

# A Literature Review of Roadway Safety for Firefighters

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## BACKGROUND AND SIGNIFICANCE

In 2002, while working a roll-over accident in the median of Interstate 5 just south of Everett, Washington the author of this paper heard what he thought to be a freight train running through the emergency incident. It wasn't. Rather, it was an articulating Community Transit bus that had just side-swiped a Fire Engine that was parked next to the freeway. It was a clear, dry, sunny day at about 14:00 hours. The engine was rocking, the engine operator was screaming "we just got hit," the roof ladder and extension ladders that were moments before secured to the side of the apparatus were lying in the middle of a river of broken glass about 300' down the freeway in the middle of the High Occupancy Vehicle traveling lane.

In 2004, a local fire department's engine had a car loose control on a wet limited access roadway and slide into the rear of a fire engine killing the driver. This collision may have been much worse had the apparatus operator not parked the apparatus appropriately shielding the scene from this out-of-control car.

Can these collisions, injuries, and deaths be prevented?  
Many of them can be with a little preparation at the local level.

#### LITERATURE REVIEW

Each year many firefighters are needlessly killed while working on or near roadways. The five year period between 1995 and 1999, 17 firefighter were struck and killed by vehicles (CDC, 2001). In 2002, 14 fire and EMS personnel were killed the same way (Parker, 2003). According to the USFA, in 2004 five firefighters were struck by passing vehicles (USFA, 2005), and in 2005 struck by deaths constituted 4 deaths and was the fifth leading cause of Firefighter fatalities (USFA, 2006).

Many of these stories all seem to be a alike. In 1999, one firefighter was killed, a second firefighters and a civilian were seriously injured when a vehicle lost control on a busy highway (CDC, 2001). In 1998, an out-of-control tractor trailer ripped through an emergency scene killing one firefighter, injuring seven additional firefighters and two EMTs (Parker, 2003). September 27, 1999 a fire fighter was killed after being struck by a tractor trailer along a four-lane highway. He was standing in front on an apparatus

that was parked in the outer emergency lane with warning lights flashing (CDC, 2001).

This issue is not specific only to the fire service. Each year many law enforcement officers are also injured and killed in similar circumstances. In 2002, 14 officers were killed while working on or near roadways (Parker, 2003).

June 16, 2004 a Texas Officer was struck in his patrol car while parked on the side of the road. The officer only sustained minor injuries, but had to be cut out of his patrol car (Allen, 2004).

Preventing any accident requires one to identify the root or factors contributing to the problem. According to Master Sergeant Mark Karczewski of the Illinois State Police, mitigation of roadway related incidents comes down to two primary factors:

1. Visibility for the responders, and
2. Advanced warning for approaching motorists

(Parker, 2003).

Many articles and texts books address the above two items but the gold standard in traffic control is found in Part 6, Temporary Traffic Control, of The Manual on Uniform

Traffic Control Devices for Streets and Highways, 2003 edition. This manual was developed by the US Department of Transportation Federal Highway Administration and outlines best practices when using temporary traffic control (TTC) measures. It also discusses common terminology that can be useful when communicating with supporting agencies such as law enforcement and Department of Transportation. Diagram 1. *Parts of Temporary Traffic Control Zone* further explains common terminology and scene design when using TTC equipment.

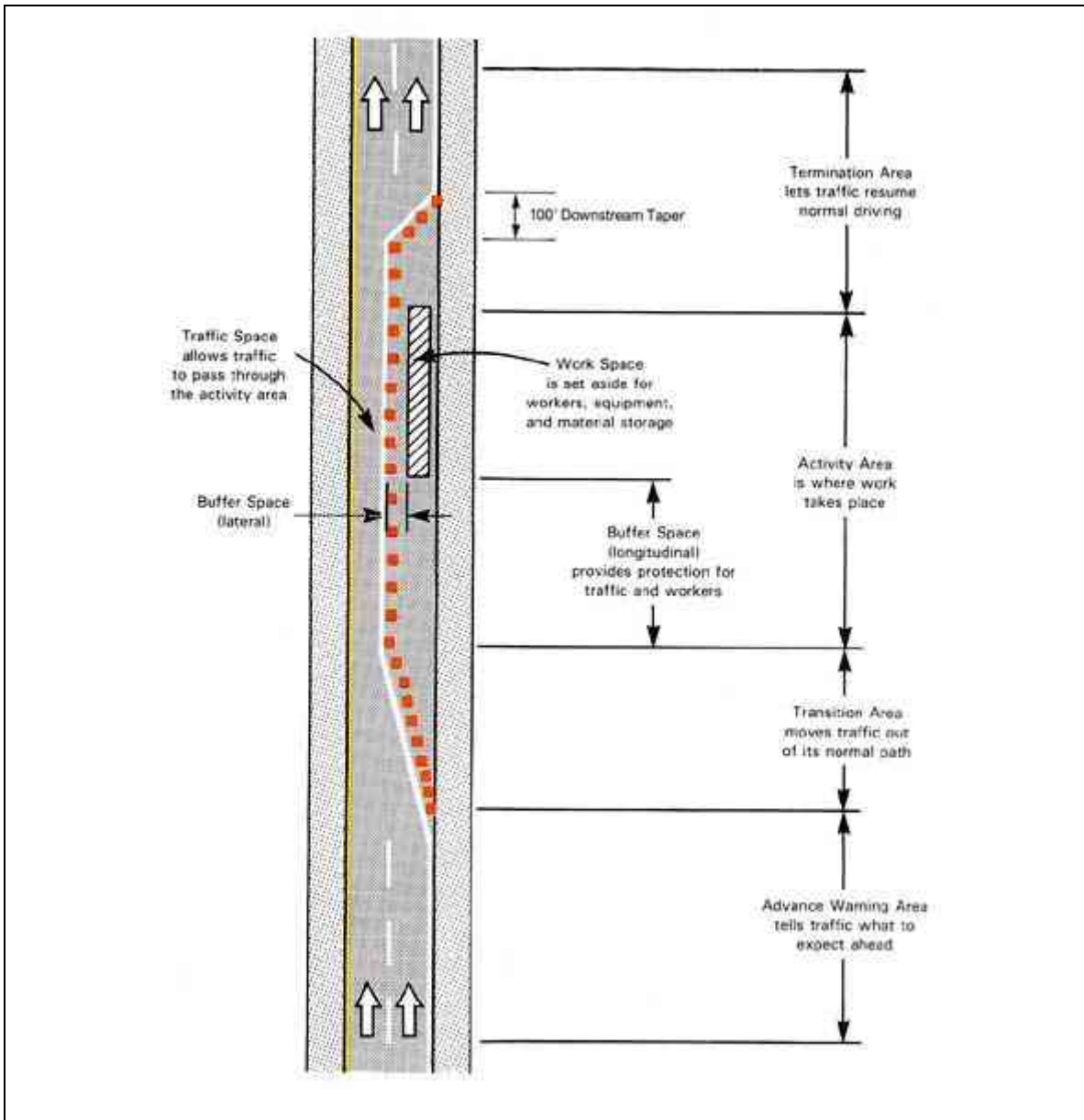


Diagram 1. *Parts of Temporary Traffic Control Zone* (OSHA, 2007)

Visibility, with respect for emergency responders involves the use of high visibility clothing. Many fire departments have added high visibility vests to their arsenal of personal protective equipment. The Edmonds (WA) Fire

Department and other local agencies have purchased this equipment for its firefighters. Edmonds (WA) Firefighters are now required to wear vests on emergency incidents. The only exception to this is for firefighters that are actively engaged in firefighting activity (Edmonds, 2004). This doctrine is further support in NFPA 1500 *Standard on Occupational and Health Standard, 2007 Edition* which states Members that operate on roadway incidents should be provided with vests or garments that ensure proper reflectivity such as a highly retro-reflective vest (strong yellow, green, and orange)(NFPA, 2007).

Warning Devices should also be employed when working on or around roadways. Common warning devices include fire apparatus warning lights, flaggers, flares, cones, barrels, and barricades. NFPA 1500 requires deployment specialized advanced warning signs when fire responders work on or near moving traffic. These devices cost approximately \$250 for the appropriate retroreflective fluorescent pink. This recently officially DOT adopted color signifies an emergency situation ahead on the roadway (Moore, 2004). Also, proper cones design is necessary to protect incident scenes. Cones used at traffic related incidents should not be less than 28" in height, and 6" reflective tape should

be 3"-4" inches from the top of the cone, and an additional 4" reflective tape 2" below the tope marking tape. This style cone is recommended for night-time and high speed road emergency scenes (MDI, 2004).

Placement of warning devices is crucial and Standard Operating Procedures should be adopted to stress the importance of early warning devices. The Edmonds (WA) SOP On Roadway explains the following with regard to deploying warning devices:

The first arriving apparatus should block the incident scene from traffic, cones and/or flares shall be deployed from the rear of the blocking apparatus toward oncoming traffic to increase the advance warning, cones shall be placed at least Personnel shall face oncoming traffic at all times when placing and retrieving cones and flares. Traffic cones shall be deployed at 15-foot intervals upstream of the blocking apparatus with the furthest traffic cone a minimum of 75 feet upstream on surface streets, and a minimum of 100- to 150-feet on freeways to allow adequate advance warning (Edmonds, 2006).

Comprehensive responder training programs should be adopted and periodically refreshed. Training elements should include common terminology (ICS), proper traffic control and responder safety. Roadway Safety Training Programs can

be found at ResponderSafety.com. Courses available at this site include Intermediate Incidents, Minor Incidents, Definitions of Roadway Incident Terms, and Safety Benchmarks for Roadway Incidents (Responder Institute, 2007). These training programs outline necessary training elements and provide an additional layer of safety when working near and around roadways. The author of this paper recommends that training elements include the following:

- ~ Common Terminology: The use of common terms used while working on and around roadways should be established, mandated, and enforced. Terms such as up and downstream, taper, block, and lane numbering should be taught and used at emergency scenes (US DOT, 2003)
- ~ Signage and safety equipment: Appropriate color signage and safety equipment should be employed at all roadway emergency scenes, or incidents near roadways. Florescent Pink signage, lighting equipment, reflective apparatus striping, appropriate sized and marked cones, and safety vests are examples of such safety equipment.
- ~ Traffic Diversion Practices: According to Mike Kelly of the START Group Training, in an informal interview in March of 2004, each time traffic is diverted, 38% of the time a secondary vehicle accident occurs.

Traffic diversion practices should be coordinated with local Department of Transportation response units and its practices. During research for this paper it was found that the State of Washington uses the *Manual on Uniform Traffic Control Devices for Streets and Highways* as its standard for policy development and training.

~ Incident Safety Officer (ISO)- Scene safety is the pinnacle of a traffic safety program. Training programs should include the use of Incident Safety Officer who would have oversight for overall scene safety which would include safety device deployment, equipment use, and apparatus scene placement. ISO duties must be coordinated with the Incident Commander or Unified Command Post in order to be effective.

Policies and procedures should be written that further explain roadway safety and support the training and equipment used by the local emergency response agency. Model SOPs can be found by using common internet search practices, or by going to [respondersafey.com](http://respondersafey.com) (Responder Institute, 2007). The Edmonds (WA) Fire Department SOP on Roadside safety has been added to this document as Appendix A as an example of such SOP.

## CONCLUSION

Roadway safety is contributing to many firefighter deaths annually. Fire Departments should establish training programs that outline the importance of working safe on or near roadways. Programs should include common terminology and its use within the incident command system, the use of signage and safety equipment, traffic diversion practices and the risks associated with diverting traffic, use of local state Department of Transportation response units, employment of Incident Safety Officers at roadway incidents, common evacuation/abandonment signal, mobilization and demobilization when responding to and from roadway incidents, and general safety practices while working in these dangerous environments.

Furthermore, these programs should be taught on a regional basis and across multiple emergency disciplines (Fire, Law Enforcement, Hazardous Materials Response, Public Works, etc) to allow for agencies that work together on roadways to communicate using uniform terminology and enforcing the same policies to limit the risk and make firefighters more safe.

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