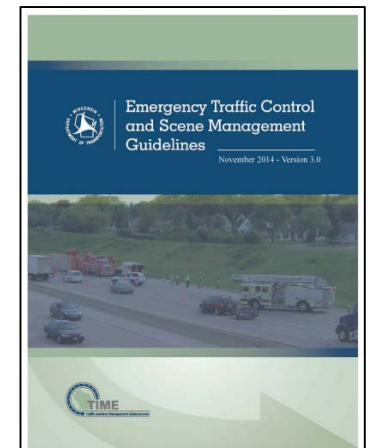
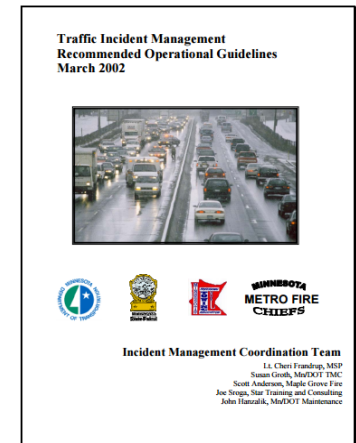
Con

- Contractor could get in the way of first responders
- Contractor personnel might lack relevant training
- Contractors might not understand Integrated Command
- Not a contractual bid item

ADDITIONAL RESOURCES

Agency Guideline Examples

- **MN: Traffic Incident Management – Recommended Operational Guidelines** – 2002 document by the Minnesota Incident Management Coordination Team; incorporates practices agreed upon by Minnesota DOT, Minnesota State Patrol, Minnesota Metro Fire Chiefs, and Minnesota Professional Towing Association
- **WI: Emergency Traffic Control and Scene Management Guidelines** – Guidelines established to provide incident responders with a uniform approach to emergency traffic control and scene management, maximize responder safety, and minimize the risk of secondary crashes



Traffic Incident Management— General Publications

- **Guidebook on Incident Management Planning in Work Zones** – Developed in 2005 for the Smart Work Zone Deployment Initiative; provides engineers and construction managers guidance on developing WZ incident management plans
- **CO: Guidelines for Developing Traffic Incident Management Plans for Work Zones** –2008 report from Colorado DOT that discusses best practices, existing TIM programs, and considerations/key components for developing/implementing work zone TIM programs



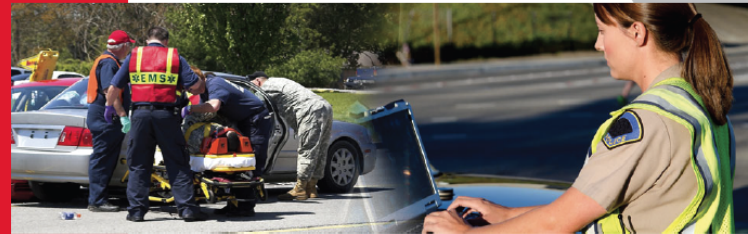
National Traffic Incident Management – Responder Training

- 4-Hour Web-based Training (WBT). This training was developed under the second Strategic Highway Research Program (SHRP2), and is being provided by the FHWA Office of Operations.



FHWA-NHI-133126A

National Traffic Incident Management Responder Training
Web-based Training (WBT)



Training for safer, faster, stronger, more integrated incident response.

The National Traffic Incident Management Responder Training was created by responders for responders. This Web-based Training provides a shared understanding of the requirements for safe, quick clearance of traffic incident scenes; prompt, reliable and open communication; and motorist and responder safeguards. First responders from all TIM responder disciplines will learn how to operate more efficiently and collectively.

Is this training right for my agency?

This training covers many TIM recommended procedures and techniques, including:

- TIM Fundamentals and Terminology
- Notification and Scene Size-Up
- Safe Vehicle Positioning
- Scene Safety
- Command Responsibilities
- Traffic Management
- Special Circumstances
- Clearance and Termination

For more information about this training, please contact:

James "Jim" Austrich
Phone: 202-366-0731
James.Austrich@dot.gov

For detailed information on the course, as well as information on registering for NHI courses, please visit our website at: www.nhi.fhwa.gov/



https://www.nhi.fhwa.dot.gov/course-search?course_no=133126A

Conclusion

First Responders are Advised To:

- Understand the uniformity of work zones and proper devices/layouts
- Look for and identify problems/deficiencies
- Report problems/deficiencies through appropriate channels
- Understand the minimum standards articulated in the MUTCD
- Work with one another and with contractors and engineers to improve incident response continuously
- Leverage resources available through TMCs

Contact Information

Dave Pichette david.pichette@lakesideengineers.com

Dave Collins david.collins@lakesideengineers.com

Todd Peterson todd.peterson@dot.gov

Andi Bill bill@wisc.edu

Adam Francour afrancour@wisc.edu

SCHEDULING FOR NEW TRAINING IN 2019: HIGHWAY WORK ZONE TRAFFIC INCIDENT MANAGEMENT (WZ-TIM)

Webinar Training for Contractors and Field Engineers

Contact for Questions/Registration:

David Collins

david.collins@lakesideengineers.com

Cell: 608-444-3903