

Designing for Work Zone Incident Management

Andi Bill

FHWA Work Zone Design Course



U.S. Department
of Transportation

**Federal Highway
Administration**

Who Created the Course?

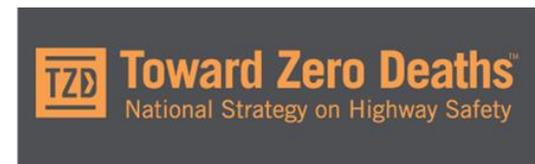
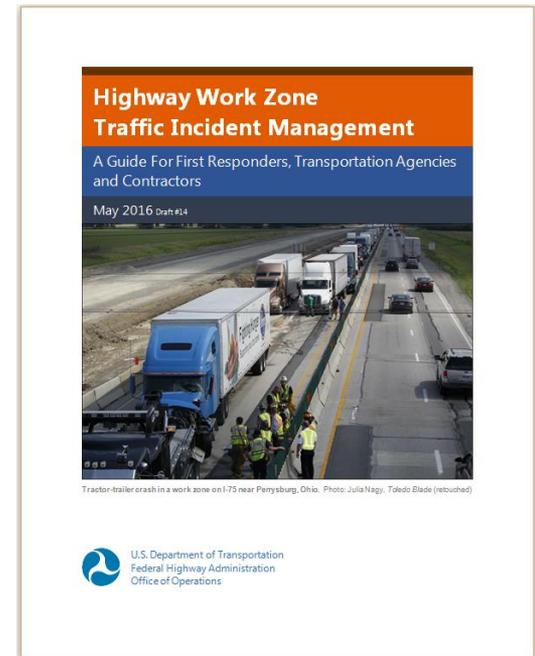
- Funding for course development from FHWA Office of Operations in a 2013 Work Zone Safety Grant.
- Course developed by University of Wisconsin Traffic Operations & Safety Laboratory.
- Total of 6 training sessions to date: Wisconsin, New York, Missouri, North Carolina, Ohio, and Minnesota.
- Next steps: 2016 Work Zone Safety Grant will provide opportunity for additional train-the-trainer sessions at multiple locations in the United States.
- Course materials will be freely available for state and local transportation agencies to use and customize.

FHWA Work Zone Design Course

- Description of Course: Gain better understanding for designing work zones on a select number of work zone design topics.
- Based on the initial five work zone design guidebooks: Traffic Control Design Overview, Pedestrian and Bicyclist Accommodation, Positive Protection, Illumination for Night Construction, and Designing for Incident Management.
- Intended Audience: State highway work zone policy engineers (State work zone subject matter experts) and highway work zone design engineers.
- Registration cost: Free – Presentation costs are part of a FHWA Work Zone Safety Grant. State responsible for employee salaries and travel costs of participants.

Resources

- Designing for Work Zone Incident Management Guidebook
- *Highway Work Zone Traffic Incident Management: A Guide for First Responders, Transportation Agencies and Contractors.*
- *Toward Zero Deaths* national strategy on highway safety.
- OECD *Safe System* approach to highway safety management.



Types of Work Zone Incidents

- Traffic crashes and similar incidents
 - Within work zone
 - In approach to work zone
- Worker medical problems
 - Injury
 - Illness
- Work site mishaps
 - Damage to roadway or other infrastructure
 - Trench collapse
 - Embankment collapse
 - Equipment tip-over
 - Fire, explosion, etc.
- Work Area Intrusions



Incident Response Involves Many Disciplines

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



WZ-TIM Goals

- **Reduce time** to detect and verify that an incident has occurred.
- **Expedite arrival** of response personnel and equipment.
- **Minimize roadway capacity loss** due to the incident (and the presence of response personnel and equipment).
- **Facilitate management** of response apparatus and personnel.
- **Reduce incident clearance time.**
- **Rapidly notify upstream travelers** to encourage a reduction in traffic entering the incident area and to reduce driver dissatisfaction.

Unique WZ Challenges

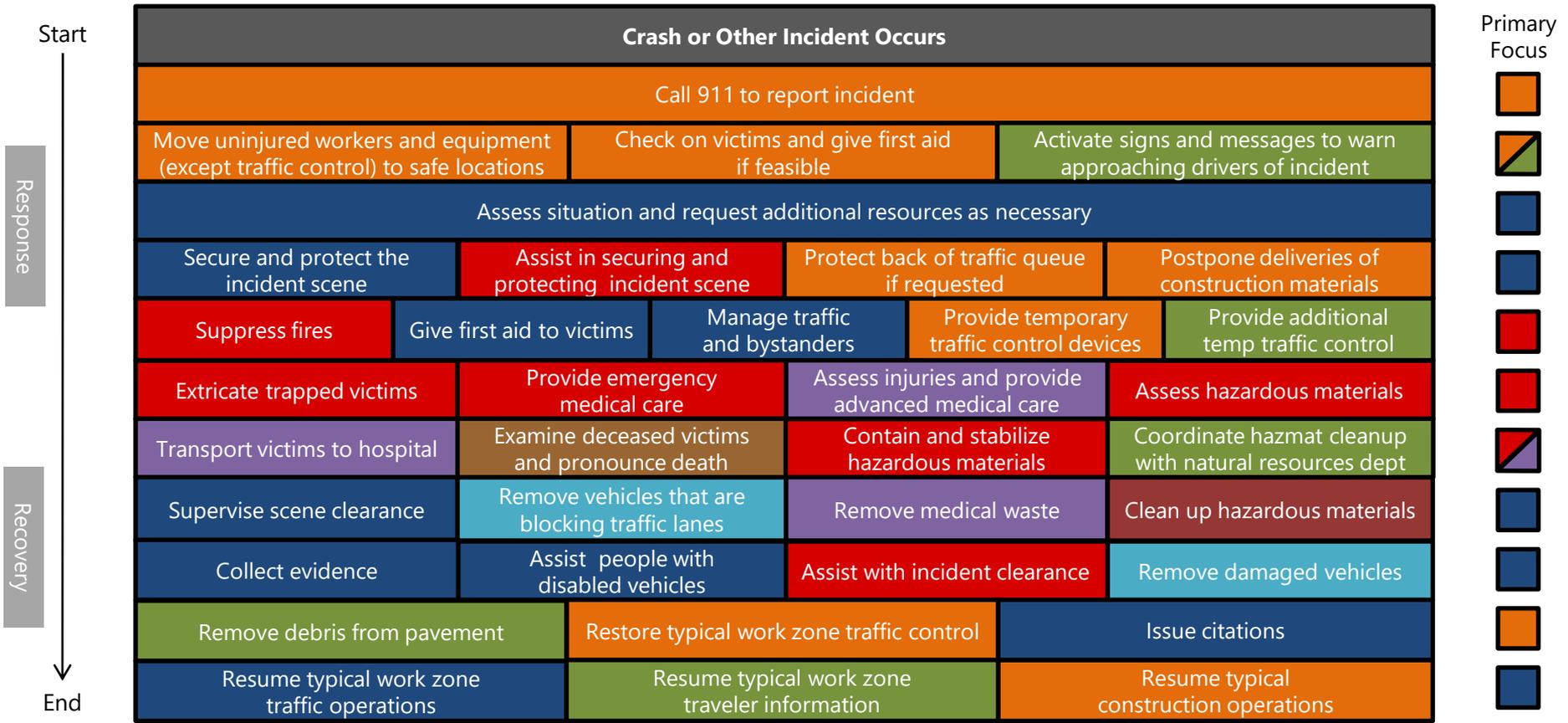
Work Zone Traffic Incident Management (WZ-TIM) differs from TIM on ordinary roadways in several ways:

- **Difficult access** to work zone incidents
- **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



WHAT HAPPENS WHEN AN INCIDENT OCCURS?

Working Together: Coordinated Response to a Generic Work Zone Incident



- Contractor
- Highway Agency
- Police
- Fire Dept
- EMS
- Coroner/ Med Exmnr
- Towing Service
- Hazmat Specialist

Note: Roles and responsibilities shown in this chart are generalized, and could vary based on State and local laws, agreements, and contracts.

Case Study: Truck Rollover

West Des Moines, Iowa – September 2014



Facts & Circumstances

- Rural freeway with 25,800 veh/day
- Northbound semi struck, penetrated concrete barrier
- Two SB passenger cars struck the semi
- All lanes blocked
- Diesel spill



- Traffic re-routed to arterials
- Extended closure due to delayed arrival of HazMat contractor

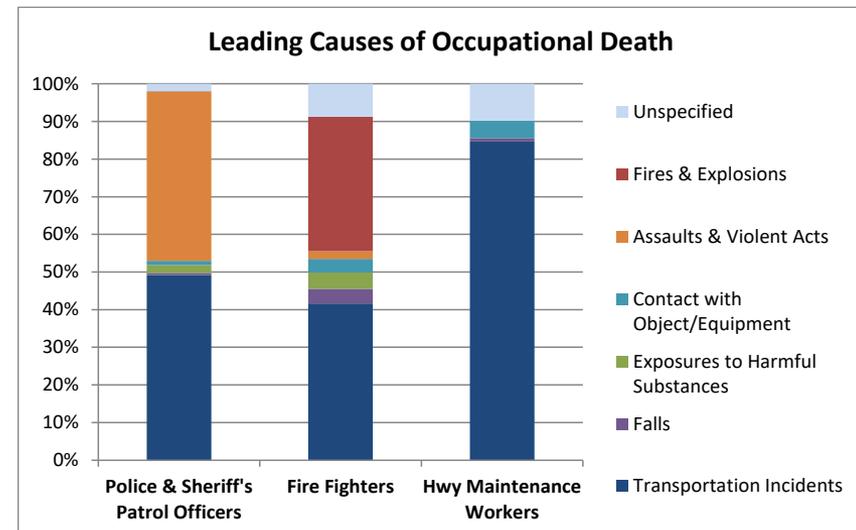
What goes wrong?

- 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



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

WZ-TIM Complexity Varies from Site to Site

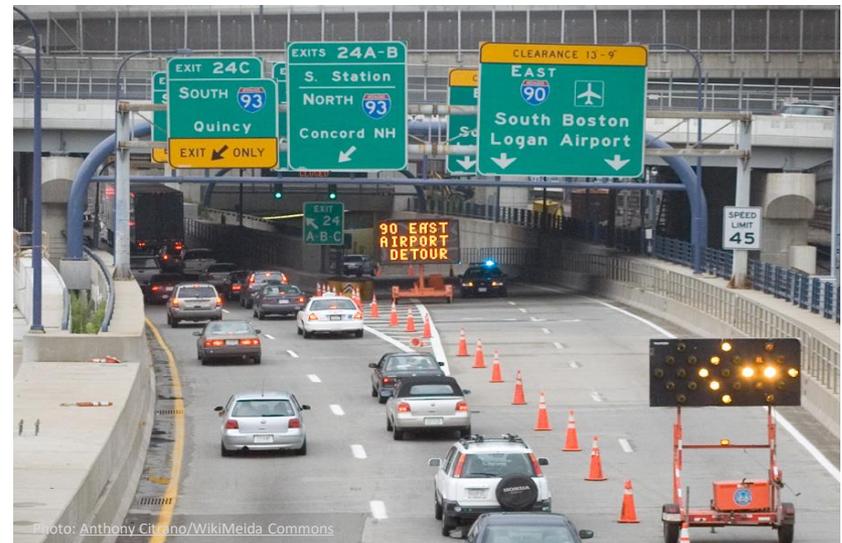
Site Conditions

- Terrain
- Accessibility
- Distance from project site to emergency response resources
- Extent of closures and degree of traffic impacts
- Working conditions, e.g. night work



Administrative

- Working relationships between highway agency and first responders
- Legal issues, e.g. who has authority to decide when to divert traffic to alternate routes
- Types of emergency response equipment likely to be available



BACK-OF-QUEUE PROTECTION

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

Hinged Fixed Signs

- Pro: Bigger and more conspicuous than portable signs
- Con: Queues move, signs don't

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



Queue Warning Vehicles

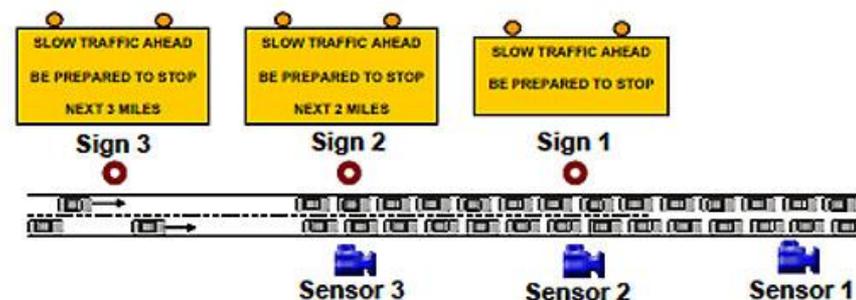


Contractor- or Agency-Supplied Vehicle

Pro: Can move as queue grows/shrinks

Con: Requires special contractual provisions, response time possibly slower than law enforcement

Automated Queue Warning Systems



- Series of speed sensors and electronically-actuated signs
- If speeds near sensor fall below pre-determined threshold, the corresponding upstream sign is activated.
- In freeway applications, the distance between the sensor and its upstream sign is typically $\frac{1}{2}$ to 1 mile.

SITE ACCESS

Primary & Secondary Access/Egress

Fire codes for buildings: every occupied space must have a secondary means of egress.

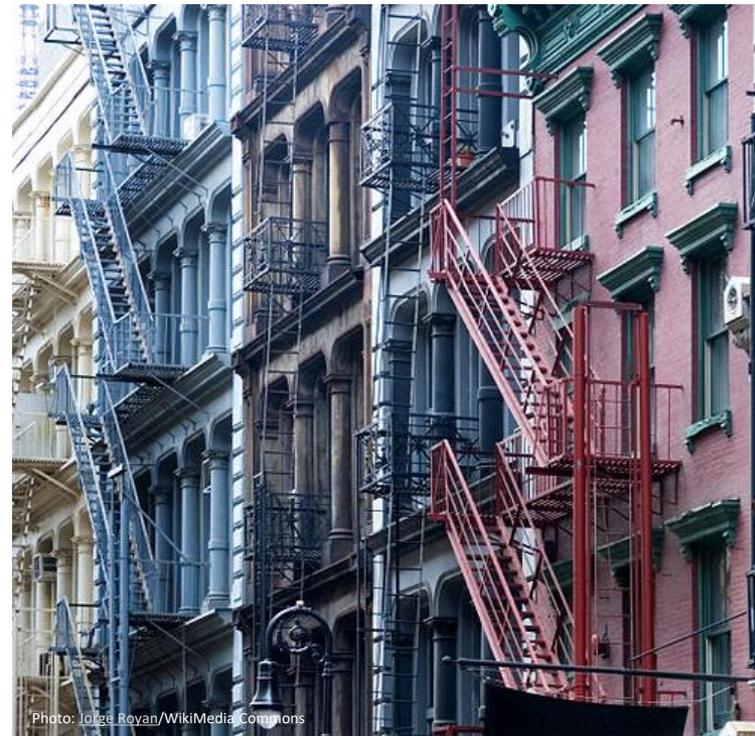
- Primary egress: doors, hallways, stairs
- Secondary egress: windows, fire escapes

Work Zones

- Not codified, but...
- Same concepts apply

Some Sites are Challenging, e.g.:

- Barrier-separated lanes without shoulders
- Multi-level interchanges



Congestion caused by incidents often hampers response and recovery

Improving Access to Incident Sites

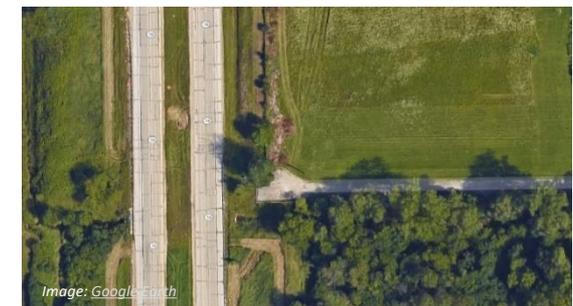


- Gates in temporary barriers
- Temporary access from overpasses or side roads



Gated Secondary Access

- Alternate pathway to access work zone
- Helps avoid driving through traffic back-ups to reach incident site
- Access usually from local road
- Usually locked to deter unauthorized use
- Traversable surface (sometimes unpaved)
- Can be given a name/number and mapped for 911 dispatch systems



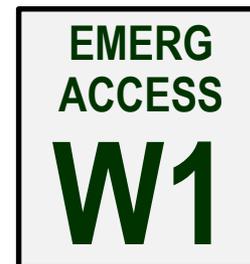
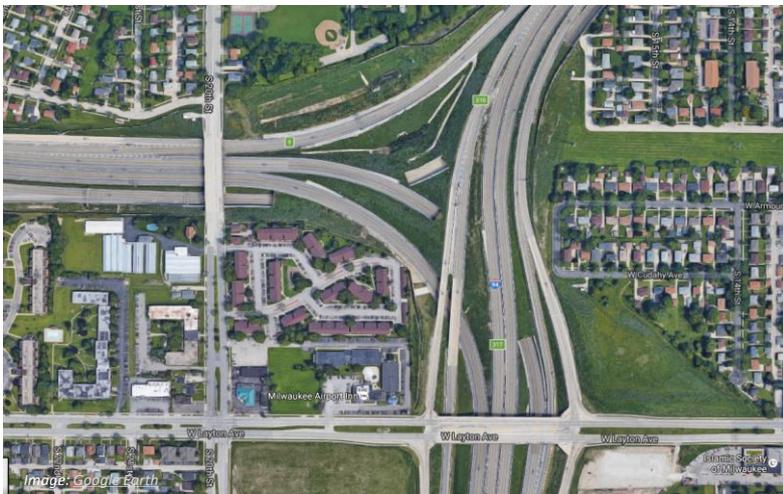
Emergency Access Identification

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



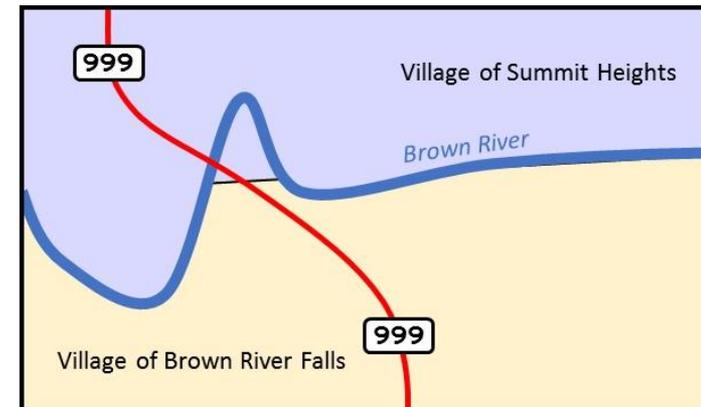
All-Terrain Emergency Response Vehicles

- All-terrain vehicles can resolve some access issues
- Some fire agencies own all-terrain vehicles
- May need to redeploy from other locations



Temporary Loss of Access for Emergency Response Stations

- Some projects temporarily cut off access to police, fire, or ambulance stations.
- Sometimes can be resolved administratively (mutual aid)
- Semi-permanent solutions should be proportionate to the project impact
- Response time is the usual measure of effectiveness



PHYSICAL ACCOMMODATIONS

Ramp Closure Gates & Signs



Gates reduce police manpower required to:

- Reduce traffic volume approaching incident site
- Prevent vehicles from entering a high-delay situation

Type III barricades can be used temporarily

Flip-up signs reduce unintentional entry to closed ramps



Traffic Control Device Caches



- Near-site supply of incident management cones, drums, signs, etc.
- Possibly upstream of work zone
- Some agencies pre-load equipment on a trailer
- Urban areas: possibly include portable fences and other crowd control devices



Orange:
Construction



Fluorescent Pink:
Incident Management



W3-4



W4-2



W9-3



E5-2a



M4-8a



M4-9



M4-10

FHWA Work Zone Design Course

Further Information and Course Scheduling

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