



U.S. Fire Administration

Traffic Incident Management Systems

April 2008



FEMA

U.S. Fire Administration

Mission Statement

As an entity of the Federal Emergency Management Agency (FEMA), the mission of the U.S. Fire Administration (USFA) is to reduce life and economic losses due to fire and related emergencies, through leadership, advocacy, coordination, and support. We serve the Nation independently, in coordination with other Federal agencies, and in partnership with fire protection and emergency service communities. With a commitment to excellence, we provide public education, training, technology, and data initiatives.



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U.S. Department of Transportation
Federal Highway Administration



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PREFACE

The U.S. Fire Administration (USFA) would like to acknowledge the U.S. Department of Transportation (DOT) Federal Highway Administration (FHWA) for providing the substantial support necessary to perform this research and develop this report.

This report was developed through a Cooperative Agreement between the USFA and the International Fire Service Training Association (IFSTA) at Oklahoma State University. IFSTA and its partner OSU Fire Protection Publications has been a major publisher of fire service training materials since 1934 and, through its association with the OSU College of Engineering, Architecture, and Technology, it also conducts a variety of funded, technical research on fire service, fire prevention, and life safety issues.

The extensive information provided within this report would not have been possible without the dedication and efforts of the following people assigned to this project:

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The USFA would also like to acknowledge the efforts of the National Fire Service Incident Management Consortium in developing the excellent procedures for applying the Incident Command System (ICS) to highway incidents that are outlined in this document. This information was excerpted from the Consortium's *IMS Model Procedures Guide for Highway Incidents* that was developed with funding from the DOT. We are grateful for the use of that information in this report.

INTRODUCTION

The U.S. Fire Administration (USFA) is committed to reducing on-duty firefighter fatalities by 25 percent within 5 years and 50 percent within 10 years. It also is committed to doing research that would support that goal. The consistently high annual percentage of fatalities related to fire department response and roadway scene operations prompted the USFA to look at several aspects related to these collisions in an effort to improve responder safety.

Firefighters who are killed in privately owned vehicles (POVs) during the course of their duties account for the largest percentage of vehicle-related deaths. These are typically volunteer firefighters who are responding to or returning from emergency calls. However, career firefighters also are killed occasionally in POVs during the performance of their duties.

Fire department tankers (tenders) account for the most firefighter response-related fatalities in fire apparatus (**Figure 1.1**). More firefighters are killed in tankers than in pumpers and ladder apparatus combined. In response to the alarming numbers of fatalities occurring in tankers, the USFA published *Safe Operations of Fire Tankers* (FA-248) in 2003. In partnership with the U.S. Department of Transportation (DOT)/National Highway Transportation Safety Administration (NHTSA) and the DOT/Intelligent Transportation Systems (ITS) Joint Program Office, USFA initiated the Emergency Vehicle Safety Initiative (EVSU) in 2002. The initiative:

- ▶ identified the major issues related to firefighter fatalities that occur while responding to or returning from alarms and while operating on roadway emergency scenes; and
- ▶ developed and obtained consensus among major national-level fire and emergency service trade associations on draft “best practices” guidelines, mitigation techniques, and technologies to reduce firefighter response and roadway scene fatalities.



Figure 1.1—More firefighters die in tanker/tender crashes than in any other type of fire apparatus.

The USFA published the results in *FA-272 Emergency Vehicle Safety Initiative* in August 2004 (**Figure 1.2**). The report identified several recommendations to improve safety related to response and highway operations.

As a follow-up to the EVSI, the USFA initiated partnerships with the International Association of Fire Chiefs (IAFC), the International Association of Fire Fighters (IAFF), and the National Volunteer Fire Council (NVFC) to reduce the number of firefighters killed while responding to or returning from the emergency scene or while working at roadway emergency scenes. The USFA and the NVFC developed the *Emergency Vehicle Safe Operations for Volunteer and Small Combination Emergency Service Organizations* program. This Web-based educational program includes an emergency vehicle safety best practices self-assessment, standard operating guideline examples, and behavioral motivation techniques to enhance emergency vehicle safety. This program also discusses critical safety issues of volunteer firefighting.

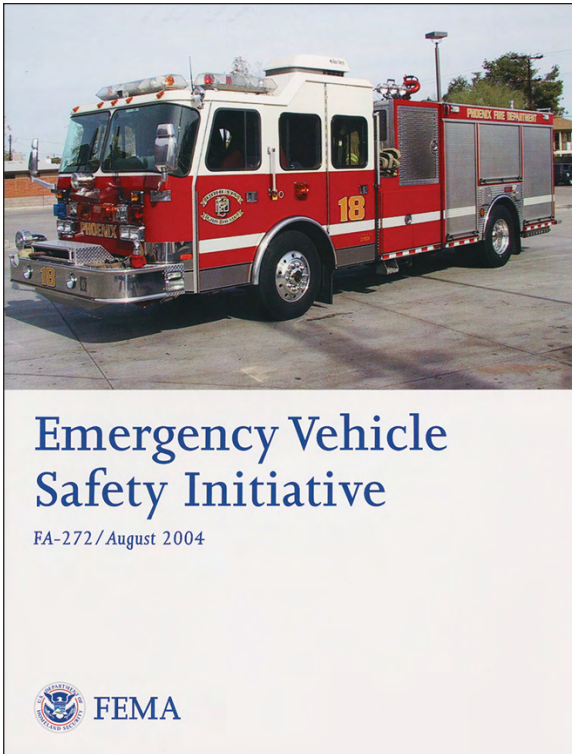


Figure 1.2—The Emergency Vehicle Safety Initiative was released by the USFA in 2004.

The USFA and IAFF developed a similar Web- and computer-based training and educational program—*Improving Apparatus Response and Roadway Operations Safety in the Career Fire Service*. This program discusses critical emergency vehicle safety issues such as seatbelt use, intersection safety, roadway operations safety on crowded interstates and local roads, and driver training. Instructor and participant guides and PowerPoint™ slides are included.

The USFA and the IAFC developed *IAFC Policies & Procedures for Emergency Vehicle Safety*. This Web-based document provides guidance for developing the basic policies and procedures required to support the safe and effective operation of all fire and emergency vehicles, including fire apparatus, rescue vehicles, ambulances, command and support units, POVs, and any other vehicles operated by fire department members in the performance of their duties. Links to each of these three programs are included in **Appendix B: Resource Web Sites**.

Most agencies that collect and report data on firefighter injuries and deaths, such as the USFA and the National Fire Protection Association (NFPA), combine response-related casualties with roadway scene casualties into a single “vehicle-related” casualty reporting area. Of the two, clearly response-related injuries and deaths account for the majority of these casualties. This is why response-related issues were the primary focus of

the previous USFA projects discussed earlier in this section. Roadway incidents were the focus of portions of the EVSI report, the USFA/IAFF project, and the work of the Emergency Responder Safety Institute.

The USFA has been working with the Cumberland Valley Volunteer Fireman’s Association’s (CVVFA) Emergency Responder Safety Institute to enhance the operational safety of emergency responders on the highway. The ongoing effort has resulted in the development of a white paper—*Protecting Emergency Responders on the Highway*—and supporting their ResponderSafety.com Web site.

The USFA has received support for this initiative from the DOT, Federal Highway Administration (FHWA) and most recently from the U.S. Department of Justice (DOJ) National Institute of Justice (NIJ) Office of Justice Programs (OJP).

When the two areas are analyzed separately, it becomes evident that injuries and deaths that occur at roadway emergency scenes have increased steadily in recent years. The purpose of this report is to focus on the causes of firefighter injuries and deaths when working on roadway incidents. This report will focus on the causes of these incidents and provide strategies for mitigating them in the future. The occurrence and severity of these incidents can be reduced through proper roadway incident scene tactics and incident management, information which will be covered in the remaining chapters of this document.

The remainder of this chapter focuses on statistics and causal information on these types of incidents. Although the remaining chapters of this report focus on roadway incident scene issues, some data on response-related injuries and deaths also are provided below to put the overall vehicle-related injury and death problem in perspective. In some cases, such as the topic of secondary collisions at roadway scene operations, the two are directly related.

Firefighter Fatalities

Over the last decade (1996 to 2006) for which complete figures were available, vehicle collisions claimed 227 firefighter lives, and another 52 firefighters were lost as a result of being struck by a vehicle. Between 1996 and 2006, vehicle collisions/struck-by incidents accounted for 20 percent of all fatalities. In 2003, this figure jumped dramatically to 35 percent of all fatalities, with 34 firefighters killed in vehicle collisions and 5 struck by vehicles.

This trend continued in 2005, with 22 percent (25) of the 115 fatalities resulting from vehicle collisions. Five firefighters were killed in tender crashes, five firefighters were killed in crashes that involved passenger vehicles, and four firefighters were killed in pumper crashes. Firefighters also were killed in crashes involving all-terrain vehicles, aircraft, and a boat. The numbers remained consistent in 2006. **Table 1.1** provides a summary analysis of firefighter fatalities occurring in vehicle collisions and those struck by a vehicle while working on an emergency scene for the past decade.

Table 1.1—Firefighter Fatalities in Vehicle Collisions and Struck by Vehicles: 1996-2005

Year	Total Deaths	Vehicle Collision	Struck by Vehicle	Percent of Total Deaths
1996	99	17	3	20
1997	100	22	5	27
1998	93	17	4	23
1999	113	11	5	14
2000	103	21	7	27
2001	106	21	4	24
2002	101	24	7	31
2003	112	34	5	35
2004	119	20	6	22
2005	115	25	3	24
2006	106	19	3	21

Source: U.S. Fire Administration, Firefighter Fatality Reports (1996 to 2006).

The types of vehicles involved in fatal collisions have remained consistent over this time period as well; POVs continue to be the most common vehicle involved in firefighter fatalities responding to and returning from an incident, accounting for approximately 25 percent of all vehicle collision fatalities. Water tankers continue to be the most common fire apparatus involved in fatal collisions.

A report released by the Centers for Disease Control and Prevention (CDC) in 2005 also provides some interesting comparative data related to this study. The CDC report titled *Fatal Injuries Among Volunteer Workers—United States, 1993-2002* looked at the causes of deaths in all areas of volunteerism in the United States. This report noted that firefighters accounted for 185 (37 percent) of the 501 fatal injuries to volunteers of all types. The single most common volunteer activity (in all volunteer disciplines) at the time of death was firefighting, with 76 deaths (15 percent) recorded. Fifty-four percent of fatalities in volunteer workers aged 34 years or less were volunteer firefighters or firefighting supervisors.

Perhaps most interesting to note in relation to the topic of this document was the fact that the CDC report showed that 21 percent of the total fatalities experienced by volunteers in all disciplines were driving related. This figure is very consistent with the fire service's own experience in this area. What this number may be telling us is that, although any number of injuries and deaths is unacceptable, the number of vehicle-related deaths that the fire service experiences is not out of line with those in the general population of the U.S. This does not mean, however, that we cannot improve upon those statistics.

Firefighter Injuries

Table 1.2 shows the summary of firefighter injuries occurring during response and return, from 1995 through 2004, the most recent years available at the time this report was written. What is statistically interesting in these numbers is the fact that, while vehicle-related deaths account for a fairly significant percentage (second leading cause overall) of firefighter deaths, they actually account for only a small percentage of overall firefighter injuries.

Table 1.2—Firefighter Injuries Responding To/Returning From Incidents 1995-2004

Year	Responding and Returning Injuries	Crash Injuries	Crash Injuries as a Percent of All Firefighter Injuries
1995	5,230	1,140	1.2
1996	5,315	1,150	1.3
1997	5,410	1,530	1.8
1998	7,070	1,365	1.6
1999	5,890	965	1.1
2000	4,700	1,160	1.4
2001	4,640	1,100	1.3
2002	5,805	1,250	1.5
2003	5,200	935	1.2
2004	4,840	1,200	1.6

Source: U.S. Fire Administration data.

Interestingly, these numbers tend to mirror the fire service's experience with cardiac-related injuries and deaths. Heart attacks and strokes are the leading killer of firefighters. On average, these events are responsible for 40 to 50 percent of firefighter deaths annually. However, cardiac events account for less than 2 percent of all firefighter injuries. What this tells us about both cardiac and vehicle-related events is that while they tend to be lower in frequency in the grand scheme of overall firefighter casualties, when they do occur they are serious events.

Secondary Collisions

A collision that occurs as a result of distraction or congestion from a prior incident is considered a secondary collision (**Figure 1.3**). There are many documented incidents resulting in both responder



and civilian injuries/deaths as the result of secondary crashes. However, there is no specific database that allows for retrieval of the total numbers or any condition (e.g., weather, lighting, apparatus placement) related to the collisions. A DOT report indicated that approximately 18 percent of all traffic fatalities nationwide occur as a result of secondary collisions.

The Minnesota DOT references two studies in their Incident Management Program that estimate approximately 15 percent of all collisions result from an earlier incident. What must be remembered is that a secondary collision is often more serious than the original collision, especially if it occurs between free-flowing and stopped traffic. Secondary collision is an area where more studies and data are needed.

Law enforcement personnel are very cognizant of the likelihood and severity of secondary collisions. This often translates into one of the causes of friction that sometimes occurs between police officers and other emergency responders at the scene of roadway incidents. The police are under pressure to clear the scene as soon as possible, as this helps to minimize traffic delays and reduce the possibility of a secondary collision. In their view, the more apparatus and people brought to an incident, the more time it will take to eventually clear the scene, putting more sources of contact for secondary collisions on the roadway. In reality, the needs of both agencies must be balanced. This needs to be done in preincident planning and interagency cooperation. Trying to iron these issues out while standing in the roadway at an incident is rarely successful.

For the purpose of this report it must be realized that the majority of firefighter struck-by incidents fall into the category of secondary collisions. Most of the time, the only reason that firefighters are in the roadway in a position to be struck is because they are operating at an incident that already occurred. The principal purpose of much of the information contained in the remainder of this report is aimed at the prevention of secondary collisions.

Factors Influencing the Occurrence of Roadway Incidents

Modern fire departments deliver a full range of fire, rescue, and emergency medical services to handle virtually every type of emergency that may occur in a jurisdiction. These emergencies can happen at any time and in any location. Many of the emergencies that fire departments routinely respond to happen on the roadway. These include vehicle collisions, pedestrian collisions, vehicle fires, medical emergencies, and hazardous materials incidents. Other incidents may not actually occur on the roadway but require responders to deliver their services from the roadway, such as a medical emergency in a house next to the road.

In order to reduce the frequency of firefighters being struck by vehicles during the performance of their duties, it is important to understand some of the more common causes that lead to these incidents. The following is a summary of causal factors that have been noted in incident reports and through experience to be responsible for firefighters and other emergency responders coming in contact with other vehicles at a roadway incident scene.

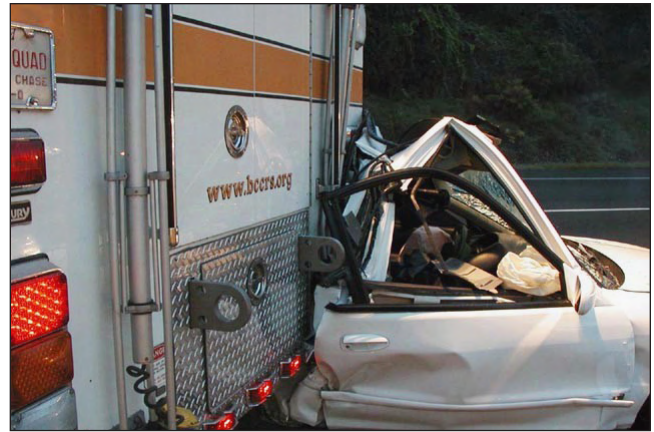


Figure 1.3—Fire apparatus are commonly struck in secondary collisions.



Figure 1.4—Failure to properly establish a temporary traffic control zone places firefighters in a dangerous position. Courtesy of Bob Esposito, Pennsburg, PA.

- ▶▶ **Lack of training**—Responders are not trained on the hazards associated with roadway incidents and the proper ways to minimize their occurrence.
- ▶▶ **Lack of situational awareness**—Responders fail to recognize the dangers associated with a particular roadway situation they are facing due to insufficient training or lack of experience.
- ▶▶ **Failure to establish a proper Temporary Traffic Control (TTC) zone**—Many fire departments do not have sufficient training, equipment, or Standard Operating Procedures (SOPs) for the correct way to set up a properly marked work area when operating at a roadway incident scene. Cases also have been noted where the responders did have good training, equipment, and SOPs, but for whatever reason failed to use or follow them (**Figure 1.4**).

- ▶▶ **Improper positioning of apparatus**—Numerous cases have been cited where apparatus was not positioned to the fullest advantage of the incident. In some cases the apparatus was not positioned in a manner that protected the work area. In other cases apparatus was unnecessarily positioned in the roadway.
- ▶▶ **Inappropriate use of scene lighting**—Inappropriate use of vehicle headlights, warning lights, and floodlights can confuse or blind approaching motorists (**Figure 1.5**). This causes them to strike an emergency vehicle, responder, or other vehicle in the incident area.
- ▶▶ **Failure to use PPE and high-visibility apparel and safety equipment**—Responders working in the roadway must wear appropriate protective garments and use all available traffic control devices in order to prevent being struck by oncoming traffic.
- ▶▶ **Careless, inattentive, or impaired drivers**—Even when we try to do everything correctly, we must be cognizant of the fact that there are drivers out there who will not react correctly to the altered traffic pattern that occurs at a roadway incident. This may result in them driving into our work space.
- ▶▶ **Reduced vision driving conditions**—Although firefighters may be struck by vehicles in virtually any condition, the chances of an incident occurring are greater during obscured vision conditions, including darkness, fog, rain, snow, and blinding sunshine.

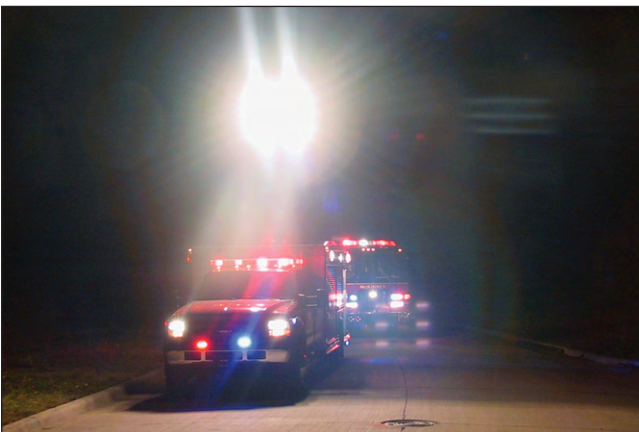



Figure 1.5—Failure to tilt down floodlights can have blinding effects on approaching drivers.

- ▶▶ **Altered traffic patterns**—Drivers may be confused by the traffic control measures used at an incident scene or those being employed in a construction zone.

Other Considerations Relative to Roadway Incident Scenes

Fire service personnel need to look beyond the obvious, immediate concerns when considering the implications and impacts of roadway incident scenes. Taking a broader view of the subject will reveal some issues that fire service



personnel and agencies should be more concerned about. It also gives keen insight into some of the major concerns held by other agencies with responsibility for roadway incident response. The fire service's failure to recognize these other concerns is one of the frequent sources of conflict that occurs between responding agencies at a roadway incident scene. Of course, the reverse is true as well.

ECONOMIC IMPACT

Some of the economic impacts of roadway incident scenes are quite obvious, while others may not be so apparent. Vehicle collisions have immediate and long-term economic effects on both the individual and society. Costs are both direct (those that are the result of the collision and resultant injury/fatality) and indirect (overall cost to society). These costs apply to both the victims of the primary incident and any responders who may be involved in a secondary incident and include, but are not necessarily limited to:

- ▶ **Property damage**—Many of these costs are obvious and include the value of vehicles, cargo, roadways, adjacent property, and other items damaged in the incident.
- ▶ **Medical cost**—These costs include emergency room and inpatient costs, followup visits, physical therapy, rehabilitation, prescriptions, prosthetic devices, and home modifications for both the original victims of the incident and any responders who may be injured in a secondary collision.
- ▶ **Emergency services cost**—This includes the cost of providing police, emergency medical services (EMS), and fire department response to the original incident and the additional costs of a secondary incident. In many cases the costs associated with providing service to the second incident will exceed those of the original incident.
- ▶ **Investigation cost**—The cost includes time spent investigating the incident and writing reports for primary and secondary incidents. In the case of fatal incidents these costs increase exponentially over injury or noninjury incidents.
- ▶ **Legal cost**—This includes fees, court costs, and overtime costs associated with civil litigation resulting from primary and secondary incidents.
- ▶ **Vocational rehabilitation**—This is the cost of job or career retraining required as a result of disability caused by roadway incident scene injuries.
- ▶ **Replacement employees**—Employers will often have to hire temporary help or pay other people overtime to cover the position of an injured employee.
- ▶ **Disability/Retirement income**—These costs occur when employees, including firefighters, cannot return to work.
- ▶ **Market productivity reduction**—This cost includes lost wages and benefits over the victim's remaining life span.
- ▶ **Insurance administration**—This is the administrative cost associated with processing insurance claims and attorney costs.
- ▶ **Travel delay**—This cost is the value of travel time delay for persons not involved in the collision, but who are delayed by the resulting traffic congestion. This is covered in more detail below.
- ▶ **Psychosocial impact**—This includes the cost of emotional trauma that inhibits, limits, or otherwise negatively influences a person's life.

- ▶ *Functional capacity*—This includes the long-term changes in a person’s ability to function in daily living.
- ▶ *New operational costs*—This is the cost of developing new procedures and training to improve safety at future incidents.

IMPACT OF TRAVEL DELAY RESULTING FROM VEHICLE COLLISIONS

DOT and law enforcement officials try to minimize lane blockages not only because of fear of a secondary collision, but also because they realize the economic impact it has on those who become delayed in the resultant congestion. A general rule-of-thumb is that every minute a lane of traffic is blocked by an incident results in four minutes of congestion. The FHWA estimates that the Nation loses 1.3 billion vehicle-hours of delay due to incident congestion each year, at a cost of almost \$10 billion. This does not take into consideration the cost of wasted fuel and environmental damage by idling vehicles in incident-related lanes of stopped traffic.

Every driver reacts differently to an unexpected incident. Reactions include slamming on the brakes, swerving into another lane, or just slowing down in order to gawk at the event. Regardless of the response, it creates a wave that progressively slows following traffic. **Table 1.3** shows the reduction of vehicular traffic in relation to the location of the incident on a three-lane freeway (three lanes in each direction).

Table 1.3—Incident Effects of Blocking Lanes on Three-Lane Freeway

Incident Location	Capacity Reduction
None	None
Shoulder	17%
1 Lane Blocked	49%
2 Lanes Blocked	83%
3 Lanes Blocked	100%

Source: National Highway Traffic Safety Administration. Highway Safety Desk Book.

It should be noted that the figures in **Table 1.3** do not take into consideration the slowdowns that also typically take place in the opposing lanes of traffic due to curiosity, rubbernecking, and confusion caused by warning lights.

Several studies have been conducted to determine the cost of travel delay as the result of vehicle collisions. Lan and Hu’s (2000) study in Minneapolis-St. Paul, found an average of 5,057 hours of delay per heavy truck crash and 2,405 hours per crash without heavy vehicles involved. The study collected data on 289 heavy truck crashes and 3,762 other crashes.

NHTSA found that travel delay cost \$25.6 billion, or 11 percent of total collision costs, in 2000. Costs were calculated based only on police-reported crashes using the premise that any substantial impact on traffic would attract the attention of police. The costs per hour of delay were calculated using 60 percent of the wage rate for noncommercial drivers and 100 percent for commercial drivers. **Table 1.4** shows a breakdown of the hours of delay by roadway type.

Table 1.4—Hours of Delay per Heavy Vehicle Crash by Roadway Type and Location—2000

Roadway Type	Property Damage Only	Injury	Fatality
Urban			
Interstate	2,260	7,344	21,749
Other Freeway	1,766	5,737	16,990
Major Arterial	949	3,082	9,127
Minor Arterial	594	1,929	5,711
Collector	31	102	301
Local Street	9	28	83
Rural			
Interstate	814	2,646	7,835
Major Arterial	416	1,350	3,999
Minor Arterial	255	829	2,454
Major Collector	10	24	100
Minor Collector	4	14	42
Local Street	1	4	12

NOTE: Delay on local streets includes vehicles unable to exit from driveways. Each hour of delay in urban areas is valued at \$13.86, and \$16.49 in rural areas. Cost differential is due to differences in vehicle occupancy.

Source: National Highway Transportation Safety Administration.

Project Goals

The USFA and the DOT/FHWA formed a partnership with the International Fire Service Training Association (IFSTA) to research and identify effective technical guidance and training programs for fire and emergency service providers in Traffic Incident Management Systems (TIMS).

The purpose of the project was to enhance responder safety and provide guidance to local-level fire departments on compliance with the DOT’s *Manual on Uniform Traffic Control Devices* (MUTCD) and the National Fire Service Incident Management System Consortium’s (NFSIMSC’s) *Model Procedures Guide for Highway Incidents*. The information contained in this document should help enhance firefighter operational effectiveness, reduce potential liability, and enhance responder safety at roadway emergency scenes.

MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES

The effective use of approved traffic control devices promotes highway safety and efficiency by providing for orderly movement of all road users. The MUTCD, which is published by the FHWA, contains the basic principles that govern the design and use of traffic control devices for all streets and highways, regardless of the public agency having jurisdiction (**Figure 1.6**). The MUTCD is divided into 10 parts, each with chapters. Part 6 is “Temporary Traffic Control” and within Part 6 is Chapter 6I, “Control of Traffic Through Traffic Incident Management Areas.” This section is particularly relevant to emergency highway operations, which are covered in depth in Chapter 4 of this document, “Setting Up Safe Highway Work Zones.”

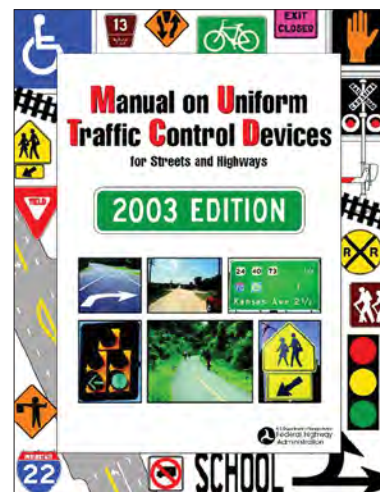
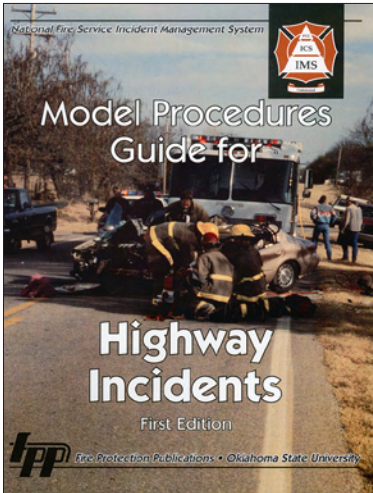


Figure 1.6—The MUTCD can be downloaded from the USDOT Web site, at <http://mutcd.fhwa.dot.gov>



MODEL PROCEDURES GUIDE FOR HIGHWAY INCIDENTS

Experience shows that it is critical to integrate all response agencies on highway incidents. *Model Procedures Guide for Highway Incidents*, developed by the NFSIMSC in cooperation with the DOT, applies the organizational principles of the Incident Management System (IMS) to generic highway incidents (**Figure 1.7**). It concentrates on the integration of all responders into a unified effort. The guide supports all response disciplines (fire, EMS, transportation, law enforcement, public works) to address their specific tactical needs, while retaining the overall IMS structure. This guide is reviewed in depth in Chapter 5 of this document, “Management of Highway Incidents.”

Figure 1.7—The IMS Model Procedures Guide for Highway Incidents was a joint project of the NFSIMSC and the DOT.

INCIDENT CASE STUDIES

It is important to be aware of the numerical data and statistics on fatalities related to fire department response and roadway scene operations. These data give a sense of the magnitude of the problem we are facing. However, it also is important to review several specific incidents in order to identify the factors involved and show the personal side of these tragedies. This chapter presents selected cases on firefighter pedestrian fatalities that were identified through the data obtained from the USFA firefighter fatalities studies over the past several years prior to the development of this report. As you read these cases studies, think about how many times you have been in a similar position or situation, yet did not fall victim to a collision.

▶▶ Case Study 1

On October 27, 2003, at 2137 hours, volunteer members of a combination fire department responded to a report of a smoking generator at a road construction site. Seven volunteer firefighters in three apparatus responded. They determined that the problem was electrical, and notified the contractor who owned the equipment. One piece of apparatus, the brush truck, and three firefighters stayed on the scene to wait for the contractor to come and tend to the equipment.

When the contractor arrived, the assistant chief briefed the contractor on the situation and made preparations to leave the scene. As the brush truck crew departed, they stopped at the entrance to the construction site to replace barricades they had moved upon entering. All three fire personnel got out of the brush truck, which was parked with its engine running and headlights and emergency lights on. As the assistant chief reached for a barricade, one of the firefighters noticed a white pickup truck headed towards them, fishtailing and apparently moving much faster than the posted 20 mile per hour speed limit. The firefighter yelled a warning to the other personnel, and he and the other firefighter dove for cover. The pickup failed to make the sharp turn necessary to detour around the construction site. The pickup hit the left front corner of the brush truck. The vehicle then struck the assistant chief, who was standing towards the rear of the brush truck, and dragged him 60 feet before coming to a stop. The pickup lost its front left wheel in the crash, and the assistant chief was partially pinned underneath the front of it, which was resting on the ground.

The other two firefighters ran back to the brush truck to call for assistance and get equipment. In the meantime, the driver of the pickup left the scene on foot. Medical care was provided by the firefighters on the scene and by responding paramedics. Despite their efforts, treatment was discontinued at the scene, and the assistant chief was pronounced dead at 2348 hours.

Police searched through the night for the driver of the pickup involved in the crash but did not find him. The driver turned himself in the next day, admitting that his blood alcohol level was more than 0.10, the State's legal limit, at the time of the crash. He had been drinking at several bars before losing control of the pickup. After leaving the scene, he passed out in the yard of a house nearby and woke the next morning unaware of what had happened. The driver pled guilty to criminal vehicular homicide.



CAUSAL FACTORS FOR THE INCIDENT

- ▶ The driver of the striking vehicle was reported to be under the influence of alcohol and was driving too fast for conditions.
- ▶ Visibility was decreased due to darkness at the time of the collision.
- ▶ The firefighters failed to exercise situational awareness and take appropriate precautions to prevent being struck by oncoming traffic.

▶▶ **Case Study 2**

On January 9, 2001, at 1642 hours, a fire department was dispatched to a reported motor vehicle crash with downed power lines. At the time of the crash, the weather was reported as light snow with high winds causing limited visibility.

The department's assistant chief responded to the scene in his personal vehicle. Upon arrival, he reported that a vehicle had struck a power pole, and power lines were down, but there were no injuries. He secured the scene and requested that the road be closed at the intersection of the State highway and a local road, 1.8 miles north of the crash site. The road was reported as having loose wet snow with ice under the snow. Traffic was reported as unusually high due to a sporting event being held at a nearby school. There was a traffic signal at the intersection that was to be closed. The State highway had yellow caution lights, and the cross street had stop signs and red lights.

Two firefighters proceeded to this intersection to close the road. There were no flares, cones, or signs posted on the roadway or at the intersection. The two firefighters were in street clothes, with no reflective vests, belts, or coats.


At 1720 hours, a civilian driver stopped in the intersection, signaling to make a left turn onto the closed road. One firefighter walked over to inform the driver that the road was closed due to the crash and downed power lines. At 1722 hours, he stepped backward away from the driver's side window and a pickup truck traveling the other direction at approximately 20 to 25 miles per hour struck him. The driver of the pickup reported applying the brakes as soon as he saw the firefighter step into his lane; however, the pickup slid on the slippery roadway and struck him.

The firefighter was thrown approximately 32 feet and pinned underneath a pickup in the opposing lane that was stopped in traffic. Ambulances responding to a simultaneous call were diverted to provide care for him. Firefighters and civilians at the scene lifted the pickup off of him by hand. He was transported first to a local hospital and then transferred by air ambulance to a regional trauma center. He was pronounced dead at 0323 hours on January 10 from a massive closed head injury, pulmonary contusion, and chest injuries.

Additional information on this incident is available in National Institute for Occupational Safety and Health (NIOSH) Fire Fighter Fatality Investigation and Prevention Program report number 2001-07. The report is available for review at www.cdc.gov/niosh/fire/reports/face200107.html

CAUSAL FACTORS FOR THE INCIDENT

- ▶▶ Visibility was decreased due to darkness at the time of the collision.

- 
- ▶▶ The firefighters failed to exercise situational awareness and take appropriate precautions to prevent being struck by oncoming traffic.
 - ▶▶ The firefighters were not wearing appropriate retroreflective protective clothing.
 - ▶▶ Road conditions at the time of the incident were poor (snow and ice) and may have prevented the striking vehicle from slowing or stopping in time to avoid the collision.
 - ▶▶ The victim had no training on traffic control, nor did the department have any SOPs on traffic control.

▶▶ **Case Study 3**

On March 13, 2004, at 1654 hours, a fire department was dispatched to a vehicle and brush fire on a four-lane highway. The engine arrived at 1704 hours to find a fully involved minivan on the side of the road. Although a State highway patrol trooper was on the scene, the trooper had not slowed or diverted traffic and both northbound lanes were open. The engine was parked upwind of the burning vehicle.

As a firefighter stretched hose to begin fire suppression, the wind shifted and caused smoke to obscure visibility for oncoming motorists. The firefighter was struck by a Chevy Corsica that was driven through the smoke. He was thrown on top of the apparatus and then fell to the ground, where he died instantly.

The driver of the Corsica left the scene but was apprehended about an hour later. She proved to be a 28-year-old undocumented immigrant who was driving without a license. The driver told investigators that she thought that she had hit a cone, despite the fact that pieces of the firefighter's protective clothing were lodged in her windshield.

Subsequently, the driver pleaded no contest to leaving the scene of an accident and driving without a license and was sentenced to 2 years in prison.

In May of 2005, the County Training Officers Association adopted a standard set of procedures for highway incidents. The procedures include warning signs and high visibility vests.


CAUSAL FACTORS FOR THE INCIDENT

- ▶▶ Visibility was decreased due to smoke blowing across the roadway at the time of the collision.
- ▶▶ The firefighters failed to exercise situational awareness and take appropriate precautions to prevent being struck by oncoming traffic.
- ▶▶ The roadway was left open to traffic even though visibility was near zero because of smoke.

▶▶ **Case Study 4**

On March 25, 2002, a truck company performed a required fire training exercise. The exercise involved search and rescue drills using machine-made smoke and mannequins.

The fire captain was working with other firefighters in a barricaded area to recover and repack hose on the apparatus following the drill. During this process a civilian vehicle entered the barricaded area at a high rate of speed, striking the captain and another firefighter.



The captain received serious injuries. The firefighter standing next to him received non-life-threatening injuries. The captain was aggressively treated by firefighters and paramedics at the scene and transported to the hospital. His treatment continued upon arrival at the hospital, but he had suffered a massive head injury. Despite the efforts of responders and hospital staff, he died as a result of his injuries. The autopsy determined his death was due to skull fractures, subarachnoid hemorrhage, and cerebral edema. The police investigation classified the incident as vehicular manslaughter.

The driver of the car that struck him was arrested at the scene and later charged with driving while impaired by alcohol and prescription drugs.

CAUSAL FACTORS FOR THE INCIDENT

- ▶ The driver of the striking vehicle was reported to be under the influence of drugs at the time of the collision.
- ▶ Visibility was decreased due to darkness at the time of the collision.

▶▶ Case Study 5

On December 23, 2003, at 0238 hours, a truck company was dispatched to assist an ambulance responding to a vehicle crash on an expressway. Per the department's Standard Operating Guidelines (SOGs), the truck was positioned to protect the ambulance and the crash scene from the flow of traffic, blocking the inside and center lanes. State police also set flares to mark the scene.

Once it was determined that there were no injuries in the initial collision, the truck company was advised to return to service. The fire lieutenant was in the process of checking the truck to make sure all equipment had been replaced and that the compartment doors were closed. As the lieutenant was checking the exposed side of the apparatus, a 1997 Oldsmobile Cutlass illegally crossed over the center lane to cut in front of a tractor trailer in the outside lane, in an attempt to circumvent the crash scene. The Oldsmobile struck the tractor trailer on the front passenger side, causing it to spin counterclockwise and strike the lieutenant, pinning him between the car and the rear bumper of the fire truck. His legs were crushed by the impact, and he died less than 12 hours later after suffering massive blood loss and kidney and heart failure.

The 26-year-old driver of the Oldsmobile had a blood alcohol level of .132 percent at the time of the crash, well above the State limit of .08. He also had a history of traffic violations in the State, where he never held a valid driver's license. He was charged with drunk driving and reckless homicide.

CAUSAL FACTORS FOR THE INCIDENT

- ▶ The driver of the striking vehicle was reported to be under the influence of alcohol and was driving too fast for conditions.
- ▶ Visibility was decreased due to darkness at the time of the collision.
- ▶ The lieutenant failed to exercise situational awareness and take appropriate precautions to prevent being struck by oncoming traffic. He should not have placed himself between oncoming traffic and the exposed side of the apparatus.



▶▶ Case Study 6

On July 1, 2002, at 0708 hours, a volunteer fire department and police personnel were dispatched to a vehicle fire on the right shoulder of the local interstate. A municipal police officer was first on the scene, parking his vehicle, with emergency lights activated, 30 feet behind the incident vehicle. An engine company with four firefighters on it arrived at 0712 hours and was positioned on the shoulder approximately 50 feet in front of the incident vehicle. The brush truck, with the captain on it, arrived at 0715 hours and was parked approximately 100 feet behind the incident vehicle, with all emergency lights activated. At the point where the incident occurred, the highway was straight and level and the road was dry.

The firefighters on the engine were working under the hood of the incident vehicle while the captain and the police officer stood near the passenger door talking with the driver. A northbound passenger car in the left lane was rear-ended by a pickup truck pulling a fifth-wheel camper. The passenger car skidded toward the shoulder, hit the police car, and then struck the captain, two other firefighters, the driver of the incident vehicle, and the police officer. It then impacted the incident vehicle, which was propelled approximately 50 feet and lodged under the rear of the engine company. The passenger vehicle came to rest about 50 feet behind the engine. The pickup crossed the median into the southbound traffic lane and then left the scene.

A State highway patrol officer witnessed the incident and radioed for assistance. The captain was found unresponsive, lying on the right shoulder of the highway just north of where the passenger vehicle came to a stop. After advanced life support efforts, he was transported by air ambulance to a nearby hospital where he was later pronounced dead. The police officer was found unconscious, lying near the right rear tire of the passenger vehicle. Two firefighters and the owner of the incident vehicle were thrown onto the grassy area east of the right northbound shoulder. All three were injured but conscious. Two firefighters jumped clear of the vehicles and escaped injury.


The captain was killed as the result of multiple traumatic injuries including a ruptured aorta. Additional information on this incident is available in NIOSH Fire Fighter Fatality Investigation and Prevention Program report number 2002-38. The report is available for review at www.cdc.gov/niosh/fire/reports/face200238.html

CAUSAL FACTORS FOR THE INCIDENT

- ▶▶ The firefighters failed to exercise situational awareness and take appropriate precautions to prevent being struck by oncoming traffic. The engine company was not parked in a manner that shielded the work area.
- ▶▶ Neither police nor fire personnel made any attempt to mark the incident scene properly or to route traffic away from the work area.
- ▶▶ The victim had no formal training on traffic control nor did the department have any SOPs on traffic control.

▶▶ Case Study 7

On the evening of February 3, 2004, a volunteer fire department was dispatched to a roll-over motor vehicle crash with injuries on a four-lane highway. The crash had blocked the right lane. A firefighter, wearing a reflective vest, was standing in that lane about 200 feet upstream of the crash scene to slow



traffic and direct vehicles to move into the left lane. The firefighter was standing in the right-hand lane of two westbound lanes of the highway. He was wearing a retroreflective vest.

An automobile in the left lane passing the firefighter slowed suddenly and the vehicle behind it swerved to the right to avoid rear-ending it. In swerving, this vehicle entered the right-hand lane where the firefighter was standing. He was struck by the vehicle and thrown 136 feet into the ditch beside the road. He died of traumatic injuries on his way to the hospital.

His widow later sued the driver of the vehicle that struck him, a 19-year-old man who was not injured in the crash, as well as his parents, under a State law that allows parents of teenagers to be held responsible for the driving actions of their children. The driver of the car later pled guilty to careless driving involving a death.

CAUSAL FACTORS FOR THE INCIDENT

- ▶▶ The driver of the striking vehicle was driving too fast for conditions.
- ▶▶ Visibility was decreased due to darkness at the time of the collision.
- ▶▶ The firefighters failed to exercise situational awareness and take appropriate precautions to prevent being struck by oncoming traffic.
- ▶▶ There were no signs or other traffic markers being used to direct traffic away from the flagger or incident scene.

▶▶ Case Study 8

On March 19, 2003, at 0237 hours, a volunteer fire department was dispatched to a traffic incident with reported minor injuries in the eastbound lane of an interstate highway. The dispatcher realized that the incident was actually in a neighboring department's service area and she notified that department. That department dispatched an engine to the scene and requested mutual aid in the form of an ambulance because they were short on manpower.

A lieutenant from the first department that was dispatched started towards the fire station in his personal vehicle, but diverted straight to the scene. There was heavy fog at the station, and the responding captain announced on the radio for all personnel to use caution. The lieutenant acknowledged the fog warning.

The first-arriving firefighter responded westbound and parked his vehicle in the median directly across from the incident, turning off his headlights but leaving his emergency flashers on. He notified the dispatcher that only one person had sustained hand injuries at the incident. The mutual-aid department uses the Incident Command System (ICS), but this firefighter did not take command because the incident was in the neighboring department's service area.

A paramedic had arrived before the first firefighter and parked her personal vehicle on the eastbound outside shoulder near the incident. A county sheriff's deputy was also on the scene. No traffic control had been established, and all the vehicles involved in the original incident were parked on the shoulder or off the roadway.

At approximately 0259 hours, the lieutenant arrived and parked his personal vehicle behind the first-arriving firefighter's, in the median on the westbound side of the interstate. He exited his vehicle; he was wearing street clothes and did not put on his vest with reflective trim.



The driver of an eastbound tractor-trailer heard CB radio traffic regarding the incident, moved to the inside lane and slowed to 48 to 50 miles per hour. He saw the emergency lights on the vehicles parked on the eastbound outside shoulder and saw other nonemergency vehicles parked on the inside westbound shoulder.

As he passed the incident, the truck driver checked his right mirror to see if he had cleared the scene. When he looked back to the front, he saw the lieutenant step into the eastbound lane of traffic. He was unable to stop and struck him with the right front of the truck just to the left of the center divider line. He came to a controlled stop on the shoulder approximately 598 feet beyond the point of impact.

The lieutenant was thrown by the impact to the grassy median approximately 170 feet east of the point of impact. Others on the scene checked him, but he was obviously deceased. No charges were filed against the truck driver.

Additional information on this incident is available in NIOSH Fire Fighter Fatality Investigation and Prevention Program report number 2003-13. The report is available for review (www.cdc.gov/niosh/fire/reports/face200313.html). The State Fire Marshal also prepared a thorough report on this incident. That report is available at www.tdi.state.tx.us/fire/fmlodinvesti.html

CAUSAL FACTORS FOR THE INCIDENT

- ▶▶ Visibility was decreased due to darkness at the time of the collision.
- ▶▶ The lieutenant failed to exercise situational awareness and take appropriate precautions to prevent being struck by oncoming traffic.
- ▶▶ The lieutenant failed to don high-visibility apparel that had been provided to him.
- ▶▶ The victim had no training on traffic control nor did the department have any SOPs or preplans for traffic control.

▶▶ Case Study 9

On December 21, 2004, at 1645 hours, a fire department was dispatched to a vehicle crash. The first-arriving unit, a brush truck, found that the incident was actually on the border of the neighboring county. The incident was not technically a crash, as a vehicle had driven into a ditch at that location. Prior to the fire department's arrival, the people involved had been able to get their vehicle out of the ditch without assistance. The fire chief and one firefighter arrived on an engine shortly thereafter, only to learn from the first-arriving firefighter that they were not needed.

The two units proceeded south to find a driveway where they could turn around and return to the station. Although the chief asked him not to, the firefighter exited the engine to assist in allowing the truck to turn around. He took a traffic flashlight with him.

According to the traffic crash report, the driver of a white pickup truck headed northbound noticed the shadow of someone walking across the roadway and surmised the person was headed to his mailbox. As he approached the driveway, he saw the firefighter standing in his lane of traffic. He hit his brakes and swerved to the left, in an attempt to avoid hitting the firefighter, but the maneuver was not successful. The ambulance that had been dispatched to the original incident proceeded in and took the firefighter to the hospital, where he was pronounced dead. The cause of death was listed as multiple traumas.



CAUSAL FACTORS FOR THE INCIDENT

- ▶ Visibility was decreased due to darkness at the time of the collision.
- ▶ The firefighter failed to exercise situational awareness and take appropriate precautions to prevent being struck by oncoming traffic.
- ▶ The firefighter failed to don retroreflective personal protective pquipment (PPE) while working in the roadway.

▶ **Case Study 10**

On January 7, 2006, at 0715 hours, the fire department's shift had just come on duty when fire companies were dispatched to a series of weather-related motor vehicle crashes in a curve on an eastbound interstate. According to a responding police officer, the road went from wet to black ice in a matter of minutes; there was no indication that ice had formed until vehicles began to slip and crash. A total of 13 vehicles was involved in six crashes along that stretch of roadway, supporting the finding that the road iced over very quickly and drivers had no knowledge of the need to slow down.

As the firefighter and her partner approached a pickup truck that had been involved in a crash to check on the occupants, another pickup came around the curve and lost control, striking a median wall and the first pickup. Someone yelled a warning to the firefighters, who began to move out of the way. Her partner was able to avoid the pickup, but she was struck by the front quarter panel of the vehicle on the driver's side. She was wearing her turnout gear, and her helmet was knocked off by the impact. She was thrown an unknown distance to the east of the crash.

Firefighters coming to her aid found her lying on her side and unresponsive. She was quickly transported to the hospital and put on life support. However, she suffered closed head trauma and was taken off life support late in the afternoon of January 12, 2006. She died the next morning.

The district attorney's office declined to press charges against the driver of the pickup that hit her, citing the fact that no witnesses reported him driving in an erratic or unsafe manner. Blood tests done the day of the crash indicated that he was not under the influence of alcohol or drugs at the time.

CAUSAL FACTORS FOR THE INCIDENT

- ▶ Visibility was decreased due to darkness at the time of the collision.
- ▶ Road conditions were poor due to ice on the roadway.
- ▶ The firefighters failed to exercise situational awareness and take appropriate precautions to prevent being struck by oncoming traffic.
- ▶ Neither police nor fire personnel made any attempt to close the roadway or shield the work area from approaching traffic.

▶ **Case Study 11**

On June 29, 2001, at 2358 hours, a volunteer fire department was dispatched to a vehicle fire with a building exposure. Per departmental SOP, one properly attired firefighter was to respond to the intersection



near the fire station to assist with traffic control as the fire apparatus left the station. Because he lived close by, one fire police officer usually performed this role, as he did this evening.

The fire police officer was wearing reflective safety gear consisting of reflective safety helmet, high-visibility strobe light, high-visibility safety vest, and strobe traffic wand. The intersection was well lit by properly operating mercury vapor street lights. Also per SOP, the responding fire engine came to a complete stop at the intersection. As it did, the lieutenant on the engine saw a pickup truck coming down the road faster than the posted 35 mile-per-hour speed limit.

The fire police officer had his back to the pickup, but he turned and saw it coming toward him as the fire engine stopped. He took one step forward into the other lane to avoid the pickup, but it was over the double yellow lane marker and struck him. His body impacted the hood and cab of the pickup and was thrown approximately 75 feet forward, landing in a driveway.

The lieutenant radioed the dispatch center that a firefighter had been struck, and the crew on the engine immediately went to his aid. A firefighter/EMT who was responding to the original incident witnessed the event and provided care. The fire police officer was transported to the hospital, where he was pronounced dead.

The State police investigated his death and placed the driver of the pickup under arrest for driving while intoxicated and vehicular manslaughter.

CAUSAL FACTOR FOR THE INCIDENT


- ▶ The driver of the striking vehicle was reported to be under the influence of alcohol and was driving too fast for conditions.

▶▶ Case Study 12

On March 20, 2002, at approximately 1430 hours, a volunteer fire department was dispatched to a motor vehicle crash on the interstate in the southbound lane. There was a thunderstorm with heavy rains in progress in the area. One firefighter was the first volunteer to reach the scene, coming in from the north in his personal vehicle and crossing the median to park on the outbound shoulder in front of the original crash. He was wearing street clothes, jeans, and a light-colored shirt.

While he was on the scene, another crash occurred approximately 150 yards south of the first incident. He walked along the outside shoulder and approached the vehicle involved in the second crash on the passenger side to assess any injuries. He radioed the driver of the responding engine that there were no major injuries and that he could slow his response.

Approximately 2 minutes later, a motorist attempted to move from the right to the left lane but lost control of the vehicle. The automobile skidded off the road, traveled along the outer shoulder of the southbound lane, and struck the firefighter. The impact threw the firefighter into passing traffic, where he was hit by a pickup truck and thrown into the median. By that time, a sheriff's deputy had arrived on scene and radioed for assistance. A rescue unit with two paramedics from a mutual-aid department self-dispatched to the scene and attended to the firefighter, who was unresponsive with no pulse or respirations. He was transported to the hospital, where he was pronounced dead.



Additional information on this incident is available in NIOSH Fire Fighter Fatality Investigation and Prevention Program report number 2002-13. The report is available for review at www.cdc.gov/niosh/fire/reports/face200213.html

CAUSAL FACTORS FOR THE INCIDENT

- ▶▶ Visibility was decreased due to heavy rain at the time of the collision.
- ▶▶ The firefighter failed to exercise situational awareness and take appropriate precautions to prevent being struck by oncoming traffic.
- ▶▶ The firefighter was not wearing high-visibility apparel.
- ▶▶ Road conditions were poor at the time of the incident due to heavy rainfall.
- ▶▶ There was a failure to establish a protected work area before starting incident operations.
- ▶▶ The department did not have or enforce SOPs or preplans for these situations.

Summary

A review of these case studies finds that some of the factors that led to these deaths are within the control of firefighters and some are not. Of those that are within our control, we see multiple examples of basic safety procedures not being followed. In these case studies we see firefighters who consistently do not recognize the danger signs present at the roadway scene, firefighters who fail to wear appropriate protective clothing, and fire and police agencies that do not take effective actions in guarding the incident scene and work area from oncoming traffic. The remainder of this manual is focused on information to improve the performance of firefighters and other emergency responders in these situations.

EQUIPMENT TO IMPROVE HIGHWAY SAFETY

For several years now, the DOT has been engaged in a program called the Intelligent Transportation Systems (ITS). The goal of ITS is to improve transportation safety and mobility and enhance productivity through the use of advanced communications technologies. There are nine major initiatives within the ITS program:

- ▶ Vehicle Infrastructure Integration (VII);
- ▶ Next Generation 9-1-1;
- ▶ Cooperative Intersection Collision Avoidance Systems;
- ▶ Integrated Vehicle Based Safety Systems;
- ▶ Integrated Corridor Management Systems;
- ▶ Clarus, the Nationwide Surface Transportation Weather Observing and Forecasting System;
- ▶ Emergency Transportation Operations;
- ▶ Mobility Services for All Americans; and
- ▶ Electronic Freight Management.

Much work has been done within the Emergency Transportation Operations section of this effort relative to the safety of firefighters and other first responders who are working on the roadway. One of the concepts being studied within this area of the project is the concept of using Traffic Incident Management Systems (TIMS) to reduce the effects of incident-related traffic congestion by decreasing the time necessary to detect incidents, the time for responding vehicles to arrive, and the time required for traffic to return to normal conditions. TIMS contributes to increasing emergency responders' safety at an incident scene both directly and indirectly.

Though many of the findings and features of the overall ITS project are not related directly to issues firefighters will work with or even be concerned about, they indirectly have a positive impact on the safety of firefighters who work on the roadway. The first portion of this chapter discusses some of these projects. This information is based on the Federal Highway Administration's *Intelligent Transportation Systems Benefits and Costs: 2003 Update* (http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13772.html#2.4).

Much of what firefighters need to know about traffic control and safe operations on the highway is contained in a DOT document titled *Manual on Uniform Traffic Control Devices* (MUTCD). The MUTCD is the national standard of roadway operations for all highway operations, both routine and emergency. The MUTCD refers to the incidents we work on as "traffic incident management areas" and states that effective Temporary Traffic Control (TTC) measures must be in place at these scenes. The MUTCD states that the primary functions of TTC at a traffic incident management area are to:

1. Move road users past or around the traffic incident in a reasonably safe and expeditious manner.
2. Reduce the likelihood of secondary traffic collisions.
3. Preclude unnecessary use of the surrounding local road system.

The latter portions of this chapter discuss the appropriate types of MUTCD-compliant equipment that can be used to establish TTC at roadway emergency incidents. It also discusses some new technologies and equipment used outside the United States. The goal of this chapter is to provide firefighters with information on the correct types of equipment that should be used when working on the roadway.

ITS Technologies to Improve Roadway Safety

This section details a selection of new technologies that the ITS program has advanced for the improvement of roadway safety and incident scene safety. Many of these are related to the role of firefighters only indirectly, but firefighters should be aware of their existence and impact on the jobs they perform.

TRAFFIC SURVEILLANCE TECHNOLOGY

The ITS program has been responsible for the development and installation of a wide variety of traffic surveillance and detection technologies, such as acoustic roadway detectors, still photos, and video camera systems (**Figure 3.1**). These technologies monitor traffic flow, detect deviations in traffic patterns, and



Figure 3.1—The Pennsylvania Turnpike Commission traffic control center.

feed information to a traffic control center. In some cases the traffic control center is able to send emergency help before civilians on the scene are able to dial 9-1-1. Video-based systems also may be used to provide emergency responders with important information on the incident while they are still en route.

ITS also is responsible for advances in wireless enhanced 9-1-1 systems and Automated Collision Notification (ACN) systems. Although not directly involved with emergency response, these technologies can help identify the problem early, contact the appropriate help, and divert traffic through announcements to the public. This helps to reduce congestion, speed response to the scene, and prevent secondary collisions.

MAYDAY AND AUTOMATIC COLLISION NOTIFICATION SYSTEMS

The ACN systems can affect both firefighter and motorist safety. These systems transmit voice and data to an emergency call center on manual activation when the driver presses a button (Mayday), or automatically when they are triggered by onboard safety equipment such as air-bag deployment. The On-Star™ system that is used in GM vehicles is perhaps the most recognizable of these systems. These units use in-vehicle crash sensors, Global Positioning System (GPS) technology, and wireless communications to supply call centers with crash location and, in some cases, the number of injured passengers and nature of injuries. Advanced ACN products can assist in determining the type of equipment needed (basic or advanced life support), mode of transport (air or ground), and location of the nearest trauma center. Although anecdotal, reports suggest that ACNs have a positive effect on victim outcomes by reducing time to emergency medical care.

The National Highway Traffic Safety Administration's (NHTSA) 1998 Strategic Plan noted that 24 percent of all fatal crashes in the United States occur on rural roads. However, this relatively small percentage of crashes accounts for nearly 59 percent of all crash deaths. One factor that contributed to the

disproportionately high fatality rate for rural crash victims was a delay in delivering emergency medical services to the scene. Included in these deaths are many volunteer firefighter deaths responding to rural incidents or fire stations in private vehicles. The highest percentage of deaths in actual fire apparatus crashes are those involving fire department tankers (tenders), which also tend to occur in rural areas. ACNs could help decrease those fatalities by lessening the response time of emergency medical care for those involved in the collision.

Two studies on ACN are worth reviewing. Under a grant from DOT, Harris County, TX, installed ACN systems in 500 police and fire department vehicles in 2002 for a 2-year pilot study. The ACN fed information directly to a roadside assistance provider in Boston, who called the vehicle to confirm the crash and verify the identities of occupants. They then forwarded the information to a Colorado-based telecommunications and public safety technology provider, who used the vehicle's location to route the data to the appropriate Public Safety Answering Point (PSAP) using existing 9-1-1 systems. Simultaneously, the occupants' demographic data were forwarded to a Virginia-based technology provider who generated an injury prediction algorithm and related that to the trauma center. As of this writing, there were no published results of this study.

The Minnesota DOT, in partnership with the Mayo Clinic (Rochester, MN) launched a lower-tech system in 2003. In the Minnesota system, telematics system providers (TSPs) relay emergency calls and caller location obtained from the GPS unit in the vehicles equipped with an ACN system to the PSAP on 9-1-1 priority voice communications lines. The TSP transmits additional data on to the Condition Acquisition and Reporting System secure data network. Responding agencies are able to access the incident data from the Internet, according to their data access privilege classifications.

ACNs are becoming more common as standard installation on new cars, and there also are after-market products. The cost of market devices range from approximately \$400 to \$1,900. These units appear to hold a great deal of promise in improving incident reporting and thus emergency response. However, there is a fee for the service of the TSPs, ranging from \$10 to \$27 per month, so if the fee has not been paid the ACN will be inactive.

FREEWAY SERVICE PATROLS

ITS has encouraged the development and operation of freeway service patrols. Freeway service patrols operate in many major metropolitan areas, as well as some suburban and rural areas. These are often State DOT programs and consist of a fleet of light-duty trucks that have two-way radio communication with a traffic control center. They usually are equipped with motorist assist supplies, traffic cones, a lighted vehicle arrow board, and, in some cases, extendable floodlights (Figure 3.2).

While the primary focus of these units is to monitor roadway conditions and provide assistance to disabled motorists, these patrol vehicles also may be dispatched to roadway incidents to assist other emergency responders with traffic control. Depending on local protocols, dispatch of these units may be automatic, by request of the Incident Commander (IC), or from law enforcement personnel. State DOT representatives should be included as part of the traffic incident management team to identify criteria and Standard Operating Procedures (SOPs)



Figure 3.2—A traffic patrol unit in the Hampton Roads, Virginia region.



Figure 3.3—Variable message signs provide advanced warning to approaching motorists. Note that the DOT would prefer the use of the term “Crash Ahead” rather than “Accident Ahead.”

for incorporating DOT resources into roadway scene responses to aid in traffic control and reduce incident-related delay.

VARIABLE MESSAGE SIGNS

Variable message signs (VMS) are becoming more common on the Nation’s freeways (Figure 3.3). They provide a versatile means of communicating information to drivers and can be invaluable in alerting oncoming traffic to an emergency incident. Although, in some locations, incident management personnel can directly post incident-related information to VMS, usually messages are posted by transportation management center personnel.

For VMS to be useful, the message must be concise and clear. Drivers must be able to interpret the message while traveling at high speed with distractions. The MUCTD requires minimum legibility of portable variable message signs at 650 feet and 1,000 feet for higher speeds. If a series of message panels is displayed, 2 to 4 seconds per message panel is recommended. Tables 3.1 and 3.2 show how many seconds it takes to travel 1,000 feet at various speeds, and the number of message panels that can be displayed for each speed limit for at least 1,000 feet of sight distance.

Table 3.1—Time to Travel 1,000 Feet in Seconds

Speed in mph	Time in Seconds
45	15.2
55	12.3
65	10.5
75	9.1

Table 3.2—Number of Message Panels

Speed in mph	Number of Panels
45	3
55	3
65	2
75	2

Drivers should be able to read the message twice while traveling at the posted speed. In addition, messages that take more than two panels can be confusing, since drivers may not be able to determine the appropriate order. Therefore, messages should be limited to two panels.

Messages should be concise, clear, and provide relevant information. All messages are printed in capital letters. The average driver traveling at a high rate of speed can handle 8-word messages of 4 to 8 characters per word at 2 to 4 seconds per message. The message should consist of at least the problem and action and may contain an effect. For example, let’s say the problem is an accident 2 miles ahead in the right lane. Drivers should expect delays and merge left. A two-pane VMS might read:

Panel 1: CRASH AHEAD TWO MILES

Panel 2: MERGE LEFT EXPECT DELAYS

A one panel might read: CRASH TWO MILES MERGE LEFT



Portable changeable message signs should be visible from a half mile under both day and night conditions. Letter height should be a minimum of 18 inches and legible from at least 650 feet if the sign is mounted on a trailer or large truck. If mounted on service patrol trucks, letter height should be a minimum of 10 inches and visible from at least 330 feet (**Figures 3.4a and b**).

Temporary Traffic Control Zones

Before getting into a detailed discussion of the types of equipment most emergency responders will use to assist with traffic control at a roadway emergency scene, it is first necessary to review the basic components of a TTC zone. The procedures for establishing these zones will be covered in more detail in Chapter 4. The MUTCD defines a TTC zone as: “an area of a highway where road user conditions are changed because of a work zone or an incident through the use of TTC devices, uniformed law enforcement officers, or other authorized personnel. An incident area is an area of a highway where temporary traffic controls are imposed by authorized officials in response to a traffic incident, natural disaster, or special event. It extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where road users return to the original lane alignment and are clear of the incident” (MUTCD Section 6C.02).

The primary function of the TTC is to provide for reasonably safe and effective movement of road users through or around the work area, while providing a reasonable level of protection to the responders operating on the scene.

TTC zones may be established for a variety of reasons, including road maintenance, weather conditions, disabled vehicles, and emergency incidents. The MUTCD refers to emergency scenes on the roadway as traffic incident management areas (TIMA). To be specific, emergency responders need to be familiar with the MUTCD procedures for establishing TTC at TIMAs.

Most TTC/incident zones are divided into four areas (**Figure 3.5**). The **advanced warning area** is the section of highway where drivers are informed of the upcoming incident area. Because drivers on freeways are assuming uninterrupted traffic flow, the advance warning sign should be placed further back from the incident scene than on two-lane roads or urban streets. **Table 3.3** shows the stopping sight distance as a function of speed.



Figure 3.4a—Fire departments may carry portable electronic message boards. Courtesy of Ron Moore, McKinney, TX FD.



Figure 3.4b—This portable electronic message board is mounted to a vehicle trailer hitch. Courtesy of Ron Moore, McKinney, TX FD.

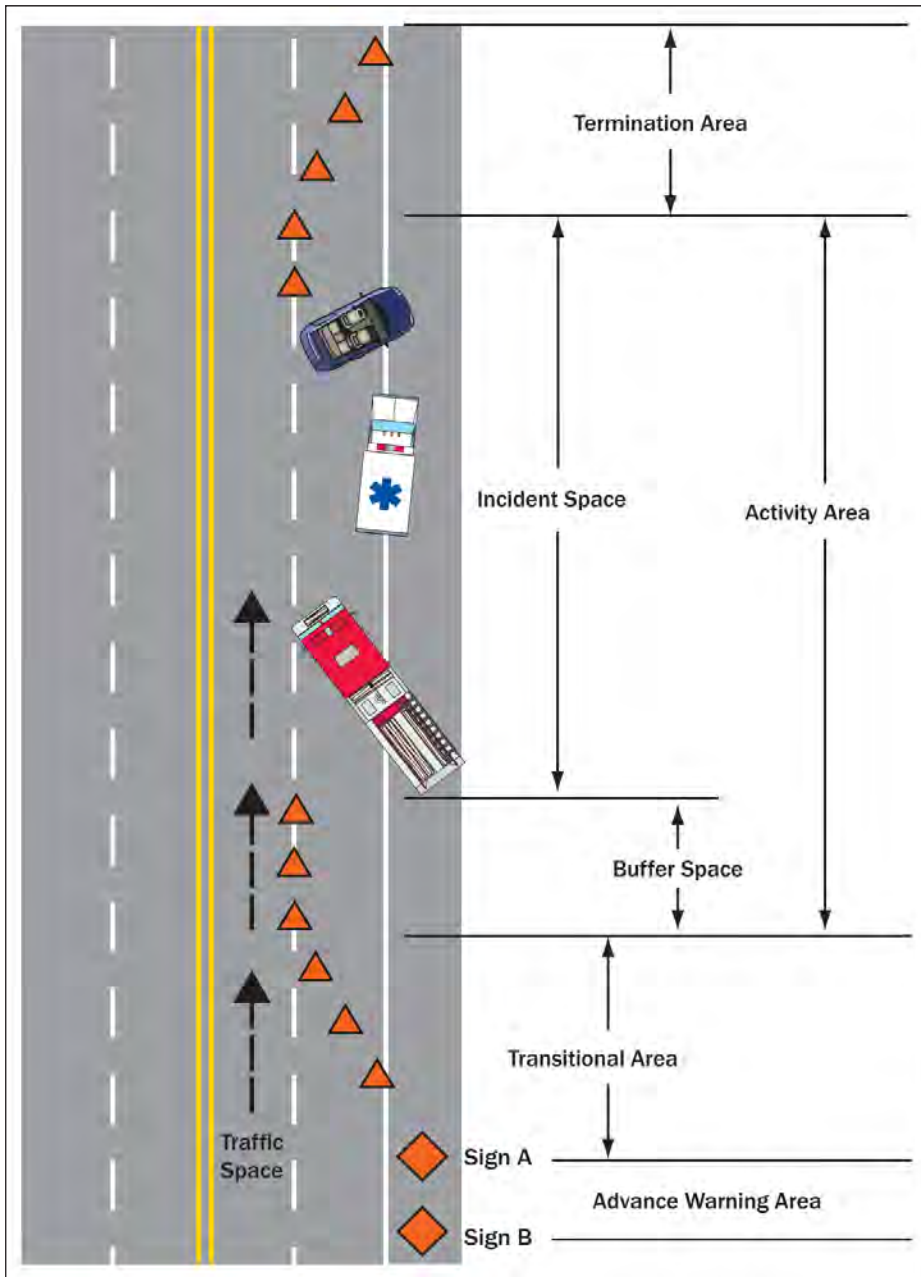


Figure 3.5—The parts of a TTC/incident area.

Table 3.3—Stopping Sight Distance as a Function of Speed

Speed (mph)	Distance (ft.)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

The **transition area** is the section of the TTC zone where drivers are redirected from their normal path. This usually involves the creation of tapers using channelizing devices. Tapers may be used in both the transition and termination areas. The MUTCD designates the distance of cone placement to form the tapers based on the speed limit multiplied by the width of the lanes being closed off. This can be shown mathematically as follows:

$$TL = (LW \times \# \text{ of lanes}) \times PSL$$

Where: TL = Taper length in feet

LW = Lane width in feet

PSL = Posted Speed Limit in miles per hour

For example, suppose you are closing two lanes of an interstate highway whose speed limit is 75 miles per hour. The lanes are 12 feet wide. In this example, the taper length would be calculated as follows:

$$\begin{aligned}
 TL &= (LW \times \# \text{ of lanes}) \times PSL \\
 TL &= (12 \text{ ft} \times 2 \text{ lanes}) \times 75 \text{ mph} \\
 TL &= (24)(75) \\
 TL &= 1,800 \text{ feet}
 \end{aligned}$$

The **activity area** is the section of highway where the work activity or incident takes place. It is made up of the incident space, the traffic space, and the buffer space. The incident space is where the actual work activity occurs. The traffic space is the portion of the roadway used to route traffic through the incident area. The buffer space is the lateral and/or longitudinal area that separates traffic flow from the work area. The buffer space may provide some recovery space for an errant vehicle. The MUTCD (Section 6C.06) specifically states that “an incident response and emergency-vehicle storage area should not extend into any portion of the buffer space.”

The **termination area** is used to return drivers to their normal path. It ends at the last TTC device. Conditions and safety considerations may dictate the need for a longitudinal buffer space between the work area and the start of the downstream taper.

See Chapter 4 of this publication for more information on establishing TTCs.

Channelizing Devices

Channelizing devices are used to warn drivers of conditions created by incident activities in or near the roadway and to guide drivers around the incident. Channelizing devices used during an emergency incident can include signs, cones, tubular markers, flares, directional arrows, and flaggers.

SIGNS

The MUTCD establishes specific color requirements for signs that will be used in different situations. The MUTCD (Section 6I.01) states that the required colors for warning signs used for TTC in TIMAs is fluorescent pink with black letters and border. In emergency situations where fluorescent pink signs are not available, older style signs with yellow backgrounds may be used (Section 6F.15). However, it is recommended that as fire departments and other emergency response agencies replace old signs or purchase new signs that the new signs be pink with black letters.

Minimum sign size on roadways with moderately low speeds and volumes is 36 by 36 inches. Minimum size on roadways with higher speeds and on freeways and expressways is 48 by 48 inches. Departments with limited resources are advised to acquire the larger signs, as they can be used in either situation. When a series of two or more advance warning signs is used, the closest sign to the TTC zone should be approximately 100 feet for low-speed urban streets to 1,000 feet or more for freeways and expressways (Section 6F.16). Exact distances are detailed in Chapter 4.

National Fire Protection Association (NFPA) Standard 1500, *Standard on Fire Department Occupational Safety and Health Program*, also requires that a retroreflective fluorescent pink highway safety sign be deployed as advance warning anytime a fire department vehicle is used in a blocking mode at a highway incident. NFPA requires the wording “EMERGENCY SCENE AHEAD” for the sign (**Figure 3.6**). In essence, this mirrors the MUTCD requirement.



Figure 3.6—NFPA 1500 requires the use of pink “Emergency Scene Ahead” signs on roadway incidents.



Figure 3.7—An MUTCD-compliant traffic cone.

CONES

Traffic cones are perhaps the most commonly used channelizing devices. Cones must be predominantly orange and made of a material that can be struck without causing damage to the impacting vehicle. Cones should be weighted enough that they will not be blown over or displaced by wind or moving traffic. It is important to understand that MUTCD (Section 6F.59) requirements for traffic cones used during the day and on low-speed roadways (≤ 40 mph) are different than for cones used at night and/or on freeway or high-speed roadways (≥ 45 mph).

For daytime and low-speed roadways, cones shall be not less than 18 inches (450 mm) in height. When used on freeways and other high-speed highways or at night on all highways, cones shall be a minimum

of 28 inches (700 mm) in height. When used at night, cones must also be retroreflectorized by a 6-inch-wide white band located 3 to 4 inches from the top of the cone and an additional 4-inch-wide white band located approximately 2 inches below the 6-inch band (**Figure 3.7**). The retroreflective material used on cones or any other channelizing devices must be smooth with a sealed outer surface that displays a similar color, day or night.

The MUTCD does not specify whether the cones need to be of the solid or collapsible styles. Many fire departments choose to equip fire apparatus with collapsible cones, as they reduce the amount of required storage space. Others find unique, easily accessible locations to carry cones on the apparatus (**Figure 3.8**). There are a variety of options that can be used to increase the effectiveness of the cones, particularly in low light situations. Cones are available that illuminate from within or are equipped with light strips that encircle them. Cones may also be equipped with flashers attached to the tops (**Figure 3.9**).



Figure 3.8—This department designed a place to store traffic cones in the extended front bumper of the apparatus.

TUBULAR MARKERS

Tubular markers also must be predominantly orange and not less than 18 inches high and 2 inches wide facing drivers. They shall be



Figure 3.9—These traffic cones are fitted with battery-operated flashers on top.

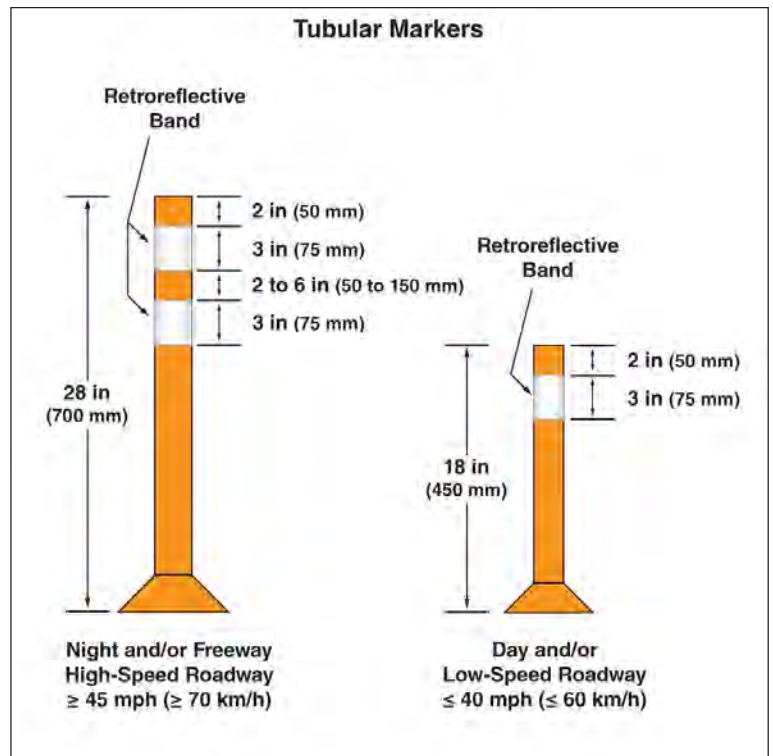


Figure 3.10—Some agencies use tubular traffic markers instead of cones.

made of a material that can be struck without causing damage to the impacting vehicle. The MUTCD (Section 6F.60) requires tubular markers used during the day and on low-speed roadways (≤ 40 mph) to be a minimum of 18 inches high. Tubular markers used on freeways and other high-speed highways, and on all highways during nighttime, must be a minimum of 28 inches high. For nighttime use, the markers must be retroreflectorized by two 3-inch-wide white bands placed a maximum of 2 inches from the top with a maximum of 6 inches between the bands (**Figure 3.10**). Again, jurisdictions that use tubular markers are advised to carry the larger size so they are appropriate for use at any incident.

FLARES

There are three basic types of flare devices that may be used in TTC zones. These devices include

- ▶ incendiary flares;
- ▶ chemical light sticks; and
- ▶ light-emitting diode (LED) flares.

Each of these devices is detailed in the following section.

Incendiary Flares

Some form of incendiary road flare has been used to alert drivers to dangerous conditions for almost 100 years (**Figure 3.11**). Incendiary flares are self-sustaining. There are no concerns about battery life or corroding electrical parts. Incendiary flares burn at approximately 70 candela. By comparison, chemiluminescent light sticks are approximately 10 candela, and a typical flashlight is 5 candela.



Figure 3.11—Flares are extremely bright at night.

There are several concerns with the use of incendiary flares. Incendiary flares are classified as a flammable solid and must be stored according to specific guidelines. The chemicals in standard incendiary road flares (strontium nitrate, potassium perchlorate, and sulfur with a sawdust/oil binder) are hazardous substances. Exposure to the chemicals causes corrosive injury to the eyes and irritation to the skin and respiratory tract. Lit flares can cause skin burns and destroy clothing and vehicle tires. Incendiary flares cannot be used at scenes with fuel spills, hazardous materials or during high wind conditions. Often cleanup is required after use.

Chemical Light Sticks

Chemical light sticks generate chemiluminescence in an enclosed container, making them suitable for use in hazardous environments. Two different types of chemicals (usually luminal and oxalate) are stored within two tubes, an outer one and an inner glass vial. These two tubes are stored in a transparent plastic container. The glass vial floats in the outer tube's chemical. When the outer tube is bent or broken and shaken, the chemicals combine and start to glow. Glow time is between 6 and 12 hours.

Chemical light sticks are inexpensive and easy to store and use. However, once they are activated, they cannot be reused. LED light sticks are a reusable alternative to chemical light sticks. They are battery operated and will last about 20 hours if left on continuously; longer if turned on and off intermittently. Light sticks are not as bright as incendiary fuses or LED flares.

Light-Emitting Diode Flare

These devices use LEDs to project an extremely bright light, visible 360° from great distances. Depending on the manufacturer, the lights may be adjusted between a steady, flashing, or rotating mode. One manufacturer has a mode that emulates the flicker of an incendiary flare. The rotating and flashing signals put out by these units are non-hypnotic and non-disorienting. These units come in a variety of configurations—some lie flat on the ground, some can sit on stands, and some come with a bracket that attaches them to the top of a traffic cone (**Figures 3.12a** and **3.12b**). Most use disposable or rechargeable AA or AAA batteries.

These units average approximately 90 to 100 hours running time. They are sturdy, standing up to the weight of vehicle traffic, and weather proof. As of this writing the cost of the units varied from \$10 to \$50 per unit.

Directional Arrow Panels

An arrow panel is a sign with a matrix of elements capable of either flashing or sequential displays. Directional arrow panels can provide additional warning and directional information for merging and controlling drivers through/around a TTC zone. Directional arrow panels must be used in conjunction with other TTC devices such as channelizing equipment. There are four types of arrow panels. Type A is used on low-speed urban streets. Type B is used on intermediate-speed roadways and for maintenance or mobile operations on high-speed roadways. Type C is used in areas of high-speed, high-volume motor vehicle traffic. Type D is used on authorized vehicles. Type A, B, and C arrow panels shall be a solid



Figure 3.12a—One style of LED road marker. Courtesy of Keystone Products, Inc.



Figure 3.12b—The LED marker can be mounted on a traffic cone.

rectangle. Type D shall conform to the shape of the arrow. All arrow panels shall be finished in non-reflective black. The minimum mounting height of an arrow is 7 feet from the roadway to the bottom of the panel, except on vehicle-mounted panels.

It is becoming increasingly common for fire departments to mount directional arrows on apparatus (**Figure 3.13a** and **3.13b**). When contemplating this, it is important to review the MUTCD requirements in Section 6F.56 to assure the signs are compliant. Arrow panels should be able to operate in all of three modes: 1) flashing arrow, sequential arrow, or sequential chevron, 2) flashing double arrow, and 3) flashing caution mode. **Figure 3.14** shows these modes. The panel must be capable of at least a 50 percent dimming from full brilliance for use during nighttime operation in order not to have an adverse effect on oncoming driver vision. The size of the arrow must equal 48 inches long, and the width of the arrowhead must be 24 inches and must be visible at a minimum of 0.5 miles. Note that many of the arrow panels and directional light bars currently located on apparatus do not meet this standard. If the arrowhead is not obvious to approaching traffic, it simply becomes another blinking

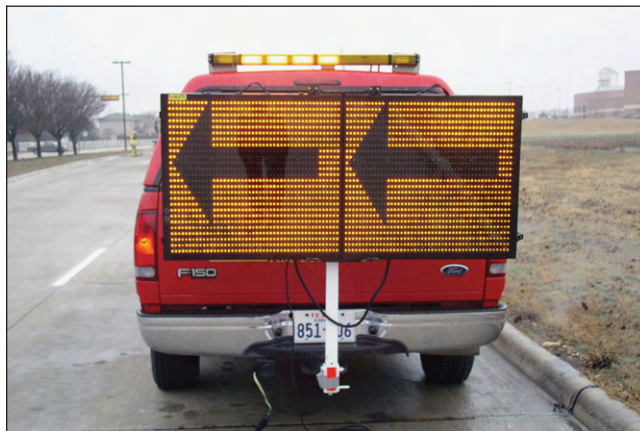


Figure 3.13a—The command vehicle has a trailer hitch-mounted LED arrow board. Courtesy of Ron Moore, McKinney, TX FD.



Figure 3.13b—Some department equip their fire apparatus with flashing arrows.

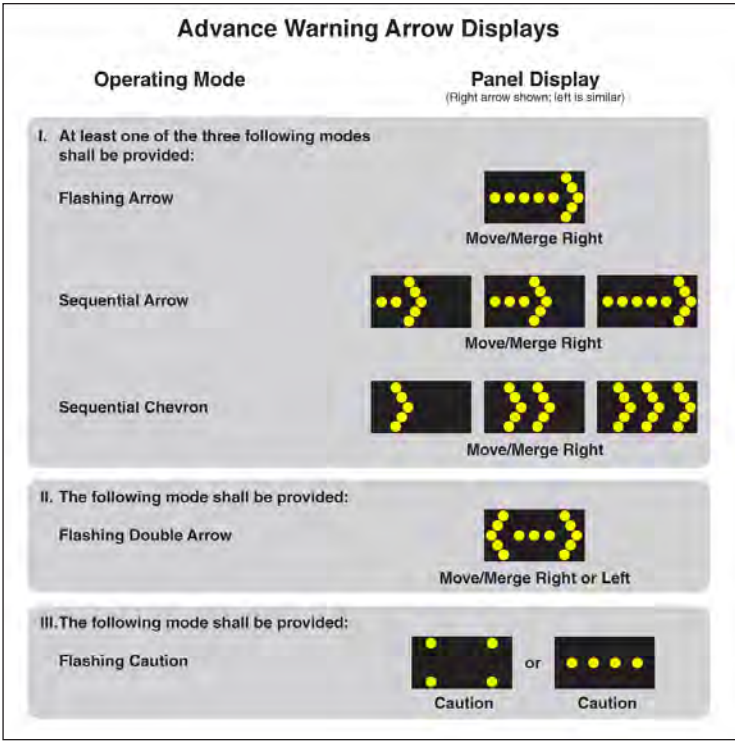


Figure 3.14—The MUTCD specifies required sign modes.

yellow light. Although there is no specified height, vehicle-mounted arrow panels should be as high as practical, and have remote controls, and the vehicle must have high-intensity rotating, flashing, oscillating, or strobe lights.

Barricades

Collisions involving multiple vehicles, collisions resulting in fatalities, or hazardous material spills may require a road closure. As part of an overall incident management plan, this type of incident would most likely involve the State DOT for incidents on major roadways, and local or county street departments on surface roads. The freeway patrol units discussed earlier would be able to provide initial traffic control, if available. Neither fire apparatus nor the freeway patrol units normally carry barricades. Thus, DOT resources would need to be dispatched to place barricades and other appropriate portable signs and TTC devices.

The MUTCD (Section 6-F) identifies four types of barricades (**Figure 3.15**). Rail stripe width on all barricades 36 inches or over must be 6 inches. For barricades that are less than 36 inches wide, the rail stripe may be 4 inches. The side of the barricade facing traffic must have retroreflective rail faces. Warning lights on barricades are optional.

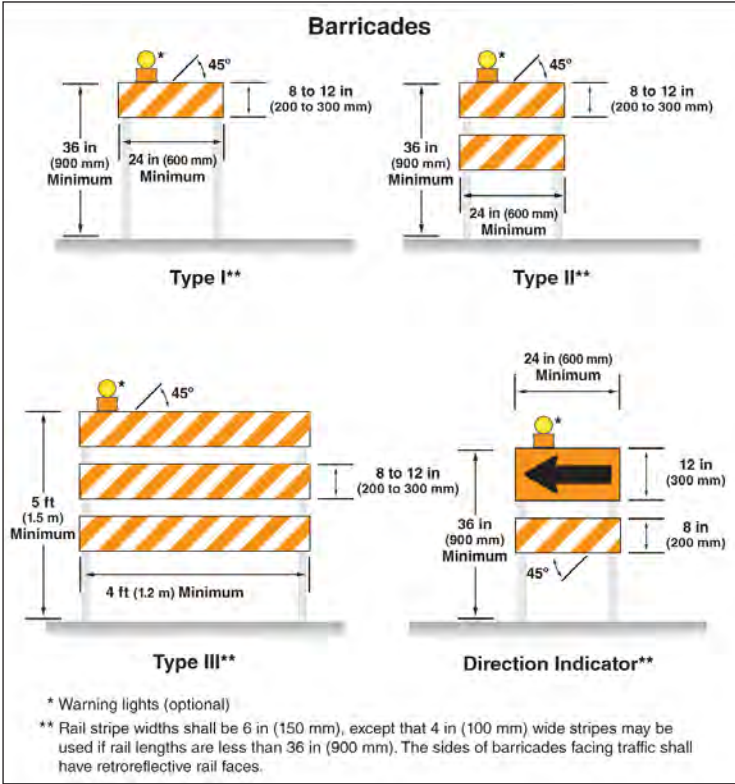


Figure 3.15—There are four types of barricades shown in the MUTCD.

Flagger Control

In many situations it will be necessary to use emergency personnel to assist in directing traffic at a roadway incident, especially early in the incident. This section details the requirements for personnel who are assigned this function.

A flagger manually provides temporary traffic control. According to the MUTCD, a flagger is responsible for the safety of both emergency workers and the motoring public. Any person, including an emergency responder, who is assigned to direct traffic is considered a flagger and therefore must be trained and meet the MUTCD flagger requirements.



Many volunteer departments on the east coast of the United States use fire police to direct traffic at incident scenes. Fire police are members of the fire department who focus on providing roadway scene safety, protection functions, and crowd control at incidents. This includes directing traffic, setting up signs and other blocking equipment, and securing incident scenes. In many cases they operate apparatus specially equipped for these functions (**Figure 3.16**). In other jurisdictions, firefighters may be assigned this function. Regardless of who is assigned this function, it is important to review the MUTCD qualifications for flaggers. Flaggers should have the following abilities:



Figure 3.16—Many fire departments in the eastern U.S. operate fire police/traffic control units.

- ▶ Receive and communicate specific instructions.
- ▶ Move and maneuver quickly.
- ▶ Control signaling devices, such as signs, paddles, and flags, to provide clear and positive guidance to drivers.
- ▶ Understand and apply safe traffic control practices.
- ▶ Recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.

Departments that require personnel to perform flagger duties should ensure that those personnel complete an MUTCD-compliant flagger course. Fire officials may wish to consult local transportation officials for information on these courses within their jurisdiction.

HAND-SIGNALING DEVICES

Hand-signaling devices, such as STOP/SLOW paddles, flashlights/wands, and red flags, are used by flaggers to control drivers. The STOP/SLOW paddle (**Figure 3.17**) is the MUTCD-preferred hand-signaling device because it provides more positive guidance for drivers. The paddle is octagonal on a rigid handle. It must be at least 18 inches wide with letters at least 6 inches high. The background of the STOP side must be red with white letters and border, while the SLOW side must be orange with black letters and border. When used at night, the paddle must be retroreflectorized (MUTCD Section 6E.03).

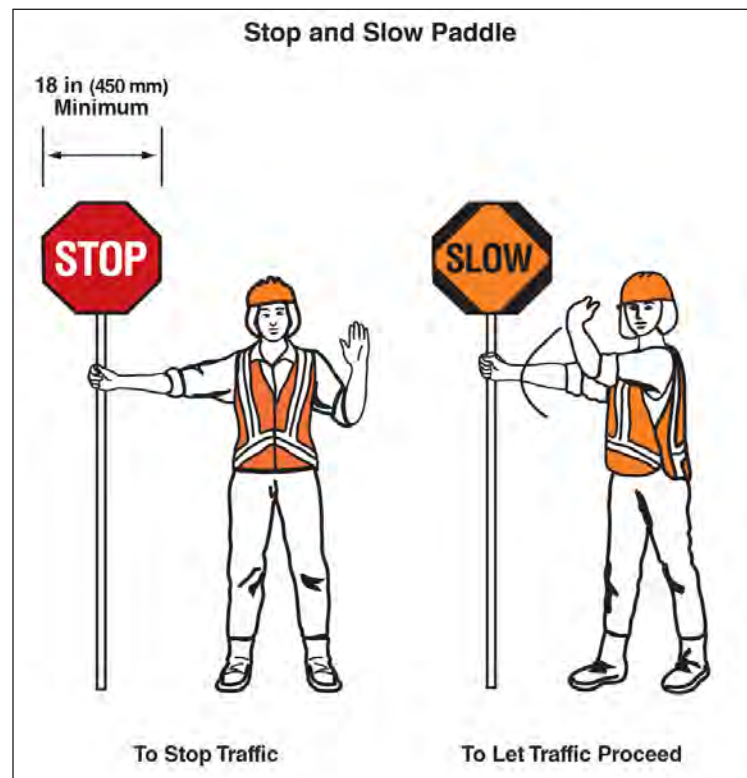


Figure 3.17—Flaggers may use STOP/SLOW paddles.

FLAGGER LOCATION

Flaggers must be located so that approaching drivers have sufficient distance to stop at the intended stopping point or slow to merge lanes. Refer back to Table 3.3 to review the stopping sight distance



Figure 3.18—Flaggers should be adjacent to the lane of traffic being controlled.

as a function of speed and thus determine the flagger location. The flagger should be far enough in advance of workers to warn them of approaching danger by out-of-control vehicles. The flagger should wear proper protective equipment as described below and always stand alone.

Flaggers should stand either on the shoulder adjacent to the lane being controlled or in the closed lane prior to stopping drivers (**Figure 3.18**). The flagger should only stand in the lane being used by moving traffic after traffic has been halted. The flagger should be clearly visible to the first approaching driver at all times, as well as being visible to other drivers. Flaggers at emergency incidents must use extreme vigilance since there may not be an

advance warning sign before traffic reaches the flagger. When possible, the flagger should attempt to make eye contact with each approaching driver.

AUDIBLE WARNING SIGNALS

The MUTCD suggests equipping flaggers with a horn or whistle to provide an audible warning to workers of oncoming danger. An air horn or compressed-gas horn would work well. If a whistle is used, make sure the necklace has a break-away attachment allowing it to pull loose if caught on an object or moving vehicle.

The device used to warn workers of dangers when working at a traffic incident should be loud enough to be heard above the noise of traffic and any equipment being used by emergency workers. Ron Moore of *Firehouse Magazine* states that relying on a radio call may not be sufficient for all to hear during highway operations. The radio channel may be busy, not everyone on the scene may have a radio, or not everyone may be on the same channel.

High Visibility Safety Apparel

Every year traffic increases, leading to more congestion and greater risk to emergency response personnel. Conditions at dawn, dusk, night and during inclement weather increase the risk. Personnel visibility is imperative to responder safety. **NOTE:** Although all firefighter turnout clothing includes the use of retroreflective markings per NFPA 1971 requirements, these requirements fall well short of meeting MUTCD requirements for safety garments to be worn on the roadway. Firefighters must wear additional protective garments when working on roadway emergency scenes.

There are two documents with which firefighters and other public safety responders should be familiar. The first is American National Standards Institute/International Safety Equipment Association (ANSI/ISEA) *American National Standard for High-Visibility Apparel* (ANSI 107). This document set the requirements for high visibility worn by public safety personnel (and all other highway workers) for many years and much of the equipment in use today was designed to this document. In 2007, ANSI/ISEA released a new standard, ANSI/ISEA 207-2006, *American National Standard for High-Visibility Public Safety Vests*. This document has more specific requirements for safety apparel that should be worn by firefighters and other public safety personnel who work on the highway.

Also, in a 2005 report to Congress prepared by the NHTSA, the writers reported a link between some struck-by incidents and low visibility and they recommended that first responders and motorists outside their vehicles along a roadway wear high-visibility safety apparel.

ANSI/ISEA 107

The MUTCD specifies safety apparel “meet the requirements of the American National Standards Institute/International Safety Equipment Association (ANSI/ISEA) American National Standard for High-Visibility Apparel and it must be labeled as meeting the ANSI 107-1999 standard performance for Class 2 risk exposure. The apparel background (outer) material color shall be either fluorescent orange-red or fluorescent yellow-green as defined in the standard. The retroreflective material shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 1,000 feet. The retroreflective safety apparel shall be designed to clearly identify the wearer as a person. (This is particularly important for emergency workers among the flashing lights and other apparatus markings at the scene.) For nighttime activity, Class 3 risk exposure should be considered for flaggers” (Section 6E.02). **Figure 3.19** shows ANSI Class II- and Class III-compliant garments.



Figure 3.19—Class II and III garments. Courtesy of Ron Moore, McKinney, TX FD.

After 5 years ANSI/ISEA revised this standard and released ANSI/ISEA 107-2004. The new standard sets performance criteria and guidelines for the selection, design, and wearing of high visibility safety clothing. It defines three protective classes based on background material, retroreflective material, and design and usage requirements. It also provides criteria to assist in determining the appropriate garment based on roadway hazards, work tasks, complexity of the work environment, and vehicular traffic and speed. **Table 3.4** summarizes the classes.

Table 3.4—ANSI/ISEA Garment Classifications

Class	Intended Use	Worker Example
I	Activities that permit the wearer’s full and undivided attention to approaching traffic. There should be ample separation of the worker from traffic, which should be traveling no faster than 25 mph.	<ul style="list-style-type: none"> • Parking lot attendants • Warehouse workers • Roadside “right of way” or sidewalk maintenance workers
II	Activities where greater visibility is necessary during inclement weather conditions or in work environments with risks that exceed those for Class I. Garments in this class also cover workers who perform tasks that divert their attention from approaching traffic, or are in close proximity to passing vehicles traveling at 25 mph or higher.	<ul style="list-style-type: none"> • Forestry operations • Roadway construction, utility and railway workers • School crossing guards • Delivery vehicle drivers • Emergency response and law enforcement personnel
III	Activities of workers who face serious hazards and often have high task loads that require attention away from their surroundings. Garments should provide enhanced visibility to more of the body, such as the arms and legs.	<ul style="list-style-type: none"> • Roadway construction personnel and flaggers • Utility workers • Survey crews • Emergency response personnel

FABRIC

ANSI/ISEA 107-2004 specifies that the fabric must be tightly knit or woven for background coverage. Therefore, open mesh fabrics are not in compliance, since they do not provide the background coverage or brightness to meet the standard. The fabric also must be stain- and water-repellent. The standard also requires retesting the chromaticity (brightness and purity of color) of fabrics after a laboratory light exposure test.

FLUORESCENCE

Fluorescent fabrics absorb ultraviolet (UV) light of a certain wavelength and regenerate it into lower energy and longer wavelengths. This property makes the garments especially bright on cloudy days and at dawn and dusk, when UV light waves are high. Fluorescent fabric does not glow in the dark. The new standard requires certification of the fluorescent background fabric to specific chromaticity minimums. Although several colors are available, the most popular safety colors are lime/yellow and orange.

A 1990 survey conducted by the Minnesota DOT displayed four mannequins in fluorescent jumpsuits. Minnesota State Fair attendees were asked to choose the most visible mannequin. Fluorescent yellow was clearly the most visible color (**Table 3.5**). In addition, of 119 color-impaired attendees surveyed, 97 percent selected fluorescent yellow.

Table 3.5—Minnesota Fluorescent Color Survey—1990

Color	Number of Participants
Yellow	5,796
Green	2,706
Orange	2,231
Pink	2,017

RETROREFLECTIVITY

Retroreflective fabrics are necessary to extend the same level of protection at night that fluorescent fabrics provide during daylight. Retroreflective fabric works like a mirror, reflecting light back to its source. The standard identifies the requirement (photometric performance) of retroreflective material alone or combined with fluorescent fabric. Photometric performance is measured by candle power (cd/lux/m²). There are two classes of retroreflectivity. Apparel must provide 360 degrees of visibility, so the retroreflective striping must basically encircle the torso. All retroreflectors deteriorate with time. The rates of deterioration depend on the type of material, use, and exposure to the environment. **Table 3.6** provides a summary of the ANSI/ISEA 107-2004 garment class requirement.

Appendix C of this document also shows some preliminary findings from a study that was being conducted at the time this report was written by the USFA and the Society of Automotive Engineers (SAE). This study shows the effective sight-line and stopping distances for personnel wearing retroreflective clothing versus those who are not.

Table 3.6 107-2004 ANSI/ISEA Garment Class Requirement

Requirement	Class I	Class II	Class III
Background material minimum area	217 in ² (0.14 m ²)	775 in ² (0.5 m ²)	1,240 in ² (0.80 m ²)
Retroreflective or combined-performance material used with background material	155 in ² (0.10 m ²)	201 in ² (0.13 m ²)	310 in ² (0.20 m ²)
Minimum width of retroreflective bands	310 in ² (0.20 m ²)	N/A	N/A
Minimum number of yards per retroreflective band width	1 in (25 mm) or 2 in (50 mm) combined-performance material (without background material)	1.378 in ² (35 mm ²)	2 in ² (50 mm ²)
Minimum number of yards per retroreflective band width	4.3 yds of 1 in (25 mm)-wide bands; 3.1 yds of 1.378 in (35 mm)-wide bands; 2.15 yds of 2 in (50 mm)-wide bands	4 yds of 1.378 in (35 mm)-wide bands; 2.8 yds of 2 in (50 mm)-wide bands	4.3 yds of 2 in (50 mm)-wide bands

ANSI/ISEA 207


The revised ANSI/ISEA 107-2004 standard clearly prohibits any kind of sleeveless garment to be labeled Class 3 when worn alone. This change would have a significant effect on some emergency response departments. Because of these problems, a number of public safety organizations, led by the National Traffic Incident Management Coalition, lobbied DOT, ANSI, and ISEA for a specific standard for a vest to be used in the public safety sector.

A significant event related to the safety of emergency workers operating on the roadway occurred on December 8, 2006, with the release of ANSI/ISEA 207-2006, *American National Standard for High-Visibility Public Safety Vests*. ANSI/ISEA 207-2006 establishes design, performance specifications, and use criteria for highly visible vests that are used by public safety industries. The standard includes basic requirements such as vest dimensions, color, and materials performance, and also incorporates criteria for special features for users in fire, emergency medical services (EMS), and law enforcement services.

These special features include easier access to belt-mounted equipment (guns for police, EMS tools, etc.) and the ability for vests to tear away from the body if they are caught on a moving vehicle. Vests labeled as ANSI 207-compliant should have breakaway features on the two shoulder seams, two sides and in the front for a total of five breakaway points (**Figure 3.20**). The Emergency Responder Safety Institute (ERSI) urges buyers to specify five breakaway points and accept no less than



Figure 3.20—An ANSI 207-compliant public safety vest.



four breakaway points (all except the front closure) when ordering the public safety vests. ANSI/ISEA 207-2006 also allows for color-specific markings on the vest panel or trim to distinguish clearly and visibly among police, fire, and EMS responders. These colors include red for fire officials, blue for law enforcement, green for emergency responders, and orange for DOT officials.

When comparing the new ANSI/ISEA 207-2006 public safety vest standard to the ANSI/ISEA 107-2004 standard, the following distinctions should be noted:

- ▶▶ ANSI/ISEA 207-2006 is for public safety responders only, and is not intended to replace or be interchangeable with ANSI 107-2004 Class 2 requirements. In fact, the 450 in² of reflective material required of an ANSI 207 vest falls between the requirements for ANSI 107 Class 1 and 2.
- ▶▶ Law enforcement officers performing traffic control duties are still encouraged to follow ANSI 107 Class 2 or Class 3 guidelines whenever possible.
- ▶▶ A lesser background area requirement on ANSI/ISEA 207-2006 allows for short designs, giving tactical access to equipment belts.
- ▶▶ Retroreflective area requirements for ANSI/ISEA 207-2006 are the same as those for ANSI 107-2004, Class 2 vests.
- ▶▶ The new standard suggests use of many design options, such as breakaways, colored identifiers, loops, pockets, badge holders, and ID panels.

In addition to the ANSI/ISEA draft for public safety vests, the Federal Highway Administration (FHWA) has released a Notice of Proposed Rulemaking on Worker Visibility. This rule requires that all workers (including emergency responders) on U.S. Federal Aid Highways must wear high visibility garments while performing their duties. The proposed rule references Class 2 and Class 3 garments, but not public safety vests. The ERSI submitted a comment to reference public safety vests in addition to Class 2 and 3 garments. The latest progress on both these proposals can be accessed on the ERSI Web site at http://www.respondersafety.com/news/2005/0802_letter.html

The standard will affect law enforcement, emergency responders, fire officials, and other DOT personnel sectors. It will improve safety in multiagency incidents by improving visibility and identification. It will reduce confusion and enhance communication between agencies. Basic vest requirements will include

- ▶▶ vest dimensions;
- ▶▶ material performance;
- ▶▶ special design features for users in fire, emergency medical, and law enforcement services; and
- ▶▶ higher visibility (checkered color-coded reflective trim).

Fire Apparatus Safety Equipment

Many fire apparatus markings and devices are used to improve the safety of personnel riding in the apparatus, working at an incident, and working in close proximity to the apparatus. Most of these features are also addressed in USFA publication FA-272 *Emergency Vehicle Safety Initiative* (2004). This section will review those that have the most impact on safety at highway operations.

RESTRAINTS

Managing an incident scene appropriately is contingent on personnel arriving safely. Fatalities occurring as a result of apparatus collisions almost doubled from 2003 to 2004 over fatalities occurring in apparatus collisions from 1994 to 2002. The average number of fatalities from 1994 to 2002 was 12, compared to 22 for 2003 to 2004. Lack of restraint use continues to be a problem. Only 21 percent of firefighter fatalities in vehicle collisions from 1994 to 2000 were wearing restraints.

In addition, often firefighters may simply be sitting in vehicles that are parked for the purpose of blocking at roadway emergency scenes. If the fire apparatus is struck by a vehicle approaching the incident scene, unsecured firefighters could sustain serious injuries or be killed in that collision.

NFPA 1500 specifies the mandatory use of restraints during any response, whether emergency or nonemergency in nature. NFPA 1901, *Standard for Automotive Fire Apparatus*, requires red seatbelt Webbing, making it easier to check compliance (**Figure 3.21**).



Figure 3.21—NFPA 1901 requires seat restraints to be red.

VEHICLE STRIPING

Historically, NFPA 1901 required a simple 4-inch wide retroreflective stripe around the perimeter of the majority of a fire apparatus to illuminate the apparatus at night when visibility is limited. Placement of the striping was meant to provide an indication of the location and size of the apparatus. NFPA 1901 also requires retroreflective striping inside cab doors to maintain conspicuity and alert passing drivers to an open door (**Figure 3.22**).

However, many jurisdictions felt that the minimum amount of reflective trim required by NFPA 1901 was not sufficient to provide maximum safety for their responders. Some agencies made simple additions, such as the use of additional striping in rubrail areas (**Figure 3.23**). Other agencies noted the extensive use of retroreflective trim on European apparatus and the improved safety benefits they received (**Figure**



Figure 3.22—Some department use reflective stops signs on the insides of doors as opposed to striping.

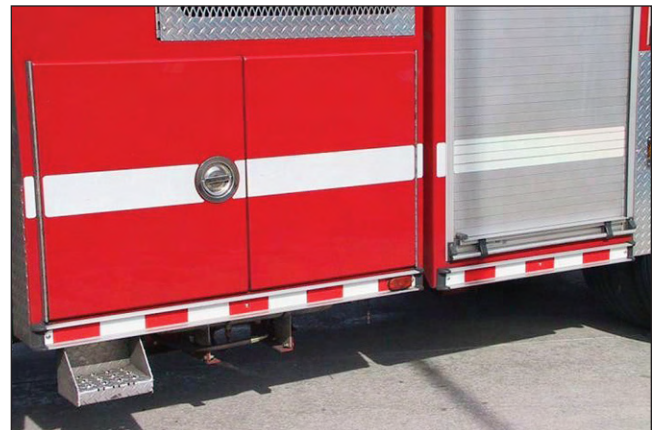


Figure 3.23—The use of DOT-style reflective trim in apparatus rub rails is an expensive way to increase apparatus visibility.



Figure 3.24—European fire apparatus have used reflective marking on the rear of their apparatus for many years.

3.24). Thus, many fire departments in the U.S. began applying this chevron-style trim to their apparatus (Figure 3.25). In the 2008 version of NFPA 1901 that was under development at the time of this report, requirements for this style of striping were being added.

At the time this report was being written, the USFA had engaged the International Fire Service Training Association (IFSTA) to perform a detailed research study on the effectiveness of retroreflective markings on emergency vehicles. The purpose of this study is to determine effective colors, patterns, and overall usage of these markings. This information will be made available to all agencies, manufacturers, and the standards-making community for future use.

WARNING LIGHTS

NFPA 1901 requires all fire apparatus have a system of optical warning lights in the upper and lower zones and on all four sides. The standard identifies two modes of emergency lighting. The “calling for right of way” is the light pattern used while the apparatus is in motion. The “blocking right of way” mode is the light pattern used while the apparatus is parked at the incident. The “best” light color(s) continue to be debated. A 1978 study by the National Institute of

Standards and Technology (NIST) showed that, as the number of flashing lights increases, the ability of drivers to respond quickly decreases. Strong stimuli holds central gaze, and drivers tend to steer in the direction of gaze.

The MUTCD also addresses the use of warning lights at roadway incident scenes in Section 6I.05. The use of emergency lighting is essential, especially in the initial stages of a traffic incident. However, it only provides warning; it does not provide traffic control. Often emergency lighting is confusing to drivers, especially at night. Drivers approaching the incident from the opposite direction on a divided roadway are often distracted by the lights and slow their response, resulting in a hazard to themselves and others traveling in their direction. (It also often results in

traffic congestion in the unaffected opposite lane[s] and increases the chance of a secondary collision.)

Emergency vehicle lighting can be reduced if good traffic control has been established. If good traffic control is established through placement of advanced warning signs and TTC devices, responders can perform their tasks with minimal emergency vehicle lighting. This is especially true at major incidents that involve a number of emergency vehicles. Departments should review policies on emergency vehicle lighting, especially after a traffic incident scene is secured, with the aim of reducing the use of vehicle lighting as much as possible while not endangering those at the scene. Especially consider reducing or extinguishing forward-facing vehicle lighting, such as headlights, especially on divided roadways.



Figure 3.25—Many U.S. apparatus now sport reflective markings on the rear of the vehicles.

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An internal lighting study conducted by the Phoenix Fire Department following a 1994 fatality suggested that a reduced level of amber (yellow) lighting was less likely to blind drivers and less likely to draw the interest and attention of passing drivers. As a result, the process began to reconfigure engines for all nonamber warning lights (clear, red, and blue) to go off when the apparatus parking brake was engaged. Amber lights on all four sides of the apparatus are the only functioning lights in the “blocking right of way” mode. Many other fire departments in the United States also have adopted this practice.

USFA is currently working with the SAE to study the effect and effective mitigation of the disorientation of motorists caused by emergency warning lights, including the effects on normal, impaired, and drowsy drivers (also known as the “moth effect”). The project is titled *Effects of Warning Lamps on Pedestrian Visibility and Driver Behavior*. Issues such as lighting design and flash rate, lighting color and emergency vehicle visibility/conspicuity, as well as operational mitigation, i.e., reducing amount of lighting used, will be researched. This study will examine lighting colors including the “traditional” red and white used by the fire service and EMS and other colors typically used for construction and tow vehicle warning, such as yellow, as well as blue and other colors.

This research involves field study of emergency warning lighting examining colors, intensity, and flash patterns of emergency-vehicle warning lamps related to desirable effects of the lamps (conspicuity) and undesirable effects (glare).

Research findings from this project will be forwarded to national-level consensus standards organizations, such as the NFPA, as well as others involved in the development of relevant/related standards. Additionally, SAE and their *Emergency Warning Lighting and Devices Standard Committee* may use the findings in development of standards.

European Concepts in Roadway Scene Equipment and Practices

The information covered to this point in this chapter has focused on common equipment and practices used for temporary traffic control in the United States. This is important because of the mandates set forth in the MUTCD, NFPA standards, and other pertinent regulations. However, emergency response organizations in other parts of the world use different equipment and practices for the same purposes. Though some of these alternatives may not currently meet all the requirements of U.S. regulations, there is much we can learn from these foreign services. Information on some of these practices is provided here for the sake of furthering research and study of new methods and equipment that can be used to improve responders’ safety.

European fire departments historically have tended to take a more aggressive and participative role in traffic management around roadway emergency scenes than have U.S. fire departments. This may be due to more traffic congestion and typically higher speeds. Fire apparatus in countries such as the United Kingdom and Germany carry considerably more highway safety equipment on their fire apparatus than do typical U.S. fire departments (**Figure 3.26**).



Figure 3.26—German fire apparatus commonly have whole compartments dedicated to carrying traffic safety equipment.



Figure 3.27 –Traffic control carts are clipped to the back of German fire apparatus and can be deployed by a single firefighter.

One innovation used by many German fire departments is a hand cart that carries a variety of traffic control equipment (**Figure 3.27**). The cart allows one firefighter to deploy a significant amount of traffic safety equipment easily. A container in the bottom of the cart carries traffic cones, flat traffic paddles that are commonly used throughout Europe, and flashlights or traffic wands. The cart itself is equipped with a large, amber flashing arrow that can be pointed in either direction or simply placed in a flashing alert mode (**Figure 3.28**). The arrow is powered by a battery on the cart that allows the arrow to be operated for up to 8 hours without recharging.

The flat traffic paddles that are often carried on these carts are also commonly carried directly on the apparatus. These paddles have weighted bottoms and are used in the same manner as traffic cones or tubular markers. They have a combination of orange stripes and retroreflective white stripes. Many of them also are equipped with LED flashers (**Figure 3.29**). The advantage of these paddles over cones and tubular markers is the fact that they fold flat and take up considerably less storage space.

Another device commonly found on European apparatus is battery-operated traffic cones that are back-lit for night operations (**Figure 3.30**). In addition to having retroreflective stripes on the



Figure 3.28—This traffic control cart includes a battery-operated arrow board.

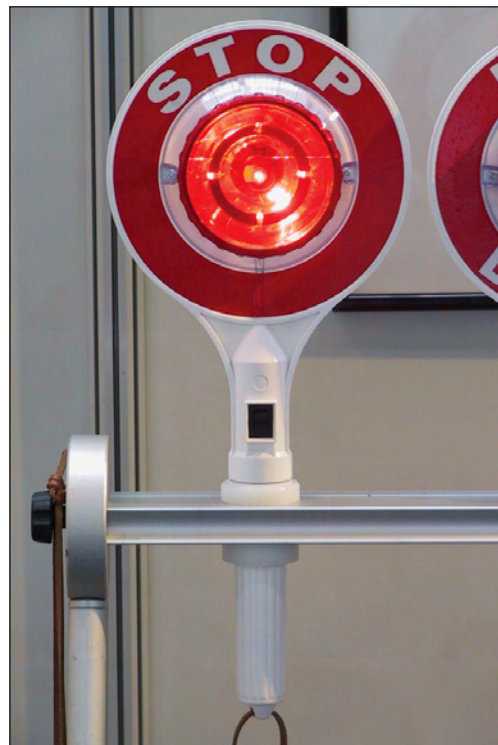


Figure 3.29—European responders used lighted STOP/SLOW hand paddles.



Figure 3.30—Illuminated traffic cones are widely used throughout Europe.

cones, they glow brightly during night operations, making them much more visible before coming into range of the approaching vehicle’s headlights.

European fire and police vehicles commonly tow large arrow board trailers behind their vehicles when responding to roadway incident scenes (**Figure 3.31**). These may be placed for advanced warning or as directional signals at the beginning of a taper or lane change.

Many of these ideas have application for U.S. emergency responders and should be considered for implementation into equipment inventories and SOPs.



Figure 3.31—This large arrow board trailer is towed by German police vehicles.

Recommendations for Highway Safety Equipment

- ▶ Consider the use of ACN systems on emergency vehicles, especially in rural areas.
- ▶ Ensure all channelizing devices meet applicable requirements.
- ▶ Ensure flaggers, if used, are properly trained and meet MUTCD qualifications.
- ▶ Require members to wear ANSI II, ANSI III, or ANSI 207 public safety vest compliant PPE when conducting highway operations.
- ▶ Mark apparatus with conspicuous, contrasting colors.
- ▶ Use contrasting colored restraints and enforce mandatory use any time the vehicle is in motion or while sitting in a parked apparatus on the scene.

SETTING UP SAFE TRAFFIC INCIDENT MANAGEMENT AREAS

Chapter 3 gave some basic background on concepts of effective Temporary Traffic Control (TTC) and the equipment used to achieve this. This chapter will focus on using this information to set up a safe and effective traffic incident management area (TIMA).

The *Manual on Uniform Traffic Control Devices* (MUTCD) defines a traffic incident as “an emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic” (section 6I.01). Traffic incidents are divided into three general classes of duration:

- ▶ *minor*—expected duration under 30 minutes;
- ▶ *intermediate*—expected duration of 30 minutes to 2 hours; and
- ▶ *major*—expected duration of more than 2 hours.



Figure 4.1—A TTC zone is established by responders to a roadway incident.

A TIMA is that part of a roadway where TTC measures are imposed by authorized officials in response to a traffic incident (**Figure 4.1**). It extends from the first warning device to the last TTC point, or to a point where vehicles return to the original lane alignment. The primary functions of TTC at a TIMA are to move traffic safely and expeditiously past/around the incident, reduce the likelihood of secondary collisions, and protect workers operating in the TTC zone.

All responders should be trained to work next to motor vehicle traffic in a way that minimizes their vulnerability to being struck by passing traffic. Those having specific TTC responsibilities should be trained in TTC techniques, device usage, and placement.

Emergency responders do not have to meet all MUTCD requirements for TTC during the initial phase of a highway incident. The MUTCD requirements for TTC, beyond the basic cones, flares, or fluorescent pink signs, begin 30 minutes after scene arrival. By this time law enforcement and highway agencies should be on scene to establish compliant TTC that fully meets at least the MUTCD minimum standards for the extended incident. Fire departments should accept the responsibility for providing a minimum number of traffic control devices to be carried on each responding apparatus, and to direct traffic until law enforcement arrives.

Drivers have a variety of driving skill levels. Some drive without a license. Some drive extremely slow. Some drive well beyond the speed limit. Some drive visually impaired. Some drive alcohol/drug impaired. All of them “rubberneck” the scene instead of focusing on the road. Incident work zones should be set up to provide the best possible protection of the work area and personnel from vehicle traffic and any other potential hazards.

Establishing the Work Area

As with any type of incident, the key to a successful roadway incident scene operation is getting the incident off to a good start and then building on that foundation. Getting the incident off to a good start actually begins at the time of dispatch. It is important that the correct units are dispatched to the initial call for help. The units dispatched to the incident must take the safest and most expedient route of travel. Along the way, personnel should draw upon their previous experiences and knowledge of the reported incident location to determine possible appropriate courses of action once they arrive.

This section examines some of the basic steps in getting the roadway incident off to a good start. This includes proper positioning of the initial arriving vehicles, performing an effective sizeup of the incident, and determining the traffic control procedures that will be required.

Apparatus Placement

Effective and safe management of a roadway incident scene begins with the arrival and positioning of the first apparatus. From the very outset of the incident it should be the goal of all responders to protect the incident work area and those who will be operating within this area. According to *Improving Apparatus Response and Roadway Operations Safety in the Career Fire Service*, developed by the International Association of Fire Fighters (IAFF) in conjunction with the U.S. Fire Administration (USFA), the driver/operator has three primary concerns when determining where to park the apparatus on a roadway emergency scene:

1. Park the apparatus in a manner that reduces the chance of the vehicle being struck by oncoming traffic.
2. Park the apparatus in a manner that shields responders and the operational work area from being exposed to oncoming traffic (**Figure 4.2**).
3. Park the apparatus in a location that allows for effective deployment of equipment and resources to handle the incident.

The procedures for performing each of these options will differ depending on the type of incident, the type of road, and the surroundings of the emergency scene. Drivers must be versed in the appropriate positioning procedures for all of the possible environments within which they may be expected to operate.



Figure 4.2—Park the apparatus in a manner that shields the work area.

OPERATIONS ON SURFACE STREETS

Surface streets range from rural unpaved roads to busy urban and suburban avenues. Most often the tactical needs of the incident will dictate the positioning of the apparatus. However, there are some safety principles that must be followed as much as possible:

- ▶ Park the apparatus off the street in a parking lot or driveway, when possible. This reduces the risk of being struck by a moving vehicle whose driver is not paying attention to the emergency scene.
- ▶ Close the street that the emergency is located on to through traffic. This eliminates the potential of a civilian vehicle driving into the apparatus or firefighters.



Figure 4.3—Always protect the ambulance loading area.



Figure 4.4—Incidents in intersections may require blocking in more than one direction of travel. Courtesy of Ron Moore, McKinney, TX FD.

- ▶▶ Do not block access to the scene for later-arriving emergency vehicles. Often crashes occur when one vehicle is parked in a poor position and another attempts to squeeze around it.
- ▶▶ If the emergency scene is in the street, such as with a vehicle fire or motor vehicle crash, and the street may not be closed to all traffic, park the apparatus in a manner that uses it as a shield between the scene and oncoming traffic. It would be better for a stray vehicle to drive into the fire apparatus than it would be for it to strike a group of responders.
- ▶▶ On emergency medical services (EMS) calls, use the apparatus to shield the patient loading area behind the ambulance (**Figure 4.3**). This area is particularly vulnerable to oncoming traffic. If at all possible, the ambulance should be pulled into a driveway or otherwise out of the route of traffic to reduce the exposure of the loading area.
- ▶▶ Never park the apparatus on railroad tracks. Keep the apparatus far enough away from the tracks so that a passing train will not strike it. Park the apparatus on the same side of the tracks as the incident. This negates the need to stretch hoselines across the tracks or for personnel to be traversing back and forth from one side to the other.
- ▶▶ Position pumping apparatus so that the pump panel is located on the opposite side of the vehicle from oncoming traffic. This will protect the pump operator from being struck by a stray vehicle.

When the incident occurs in an intersection, it may be necessary to shield the incident scene from two or more directions (**Figure 4.4**). Whenever possible, law enforcement personnel should be used to assist with scene protection and redirection of traffic at these incidents. If sufficient law enforcement personnel are not available to redirect traffic and protect the scene adequately, additional fire companies may be dispatched, and their apparatus used to shield the scene. The additional personnel that respond with the extra apparatus can be used to assist with onscene tactical operations or to perform flagging and other scene protection duties.

OPERATIONS ON HIGHWAYS

Some of the most dangerous scenarios faced by firefighters are operations on highways, interstates, turnpikes, and other busy roadways. There are numerous challenges relative to apparatus placement, operational effectiveness, and responder safety when dealing with incidents on limited-access highways.

Simply accessing the emergency scene on a limited-access highway can be a challenge to emergency responders. Apparatus may have to respond over long distances between exits to reach an incident. In some cases, apparatus will be required to travel a long distance before there is a turnaround that allows them to get to the



opposite side of the median. Apparatus must not be driven against the normal flow of traffic unless police units or highway department officials have closed the road.

The driver/operator must use common sense when responding to an incident on a highway or turnpike. A fire apparatus usually travels slower than the normal flow of traffic, and the use of warning lights and sirens may create traffic conditions that actually slow the fire unit's response. Some fire departments have Standard Operating Procedures (SOPs) that require the driver/operator to turn off all warning lights and audible warning devices when responding on limited-access highways. The warning lights are turned back on once the apparatus reaches the scene. However, as will be discussed later in this section, only select warning lights must be used to prevent the blinding of oncoming civilian drivers.

It is important that police and fire department personnel have a good working relationship and compatible SOPs when operating at highway incidents. At a minimum, at least one lane next to the incident lane should be closed when prudent. Additional or all traffic lanes may have to be closed if the extra lane does not provide a safe barrier. More detailed information on lane closures is covered in the next portion of this section.

Fire apparatus must be placed between the flow of traffic and the firefighters working on the incident to act as a shield (**Figure 4.5**). The apparatus must be parked at an angle so that the operator is protected from traffic by the tailboard. Front wheels must be turned away from the firefighters working highway incidents so that the apparatus will not be driven into them if struck from behind. Also consider parking additional apparatus 150 to 200 feet behind the shielding apparatus to act as an additional barrier between firefighters and the flow of traffic (**Figure 4.6**).



Figure 4.5—Place apparatus between the flow of traffic and the work area. Courtesy of Ron Moore, McKinney, TX FD.

All firefighters must use extreme caution when getting off the apparatus so that they are not struck by passing traffic. The firefighters must mount and dismount the apparatus only on the side opposite flowing traffic whenever possible. Similarly, drivers are extremely vulnerable to being struck by motorists if they step back beyond the protection offered by properly spotted apparatus.

Apparatus Warning Lights

The use of apparatus warning lights needs to be discussed, as it is something of a two-edged sword. While it is clear that some lighting is necessary in order to warn approaching motorists of the presence of emergency responders, it is also suspected that too much or certain types of lighting can actually increase the hazard to personnel operating on the scene, particularly during nighttime operations.

Two critical issues related to night visibility are color recognition and glare recovery. Because most emergency vehicle warning lights are red, it is important to remember that as the human eye adapts to the dark, the first color to leave the spectrum is red. Red tends to blend in to the nighttime surroundings.

Vision recovery from the effects of glare depends on the prevailing light conditions. Vision recovery from dark to light takes 3 seconds; from light to dark takes at least 6 seconds. A vehicle traveling at 50 miles per hour covers approximately 75 feet per second—or 450 feet in the 6 seconds before the driver fully regains night vision. This is extremely important when operating on roadways at night, especially on

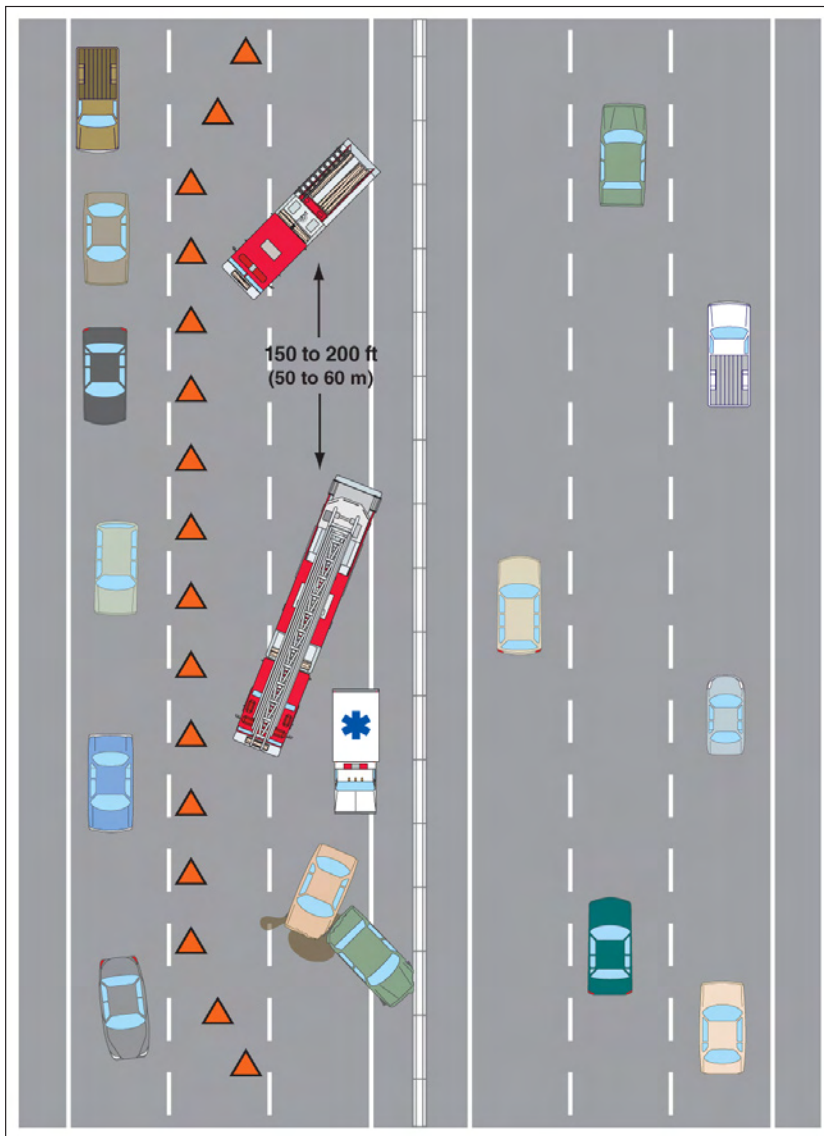


Figure 4.6—Stage additional apparatus 150 to 200 feet apart when blocking.



Figure 4.7—Make sure lights are deployed in a manner that is not blinding to approaching motorists.

two-lane roads. Headlights on the apparatus that shine directly into oncoming traffic can result in drivers literally passing the incident scene blind, with no sense of apparatus placement.

Wearing protective clothing and/or American National Standards Institute (ANSI)-compliant traffic vests does not improve the ability of the blinded driver to see personnel standing in the roadway. Studies show that the opposing driver is completely blinded at two and a half car lengths from a vehicle with its headlights on.

Available evidence suggests that strong stimuli, such as the combination of lights, light colors, and varying degrees of reflection and flashes, hold central gaze and drivers tend to steer in the direction of gaze. This has been termed the “moth effect” and is one aspect being studied in an ongoing study on emergency vehicle lighting being conducted by the USFA and the Society of Automotive Engineers (SAE). It is generally believed that this visual attraction is further accentuated when the driver is under the influence of drugs and alcohol.

To reduce the potential negative effects as a result of glare, headlights and fog lights should be shut off at night scenes. Floodlights should be raised to a height that allows light to be directed down on

the scene (**Figure 4.7**). This can reduce trip hazard by reducing shadows and reduces the chance of blinding oncoming drivers. Many highway safety specialists believe that the rear lights on emergency vehicles parked at a roadway scene should be amber. Many fire departments have moved toward the use of all amber warning lights when parked on the roadway during nighttime operations (**Figures 4.8a** and **4.8b**). In some cases the vehicles are equipped with interlocks that automatically shut off all nonamber warning lights when the parking brake is set.

Section 6I.05 of the MUTCD addresses the use of warning lights as follows.



Figure 4.8a—These amber lights are mounted on the rear of the apparatus.



Figure 4.8b—Some departments place amber flashers on all sides of the apparatus.

The use of emergency lighting is essential, especially in the initial stages of a traffic incident. However, it only provides warning; it does not provide effective traffic control. Emergency lighting is often confusing to drivers, especially at night. Drivers approaching the incident from the opposite direction on a divided roadway are often distracted by the lights and slow their response resulting in a hazard to themselves and others traveling in their direction. (It also often results in traffic congestion in the unaffected opposite lane[s] and increases the chance of a secondary collision.)

Emergency vehicle lighting can be reduced if good traffic control has been established. If good traffic control is established through placement of advanced warning signs and TTC devices, responders can perform their tasks with minimal emergency vehicle lighting. This is especially true at major incidents that involve a number of emergency vehicles. Departments should review their policies on emergency vehicle lighting, especially after a traffic incident scene is secured, with the aim of reducing the use of vehicle lighting as much as possible while not endangering those at the scene. Special consideration should be given to reducing or extinguishing forward-facing vehicle lighting, especially on divided roadways.

Exiting the Apparatus

All responders should have full protective clothing and ANSI-compliant high-visibility traffic vests as indicated before exiting the apparatus. Check for approaching traffic before exiting. Personnel should exit on the nontraffic side of the vehicle whenever possible. (This may not be possible in apparatus with non-pass-through jumpseat designs.) Personnel should remember to look down to ensure that any debris on the roadway will not become an obstacle, resulting in personal injury.

If it is necessary to move around a corner while working at the scene, personnel should move along the downstream, protected side of the apparatus. Stop at the corner of the vehicle and check approaching traffic. Constantly monitor traffic while getting whatever equipment is necessary and moving back to the protected side of the vehicle.

Determining the Magnitude of the Incident

Performing an incident sizeup is a primary function of any incident management system. Typically the lead person on the first-arriving unit will perform an initial sizeup. This commonly includes an evaluation

of the current situation, the actions that will be required to mitigate the situation, and the resources that will be needed to support those actions.

Historically, however, fire department personnel have focused their sizeup solely on handling the incident that is found, be it a collision, injury, or fire on the roadway. What often has gone unconsidered is the impact on traffic and the safety situation this may cause responders on the scene. The MUTCD places significant emphasis on giving a proper estimation of the scope and severity of the incident, as it affects traffic movement, within 15 minutes of the arrival of the first emergency responder. The MUTCD requires initial responders to determine the magnitude of the incident, the estimated time duration that the roadway will be blocked or affected, and the expected length of the vehicle queue (backup) that will occur as a result of the incident. This information then must be used to set up appropriate TTC measures to handle the incident. Keep in mind that for every 1 minute a lane of traffic is blocked, 4 minutes of backup develop. This fact emphasizes the need for a quick, accurate sizeup and the implementation of appropriate TTC procedures as soon as possible.

Note that this requirement is not necessarily placed on the actual first-arriving responder, but simply someone in the first group of responders to the incident. In many cases the fire department will be the first actual emergency agency on the scene, but later arriving law enforcement or DOT response units may handle the evaluation of traffic needs. It is just important that someone perform this task within the first 15 minutes. The goal will be to classify the incident into one of the three categories described in the first part of this chapter: minor, intermediate, or major incidents.

MINOR INCIDENT

Minor traffic incidents typically are disabled vehicles and minor crashes or fires that result in lane closures of less than 30 minutes. Often diversion of traffic into other lanes is not needed or is needed only briefly.

Traffic control is the responsibility of onscene providers, since it is not usually practical to set up a lane closure with traffic control devices.



Figure 4.9—Most extrication incidents fall into the Intermediate Incident category. Courtesy of Bob Esposito, Pennsburg, PA.

INTERMEDIATE AND MAJOR INCIDENTS

Intermediate incidents affect travel lanes for a period of 30 minutes to 2 hours and usually require diversion of traffic past the incident (**Figure 4.9**). Full roadway closures might be needed for short periods during the course of the incident. Major incidents typically involve hazardous materials, fatal vehicular collisions involving multiple vehicles, and natural or manmade disasters, and extend beyond the 2-hour mark.

In intermediate and major incidents, traffic is diverted through lane shifts or detoured around the incident and back to the original roadway. Consider large trucks, especially when having to detour them from a controlled-access roadway onto local or arterial streets. Large trucks may have to follow a separate route from cars because of weight, clearance, or geometric restrictions. Vehicles carrying hazardous materials might need to follow a different route from other vehicles. Gaining the cooperation of the news media in publicizing the existence of (and reasons for) major TIMAs can be of great assistance in keeping drivers and the general public informed and providing alternate traffic routes.

All traffic control devices needed to set up the TTC should be available for ready deployment at both intermediate and major incidents. The TTC should include proper traffic diversions, tapered lane closures, and upstream warning devices.

Expanding the Work Area

According to the MUTCD, minor traffic incidents (those that last less than 30 minutes) may be handled using the equipment at hand. For fire service purposes, this typically means using the apparatus for blocking and perhaps setting out a few markers or signs. If the incident will expand beyond this level or duration, a more formal TTC zone will need to be established. While some fire departments may have all the resources to establish a formal TTC zone, in most cases it will require cooperation among the fire department, law enforcement, and DOT responders to establish this operation. Regardless of who is involved, the MUTCD is specific on the setup of the TTC operation.

As described in Chapter 3 of this document, responders will need to establish a formal TIMA. The TIMA includes the advance warning area that tells motorists of the situation ahead, the transition area where lane changes/closures are made, the activity area where responders are operating, and the incident termination area where normal flow of traffic resumes (**Figure 4.10**). The distances for the advance warning and transition areas will differ depending on the speed limit in the area of the incident. Higher speed limits require longer advance warning and transition areas. **Table 4.1** contains the appropriate lengths based on the speed limit.



Figure 4.10—The initial stages of establishing a TIMA.

Table 4.1—MUTCD TIMA Distances

Miles Per Hour	2nd Warning Sign (B)	1st Warning Sign (A)	Transition Area Taper	Buffer Space	Work Space	Termination Area Taper
30	100	100	70	625	Length of incident	100 feet per lane
40	350	350	125	825	Length of incident	100 feet per lane
50	500	500	375	1,000	Length of incident	100 feet per lane
60	1,500	1,000	450	1,300	Length of incident	100 feet per lane
70	1,500	1,000	525	1,450	Length of incident	100 feet per lane

Only MUTCD-compliant signs and channelizing devices should be used to set up the TIMA. The manner in which they will be deployed depends on who is deploying them and from where they are doing so. Devices being deployed from apparatus that are already positioned on the scene most likely will be deployed starting at the incident scene/apparatus and working back toward the transition taper and advance warning areas. Later arriving units assigned to establish part or all of the TIMA markings may deploy channelizing devices starting from the advanced warning area and working towards the incident.

Regardless of the manner in which these devices are deployed, the following safety principles should be practiced by all of those people who will be deploying them:

- ▶ All personnel must be wearing MUTCD/ANSI-compliant high-visibility protective garments when placing markers or doing anything else on the roadway.
- ▶ Personnel always should face the traffic they are operating within and constantly pay attention to approaching vehicles.
- ▶ When possible, have a properly marked emergency vehicle provide blocking between the oncoming traffic and the person(s) deploying channelizing devices as they are being placed.
- ▶ Once the channelizing devices have been placed, retreat to the protection of the incident work space, unless flagging duties are required.

Realistically, the exact spacing between channelizing devices will be somewhat dependent upon the number of devices available and the distance to be covered. They should ideally be placed at 15-foot intervals. If flares are used initially during nighttime operations they should eventually be replaced with cones or tubular markers. Using flares and cones next to each other at night increases the visibility of cones and the direction for traffic flow.

Incidents that fall into the major incident criteria will require traffic control resources that are well beyond what most police and fire agencies have readily available. It is in these incidents that particularly close working relationships with DOT officials are important. They will be able to provide more substantial resources such as barricades, shadow vehicles, and improved signage.

FLAGGERS

In some cases it will be necessary to use emergency personnel to assist the traffic management process by performing manual direction of oncoming vehicles. In parts of the country that use fire police, this will be their primary function when responding to incidents. In other cases it most likely will be law enforcement personnel, but in some cases fire personnel may need to assist. The MUTCD refers to personnel performing these duties as flaggers and they must meet the requirements set out in 6E of the MUTCD. Personnel who have not been trained per these requirements never should be assigned to perform flagger functions.

When performing flagging duties, the flagger should stand on the shoulder adjacent to the lane being controlled or in the closed lane next to the controlled lane (**Figure 4.11**). At a spot constriction, the flagger may have to take a position on the shoulder opposite the closed section in order to operate effectively. The



Figure 4.11—Flaggers should be in the lane adjacent to the moving traffic.



Figure 4.12—Flaggers should wear highly visible garments when on the roadway.



flagger should have an identified escape route and be located far enough in advance of workers to warn them of approaching danger by out-of-control vehicles. The flagger should stand alone and be visible to motorists. The flagger always should wear MUTCD/ANSI-compliant high-visibility garments, have appropriate hand-held traffic control equipment, and be equipped with a whistle, air horn, or other communications equipment to warn downstream coworkers of impending danger (**Figure 4.12**).

The distances shown in **Table 4.2** show the stopping sight distance as a function of speed. These distances may be used for the location of flaggers, but may need to be increased for downgrades and other conditions that affect stopping distance.

Table 4.2—Stopping Sight Distance as a Function of Speed

Speed* (mph)	Distance (ft.)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

* Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed.

Source: MUTCD Chapter 6E.

Terminating the Temporary Traffic Control Operation

TTC measures must be left in place until the incident has reached its conclusion and all personnel and equipment that were located at the incident area have departed. Once it is safe to dismantle the TTC operation, this should in general be performed in one of two ways. If a shadow vehicle is available to protect personnel who are picking up TTC equipment, the devices may be picked up starting with the advance warning signs and working toward the incident area.

If a shadow vehicle is not available, it may be safer to begin picking TTC devices up at the incident area and work back towards the advance warning signs and area. When doing this, personnel should always face traffic within which they are working. If an emergency vehicle is available to provide a barrier between oncoming traffic and the devices they are picking up it should be used, and personnel should stay behind the vehicle. Once all of the equipment has been picked up and stowed, personnel and apparatus should leave the area immediately.



Recommendations for Setting Up a Safe Work Zone

- ▶▶ Extinguish potentially blinding, forward-facing emergency vehicle lighting, including headlights and emergency lights.
- ▶▶ Make sure floodlights are not shining into the eyes of oncoming drivers.
- ▶▶ Always wear MUTCD/ANSI-compliant protective garments when operating on the roadway.
- ▶▶ Carry all necessary traffic control devices on responding apparatus.
- ▶▶ Position the initial-arriving engine in a blocking position to oncoming traffic, taking into consideration topography, weather, and limits on visibility.
- ▶▶ Establish an adequately sized work zone.
- ▶▶ Always face traffic when deploying TTC devices.
- ▶▶ Make sure that personnel who will be expected to perform flagging duties are properly trained and equipped.
- ▶▶ Make sure that apparatus front wheels are turned away from the work area.

INCIDENT COMMAND FOR HIGHWAY INCIDENTS

In order to manage highway incidents effectively and safely on a regular basis, a two-pronged approach is required. The first prong is preincident planning. Agencies that develop effective preincident plans that emphasize interagency cooperation when responding to highway incidents are more likely to be successful when these incidents occur.

The *Manual on Uniform Traffic Control Devices* (MUTCD) notes that in order to reduce response and handling times for traffic incidents, highway agencies, appropriate public safety agencies (police, fire, emergency medical services (EMS), etc.), traffic management organizations, and private sector responders (towing and recovery and hazardous materials contractors) should be included in preincident plans for occurrences of traffic incidents, particularly along major and heavily traveled roadways. They also must establish ways of sharing incident information.

The second prong is effective use of the Incident Command System (ICS) when responding to incidents on the highway (or anywhere else for that matter). The proper use of ICS provides an organized framework under which all responding agencies may operate efficiently. Traffic incidents are a major cause of traffic congestion. That congestion can be minimized by diverting traffic before large numbers of vehicles are caught in the incident queue and clearing incidents as quickly as possible. The ICS is the most effective and efficient management process for traffic incident management and is particularly applicable to the response, clearance, and recovery stages. Its concepts result in reduced clearance times, mitigating the effects of traffic congestion at the incident site.

Preincident Planning for Roadway Incidents

To ensure the safety of responders and the best possible outcome for both victims and motorists involved in a highway incident, those working at the incident must understand each agency's capabilities and work together. Jurisdictional and agency/institutional issues must be resolved before the agencies come together at an incident. This can be accomplished by effective information sharing and preincident planning.

SHARING INFORMATION

In 2004, the National Cooperative Highway Research Program (NCHRP) published Report 520, *Sharing Information Between Public Safety and Transportation Agencies for Traffic Incident Management*. The objective of this study was to assess methods, issues, benefits, and costs associated with sharing information between public safety and transportation agencies in support of traffic incident management.

Nine locations were identified specifically for survey. They were selected because the public safety agencies and transportation agencies in those locations already were exchanging information. These are among the more than 130 traffic management centers operating in most U.S. urban areas. **Table 5.1** shows the locations surveyed and agencies sharing information. It is of particular interest that of the locations studied, only one (Phoenix, AZ) identified the fire department as a key public safety agency for roadway incidents. The remainder of the locations identified law enforcement as the key public safety agency.

Table 5.1—Locations Surveyed and Key Agencies Involved in Sharing Information

Location	Key Transportation Agencies	Key Public Safety Agencies
Albany, NY	New York State DOT; New York State Thruway Authority	New York State Police; Albany Police Dept.
Austin, TX	Texas DOT	Austin Police Dept.
Cincinnati, OH	Ohio DOT; Kentucky Transportation Cabinet	Hamilton County Dept of Communications; Cincinnati Police; Covington Police Dept.
Minneapolis, MN	Minnesota DOT	Minnesota State Patrol
Phoenix, AZ	Arizona DOT	Phoenix Fire Dept.
Salt Lake City, UT	Utah DOT	Utah Dept. of Public Safety Highway Patrol and Communications Bureau
San Antonio, TX	Texas DOT	San Antonio Police Dept.
San Diego, CA	California DOT	California Highway Patrol
Seattle, WA	Washington State DOT	Washington State Patrol

Source: National Cooperative Highway Research Program. (2004). Report 520, *Sharing Information Between Public Safety and Transportation Agencies for Traffic Incident Management*.

Four methods of information sharing were identified. *Face-to-face* involves direct interpersonal activities, usually at joint operations/shared facilities. *Remote voice* includes such things as telephones and mobile radio. *Electronic text* is text messaging by paging, facsimile, or email and text access to traffic-incident-related data systems, including computer-aided dispatch (CAD). It is worth noting here that most existing CAD systems are proprietary and not designed to exchange information with other CAD systems from different vendors. Therefore, public safety and transportation agencies should consider using compatible information systems to establish effective interagency information exchange whenever practical.

Other media and advanced systems includes technological methods not addressed in other categories, such as video and other imaging systems and integrated technologies, including advanced traffic management systems. No single method of sharing information was determined to be the best. Characteristics of the local environment and organizations are key factors affecting the success of a method. **Table 5.2** shows the types of information-sharing methods used at each of the locations.

Many factors influence multiagency traffic incident management information sharing. NCHRP identified the broad factors as institutional, technical, and operational. Leaders and organizations must be willing to work within cooperative partnerships and should have frameworks based on formal agreements or regional plans in place to guide day-to-day activities and working relationships at many organizational levels.

Building an effective information-sharing network or maintaining an existing network requires steps to minimize conflict and establish the basis of effective information coordination. Some suggested steps are as follows:

- ▶ establish a working-level rapport with responders from every agency working on incidents;
- ▶ ensure that working-level relationships are supported by Standard Operating Procedures (SOPs);
- ▶ create interagency agreements and system interconnections with key involved agencies; and
- ▶ institutionalize senior-level relationships among key agencies through policy agreements, interagency organizations, coordinated budget planning, and other processes to ensure operational partnerships will survive changes in political or management leadership.

Table 5.2—Summary of Information Sharing by Location

Location	Face-to-Face	Remote Voice	Electronic Text	Other Media and Advanced Systems
Albany, NY	Two co-location sites	Some sharing of public safety radios; some use of commercial wireless service “talk groups”	Shared CAD system	Roadway data; images; video shared remotely
Austin, TX	Co-location site ready to open	Service patrols equipped with local police radios	CAD data to be shared remotely	CCTV control shared with local police
Cincinnati, OH	Transportation center hosts regional incident management team operations	Some sharing of public safety radios; some use of commercial wireless service “talk groups”	Shared CAD under development	CCTV and other traveler information shared with public
Minneapolis, MN	Multiple co-location sites	Shared radio system; some use of commercial wireless service “talk groups”	Shared CAD data	CCTV and other traffic management systems are shared
Phoenix, AZ	—	Service patrols equipped with State police and DOT radios	DOT data workstations provided to local public safety agencies	CCTV shared with local fire department
Salt Lake City, UT	Co-location site	Shared radio system	Shared CAD data	CCTV and other traffic management systems are shared
San Antonio, TX	Co-location site	Service patrols equipped with local police radios; shared radio system to be deployed	Shared CAD data	CCTV and other traffic management systems are shared
San Diego, CA	Co-location site	Service patrols equipped with local police radios	Shared CAD data	CAD data are posted on traveler information Web site
Seattle, WA	—	Service patrols equipped with State patrol radios; center-center intercom system	Shared CAD data	Control of CCTV is shared with State patrol

All locations use standard telephones and facsimile machines for information sharing. CAD = Computer-Aided Dispatching. CCTV = Closed-Circuit Television. DOT = Department of Transportation. Source: National Cooperative Highway Research Program.

Although officials from locations surveyed strongly supported sharing traffic incident information and employing multiagency teams to manage traffic incidents, no location could quantify the benefits. There were no data to measure how other traffic incident management practices affected detection, notification, response, clearance time, responder safety, or other areas of performance. The study recommended that a set of performance measures be formulated and data collected and analyzed to promote information sharing, demonstrate effectiveness, and justify costs. More indepth information on this study and the nine selected locations is available online at http://gulliver.trb.org/publications/nchrp/nchrp_rpt_520.pdf



DEVELOPING THE PREINCIDENT PLAN

The basic process for developing a preincident plan has been widely published and taught throughout the fire service and will not be repeated in this document. The procedures for developing a preincident plan for roadway incidents are generally no different than for developing them for any other type of incident, with perhaps one major exception. In many cases when fire departments are developing a preincident plan they do so within the framework of the fire department only. Preincident plans for single-family dwelling fires or responses to activated fire alarms generally do not take into account other emergency response or similar agencies.

Ideally, the response to roadway incidents will involve a variety of response entities, each with its own specific role to play in the incident. In order for preincident plans to be effective and easily implemented, all agencies that may be covered under the plan must be included in the development of the plan. Many of the typical types of conflict that tend to bubble up at these incidents can be avoided if all the involved agencies understand each other's roles and operating procedures when they respond to roadway incidents.

As stated above, it is not the purpose of this document to detail the basic procedure for developing a preincident plan. Those procedures are commonly covered in officer training programs and texts such as the International Fire Service Training Association's (IFSTA)'s *Fire and Emergency Services Company Officer* manual. However, the following is a list of specific concepts that should be applied to preincident planning for roadway incident operations in order for the preincident planning to be effective and for the plans that are developed to be useful.

- ▶ Ensure that all agencies or sectors that may respond to roadway incidents are fully involved in the development of the plan.
- ▶ Different agencies or disciplines tend to use different procedures or formats/styles for developing preincident plans. Make sure that all of the involved parties agree on a process and format before beginning the planning.
- ▶ Make sure that the final plan that is developed is easily understood and implemented.
- ▶ Distribute the final plan to all of the involved agencies.
- ▶ Each agency involved in the plan should ensure that all personnel are trained on their part of the plan and understand their roles.
- ▶ Each agency or discipline should make sure that personnel are at least minimally briefed on the roles and procedures of the others included in the plan. For example, law enforcement personnel should be trained on fire department procedures for positioning apparatus at roadway scenes. This eliminates conflict on the scenes of actual incidents.
- ▶ All agencies involved in the plan should participate in training exercises on a regular basis. This ensures that new personnel learn the plan and experienced personnel are refreshed on the plan.
- ▶ All of the agencies should meet to review the plan at least on an annual basis. Problems that have been noted since the last review, or new situations that need to be addressed, can be discussed and the plan be modified accordingly. If the plan is modified, all personnel in the affected agencies should be notified of the changes.



Managing Roadway Incidents

Clearly, proper preincident planning and training are important considerations when preparing to respond to roadway incidents. However, when incidents do occur it will be necessary to apply the principles of sound incident management effectively in order to bring the incident to a safe and satisfactory conclusion. All agencies that respond to highway incidents must operate under the umbrella of a common command system in order for the incident to run efficiently.


Prior to the early 1970s, if fire departments or other response agencies had any formal incident management system in place at all, they were locally developed systems. The early 1970s saw the development of several model incident management systems that would receive wide use throughout the fire service and in some other disciplines. The ICS was developed by FIRESCOPE, which is a consortium of agencies that operated in southern California. ICS was eventually be adopted by the National Fire Academy (NFA) and most of the Federal fire and disaster response agencies, as well as numerous fire departments throughout the United States. At about the same time ICS was developed in California, the Phoenix, Arizona Fire Department developed an incident management system called the Fireground Command System (FGC). This system also was used widely throughout the United States as a result of extensive lecturing by members of the Phoenix Fire Department. Though these two systems had similarities, there were enough differences to cause problems when agencies ingrained in one or the other tried to work together.

In the early 1990s, an organization called the National Fire Service Incident Management System Consortium (NFSIMSC) was formed for the purpose of developing an incident management system that merged elements of ICS and FGC into a single system that everyone could use. This consortium consisted of representatives of most of the major fire service organizations and Federal agencies. By 1993, the group was in consensus on a merged system and the consortium began to publish a series of model procedure guides that were designed to teach people how to apply this system to specific types of incidents, such as structural fires, urban search and rescue incidents, and hazardous materials incidents. Most agencies that used one or the other of the original systems made necessary adjustments to use the merged system. However, there was still a very large number of response agencies that had failed to adopt either the old or new systems, and they continued to manage their incidents using little or no form of an organized incident management system.

Following the tragedy that occurred on September 11, 2001, it became clear to the Federal government that it would be necessary to mandate the use of an incident management system by all response disciplines in the United States. in order to effectively manage large scale emergencies, natural or manmade, that might occur in the future. In Homeland Security Presidential Directive (HSPD-5), *Management of Domestic Incidents*, the President of the United States directed the Secretary of Homeland Security to develop and administer a National Incident Management System (NIMS). On March 1, 2004, the Department of Homeland Security (DHS) issued the NIMS to provide a comprehensive national approach to incident management, applicable to all jurisdictional levels across functional disciplines. The NIMS provides a consistent nationwide approach for Federal, State, tribal, and local governments to work effectively and efficiently together to prepare for, prevent, respond to, and recover from domestic incidents, regardless of cause, size, or complexity.

The NIMS establishes standard incident management processes, protocols, and procedures so that all responders can work together more effectively. NIMS components include

- ▶▶ Command and Management;
- ▶▶ Preparedness;
- ▶▶ Resource Management;

- 
- ▶ Communications and Information Management;
 - ▶ Supporting Technologies; and
 - ▶ Ongoing Management and Maintenance.

The NIMS Integration Center (NIC) was established to oversee all aspects of NIMS. This includes the development of NIMS-related standards and guidelines and support to guidance for incident management and responder organizations as they implement the system. The NIC will validate compliance with the NIMS and National Response Framework responsibilities, standards, and requirements.

One component of NIMS is a designated ICS to be used on all incidents. With very few minor exceptions, the ICS mandated within NIMS was virtually identical to the merged system that was previously developed by the NFSIMSC. Because of this, the NFSIMSC continues to meet and develop model procedure guides that apply NIMS-ICS to particular types of incidents.

In 2004, the NFSIMSC, in cooperation with the U.S. Department of Transportation (DOT), developed a document titled *IMS Model Procedures Guide for Highway Incidents*. The purpose of this document is to introduce the use of ICS and the principles of Unified Command to all of the agencies involved with roadway incidents. On the topic of incident leadership, this document states

Rights of assumption of leadership roles can be unclear with highway incidents, especially when they involve several agencies within the same profession (e.g., Federal, State, county, and local law enforcement), or several agencies with overlapping jurisdiction (e.g., law enforcement and transportation), or mixtures of both.

Several factors affect leadership issues, including traditions, organizational capabilities, laws or statutes, etc. Leadership issues must be settled at the local level and must be settled in advance to avoid conflict at the incident scene.

The remainder of this chapter is intended to familiarize fire service personnel with the principles of applying ICS to roadway incidents. It emphasizes the need for a coordinated response and operations by all of the agencies that respond to roadway incidents. Most of the information in this section is taken, with permission, from the *IMS Model Procedures Guide for Highway Incidents*. That document should be consulted directly for more detailed information, case studies, and examples of model systems.

Initiating Incident Management

In order for incident management to be successful, effective incident command must be established beginning with the arrival of the first emergency responder, regardless of their rank or agency. The first-arriving responder should establish incident command, perform some basic command functions, and take charge of the incident. From the onset of the incident, principles of sound risk management should be integrated into the functions of incident command.

RULES OF ENGAGEMENT

Historically, the fire service has been very quick to apply rules of engagement to structure fire, wildland fire, and hazardous materials scenarios. They have not been so quick to apply those same principles to other known hazardous operations, such as emergency response and roadway scene operations. As stated previously in this document, the roadway is one of the most hazardous locations at which we operate. Therefore we must apply principles of risk management to these scenes and operations.

The National Fire Protection Association (NFPA) Standard 1500, *Standard on Fire Department Occupational Safety and Health Program*, objective 8.2.2, states that the concept of risk management shall be utilized on the basis of the following principles:

- ▶ Activities that present a significant risk to safety of members shall be limited to situations where there is a potential to save endangered lives.
- ▶ Activities that are routinely employed to protect property shall be recognized as inherent risks to the safety of members. Actions shall be taken to reduce or avoid hazards and unnecessary risks.
- ▶ No risk to safety of members shall be acceptable when there is no possibility to save lives or property.

Rules of engagement apply to all professions and all hazards encountered in conjunction with highway incidents. Therefore, all agencies should adopt common rules for highway incident management. This will greatly assist incident commanders when considering courses of action. **Figure 5.1** shows a template for Model Rules of Engagement as they are applied to roadway emergency scenes. Agencies should consider adopting them into their SOPs and applying them on all roadway incidents.

RISK ANALYSIS

Risk assessment is an ongoing process that lasts for the entire incident. The Incident Commander (IC) should continually re-evaluate conditions and change strategy or tactics as necessary. At a minimum, the risk analysis for a highway incident should consider

Hazards

- ▶ fire and explosion hazards;
- ▶ environmental hazards;
- ▶ criminal and terrorist threats; and
- ▶ traffic hazards.

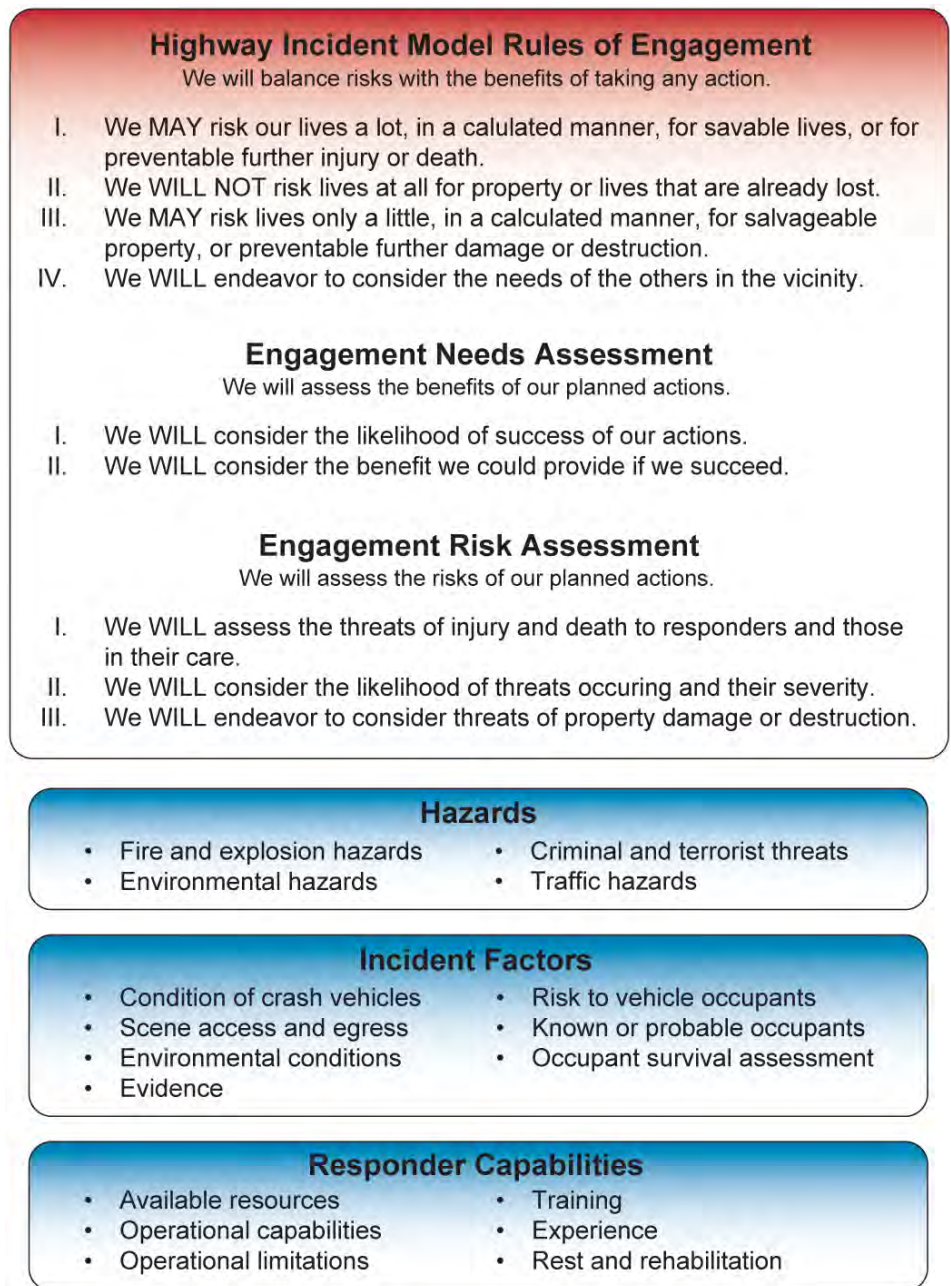


Figure 5.1—Model Rules of Engagement for highway incidents.

Incident Factors

- ▶▶ condition of involved vehicles;
- ▶▶ scene access and egress;
- ▶▶ environmental conditions;
- ▶▶ evidence;
- ▶▶ risk to vehicle occupants;
- ▶▶ known or probable occupants; and
- ▶▶ occupant survival assessment.

Responder Capabilities

- ▶▶ available resources;
- ▶▶ operational capabilities;
- ▶▶ operational limitations;
- ▶▶ training;
- ▶▶ experience; and
- ▶▶ rest and rehabilitation.

Commanding The Incident

The ICS, as mandated by NIMS, provides the mechanism for numerous emergency response disciplines to work together in an integrated and coordinated manner during major incidents. This section will review the highlights of Command structure at a highway scene, based on the *IMS Model Procedures Guide for Highway Incidents*. Refer to the actual document for indepth information.

ESTABLISHING COMMAND

As stated above, the first-arriving responder must assume Command of the incident and remains in control until command is transferred or the incident is stabilized and terminated. The initial IC has several options based on the incident type, situation, and department policy.

Initially, an incident may not have obvious, visible indicators of its significance/severity and will require **investigation**. The officer goes with the crew to provide assistance and supervision. This is often referred to as the **investigation mode** and it equates directly to the **nothing showing mode** commonly used in structural firefighting.



Figure 5.2—A car fire may require the Company Officer/IC to be directly involved in incident mitigation. Courtesy of Ron Moore, McKinney, TX FD

Some situations require immediate **intervention**, calling for direct involvement of the initial responders in initial stabilization actions (**Figure 5.2**). This may be called the **intervention mode**. The IC's direct involvement should not last more than a few minutes. At the end of that time, a) the situation is stabilized; b) the IC must withdraw to establish an Incident Command Post (ICP); or c) Command is transferred to a later-arriving officer. The intervention mode equates to the **fast-attack mode** commonly used in structural firefighting.

Large, complex incidents, or those with the potential for rapid expansion, require the first arriving responder to establish immediate, direct, overall **command**. This is referred to as operating in the command mode. When choosing the **command mode** the IC will do nothing other than command

activities until relieved of the IC duties. If the initial IC is part of a larger crew, the IC has several options on what to do with the rest of the crew while operating in the command mode. These include



- ▶ giving the crew a tactical assignment and placing them in action;
- ▶ assigning the crew to work under the supervision of another officer or crew leader; and
- ▶ assigning the crew to perform staff functions to assist the IC.

TRANSFERRING COMMAND

Transferring Command must follow predetermined procedures. Often, the first Transfer of Command takes place via radio, since there are only a few resources committed to the incident. Subsequent transfers to higher-ranking chief officers or supervisors must be conducted face-to-face at the ICP.

In some extremely complex incidents or critical situations, an inbound resource or chief officer may be advised of the intent to transfer Command to him/her upon his/her arrival at the scene; however, Command cannot be passed or transferred to any officer not onscene.

When Command is transferred, it is important for the two parties involved in the transfer to engage in an effective relay of information. The IC who is being relieved must fully brief the oncoming IC of the resources that are on the scene and the actions that are under way. Command cannot be transferred effectively until the new IC is fully apprised of the incident status and situation.

COMMAND AIDS

A number of aids can be used to assist the IC in ensuring that the Command process remains orderly and well-documented. The need to implement any or all of these aids will depend on the size and scope of the incident, as well as the capabilities of the IC and other responders.

In medium to large, complex, or escalating incidents it is essential to document resources committed on the scene as to their current location, their assigned Division or Group, and resources available. **Tactical worksheets** provide a standardized format for that documentation and allow for a more effective Transfer of Command if necessary. Many commercially available tactical worksheets can be used, or the agency can design its own based on local preferences and resources.

Progress reports provide the initial and ongoing information critical for the IC to make effective and safe decisions. Progress reports should be provided by the first resources assigned to Divisions (geographic areas) or Groups (functional assignments). It is important to communicate both progress toward objectives and when progress cannot be achieved.

The **Incident Action Plan** (IAP) identifies the strategy, tactics, and resources to manage and control the incident within a specified time. The tactics are measurable in both performance and time. Short-term, simple operations may not require a written IAP. Large-scale or complex incidents need a written IAP for each operational period. The IAP must be assessed for effectiveness and modified as necessary.

ORGANIZATIONAL STRUCTURE

The ICS organizational structure develops based on the nature, size, and complexity of the incident. The only difference between ICS on a large incident and ICS on a small incident is the method of organizational growth to meet the needs of the incident. Expanding the ICS organization is the sole decision of the IC and is done when it is determined that the initial or reinforced attack is insufficient. Terms and titles used in the ICS organizational hierarchy are defined in **Table 5.3**.

Table 5.3—ICS Organizational Hierarchy

Title	Description	Example
Incident Commander	Individual responsible for managing all incident operations	
Officer	Member of the Command Staff	Public Information Officer, Safety Officer, Liaison Officer
Section Chief	Member of the General Staff	Operations Section Chief, Planning Section Chief, Logistics Section Chief, Finance/Administration Section Chief
Director	Individual responsible for command of a Branch	Medical Branch Director, Traffic Management Branch Director
Supervisor	Individual responsible for command of a Division or Group	Extrication Group Supervisor, Traffic Control Group Supervisor, North Division Supervisor
Manager	Individual responsible for a particular activity within the incident organization	Staging Area Manager, Rehab Area Manager
Unit Leader	Individual responsible for a particular activity within the Operations, Planning, Logistics, or Finance/Administration Sections	Traffic Control Unit Leader, Supply Unit Leader
Single resource	Individual or piece of equipment and its personnel that can be used on an incident	Patrol car, engine company, ambulance, roadway service patrol

In most jurisdictions, an initial response to a reported highway incident consists of one to five single resources. The first-arriving resource assumes Command until the arrival of a higher ranking officer, at which point Command is transferred. If the initial response resources are insufficient, the IC will initiate a reinforced response, which may include special resources from within the agency or through mutual aid.



Figure 5.3—Task level activities are performed by individual companies.

Even a single unit response involves all three levels of the command structure. For example, the officer assumes Command, determines the strategy and tactics, and supervises the crew doing the task. Many incidents involve a small number of resources, such as an engine, ambulance, and chief. In this situation, the IC handles the strategic and tactical levels. Resources report directly to the IC and operate at the task level.

Complex situations often exceed the capability of one officer to manage the entire operation effectively. Dividing an incident scene into Divisions (geographic area assignments) or Groups (functional assign-

The basic configuration of Command includes three levels: strategic, tactical, and task. The strategic level involves the overall command of the incident. All planning, determining appropriate strategy, and establishing incident objectives that are included in the IAP are accomplished at the strategic level. Supervisors direct operational activities toward specific incident objectives at the tactical level. Activities at the task level are normally completed by individual companies or specific personnel (Figure 5.3).



Before Multibranch Structure

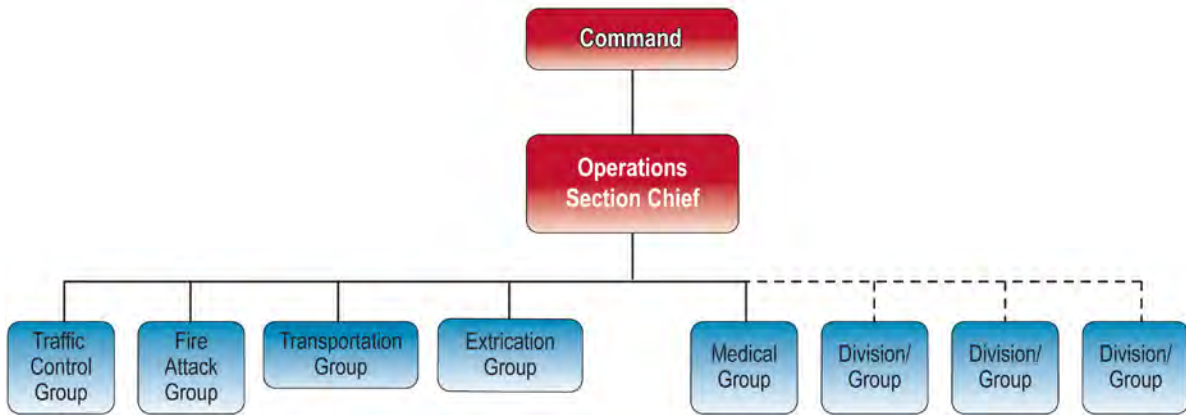


Figure 5.4 –This span-of-control is stretched too far for the IC to control effectively.

ments) reduces the span-of-control to more manageable units and allows the IC to communicate with an organizational level rather than multiple individual officers.

EXPANDING THE ORGANIZATION

When the number of Divisions/Groups exceeds the recommended span-of-control of three to seven, or the incident involves two or more distinctly different operations, the IC may choose to establish a multi-branch structure and allocate the Divisions/Groups within those Branches (Figures 5.4 and 5.5).

Some incidents may require a functional Branch structure with each involved department within the jurisdiction having its own functional Branch (Figure 5.6). It is important to remember that resources at multi-jurisdictional incidents are best managed under the agencies that have normal control over those resources.

Two-Branch Organization

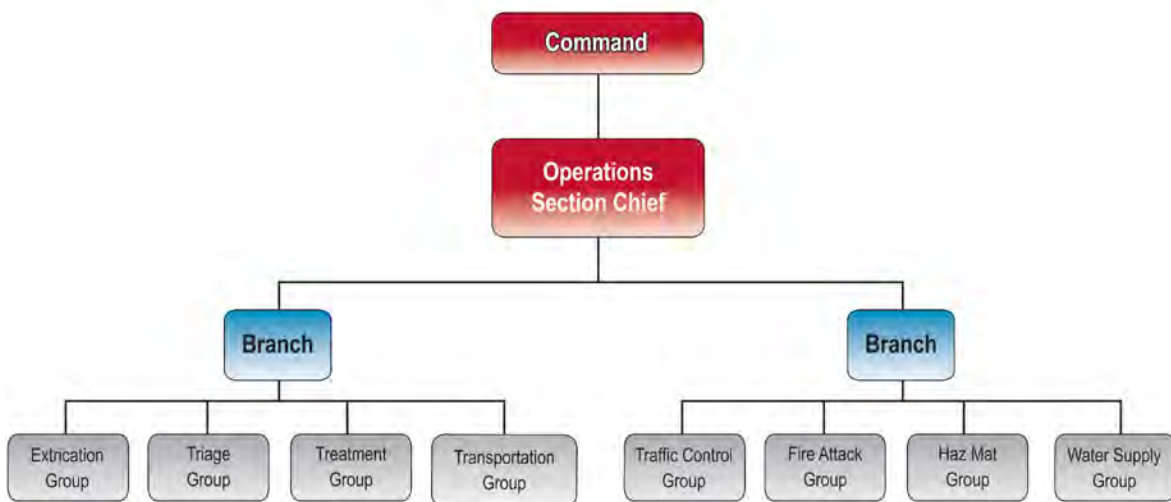


Figure 5.5—This organization represents a more manageable span-of-control for the IC.

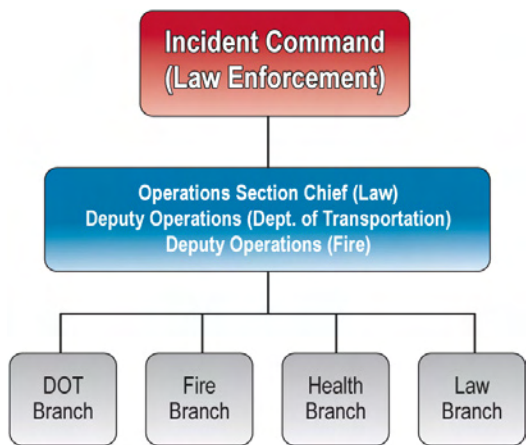


Figure 5.6—A functional branch structure.

Incidents that expand beyond the implementation of a few simple Branches in order to manage the assigned resources typically will require the activation of one or more of the four major Sections recognized by ICS: Operation, Planning, Logistics, and Finance/Administration. Each of these Sections is led by a chief who reports directly to the IC.

The IC also has the option of appointing three Command Staff positions that report directly to the IC. Command Staff positions are responsible for key activities that are not part of the line organization. The Public Information Officer (PIO) is normally the point of contact for the media and other governmental agencies seeking information related to the incident. The Safety Officer assesses hazardous and unsafe situations and develops measures for assuring responder safety. The Liaison Officer is the point of contact for representatives from cooperating or assisting agencies and is not directly involved in incident operations. All Command Staff positions can have assistants, as indicated by incident complexity.

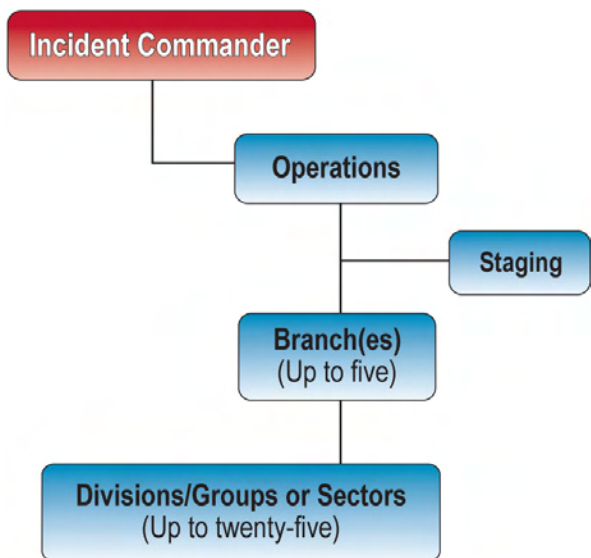


Figure 5.7—The Operations Section.

The **Operations Section** is responsible for the direct management of all incident tactical activities, the tactical priorities, and the safety and welfare of the personnel working in the Operations Section (**Figure 5.7**). The Operations Section Chief (or simply “Ops Chief”) designates an appropriate command channel to communicate strategic and specific objectives to the Branches and/or tactical-level management units. The Ops Chief also has responsibility for oversight of Staging Area functions.

The Operations Section often is implemented (staffed) as a span-of-control mechanism. When the number of Branches or Divisions/Groups exceeds the capability of the IC to manage effectively, the IC may staff the Operations Section to reduce the span-of-control, and thus transfer direct management of all tactical activities to the Operations Section Chief. The IC then is able to focus his/her attention on management of the entire incident rather than concentrating on tactical activities.

Highway incidents often involve aircraft. Aeromedical helicopters may be used to transport patients. Law enforcement may have helicopters in the vicinity, and news services may have traffic reporting helicopters in the area. If the incident is large and prolonged, sightseers in private aircraft also may contribute to air traffic in the area. If aircraft are involved in the operations of the incident, the Operations Section Chief should establish the Air Operations Branch to manage this portion of the incident.

It is important to emphasize that the implementation of an Operations Section is not an automatic event based on the arrival of the second or third chief officer on the scene. It may be more appropriate to assign later-arriving chief officers to developing Division, Group, or Branch positions first. Chief officers in these positions enhance the Command organization and improve the decisionmaking process.

In some situations, it is more prudent to implement one of the other Section Chiefs before the Operations Section is implemented. For example, a prolonged incident may require the early implementation of a

Planning Section before the span-of-control criteria requires an Operations Section Chief.

The **Planning Section** is responsible for gathering, assimilating, analyzing, and processing information needed for effective decisionmaking (Figure 5.8). Information management is a full-time task at large and complex incidents. The automation of traffic management in recent years has greatly increased the amount and quality of information available to traffic managers, enabling them to adjust traffic signals and other controls in reaction to a highway incident. These new traffic management capabilities depend on receiving information concerning the current situation, and also the forecasted duration and extent of incident scene operations. The Planning Section will handle much of this demand for information, working closely in coordination with the Information and Liaison Officers on the Command Staff.



Figure 5.8—The Planning Section.

This critical information should be forwarded immediately to Command (or whoever needs it). Information also should be used to make long-range plans. The Planning Section Chief’s goal is to plan ahead of current events and identify the need for resources before they are needed. The strategic concerns of the IC need to extend forward with sufficient foresight to cover all of his/her ICS organization’s activities.

Transportation organizations have a great deal of specialized knowledge that can be helpful to the planning function, and they should be used as technical specialists by the Planning Section on complex incidents. These technical specialists are especially helpful when the incident involves more than one mode of transportation, such as rail crossings or transit facilities.

The **Logistics Section** is the support mechanism for the organization. The Logistics Section provides services and support systems—which may be separated into Branches—to all the organizational components involved in the incident, including facilities, transportation, supplies, equipment maintenance, fueling, feeding, communications, and responder medical services and rehabilitation. Its organizational breakdown is shown in Figure 5.9.

The **Finance/Administration Section** is established only when involved agencies have a specific need for financial services (Figure 5.10). There are always cost-reimbursement issues with multiagency operations.

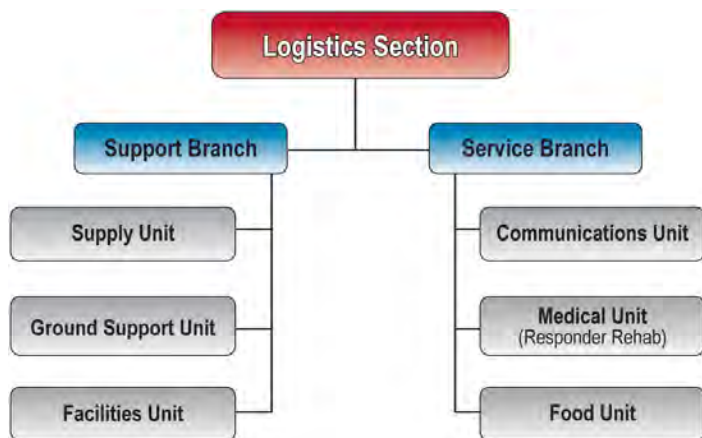


Figure 5.9—The Logistics Section.

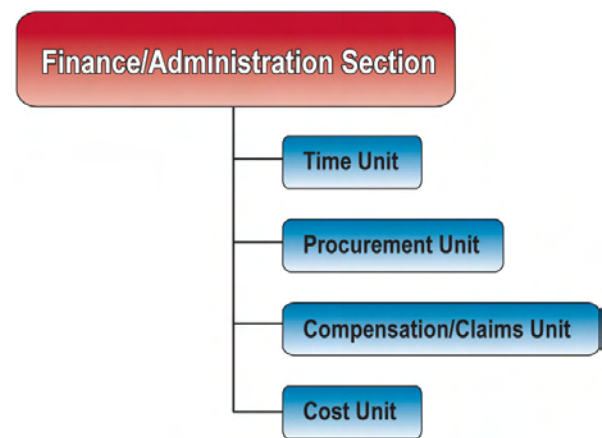


Figure 5.10—The Finance/Administration Section.



The designated members of this section are responsible for authorizing expenditures to obtain resources necessary to manage all aspects of the incident.

UNIFIED COMMAND

Unified Command may be appropriate in **a)** a multijurisdictional incident, such as a collision that crosses city and county lines or **b)** a multidepartmental incident, such as a collision on an interstate that brings responders from fire, EMS, law enforcement, DOT, and other agencies. The lead agency is determined by the initial priorities. For example, the fire department would be the lead agency if extrication or vehicle fire was involved. As priorities change, the lead agency may change. For example, once all patients have been removed and transported, law enforcement would most likely take over as lead agency. Changes in the lead agency should be accompanied by staffing changes in the Operations Section. Under Unified Command, priorities, strategies, and objectives are determined jointly by the representatives from each agency or jurisdiction.

The importance of an effective Unified Command on major roadway incidents cannot be overemphasized. There are multiple priorities by various agencies on these incidents. Failure to establish Unified Command often is responsible for conflict between agencies or responders. Some of the concepts associated with using an effective Unified Command are somewhat complex and require preincident planning and training. The concepts surrounding Unified Command exceed what can be covered in this type of document. The *IMS Model Procedures Guide to Highway Incidents* dedicates an entire chapter to this topic. It is highly recommended that agencies consult that document and work those concepts into their SOPs.

PERSONNEL ACCOUNTABILITY

The IC is responsible for the overall accountability of personnel operating at the incident scene. Each ICS position also is accountable for all subordinate responders through the chain of command to the IC. However, in large or complex incidents, separate accountability officers may be used.

Currently, there exists no single, nationally recognized or mandated personnel accountability system in use by the fire service or any other emergency response agencies. There are several fairly commonly used accountability systems throughout the fire service. However, they all differ somewhat, and are not necessarily interchangeable. Whatever the accountability system used, it must be able to locate every responder at the incident periodically by roll call. When multiple agencies respond, using the combination of each responder's identification number and each agency's name should ensure that responders from all agencies are located (e.g., Green County Engine 1, Oak City Engine 1).

EMERGENCY COMMUNICATIONS

All emergency services should have a standard method for giving emergency message and notification of imminent hazards priority over routine radio communication. NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, identifies the need to use clear text speech and to have a standard operating guideline that uses the term "Emergency Traffic" to clear radio traffic. Clear-text transmissions also are mandated by NIMS-ICS. Any responder who is in trouble or subject to an emergency condition can declare Emergency Traffic. At the conclusion of the emergency, an "All Clear" must be transmitted to allow a return to normal radio and incident operations.

A signal, such as an apparatus air horn, can be used in addition to an emergency traffic radio message to signal an ordered evacuation. Many departments use a series of three 10-second blasts of an air horn with

a 10-second silence between each series of blasts. If an air horn is used, it is important to make sure the apparatus is away from the Command Post to avoid missing radio messages while the horn is sounding.

Transportation Department Roles in the Highway Incident Incident Command System Organization

Transportation departments are one of the newer participants in highway incident management and are beginning to appear more frequently on ICS organization charts. The Federal Highway Administration (FHWA) developed the *Simplified Guide to the Incident Command System for Transportation Professionals* to educate transportation personnel and facilitate the integration of this segment into ICS. This guide is available online at: http://www.ops.fhwa.dot.gov/publications/ics_guide/index.htm#chapt1

This was also partially the reason that the DOT commissioned the NFSIMC to develop the *IMS Model Procedures Guide to Highway Incidents*. The group of subject matter experts who helped to develop that document included representatives of fire, EMS, law enforcement, transportation, and other government agencies.

Traffic control can be incorporated easily into the ICS organization as Strike Teams, Task Forces, Traffic Management/Control Groups, Divisions, or Branches. Strike Teams allow the IC to use a significant number of like resources. For example, four police patrol units that are assigned to traffic control could be considered a Traffic Control Strike Team. Task forces organize different types of resources for a specific purpose. An example of this might be two police units, a DOT response vehicle, and an engine company that are grouped together to set up a Traffic Incident Management Area (TIMA) (Figure 5.11).



Figure 5.11—Two examples of a Traffic Control Task Force.

Traffic Control Groups may be formed to consolidate traffic control functions under a single functional organizational element within the ICS. Traffic Management Divisions manage a defined geographical part of the highway incident, and may be activated to manage traffic movement from separate directions, routes, access points, or intersections. If large numbers of resources are required for this function, there may need to be several Groups and/or Divisions. This might dictate the need to appoint a Traffic Branch Director to oversee that entire part of the incident organization and operation (Figure 5.12).

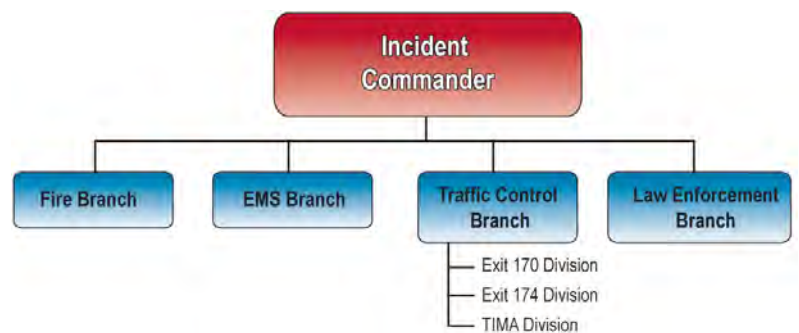


Figure 5.12—On major incidents a Traffic Control Branch may be required.

Organizing the Incident

ICS is applicable to all highway incidents. This section will summarize incidents of increasing complexity based on the *IMS Model Procedures Guide for Highway Incidents*. The reader is strongly encouraged to review the entire publication for a more indepth explanation and examples of highway incident situations with ICS applications.

PRIOR TO ARRIVAL OF RESPONSE UNITS

One of the most dangerous times of a highway incident is between when the event occurs and the arrival of the responding units. In addition to the damage, injuries, and/or spills associated with the initial event, traffic is altered with no organized control. Drivers are distracted and often trying to see what has happened rather than watching where they are driving. Further congestion occurs when “Good Samaritans” stop to help. This situation increases the risk of secondary crashes, resulting in further damage and injuries.

Information regarding the event comes to Dispatch from civilians on the scene. It is important that Dispatch passes on any additional information that is relevant to responding units to assist in their preparation for managing the incident. This should include items such as the number and types of vehicles involved, number of injured people, and basic information on the possible severity of their injuries, extent of entrapment, fires or hazardous materials involved, and other useful information.

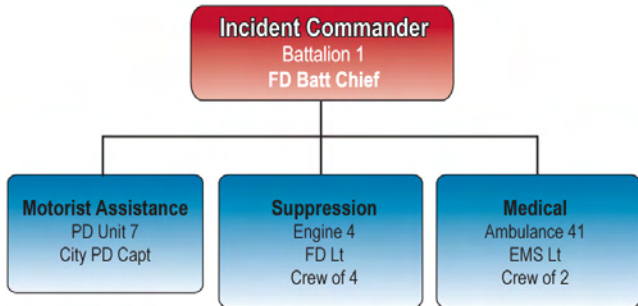


Figure 5.13 –A typical small response.

ambulance, and perhaps a battalion chief. In this case, the IC assigns companies as they arrive to provide medical care, firefighting and spill control, handle extrications if needed, and manage traffic control and accident investigation. Tasks are prioritized and assigned based on limited resources. This response calls for a simple ICS organization, with all units reporting directly to the IC (Figure 5.13).

EXPANDED INCIDENT

The ICS organization can be adjusted to deal with additional resources used on an expanded incident (Figure 5.14). Resources are put into common ICS management components to maximize the organizational effectiveness. The basic structure addresses the need for unity of command, a well-defined chain of command, and keeping the span-of-control manageable. It is generally safe to limit one’s span-of-control to between three and seven subordinates, with an optimum of five.

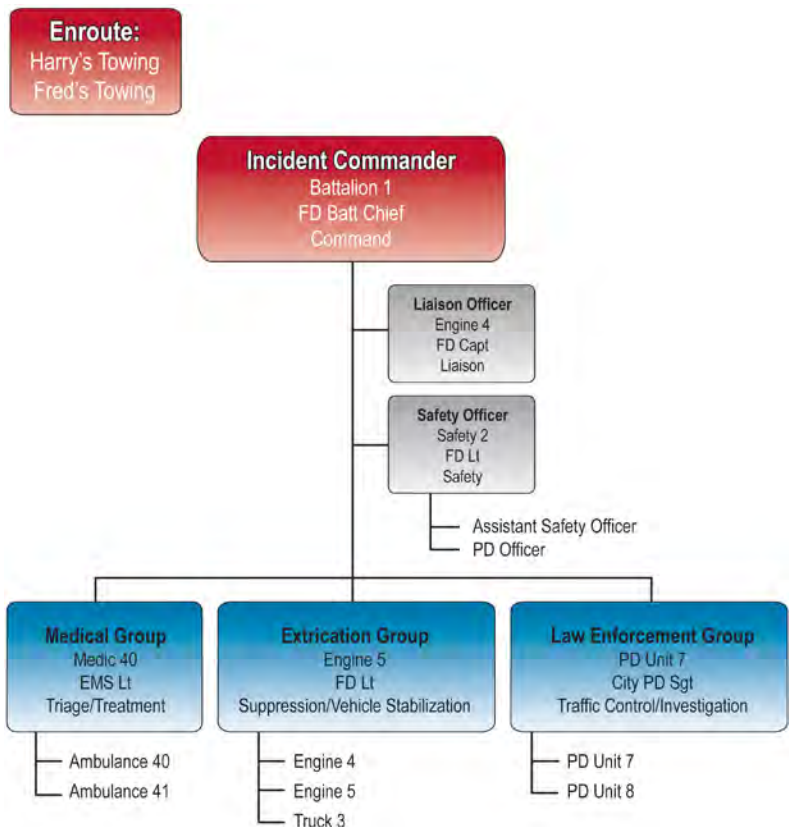


Figure 5.14—A typical expanded response.

REINFORCED RESPONSE

The reinforced response is necessary for the unusual complex highway incidents that require additional resources to deal with further complications such as extreme traffic congestion with the need for more traffic control. Incidents that grow to this level also typically will last for several hours or even more than one day. The ICS organization for a reinforced response might look like **Figure 5.15**.

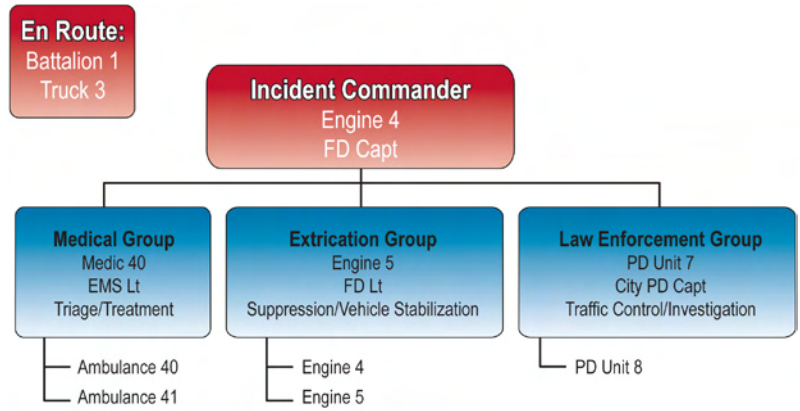


Figure 5.15—A typical reinforced response.

ADDITIONAL CONSIDERATIONS

The following are some additional considerations that must be taken into account when operating at roadway emergency scenes.

Responder Rehabilitation

The need for responder rehabilitation, usually simply called “rehab,” should be considered during the initial planning stages of the emergency response. All supervisors should be aware of the responders in their span-of-control and ensure their safety and health. In some cases it is a little more difficult to set up effective rehab at roadway incident scenes than at other, more typical, emergency scenes. Because personnel often are operating while fully exposed to traffic hazards and weather elements, the rehab unit should offer shelter and security.

During particularly hot weather, the rehab area should not be set up on the road surface, as this will make it difficult for responders to cool down. In these cases it would be better to move the rehab area to a grassy area adjacent to the road, under an overpass, or inside a rehab vehicle.

Critical Incident Stress Management

All agencies involved in responding to highway incidents should have a method of identifying the incidents that may affect responders negatively and providing appropriate stress management response. Incidents that involve large numbers of civilian casualties or deaths, or those that involve serious injury or death of a responder should result in an automatic critical incident stress management (CISM) response. Since most major highway incidents are multiagency or multijurisdictional, the primary jurisdiction should include the needs of all responders in CISM plans or response.

Recommendations for Managing Highway Incidents

- ▶ Develop a formalized traffic incident management information-sharing method between public safety and transportation agencies.
- ▶ Manage major traffic incidents using the ICS.
- ▶ Use Unified Command to manage traffic incidents involving multiple jurisdictions or departments.



- ▶▶ Include procedures for operating under Unified Command in preincident plans and practice them on a regular basis.
- ▶▶ Incorporate transportation departments into ICS when appropriate.
- ▶▶ Establish preincident plans for areas with high rates of motor vehicle incidents and highway emergencies to identify tactics, resource needs, and procedures to ensure responder safety. Tailor the plans to the characteristics and needs of each site (e.g., blind curves, hills, sloped areas, traffic volume, etc.).

BEST PRACTICES AND OTHER SOURCES OF INFORMATION FOR EFFECTIVE HIGHWAY INCIDENT OPERATIONS

There is an almost endless number of sources that fire departments and other agencies that respond to highway emergencies can go to for additional information on how best to handle these incidents. Many of these sources contain detailed information that can be described here only briefly. The purpose of this chapter is to identify some of the more common sources of highway response information and to describe briefly the information available. Responders are strongly encouraged to go to these locations for more information and assistance in forming good plans for dealing with roadway emergency scenes.

The latter portion of this chapter also contains some useful information that can be used by agencies seeking to develop their own Standard Operating Procedures (SOPs) for responding to roadway emergency scenes. The information that needs to be covered in any particular plan will vary, depending on location, conditions, and resources. However, the information here will be helpful in showing the kinds of things that should be covered in any plan.

Sources of Information

This section highlights a number of excellent sources for additional information that can be used for agencies seeking to learn more about effective highway incident management operations.


EMERGENCY RESPONDER SAFETY INSTITUTE

Created as a committee of the Cumberland Valley Volunteer Firemen's Association, the Emergency Responder Safety Institute (ERSI) serves as an informal advisory panel of public safety leaders committed to reducing deaths and injuries to America's emergency responders working at roadway incidents. Members of the institute, all highly influential and expert in their fields, are personally dedicated to the safety of men and women who respond to emergencies on or along our Nation's streets, roads, and highways. Members of the institute include trainers, writers, managers, government officials, technical experts, and leaders who, through their individual efforts and collective influence in the public safety world, can bring meaningful change.

The ERSI operates a comprehensive informational Web site at www.respondersafety.com. This Web site includes breaking news on roadway-related incidents, downloadable training courses and information, roadway incident equipment information, a photo gallery, model SOPs and Standard Operating Guidelines (SOGs), information on "move over" programs, and a large number of links to other related Web sites. This is an excellent first source of information for people and agencies looking at this topic.

NATIONAL TRAFFIC INCIDENT MANAGEMENT COALITION

The National Traffic Incident Management Coalition (NTIMC) was launched in 2004 to promote the safe and efficient management of traffic incidents. The NTIMC operates with the support of the American Association of State Highway Transportation Officials (AASHTO). More than 20 major fire, EMS, law enforcement, transportation, and other government agencies are members of this coalition.



The purpose of the NTIMC is to work together on strategies for improving congestion relief, responder safety, and domestic emergency preparedness as it relates to roadway emergency scenes. To accomplish this NTIMC members work together to:

- ▶ promote State, regional, and local traffic incident management programs;
- ▶ promote incident management program standards, best practices, and performance measures; and
- ▶ promote incident management program research.

One major accomplishment of the NTIMC was the development of a National Unified Goal (NUG) for Traffic Incident Management (TIM) in early 2007. The NUG has been ratified by most of the major participants in the NTIMC, as well as other related organizations. The NUG is a unified national policy that encourages State and local transportation and public safety agencies to adopt unified, multidisciplinary policies, procedures, and practices that will dramatically improve the way traffic incidents are managed on U.S. roadways.

The NUG is organized around three major objectives:

- ▶ responder safety;
- ▶ safe, quick clearance of roadway incidents; and
- ▶ prompt, reliable incident communications.

The NUG promotes key strategies related to each theme, and accountability to performance targets. Key strategies include development of multijurisdictional, multidisciplinary traffic incident management policies, procedures and training, and development of national, multidisciplinary recommended practices for many operational issues related to traffic incident management. The NUG consists of 18 strategies organized among four major topical areas. These are as follows:

Cross-Cutting Strategies

- ▶ **Strategy 1. TIM Partnerships and Programs.** TIM partners at the national, State, regional, and local levels should work together to promote, develop, and sustain effective TIM programs.
- ▶ **Strategy 2. Multidisciplinary National Incident Management System (NIMS) and TIM Training.** TIM responders should receive multidisciplinary NIMS and TIM training.
- ▶ **Strategy 3. Goals for Performance and Progress.** TIM partners should work together to establish and implement performance goals at the State, regional, and local levels for increasing the effectiveness of TIM, including methods for measuring and monitoring progress.
- ▶ **Strategy 4. TIM Technology.** TIM partners at the national, State, regional, and local levels should work together for rapid and coordinated implementation of beneficial new technologies for TIM.
- ▶ **Strategy 5. Effective TIM Policies.** TIM partners at the national, State, regional, and local levels should join together to raise awareness regarding proposed policies and legislation that affect achievement of the NUG Objectives of Responder Safety; safe, quick clearance; and prompt, reliable traffic incident communications.
- ▶ **Strategy 6. Awareness and Education Partnerships.** Broad partnerships should be developed to promote public awareness and education regarding the public's role in safe, efficient resolution of incidents on the roadways.

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Objective 1: Responder Safety

- ▶ **Strategy 7. Recommended Practices for Responder Safety.** Recommended practices for responder safety and for traffic control at incident scenes should be developed and widely published, distributed, and adopted (Figure 6.1).
- ▶ **Strategy 8. Move Over/Slow Down Laws.** Drivers should be required to move over/slow down when approaching traffic incident response vehicles and traffic incident responders on the roadway.
- ▶ **Strategy 9. Driver Training and Awareness.** Driver training and awareness programs should teach drivers how to react to emergencies on the roadway in order to prevent secondary incidents, including traffic incident responder injuries and deaths.



Figure 6.1—Good safety principles always must be followed.

Objective 2: Safe, Quick Clearance


- ▶ **Strategy 10. Multidisciplinary TIM Procedures.** TIM partners at the State, regional, and local levels should develop and adopt multidisciplinary procedures for coordination of TIM operations, based on national recommended practices and procedures.
- ▶ **Strategy 11. Response and Clearance Time Goals.** TIM partners at the State, regional and local levels should commit to achievement of goals for traffic incident response and clearance times (as a component of broader goals for more effective TIM—see Strategy 3).
- ▶ **Strategy 12. 24/7 Availability.** TIM responders and resources should be available 24 hours per day/7 days per week.

Objective 3: Prompt, Reliable Incident Communications

- ▶ **Strategy 13. Multidisciplinary Communications Practices and Procedures.** Traffic incident responders should develop and implement standardized multidisciplinary traffic incident communications practices and procedures (Figure 6.2).
- ▶ **Strategy 14. Prompt, Reliable Responder Notification.** All traffic incident responders should receive prompt, reliable notification of incidents to which they are expected to respond.
- ▶ **Strategy 15. Interoperable Voice and Data Networks.** State, regional, and local TIM stakeholders should work together to develop interoperable voice and data networks.
- ▶ **Strategy 16. Broadband Emergency Communications Systems.** National Traffic Incident Management stakeholders (working through the NTIMC) should work together to reduce the barriers to integrated broadband emergency communications systems' development and integration (both wired and wireless).



Figure 6.2—Various agencies must work together on these incidents.

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- ▶ **Strategy 17. Prompt, Reliable Traveler Information Systems.** TIM partners should encourage development of more prompt and reliable traveler information systems that will enable drivers to make travel decisions to reduce the impact of emergency incidents on traffic flow.
 - ▶ **Strategy 18. Partnerships with News Media and Information Providers.** TIM partners should actively partner with news media and information service providers to provide prompt, reliable incident information to the public.

For more detailed information on the NTIMC and/or the NUG, go to their Web site at <http://www.transportation.org/?siteid=41&pageid=591>

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

Much of the previous portions of this document have focused on the contents of the *Manual on Uniform Traffic Control Devices (MUTCD)*. The U.S. Department of Transportation/Federal Highway Administration (DOT/FHWA) publishes the MUTCD. This is an extensive document, and all emergency response agencies should refer to it when making traffic incident management plans and preparing to purchase equipment related to this function.

The DOT no longer publishes this document in printed format, although it does authorize several other publishers to print and distribute it. The DOT does make the entire document available online (<http://mutcd.fhwa.dot.gov>). Once at this site the user may look at the document online or download portions of the entire document to their own computers.

U.S. FIRE ADMINISTRATION ROADWAY OPERATIONS SAFETY WEB SITE

The U.S. Fire Administration (USFA), which authorized the development of this report, maintains a Web site that includes information on all of the work the agency is doing in the area of roadway safety. It also contains links to other related Web sites and has numerous related documents available for downloading. This Web site is located at: <http://www.usfa.dhs.gov/fireservice/research/safety/roadway.shtm>

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

The National Highway Traffic Safety Administration (NHTSA) is a division within the DOT focused solely on a broad variety of issues and areas related to safety within the Nation's transportation system. The range of information and programs available from NHTSA is exceptionally broad and covers topics that would not immediately seem related to DOT issues, such as the Nation's baseline standards for emergency medical response qualifications. The resources available from NHTSA can be located at: <http://www.nhtsa.dot.gov>

Other Examples/Sources of Information

At any given time there are a number of initiatives related to roadway incident safety underway. Most agencies that are working on these projects are willing to share information with other agencies that are doing the same. The following is a compilation of projects that were in progress or recently completed at the time this document was produced.

BEST PRACTICES FOR BORDER BRIDGE INCIDENT MANAGEMENT

<http://66.167.232.132/pm/projectmanagement/Upfiles/reports/full379.pdf>



This paper documents the policies and procedures established by the I-95 Corridor Coalition for managing incidents on the Woodrow Wilson Bridge, which connects Virginia and Maryland across the Potomac River on I-495/I-95. Virginia, Maryland, and the District of Columbia all have jurisdiction over part of the bridge and the highway leading to it. With the construction of a new bridge underway, all the responding agencies in the three jurisdictions have come together to establish protocols for sharing relevant information and working together to minimize disruptions in an extremely congested corridor. This paper stresses the need for good working relationships among first responders, and is an excellent place to start in researching traffic incident management issues.

The I-95 Corridor Coalition is a consortium of response organizations that have jurisdiction along this major interstate that traverses the entire eastern coast of the United States, from Maine to Florida. This highway travels through major metropolitan areas, including Boston, Providence, New York City, Philadelphia, Baltimore, Washington, DC, Richmond, Jacksonville, and Miami.

MINNESOTA TRAFFIC INCIDENT MANAGEMENT RECOMMENDED OPERATIONAL GUIDELINES

<http://www.dot.state.mn.us/tmc/documents/Freeway%20Incident%20Management.pdf>

This is the State of Minnesota’s protocol for traffic incident management. The purpose of the document is to provide incident responders with uniform guidelines for safe operations at the scene of an incident. The Incident Management Coordination Team has created a document that is easy to read and to understand. It lists the roles and responsibilities of each responding agency in clear and simple language and then sets out guidelines for response to typical incidents, including disabled vehicles, crash with property damage only, crash with minor injury, vehicle fire, brush fire (within freeway right-of-way), crash with possible fatality, heavy duty recovery, and abandoned hazardous materials.

Contact:

Minnesota Department of Transportation Central Office
 Transportation Building
 395 John Ireland Boulevard
 Saint Paul, MN 55155
 Phone: 651-296-3000

STRATEGIC PLAN FOR HIGHWAY INCIDENT MANAGEMENT IN TENNESSEE

This is a comprehensive look at the issues and needs for transportation incident management from the perspective of the State’s Department of Transportation. It is well-researched and well-written and sets forth the action steps needed to establish inclusive traffic incident management policies and procedures. Particularly interesting is the documentation of the problems that traffic incident management is designed to address. All the stakeholders were included in the planning process. Currently, there is no emergency response manual, although the need for one is identified as an action step to accomplish. The Tennessee Department of Transportation does operate a statewide network of highway service patrol and response vehicles.

Contact:

Office of Incident Management	Vanderbilt Center for Transportation Research
Tennessee Department of Transportation	Box 1831, Station B
Transportation Management Center	Vanderbilt University
6603 Centennial Boulevard	Nashville, TN 37235
Nashville, TN 37243	



EMERGENCY TRAFFIC MANAGEMENT IN CALGARY, ALBERTA, CANADA

Concerns with the safety of responders operating on the roadway and efficient management of highway incidents are not limited to the United States. These issues are of concern anywhere highway systems exist. Several excellent examples of informational documents and guidelines are available from Canadian agencies. The Calgary, Alberta, Fire Department has developed a paper that applies principles of the U.S. MUTCD to roadway incidents in its jurisdiction.

This paper examines the logistics of establishing of a safe work zone for emergency operations on a highway. It explains how to use traffic cones to create transition zones and lane closures and how to position fire apparatus to protect first responders and those they are working to assist. Graphs illustrate how to create safe zones around bends and on inclines. The document explains terms used in the MUTCD and applies them to emergency operations in a clear and usable manner.

Contact:

Calgary Fire Department
4124 11 Street S.E.
Calgary, Alberta T2G 3H2 Canada

NOVA SCOTIA TRAFFIC MANAGEMENT GUIDELINES FOR EMERGENCY SCENES

<http://www.gov.ns.ca/enla/firesafety/docs/EmergencyRespondersTrafficManagementGuidelines-EmergencyScenes.pdf>

This is a manual developed in late 2006 for fire service responders in Nova Scotia. It comprehensively documents how to establish safe work zones for a variety of highway scenarios, including illustrations of how to place cones and position fire apparatus. The manual addresses both career and volunteer firefighters and the issues they must consider for safe response. Charts use kilometers-per-hour instead of miles-per-hour, so conversions will be needed for U.S. use. The manual does not address coordination with law enforcement and other highway responders in depth. It does discuss initial response to the scene and proper illumination and signage, as well as appropriate clothing for emergency responders.

Contact:

Public Safety and Office of the Fire Marshal
Nova Scotia Environment and Labor
5151 Terminal Rd., 6th floor
P.O. Box 687
Halifax, Nova Scotia, B3J 2T8
Toll free: 1-800-559-3473 (FIRE)

Standard Operating Procedures

Ensuring the safety of firefighters and other emergency responders while working on the scene of a roadside incident merits the development and use of an SOP. SOPs remind firefighters of actions to follow on the scene and ensure that all responders know what actions to expect from others.

This section contains several model procedures that can be used as base material or modified to reflect local conditions and procedures. The first model procedure was developed originally by Battalion Chief/ Training Officer Ron Moore of the McKinney, TX, Fire Department for the ERSI. This model procedure



has been modified to include other information from a dozen other fire department emergency scene procedures.

The second example is a one-page procedure intended to be a quick reminder of scene safety survival basics. The last example is the Highway Incident Management Plan from the Hampton Roads area in Virginia. The agencies in this region have long been recognized as leaders in the area of traffic incident management. Portions of their program also were highlighted in the USFA’s Emergency Vehicle Safety Initiative report.

MODEL STANDARD OPERATING PROCEDURE FOR SAFE OPERATIONS AT ROADWAY INCIDENTS—EMERGENCY RESPONDER SAFETY INSTITUTE

Purpose:

The purpose of this procedure is to provide for the safety of firefighters and other emergency responders on the scene of crashes and other incidents at the roadside and in roadways.

Overview:

The first priority for the fire department must be to ensure that its personnel arrive safely at an emergency scene and operate safely at that scene. Operating at roadway incidents is particularly risky due to the hazards posed by moving traffic. Fire personnel must create a safe area to protect themselves and the people they are assisting while taking into account the dangers inherent in working in or near traffic.

In a roadway incident, the fire department’s response is only one part of the total mitigation effort. Thus, fire personnel must coordinate their operations with law enforcement agencies, departments of transportation, and other organizations that may have jurisdiction. The fire department should take the initiative to contact these organizations to work with their personnel in advance of emergencies to determine the roles and responsibilities each will take to make an emergency mitigation effort smooth and effective. Ongoing training involving all organizations will create the cooperation, communication, and trust necessary for safe and efficient public safety service at roadway incidents.

The fire department’s primary role at a roadway incident is to safely provide the service needed to stabilize any victims and mitigate the situation without allowing operations to cause additional hazards for passing motorists. For other roadway emergencies such as vehicle fires, the fire must be safely controlled while providing for responder safety. Fire personnel should assume that motorists will be inattentive and/or distracted and gear their operations to account for problems that may arise.

Terminology:

The following terms are relevant for roadway incidents and should be used during incidents, in analysis of incidents, and in training for response in or near moving traffic.

Advance warning—Notification procedures used to warn approaching motorists of the need to move from driving normally to driving as required by the temporary emergency traffic control measures ahead.

Block—Positioning of fire department apparatus at an angle to the lanes of traffic, creating a physical barrier between upstream traffic and the emergency work area. Includes “block to the right” and “block to the left.”

Buffer zone—The distance or space between emergency personnel and vehicles in the protected work zone and nearby moving traffic.

Downstream—The direction traffic moves as it travels away from the incident scene.

Flagger—The fire department member assigned to monitor upstream traffic and activate an emergency signal if a motorist does not conform to traffic control measures and thus presents a hazard to emergency operations.

Shadow—The protected work area of a roadway incident shielded by the block from fire apparatus and other emergency vehicles.

Taper—The action of merging lanes of moving traffic into fewer moving lanes.

Temporary work zone—The physical area of a roadway within which emergency personnel perform their mitigation tasks.

Transition zone—The lanes of a roadway within which upstream motorists must change their speed and position to comply with the traffic control measures established at an emergency scene.

Upstream—The direction traffic is traveling from as the vehicles approach the incident scene.

Safety Tactics for Fire Personnel

The risk of injury and death when working in and near moving traffic is extremely high. Fire personnel shall use the following tactics to keep themselves safe and reduce their risks:

- ▶ Firefighters shall always wear gear with retroreflective trim appropriate to the situation. If turnout gear is not necessary, safety vests with fluorescent retroreflective trim meeting the requirements of ANSI 207—Standard for High Visibility Public Safety Vests with the breakaway option shall be worn.
- ▶ At least one firefighter shall always face and be aware of oncoming traffic.
- ▶ Firefighters shall use the first arriving apparatus to establish an initial block to create a temporary work zone (**Figure 6.3**).
- ▶ Firefighters shall exit apparatus on the shadow side, away from moving traffic. If that is not possible, they shall watch carefully and use caution in exiting apparatus. They shall not walk around fire apparatus without taking caution and ensuring that they will be safe in doing so.



Figure 6.3—The first apparatus on the scene should assume a blocking position. Courtesy of Ron Moore, McKinney, TX FD.

- ▶ At dawn, dusk, and nighttime, firefighters shall ensure that apparatus headlights, spotlights, and traffic control strobes that may impair motorists' vision are turned off. Emergency warning lights should be kept to a minimum; more is not better. Amber warning lights are best for all ambient lighting conditions.
- ▶ Working with law enforcement personnel, firefighters shall establish advance warning and adequate transition area traffic control measures upstream of incidents to allow approaching motorists to reduce travel speeds in the transition zone and pass the incident safely. This includes placing traffic cones and flares at intervals on both the upstream and downstream sides of the incidents.

- ▶ A firefighter shall be assigned as flagger to monitor approaching traffic and activate a prearranged emergency signal if a motorist presents danger to firefighters operating in the temporary work zone.
- ▶ Firefighters arriving on the scene ahead of responding fire apparatus shall use extreme caution when accessing the emergency scene and while working on the incident scene.

Safety Tactics for Fire Apparatus

- ▶ In addition to conveying fire personnel to emergency scenes, fire apparatus shall be used to create safe temporary work zones.
- ▶ The first-arriving apparatus shall be angled at about 45 degrees on the roadway with a “block to the left” or “block to the right” to establish a physical barrier between the incident and oncoming traffic.
- ▶ If practical, apparatus shall be placed to block the lane of the incident and one additional lane. However, the road should not be closed unless absolutely necessary and with the agreement of law enforcement personnel.
- ▶ If practical, apparatus shall be placed so that firefighters can exit on the shadow side and the pump operator can work on the shadow side.
- ▶ Apparatus shall be used to block a temporary work zone large enough for all necessary emergency operations.
- ▶ Ambulances shall be placed within the temporary work zone downstream of the incident with their loading doors angled away from moving traffic (**Figure 6.4**).
- ▶ If the emergency is at an intersection or near the center of the roadway, two or more sides of the incident shall be protected. The blocking shall be prioritized from the most critical or highest traffic flow side to the least critical. If only one fire apparatus responds, police vehicles shall be used for blocking on the less critical sides.
- ▶ If apparatus respond to an emergency on a limited-access freeway in the lanes going opposite from where the incident has occurred, they shall use an approved lane to turn around, or go to the next exit and turn around.
- ▶ Blocking apparatus shall be positioned in a manner that will prevent it from entering the safe temporary work zone if it is struck by passing vehicles.



Figure 6.4—Protect the ambulance loading area with other apparatus.

Safety Strategy for Incident Command

- ▶ The first-arriving Company Officer and/or the Incident Commander (IC) shall be responsible for ensuring that the emergency operation is conducted in a safe manner.
- ▶ The IC shall ensure that fire apparatus provide the necessary blocking to establish a safe temporary work zone. He/She shall establish communications with other agencies on the scene to ensure that the overall response is as smooth and effective as possible. He/She shall ensure that appropriate transition zones are established and marked with cones or flares both upstream and downstream of the temporary work zone.

- ▶ The IC shall direct placement of ambulances and parking of additional vehicles to ensure safe medical operations and to ensure that such vehicles do not pose a hazard or a problem to any responding personnel.
- ▶ The first-arriving officer and/or IC shall act as scene safety officer until this assignment is delegated.
- ▶ The IC shall ensure that the temporary work zone is lighted as needed in such a way that the vision of oncoming motorists is not impaired.
- ▶ The IC shall manage the termination of the incident as swiftly and effectively as the initial activities. Personnel, apparatus, and equipment shall be removed promptly, to reduce exposure to traffic hazards and to minimize congestion.

Equipment

The following equipment shall be available and used appropriately:

- ▶ Safety vests meeting the requirements of ANSI 207—Standard for High Visibility Public Safety Vests with the breakaway option for each emergency responder.
- ▶ A minimum of six (6) traffic cones, 28 inch high fluorescent orange with white reflective striping, as described in the Manual on Uniform Traffic Control Devices.
- ▶ Illuminated warning devices such as highway flares or strobes.
- ▶ Federal Highway Administration (FHWA) compliant 48 inch by 48 inch retroreflective signs stating “Emergency Scene Ahead” (with directional arrow overlay) (Figure 6.5).
- ▶ Alternating four inch fluorescent yellow and red chevron striping shall be installed on the rear vertical surfaces of the apparatus to provide apparatus visibility (Figure 6.6).



Figure 6.5—An MUTCD compliant warning sign.



Figure 6.6—These markings make the apparatus highly visible.



SCENE SAFETY SURVIVAL BASICS

Roadside Incident One Page Standard Operating Procedure

- ▶ Never trust moving traffic. Behave as if the driver of every vehicle is trying to run you over.
- ▶ Wear retroreflective vests or retroreflective clothing while working on the incident scene. Turnout gear is not enough.
- ▶ Be situationally aware—remember that you are working on a high speed roadway just inches or feet away from certain death or injury.
- ▶ Use fire apparatus as a shield to protect the incident scene.
- ▶ Place ambulances downstream of blocking fire apparatus, if possible, to protect the loading area.
- ▶ Stage additional ambulances away from the incident scene, if possible, until they are needed.
- ▶ Minimize the use of emergency lights at night on the scene. Turn off lights that will blind or confuse oncoming drivers, such as headlights (**Figure 6.7**).
- ▶ Ask law enforcement officers on the incident scene to take an active role in traffic control and scene protection.
- ▶ Close the minimum number of traffic lanes while assuring responder safety. Work cooperatively with law enforcement officers on lane closures.
- ▶ Clear the scene as soon as possible after patients have been removed and hazards are controlled.
- ▶ Post a traffic lookout to alert responders to an out-of-control vehicle.
- ▶ Beware of the danger of secondary collisions that will propel vehicles into the incident scene.



Figure 6.7—Minimize lighting at night so as to avoid blinding approaching drivers. Courtesy of Ron Moore, McKinney, TX FD.

HAMPTON ROADS HIGHWAY INCIDENT MANAGEMENT PLAN

Hampton Roads Highway Incident Management Committee—Hampton Roads, Virginia

Multi-Jurisdictional Memorandum of Understanding Highway Incident Management Plan

This Memorandum of Understanding (MOU) is made this 9th day of December, 1999, by and between all federal, State, county, and city responders to a highway incident in the greater Hampton Roads area (represented by the signatures listed).

The purpose of this plan is to set forth guidance for response to a highway incident in this multi-jurisdictional area.

It is understood that each responding jurisdictional agency has its own set of operating guidelines and procedures. It is also agreed that each jurisdictional agency recognizes and will implement the Unified Command System should a situation occur that requires such action. This will be accomplished without any agency losing or abdicating authority, responsibility or accountability.



By way of signature, agency representatives agree to implement the plan through training of their personnel.

Definitions

The Greater Hampton Roads area includes the following counties:

- ▶▶ James City
- ▶▶ Accomack
- ▶▶ York
- ▶▶ Isle of Wight

and includes the following cities:

- ▶▶ Chesapeake
- ▶▶ Franklin
- ▶▶ Hampton
- ▶▶ Newport News
- ▶▶ Norfolk
- ▶▶ Poquoson
- ▶▶ Portsmouth
- ▶▶ Suffolk
- ▶▶ Virginia Beach
- ▶▶ Williamsburg

Incident—Any situation that impedes the continual flow of traffic. Examples include but are not limited to crashes, hazardous materials, fire, medical emergency, etc.

Incident Commander—Assigned to the first emergency responder arriving at the scene of any highway incident. This role will change as the incident changes.

Responders—Personnel on the scene of any incident.

Traffic Control Devices—Items that are used to warn and alert drivers of potential hazards and to guide or direct motorists safely past the hazard(s). May include cones, flares, and signal lights. Advance warning arrow panels (arrow boards) are intended to supplement other traffic control devices.

Incident Safety Zone—That portion of the roadway that is closed to traffic and set aside for responders, equipment, and material.

Online Video of HRHIM Plan @ Center for Transportation Studies, University of Virginia: http://cts.virginia.edu/incident_mgmt_training.htm

Preface

The primary objectives for any operation at the scene of a highway incident are preserving life, preventing injury to any responding personnel, protecting property, and the restoration of traffic flow.

Managing a highway incident and any related problems is a team effort. Incidents range from minor to major with many agencies involved. Each responding agency has an important role to play in the management of an effective incident operation. It is not a question of “Who is in charge?” but “Who is in charge of what?” Each agency present has a part to play. Although the responsibilities may vary from one incident to the next, following are normal practices for agencies in the Greater Hampton Roads area.



Virginia State Police (VSP)—The Virginia State Police are the responsible party for responding to traffic incidents on the interstate system. They work in tandem with the respective federal, county or city police departments, depending on the circumstances in each situation. The ranking VSP officer is responsible for the incident scene, unless a fire or hazardous material spill is involved; in which case the ranking fire official is responsible.

Virginia Department of Transportation (VDOT)—Will provide traffic management support, when needed, at an incident scene. VDOT is often relied upon for equipment and personnel for incident support and related activities.

Federal, State, City and County Law Enforcement Agencies—These agencies may respond to highway incidents in their jurisdiction, depending on the need, availability of personnel, and nature of the incident.

Fire and Rescue Agencies (EMS)—The determination of the need for fire and rescue services is normally made by the reporting party (call for service). Fire apparatus often respond as a protective measure and additional support.

Towing and Recovery—Will provide the necessary apparatus required for moving and/or removing disabled vehicles from the roadway.

Care of the injured, protection of the public, safety of emergency responders and clearance of traffic lanes should all be priority concerns of the IC operating at the scene of a highway incident. It is extremely important that all activities that block traffic lanes be concluded as quickly as possible and that the flow of traffic be allowed to resume promptly.

When traffic flow is heavy, small savings in incident scene clearance time can greatly reduce traffic back-ups and the probability of secondary incidents. Restoring the roadway to normal or to near normal as soon as possible creates a safer environment for motorists and emergency responders. Additionally, it improves the public's perception of the agencies involved and reduces the time and dollar loss resulting from the incident.

Purpose


The purpose of this plan is to provide incident responders with a uniform guide for safe operations at incidents occurring on the highway system. It is intended to serve as a guideline for decisionmaking and can be modified by the incident responders as necessary to address existing incident conditions.

Emergency operations at the scene of a vehicle accident are the most common occurrences and those with the greatest potential for an unfavorable outcome to personnel. Each year, many significant incidents occur on roadways. Whether it is the interstate highway or a secondary road, the potential for injury or death to any responder is overwhelming.

Response

Emergency responders need to operate safely, making every effort to minimize the risk of injury to themselves and those who use the highway system. Responders operating in the emergency mode need to operate warning devices and follow the guidelines specific to their standard operating procedures.

- ▶ **Warning Lights**—Emergency-warning lights should remain operational while responding to and, when necessary, while working at incidents.

- 
- ▶ **Headlights**—Apparatus headlights should be operational during all responses and incidents regardless of the time of the day. Caution should be used to avoid blinding oncoming traffic while on the scene.
 - ▶ **Siren and Air horn**—When responding as an emergency vehicle, appropriate warning devices will be utilized in accordance with State law.

Median strip crossovers marked “Authorized Vehicles Only” shall be used for turning around and crossing to the other travel lanes ONLY when emergency vehicles can complete the turn without obstructing the flow of traffic in either travel direction or all traffic movement has stopped. Under no circumstances shall crossovers be utilized for routine (nonemergency) changes in travel direction.

Use of U-turn access points in “jersey” barriers on limited access highways is extremely hazardous and shall be utilized only when the situation is necessary for immediate lifesaving measures.

Response on access ramps shall be in the normal direction of travel, unless the IC on the scene can confirm that oncoming traffic has been stopped and no civilian vehicles will be encountered on the ramp.

Shoulder lanes will be used only by emergency vehicles/apparatus. Emergency support vehicles are authorized to use the shoulder lanes only when directed or authorized to do so by the IC.

Arrival

The first emergency responder arriving to the scene of any highway incident will assume the role of IC. The individual assuming that role is subject to change as additional responders arrive at the scene.

If traffic control assistance is required at an incident scene, the IC will request that contact be made to TMS Control (Smart Traffic Center) at (757) 424-9903. By providing a brief description of the situation, VDOT personnel may be dispatched, if not already en route to assist.

Standard practice will be to position response vehicles in such a manner as to ensure a safe work area. This may be difficult to accomplish at incidents on secondary and one-lane roads. Position emergency response vehicles in such a manner as to provide the safest area possible.

Parking of Response Vehicles

Providing a safe incident scene for emergency responders is a priority at every emergency incident. However, consideration must be given to keeping as many traffic lanes open as possible. Except for those vehicles needed in the operation and those used as a shield for the incident scene, other response vehicles should be parked together (staging area). As a matter of routine, the parking of response vehicles should be on one side of the roadway. Parking should be on either the shoulder or median area, if one exists, but not both. Parking response vehicles completely out of available travel lanes greatly assists in the movement of traffic. If not needed to illuminate the scene, drivers should remember to turn vehicle headlights off when parked at incidents.

Recovery personnel are to report to the IC, who will then direct them to a safe, or “staging,” area.

On Scene Actions

The proper spotting and placement of emergency apparatus is the joint responsibility of the driver and IC. The proper positioning of emergency response vehicles at the scene of an incident assures other responding resources of easy access and a safe working area and helps to contribute to an effective overall



operation. The safety of everyone on the scene is foremost while they are operating, both in emergency and nonemergency situations.

An incident safety zone shall be established, allowing fire and rescue units to position in close proximity of the incident. The responding fire apparatus should be placed back some distance from the incident, making use of it as a safety shield blocking only those travel lanes necessary. In the event that a motorist enters the incident safety zone, the fire apparatus will act as a barrier; and, in the unlikely event that the fire apparatus is moved upon impact, it will travel away from the incident safety zone.

Before exiting any emergency response vehicle at an incident, personnel should check to ensure that traffic has stopped to avoid the possibility of being stuck by a passing vehicle. Personnel should remember to look down to ensure that debris on the roadway will not become an obstacle, resulting in a personal injury. All members shall be in appropriate clothing or traffic vests as the situation indicates.

As soon as possible, the initial responding unit should position traffic control devices. Traffic cones assist in channeling traffic away from an incident. Traffic control devices shall be used whenever responding vehicles are parked on or near any road surface. Placement of traffic control devices shall begin closest to the incident, working toward oncoming traffic. Taking into consideration the possibility of hazardous materials, traffic control devices shall be placed diagonally across the roadway and around the incident. This assists in establishing an incident safety zone. When placing traffic control devices, care should be exercised to avoid being struck by oncoming traffic.

The speed of traffic and travel distance must be considered when establishing an incident safety zone. The following chart provides an example of how traffic control devices are to be placed.

Posted Speed Limit	Distance
35 MPH	100 ft.
45 MPH	150 ft.
55 MPH	200 ft.
> 55 MPH	250 ft. and greater


When channeling traffic around an incident, traffic control devices shall also be used in front of the incident if those devices and the manpower are available.

It is possible to channel traffic around a curve, hill, or ramp, provided the first device is placed such that the oncoming driver is made aware of imminent danger.

Emergency Vehicle Visibility at Night

Glare vision and recovery is the amount of time required to recover from the effects of glare once a light source passes through the eye. It takes at least six seconds, going from light to dark, and three seconds, from dark to light, for vision to recover.

At 50 miles-per-hour, the distance traveled during a second is approximately 75 feet. Thus, in six seconds, the vehicle has traveled 450 feet before the driver has fully regained night vision. This is extremely important to remember when operating on roadways at night.



The headlights on stopped vehicles can temporarily blind motorists that are approaching an incident scene. Drivers of oncoming vehicles will experience the problem of glare recovery. This essentially means individuals are driving past the emergency scene blindly. The wearing of protective clothing and/or traffic vests will not help this “blinded” motorist see emergency responders standing in the roadway. Studies show that at two and a half car lengths away from a vehicle with its headlights on, the opposing driver is completely blinded.

Low beam headlights can be used to light an emergency scene using care as to light only the immediate area. Complacency at an incident scene can be hazardous.

Clearing Traffic Lanes

When outside of a vehicle on a major roadway, both civilian and emergency responders are in an extremely dangerous environment. Therefore, it is imperative to take every precaution to protect all responders and those involved at incident scenes. Although positioning emergency response vehicles to serve as a shield for work areas is a prudent practice, we must remember that reducing and/or shutting down traffic lanes creates other problems and safety concerns. Therefore, it is critical when operational phases are completed that emergency response vehicles be repositioned to allow traffic to flow on as many open lanes as possible.

Remember that unnecessarily closing or keeping traffic lanes closed greatly increases the risk of a secondary incident occurring in the resulting traffic backup. Five minutes of stopped traffic will cause a 15-minute delay in travel time.

Management of incidents on the interstate system and local roadways requires the expertise and resources of emergency responders, as defined. While the safety of emergency services personnel is of paramount concern for the IC, the flow of traffic must be taken into consideration at all times. The closing of roadways disrupts traffic throughout the area as well as having a significant impact on businesses throughout the region.

Keeping the safety of all personnel in mind, and coordinating the needs with other emergency services, the IC should begin to open any closed lanes as soon as practical.

RECOMMENDATIONS

The earlier portions of this report emphasize the frequency of firefighter injuries and deaths as a result of incidents that occur on the roadway and the consequences associated with them. Clearly, this is a growing problem that needs to be mitigated. There is no single step that can be taken to significantly improve this problem; it requires a comprehensive approach to better handling of roadway incidents.

Vehicle collisions have both immediate and long-term economic effects on the individual and society. Costs are both direct (those that are the result of the collision and resultant injury/fatality) and indirect (overall cost to society).

The effective use of approved traffic control devices promotes highway safety and efficiency by providing for orderly movement of all road users. The Incident Command System (ICS) is the most effective and efficient process for traffic incident management. Complying with the U.S. Department of Transportation's (DOT's) *Manual on Uniform Traffic Control Devices (MUTCD)* and adopting the guidelines contained in the National Fire Service Incident Management System Consortium's (NFSIMSC's) *Model Procedures Guide for Highway Incidents* should help enhance firefighter operational effectiveness, reduce potential liability, and enhance responder safety at roadway emergency scenes.

Based on the research performed to prepare this report, the following additional recommendations are presented to help decrease vehicle-related injuries and fatalities of emergency responders, if implemented at the appropriate levels.

1. DEVELOP A COMPREHENSIVE DATABASE THAT TRACKS ACCIDENTS INVOLVING EMERGENCY VEHICLES AND ANY RESULTING INJURIES/DEATHS TO BOTH FIREFIGHTERS AND CIVILIANS.

The failure to capture and analyze accurate, useful data on a wide range of issues is an age-old problem in the fire service. Some accurate data are available on firefighter fatalities. However, few reliable data are available on incidents involving injuries or no injuries. Without these data it is difficult to accurately assess the problems we are facing.

Accordingly, there exists no comprehensive database to determine specific information related to emergency vehicle collisions. There should be a national repository that collects data from all organizations and allows for retrieval of specific information regarding vehicle collisions responding to/returning from incidents, emergency workers struck by vehicles at the scene, secondary crashes, and civilian injuries/fatalities resulting from collisions with emergency vehicles.

2. LIMIT SPEEDS TO 10 MILES PER HOUR ABOVE THE POSTED SPEED LIMIT UNDER ANY CIRCUMSTANCES.

There is a simple old saying, "speed kills." We certainly know this is true in the fire service (**Figure 7.1**). The urgency that we place on responding to emergency calls often is translated into excessive speed during the response. Speeds that are significantly above the posted speed limit are dangerous, especially in fire apparatus. Stopping distances are increased dramatically, and high vehicle speeds in curves often have negative outcomes. The decision to exceed the posted speed limit should be based on comparing the risk of



Figure 7.1—There is a greater likelihood of a collision when fire apparatus are driven at excessive speeds.

such speeds with the benefit to those needing assistance. We cannot perform effective roadway scene operations if we fail to reach the scene. Furthermore, collisions as a part of an unsafe response add another roadway incident to our load that must be handled. This places even more responders in the roadway.

3. ADOPT A ZERO-TOLERANCE ALCOHOL POLICY AND ENFORCE AN 8-HOUR TIME BETWEEN ALCOHOL CONSUMPTION AND WORK.

From 1990 through 2003, there were 17 firefighter fatalities in which alcohol or drugs were a direct factor in the death of a firefighter—the firefighter who died was intoxicated or high, or another firefighter involved

in the death was intoxicated or high. Impaired firefighters may be involved in collisions during the response or may take unsafe actions when they arrive on the scene. Between 1997 and 2002, several firefighters involved in fatal accidents in privately owned vehicles (POVs) had blood alcohol concentrations that would be considered legally intoxicated in most States. Departments should adopt the IAFC's zero-tolerance alcohol policy and enforce the 8-hour time between alcohol consumption and work. It is also imperative that the fire service recognizes those with alcohol abuse problems and provides them with the help that they need.

4. EQUIP ALL FIRE DEPARTMENT VEHICLES WITH APPROPRIATE TRAFFIC CONTROL AND SAFETY EQUIPMENT.

All fire department vehicles, including staff and non-emergency response vehicles, should be equipped with an appropriate supply of traffic control and safety equipment. This includes high-visibility vests, flashlights, and channelizing equipment (**Figure 7.2**). The amount and type of equipment carried will vary, depending on the responsibilities assigned to the personnel typically riding in that specific vehicle. The fire service may consider petitioning the National Fire Protection Association (NFPA) to increase the minimum requirements for traffic control equipment to be carried on apparatus that are contained in NFPA 1901, *Standard for Automotive Fire Apparatus*.



Figure 7.2—All emergency vehicles should carry traffic control equipment.

5. ENSURE ALL TRAFFIC CHANNELIZING DEVICES MEET APPLICABLE STANDARDS.

Channelizing devices used during an emergency incident can include signs, cones, tubular markers, flares, directional arrows, flagger equipment, and related equipment. All of this equipment must meet MUTCD and NFPA requirements. All of the equipment should be in good repair and ready for deployment.



6. ENSURE FLAGGERS, IF USED, ARE PROPERLY TRAINED AND MEET MUTCD QUALIFICATIONS.

The MUTCD requires flaggers to have the following abilities:

- ▶ receive and communicate specific instructions;
- ▶ move and maneuver quickly;
- ▶ control signaling devices to provide clear and positive guidance to drivers;
- ▶ understand and apply safe traffic control practices; and
- ▶ recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.

7. REQUIRE MEMBERS TO WEAR HIGHLY REFLECTIVE AMERICAN NATIONAL STANDARDS INSTITUTE/INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ANSI/ISEA) 207-COMPLIANT PUBLIC SAFETY VESTS WHENEVER THEY OPERATE IN THE ROADWAY.

Personnel visibility is critical during highway operations. All apparatus should be equipped with one vest for each riding position on the emergency vehicle, and nonemergency vehicles also should carry at least one vest. All members must be required to wear the vests whenever they are operating in the roadway.

8. MARK APPARATUS PERIMETER WITH RETROREFLECTIVE STRIPING.

NFPA 1901 requires retroreflective striping around the perimeter of fire apparatus to illuminate the apparatus at night when visibility is limited. Placement of the striping provides an indication of the location and size of the apparatus. NFPA 1901 also requires retroreflective striping inside cab doors to maintain conspicuity and alert drivers to an open door. Departments also should consider the use of European-style retroreflective markings on the rear of apparatus (**Figure 7.3**).



Figure 7.3—European-style marking are becoming more common in the U.S. Courtesy of Ron Moore, McKinney, TX FD.

9. EXTINGUISH FORWARD-FACING EMERGENCY VEHICLE LIGHTING, ESPECIALLY ON DIVIDED ROADWAYS.

Headlights and fog lights should be shut off at night scenes. Highway safety specialists agree that the rear lights on emergency vehicles parked at a roadway scene should be amber. MUTCD states that emergency lighting often is confusing to drivers, especially at night. Drivers approaching the incident from the opposite direction on a divided roadway often are distracted by the lights and slow their response, resulting in a hazard to themselves and others traveling in the same direction. It also often results in traffic congestion in the unaffected opposite lane(s) and increases the chance of a secondary collision. If floodlights are being used for nighttime operations, they should be angled downward towards the work area to avoid blinding approaching motorists.

10. FIRE DEPARTMENTS SHOULD CONSIDER THE IMPLEMENTATION OF TRAFFIC SAFETY RESPONSE UNITS.

Traffic safety response units respond to roadway incident scenes and assist other fire personnel on the scene with providing proper blocking and marking procedures. These units are common in the mid-

Atlantic region of the United States, but scarcely used in other portions of the country. They are particularly helpful in jurisdictions that have limited law enforcement personnel available on duty.



Figure 7.4—This position allows the company officer to effectively view the incident scene.

11. POSITION THE INITIAL ARRIVING ENGINE IN A BLOCKING POSITION TO ONCOMING TRAFFIC.

The blocking position allows the officer to survey the scene from inside the apparatus (**Figure 7.4**). The apparatus should be positioned to ensure a safe work area at least one lane wider than the incident, whenever this is possible. When an incident is near the middle of the street at an intersection, two or more sides may need to be protected. Block all sides of the incident that are exposed to oncoming traffic.

12. ESTABLISH AN ADEQUATE SIZED WORK ZONE.

When no fuel, fire or spill hazards are present, the work zone should extend approximately 50 feet in all directions from the wreckage. If there is a vehicular fire involved, the work zone should extend approximately 100 feet. Low-lying areas also should become extended work zones if the vehicle(s) are leaking fuel, since fumes typically travel downhill and downwind.

13. DEVELOP A FORMAL TRAFFIC INCIDENT MANAGEMENT INFORMATION SHARING METHOD BETWEEN PUBLIC SAFETY AND TRANSPORTATION AGENCIES.

Factors involved in developing an effective information sharing program are institutional, technical, and operational. Implement cooperative partnerships and frameworks based on formal agreements or regional plans to guide day-to-day activities and working relationships. Consider using compatible information systems to establish effective interagency information exchange whenever practical.

14. MANAGE MAJOR TRAFFIC INCIDENTS USING THE INCIDENT COMMAND SYSTEM.

The ICS provides the mechanism for numerous emergency response disciplines to work together in an integrated and coordinated manner during incidents. It is the most effective and efficient process for traffic incident management and is particularly applicable to the response, clearance, and recovery stages. In addition to improving scene safety, managing a traffic incident using ICS can reduce clearance times, which mitigates the effects of traffic congestion at the incident site.

15. CONSIDER THE USE OF UNIFIED COMMAND TO MANAGE TRAFFIC INCIDENTS INVOLVING MULTIPLE JURISDICTIONS OR DISCIPLINES.

Unified Command may be appropriate in a multijurisdictional incident, such as a collision that crosses city and county lines or a multidepartmental incident, as in the case of a collision on an interstate that brings responders from fire, emergency medical services (EMS), law enforcement, and DOT. The lead agency should be determined by the initial priorities. As priorities change, the lead agency may change.

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16. INCORPORATE TRANSPORTATION DEPARTMENTS INTO THE INCIDENT MANAGEMENT SYSTEM WHEN APPROPRIATE.

Transportation departments are one of the newer participants in highway incident management (Figure 7.5). Traffic control can be incorporated easily into the IMS organization as strike teams, task forces, control groups, or traffic management divisions.



Figure 7.5—Transportation agencies can be extremely helpful in improving safety at roadway incidents.

17. ENSURE ADEQUATE TRAINING ON ROADWAY HAZARDS AND SAFETY PROCEDURES FOR RESPONDERS.

Fire departments should increase the amount of training on roadway scene safety provided to personnel who respond to these types of incidents. NFPA 1001, *Standard for Fire Fighter Professional Qualifications* contains minimum training requirements for entry-level firefighters. At a minimum, this should be followed for all firefighters already on the job. In areas with greater levels of roadway hazards, additional training should be required. Anyone who will be required to perform flagger duties should be trained as directed by the MUTCD.

18. ACTIVELY SEEK OPPORTUNITIES TO EDUCATE THE PUBLIC ON THE HAZARDS OF APPROACHING EMERGENCY SCENE USING ALL AVAILABLE MEDIA.

Encourage the passage of “Move-Over” legislation by governmental bodies as a mechanism for making the public clear the way for approaching emergency vehicles.

19. DESIGNATE A SAFETY OFFICER FOR ALL INCIDENTS ON THE ROADWAY.

This Safety Officer should closely monitor traffic control procedures, personnel safety, and deployment of traffic safety equipment. The Safety Officer should ensure that all personnel operating on the scene wear appropriate safety equipment. The Safety Officer should attempt to correct potential safety hazards, or at least report them to the Incident Commander (IC), before an incident occurs.

20. DEVELOP MULTIAGENCY STANDARD OPERATING PROCEDURES (SOPS) AND PREINCIDENT PLANS THAT INCLUDE ALL AGENCIES THAT MAY OPERATE AT A ROADWAY INCIDENT.

Actively train on these plans and implement them at all incidents. The plans should include limiting onscene exposure by sending only those agencies and apparatus that are required to handle the incident and then clearing them from the scene as soon as their duties are complete.

LIST OF ACRONYMS AND ABBREVIATIONS

24/7—24 hours per day/7 days per week
AASHTO—American Association of State Highway Transportation Officials
ACN—Automatic Collision Notification
ANSI—American National Standards Institute
CAD—Computer-Aided Dispatch
CCTV—Closed-Circuit Television
CDC—Centers for Disease Control and Prevention
CISM—Critical Incident Stress Management
D/G—Division/Group
DHS—Department of Homeland Security
DOJ—Department of Justice
DOT—Department of Transportation
e.g.—For Example
EMS—Emergency Medical Services
EMT—Emergency Medical Technician
ERSI—Emergency Responder Safety Institute
EVSI—Emergency Vehicle Safety Initiative
FGC—Fireground Command
FHWA—Federal Highway Administration
FIRESCOPE—Fire Resources of California Organized for Potential Emergencies
Ft—Feet
GPS—Global Positioning System
HRIMP—Hampton Roads Highway Incident Management Plan
HSPD—Homeland Security Presidential Directive
IAFC—International Association of Fire Chiefs
IAFF—International Association of Fire Fighters
IAP—Incident Action Plan
IC—Incident Commander
ICP—Incident Command Post
ICS—Incident Command System
ID—Identification
IFSTA—International Fire Service Training Association



IMS—Incident Management System
In—Inches
ISEA—International Safety Equipment Association
ITS—Intelligent Transportation Systems
LED—Light-Emitting Diode
MPH—Miles Per Hour
MUTCD—Manual on Uniform Traffic Control Devices
N/A—Not Applicable
NCHRP—National Cooperative Highway Research Program
NFPA—National Fire Protection Association
NFSIMSC—National Fire Service Incident Management System Consortium
NHTSA—National Highway Traffic Safety Administration
NIJ—National Institute of Justice
NIMS—National Incident Management System
NIOSH—National Institute for Occupational Safety and Health
NTIMC—National Traffic Incident Management Coalition
NRP—National Response Plan
NUG—National Unified Goal
NVFC—National Volunteer Fire Council
Ops—Operations
POV—Privately Owned Vehicle
PPE—Personal Protective Equipment
PSAP—Public Safety Answering Point
SAE—Society of Automotive Engineers
SOG—Standard Operating Guideline
SOP—Standard Operating Procedure
TIM—Traffic Incident Management
TIMA—Traffic Incident Management Area
TIMS—Traffic Incident Management Systems
TSP—Telematics System Providers
TTC—Temporary Traffic Control
USDOT—United States Department of Transportation
USFA—United States Fire Administration
UV—Ultraviolet
VDOT—Virginia Department of Transportation
VMS—Variable Message Sign
VSP—Virginia State Police

RESOURCE WEB SITES

The following Web sites contained useful information on traffic incident management and roadway incident management safety at the time this report was written. Web site addresses do change on occasion and some Web sites are discontinued, so the availability of these sites cannot be ensured in the future.

BEST PRACTICES FOR BORDER BRIDGE INCIDENT MANAGEMENT

Their main Web site is <http://66.167.232.132/pm/projectmanagement/Upfiles/reports/full379.pdf>

DRIVE TO SURVIVE WEB SITE

This Web site has safety information on emergency vehicle safety: www.drivetosurvive.org

EMERGENCY RESPONDER SAFETY INSTITUTE

Their main Web site is www.respondersafety.com

FIREFIGHTER CLOSE CALLS

This Web site contains news and other information related to all aspects of firefighter safety: www.firefighterclosecalls.com

IAFC GUIDE TO MODEL PROCEDURES FOR EMERGENCY VEHICLE SAFETY

This program can be downloaded for free from the following Web site:
<http://www.iafc.org/displaycommon.cfm?an=1&subarticlenbr=602>

IAFF RESPONSE AND ROADWAY SAFETY PROGRAM

This program can be downloaded for free from the following Web site: <http://www.iaff.org/hs/evsp/home.html>

MANUAL ON UNIFORMED TRAFFIC CONTROL DEVICES

This document can viewed online or downloaded for free at: <http://mutcd.fhwa.dot.gov>

MINNESOTA TRAFFIC INCIDENT MANAGEMENT RECOMMENDED OPERATIONAL GUIDELINES

Their main Web site is: <http://www.dot.state.mn.us/tmc/documents/Freeway%20Incident%20Management.pdf>



NATIONAL FIREFIGHTER NEAR-MISS REPORTING SYSTEM

This site allows firefighters to report and search reports on near-miss safety incidents: www.firefighternearmiss.com

NATIONAL FIRE PROTECTION ASSOCIATION

Their various standards that apply to vehicle and roadway safety can be previewed for free at: www.nfpa.org

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Their main Web site is <http://www.nhtsa.dot.gov>

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

The Web site for their Fire Fighter Fatality Investigation and Prevention Program is <http://www.cdc.gov/niosh/fire/>

The NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) conducts investigations of firefighter line-of-duty deaths to formulate recommendations for preventing future deaths and injuries. The FFFIPP posts all of its investigative reports on the Web site listed above and notifies a list-serve membership of each posting.

NATIONAL TRAFFIC INCIDENT MANAGEMENT COALITION

Their main Web site is <http://timcoalition.org/?siteid=41>

NOVA SCOTIA TRAFFIC MANAGEMENT GUIDELINES FOR EMERGENCY SCENES

Their main Web site is <http://www.gov.ns.ca/enla/firesafety/docs/EmergencyRespondersTrafficManagementGuidelines-EmergencyScenes.pdf>

NVFC EMERGENCY VEHICLE SAFE OPERATIONS FOR VOLUNTEER AND SMALL COMBINATION EMERGENCY SERVICE ORGANIZATIONS

This program can be downloaded for free from the following Web site: <http://www.nvfc.org/evsp/index.html>

UNITED STATES FIRE ADMINISTRATION

Their main Web site is <http://www.usfa.dhs.gov>

Their roadway safety Webpage is <http://www.usfa.dhs.gov/fireservice/research/safety/roadway.shtm>

USDOT INTELLIGENT TRANSPORTATION SYSTEMS PROJECT

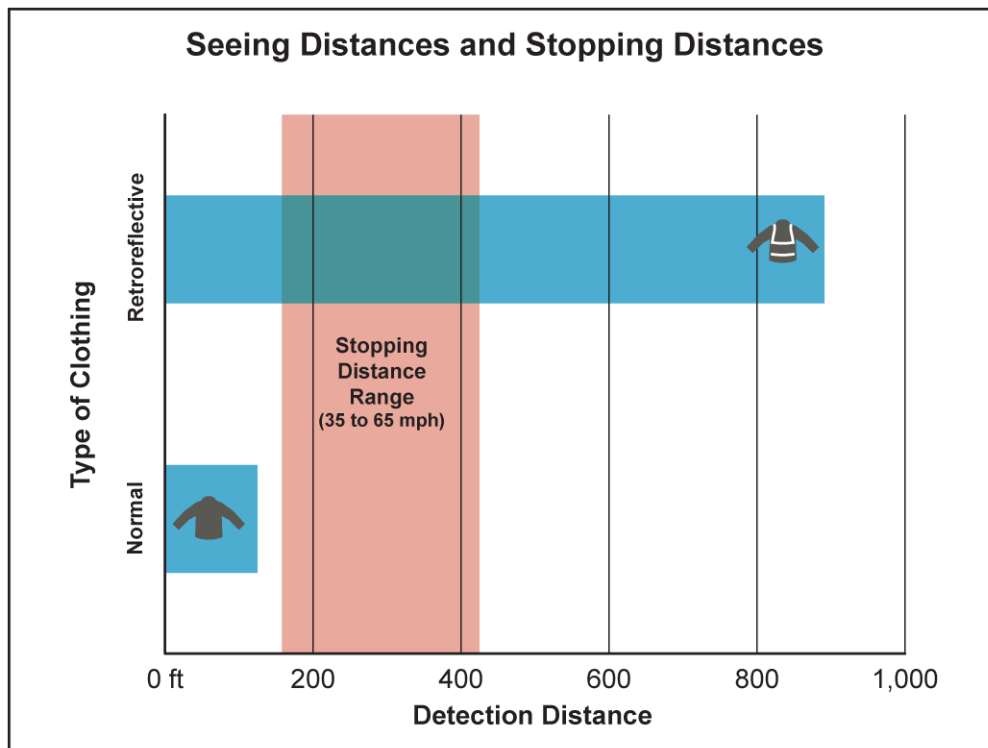
Their main Web site is <http://www.its.dot.gov/index.htm>

ILLUSTRATION OF SEEING DISTANCES AND STOPPING DISTANCES

This study comes from work done by the University of Michigan Transportation Research Institute (UMTRI), in cooperation with the Society of Automotive Engineers (SAE) and the U.S. Fire Administration (USFA). The detection distances are for pedestrians near a work zone, somewhat comparable to being near emergency vehicles, but not illuminated by fixed lighting. The attached slide details detection distance for retroreflective clothing and is the average for the two levels of intensity used in the UMTRI study. The distances shown in the slide are 125 feet (for normal clothing) and 891 feet (for retroreflective clothing). The stopping distances are based on a driver reaction time of 1.5 seconds, and braking deceleration of 0.5 g. The range shown is from 159 feet (for 35 mph) to 425 feet (for 65 mph).

The retroreflective clothing used in the study was very good relative to most civilian retroreflective clothing (clothing in the study was American National Standards Institute (ANSI) Class 2 or 3). However, weaker retroreflective treatments would still provide substantial improvement in seeing distances.

The conditions of the study were reasonably realistic. A work zone was set up on a test track and subjects drove slowly through the zone, indicating when they could detect a worker who was either dressed in typical, nonretroreflective clothing, or was wearing a retroreflective vest or jacket. Such conditions would be similar to that of an emergency incident.



TRAFFIC INCIDENT MANAGEMENT



PARTICIPANT MANUAL (supplement)

January, 2009
STATE OF CONNECTICUT
COMMISSION ON FIRE PREVENTION
AND CONTROL
34 PERIMETER ROAD, WINDSOR LOCKS, CT 06096-1069
860-627-6363
www.ct.gov/cfpc

Traffic Incident Management

Case Studies



Volunteer Captain Killed, Two Fire Fighters and Police Officer Injured When Struck by Motor Vehicle at Highway Incident - Minnesota

SUMMARY

On July 1, 2002, a 28-year-old male volunteer Captain (the victim) was struck by a motor vehicle while attending to a vehicle fire along an interstate highway. The victim was obtaining driver and vehicle information while standing near the incident scene when a passing northbound car was hit from behind by a pickup truck. The impact caused the vehicle to skid sideways, striking the victim and four others. The victim was life-flighted to a local hospital where he was pronounced dead.

NIOSH investigators concluded that, to minimize the risk of similar occurrences, fire departments should

- *ensure that fire apparatus is positioned to protect fire fighters from traffic*
- *establish pre-incident plans regarding traffic control for emergency service incidents and pre-incident agreements with law enforcement and other agencies such as the highway department*

- *establish, implement, and enforce standard operating procedures (SOPs) regarding emergency operations for highway incidents*
- *ensure that personnel receive training in the proper procedures and the hazards associated with emergency operations for highway incidents*

INTRODUCTION

On July 1, 2002, a 28-year-old male volunteer Captain (the victim) was struck by a motor vehicle while attending to a vehicle fire along an interstate highway. On July 2, 2002, the U.S. Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of this fatality. On October 7, 2002, three safety and occupational health specialists from the NIOSH Fire Fighter Fatality Investigation and Prevention Program investigated the incident. The NIOSH team visited the incident scene and conducted interviews with the officers and fire fighters involved in the incident. They met with the Chief of the department and State patrol officers who were on the scene when the incident occurred. The NIOSH team examined copies of the



Incident Site

The **Fire Fighter Fatality Investigation and Prevention Program** is conducted by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the program is to determine factors that cause or contribute to fire fighter deaths suffered in the line of duty. Identification of causal and contributing factors enable researchers and safety specialists to develop strategies for preventing future similar incidents. The program does not seek to determine fault or place blame on fire departments or individual fire fighters. To request additional copies of this report (specify the case number shown in the shield above), other fatality investigation reports, or further information, visit the Program Website at

www.cdc.gov/niosh/firehome.html
or call toll free **1-800-35-NIOSH**



Fatality Assessment and Control Evaluation Investigative Report #F2002-38

Volunteer Captain Killed, Two Fire Fighters and Police Officer Injured When Struck by Motor Vehicle at Highway Incident - Minnesota

State patrol accident reports, diagrams and drawings of the incident scene, dispatch run sheets, witness statements, and incident scene photos. The team reviewed copies of the department's standard operating procedures (SOPs), training records of the victim, and the medical examiner's report.

The volunteer fire department has 30 fire fighters and serves a population of approximately 4,400 in an area of about 43 square miles. The 28-year-old victim had been a volunteer fire fighter with this department for 3.5 years and served as Captain for 10 months. The State has no minimum training requirements for volunteer fire fighters, but the victim had approximately 270 hours of State and departmental fire and rescue training including NFPA Fire Fighter Levels I and II, First Responder, and specialized training regarding vehicle fires. There are no State-required, or department-mandated, training or standard operating procedures on traffic incident management.

Equipment

Only units and personnel that were dispatched for the initial vehicle fire and were on the scene at the time of the fatality are discussed.

1. Municipal Police Vehicle (MPV) arrived at approximately 0710.
 - One police officer (injured)
2. Engine 711 (E711) arrived at approximately 0712.
 - Four fire fighters
 - o FF1 and FF2 (injured)
 - o FF3 and FF4 (uninjured)
3. Brush Truck 706 (BT706) arrived at approximately 0715.
 - The victim
 - Fire fighter (uninjured)
4. State police (SPV1) arrived at approximately 0716.
 - One police officer (uninjured)

5. State police (SPV2) arrived at approximately 0718.
 - One police officer (uninjured)

Weather / Road Conditions

The incident occurred on a four-lane concrete interstate highway with an asphalt shoulder and grass median. The posted speed limit is 70 mph. According to the police report, traffic was estimated to be traveling at approximately 45 to 50 mph at the time of the incident. The highway is level and straight with a slight curve approximately 1/4 mile south of the incident scene. The weather was clear and the road was dry. Neither road conditions, topography, nor environmental conditions appeared to be a causal factor in this incident.

INVESTIGATION

On July 1, 2002, at 0708 hours, Central Dispatch notified appropriate fire and police departments of a minor vehicle fire located on the right shoulder of the northbound interstate highway approximately 3 miles from the fire station. The driver of the incident vehicle (POV1) reported to Central Dispatch that the fire was out but still smoldering.

A municipal police vehicle (MPV) was the first emergency unit on the scene, arriving at approximately 0710. The police officer parked on the right northbound shoulder approximately 30 feet behind POV1 and activated all emergency lights. After receiving the page, four fire fighters arrived at the fire station and responded to the incident scene in Engine 711 (E711), arriving at approximately 0712. The driver positioned E711 on the right northbound shoulder approximately 50 feet in front of the incident vehicle. The victim and another fire fighter arrived at the station shortly after E711 had departed. They followed immediately in Brush Truck 706 (BT706), arriving on the scene at approximately 0715. The driver of BT706 (victim) positioned the truck approximately 100 feet to the rear of the incident



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vehicle, straddling the fog line on the right northbound shoulder of the interstate highway (Figure 1). All emergency lights on the truck were in operation. Two State patrol units were dispatched to the incident. At approximately 0716 the first arriving State patrol officer (SPV1) parked about 1/8 mile south of the incident on the right northbound shoulder and activated all emergency lights (Photo 1). The second State patrol officer (SPV2) arrived at approximately 0718 and positioned his vehicle directly in front of the brush truck.

The victim exited the brush truck and proceeded to the incident vehicle where he met with the driver, the municipal police officer, and the four fire fighters who had initially responded in Engine 711. Three fire fighters were standing to the front of the incident vehicle attending to smoldering insulation under the hood. The municipal police officer and the driver of the incident vehicle were near the passenger door. The victim and another fire fighter were standing near the rear of the vehicle on the passenger side.

A fire fighter who was standing near the hood saw a vehicle skidding toward them and yelled "Look out!" According to the police report, a northbound passenger car (POV2) was traveling in the passing lane when it was hit from behind by a northbound pickup truck pulling a fifth-wheel camper. Following impact with the car, the pickup truck traveled across the grass median and into the southbound traffic lane before leaving the incident scene (Figure 1). After being hit by the truck, POV2 began skidding across the highway towards the shoulder where the emergency vehicles were parked. It hit the municipal police car and then struck the victim, two other fire fighters, the driver of the incident vehicle, and the municipal police officer. POV2 continued skidding at an angle, hitting POV1, which was propelled approximately 50 feet forward by the force of the impact and became lodged under the rear of E711

(Photo 2). POV2 came to a stop approximately 50 feet behind Engine 711.

The victim was found unresponsive and lying on the right shoulder of the highway just north of where POV2 came to a stop. The injured municipal police officer was unconscious and lying near the right rear tire of POV2. Two fire fighters and the owner of the incident vehicle were thrown onto the grassy area to the east of the right northbound shoulder (Figure 1). All three were conscious but had suffered various injuries. Two fire fighters jumped clear of the vehicles and escaped injury.

The State patrol officer, who had arrived immediately following the brush truck, observed the incident and radioed for assistance before exiting his vehicle to assess the scene and assist the injured. A rescue truck and emergency medical personnel were immediately dispatched from the victim's fire department. Several ambulances and a medical evacuation helicopter were sent to the scene from nearby facilities. Injured parties were treated at the scene and transported to nearby hospitals by ambulance. Following advanced life-support efforts, the victim was life-flighted to a nearby hospital where he was later pronounced dead.

CAUSE OF DEATH

The Medical Examiner listed the cause of death as multiple blunt force trauma.

RECOMMENDATIONS / DISCUSSION

Recommendation #1: Fire departments should ensure that fire apparatus is positioned to protect firefighters from traffic.¹⁻⁵

Discussion: As stated in NFPA 1451 (8.1.4.1), "fire service vehicles shall be utilized as a shield from oncoming traffic wherever possible." Placement of the first arriving fire apparatus should protect the scene by providing a work area protected from traffic

Volunteer Captain Killed, Two Fire Fighters and Police Officer Injured When Struck by Motor Vehicle at Highway Incident - Minnesota

approaching in at least one direction. If the apparatus is angled to create a block to the left or right it will create a physical barrier between the incident scene and approaching traffic. Responding emergency personnel should be kept within the shadow created by the blocking apparatus at all times. Positioning the fire apparatus at an angle to the rear of the roadway incident may have provided a work area that was protected from oncoming traffic.

Recommendation #2: Fire departments should establish pre-incident plans regarding traffic control for emergency service incidents and pre-incident agreements with law enforcement and other agencies such as the highway department.^{4, 6, 7, 8}

Discussion: According to NFPA 502, fire protection requirements for limited access highways include recommendations that “a designated authority shall carry out a complete and coordinated program of fire protection that shall include written preplanned emergency response procedures and standard operating procedures.” NFPA 1620 provides guidance to assist departments in establishing pre-incident plans. Pre-incident planning that includes agreements formed by a coalition of all involved parties such as mutual aid fire departments, EMS companies, police, and highway departments may save valuable time, present a coordinated response, and provide a safer emergency work zone.

Recommendation #3: Fire departments should establish, implement, and enforce standard operating procedures (SOPs) regarding emergency operations for highway incidents.^{2,4,6, 7}

Discussion: Fire fighters operating at the scene of a motor-vehicle incident on a highway are in danger of being struck by oncoming motor vehicles. Department standard operating procedures can help

establish proper traffic control measures when operating at an incident scene. SOPs should include, but not be limited to, the following: apparatus positioning, lane closures, methods to establish a secure work area, clearing traffic lanes, releasing the incident scene back to normal operation, and wearing appropriate protective clothing at all times including the use of high-visibility reflective apparel when operating in or near moving traffic. As recommended in Protecting Emergency Responders on the Highways, “standard operating procedures (SOPs) should guide vehicle positioning upon arrival as an integral part of traffic control. Procedures should be scalable to incidents of varying size, magnitude, and location so as to be easily adapted to any sort of incident.”

An example of a standard operating procedure (SOP) for fire departments operating at high-volume, limited access highway operations, is available at www.respondersafety.com.

Recommendation #4: Fire departments should ensure that personnel receive training in the proper procedures and the hazards associated with emergency operations for highway incidents.^{1, 4, 7, 9}

Discussion: Fire fighters who respond to highway incidents have numerous responsibilities ranging from traffic control to assisting injured or stranded motorists. Responders must be trained to safely conduct multiple tasks near moving traffic. Because of the variability of each incident, all emergency responders should have ongoing, appropriate, task-specific training.

REFERENCES

1. NFPA [2002]. NFPA1451, standard for a fire service vehicle operations training program. Quincy, MA: National Fire Protection Association.



Volunteer Captain Killed, Two Fire Fighters and Police Officer Injured When Struck by Motor Vehicle at Highway Incident - Minnesota

2. University of Extrication “Safe Parking” SOP: safe positioning while operating in or near moving traffic. Responder Safety website: www.respondersafety.com/sops.html. Accessed 01/07/2003.
3. Phoenix Fire Department. M.P. 205.07A 04/95-R, standard operating procedures for safe parking while operating in or near vehicle traffic; M.P. 205.15 12/98R, freeway response; M.P. 202-16 06/97R, vehicle fires. Phoenix, AZ: Phoenix Fire Department.
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5. International Fire Service Training Association [1999]. Pumping apparatus driver/operator handbook. Stillwater, OK: Oklahoma State University.
6. NFPA [2001]. NFPA 502, standard for road tunnels, bridges, and other limited access highways. Quincy, MA: National Fire Protection Association.
7. Cohen HS, ed. [1999]. Cumberland Valley Volunteer Firemen’s Association, A White Paper: protecting emergency responders on the highways. Emmitsburg, MD: U.S. Fire Administration.
8. NFPA [1998]. NFPA 1620, standard on recommended practice for pre-incident planning. Quincy, MA: National Fire Protection Association.
9. NFPA [1997]. NFPA 1500, standard on fire department occupational safety and health program. Quincy, MA: National Fire Protection Association.

INVESTIGATOR INFORMATION

This incident was investigated by Mark McFall, Virginia Lutz, and Carolyn Guglielmo, Safety and Occupational Health Specialists, NIOSH, Division of Safety Research, Surveillance and Field Investigation Branch.

Volunteer Captain Killed, Two Fire Fighters and Police Officer Injured When Struck by Motor Vehicle at Highway Incident - Minnesota



Photo 1. Aerial View of Highway



Volunteer Captain Killed, Two Fire Fighters and Police Officer Injured When Struck by Motor Vehicle at Highway Incident - Minnesota

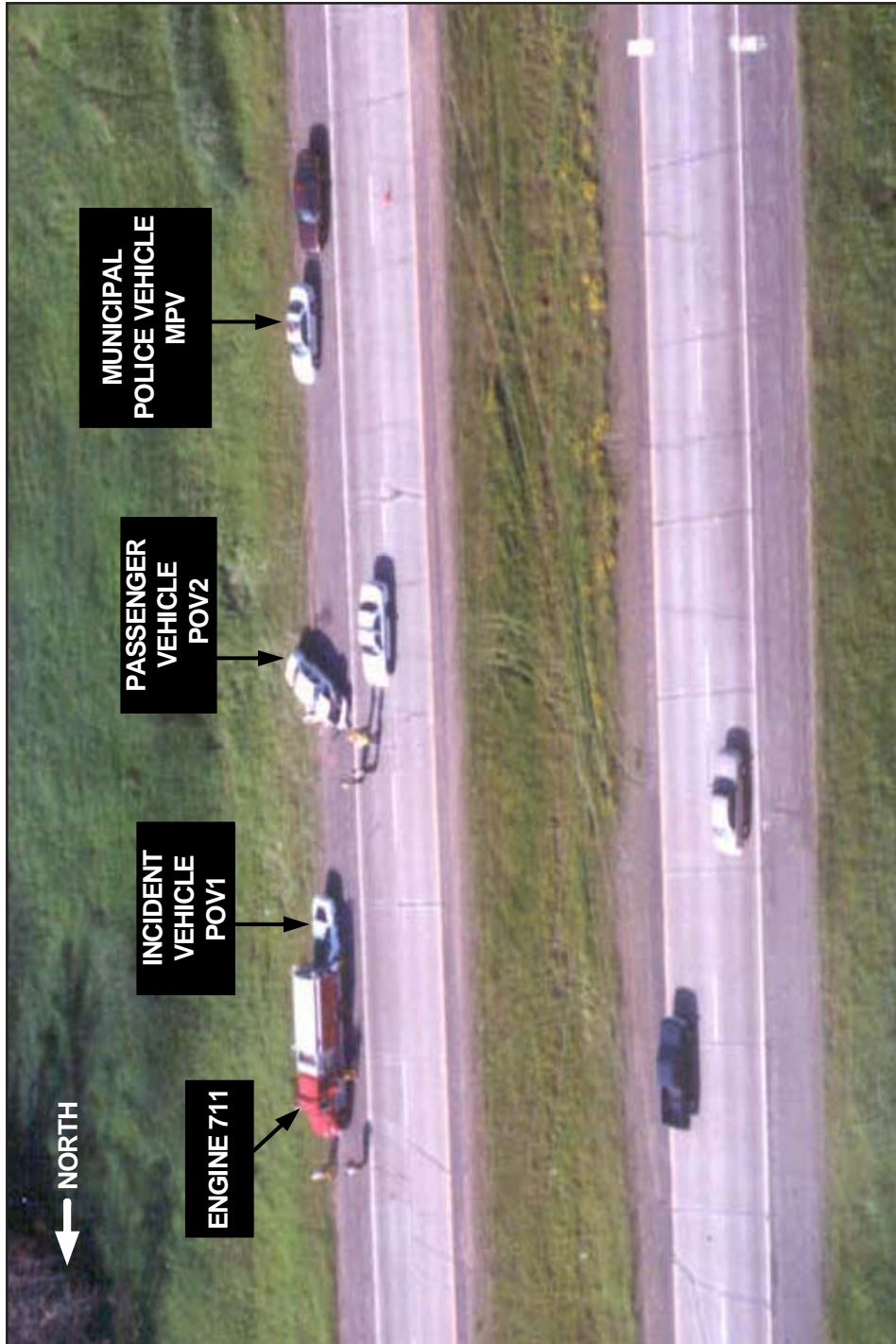


Photo 2. Aerial View of Incident Site

NOTE: Photograph depicts incident scene following removal of several vehicles identified in the investigation.



Volunteer Captain Killed, Two Fire Fighters and Police Officer Injured When Struck by Motor Vehicle at Highway Incident - Minnesota

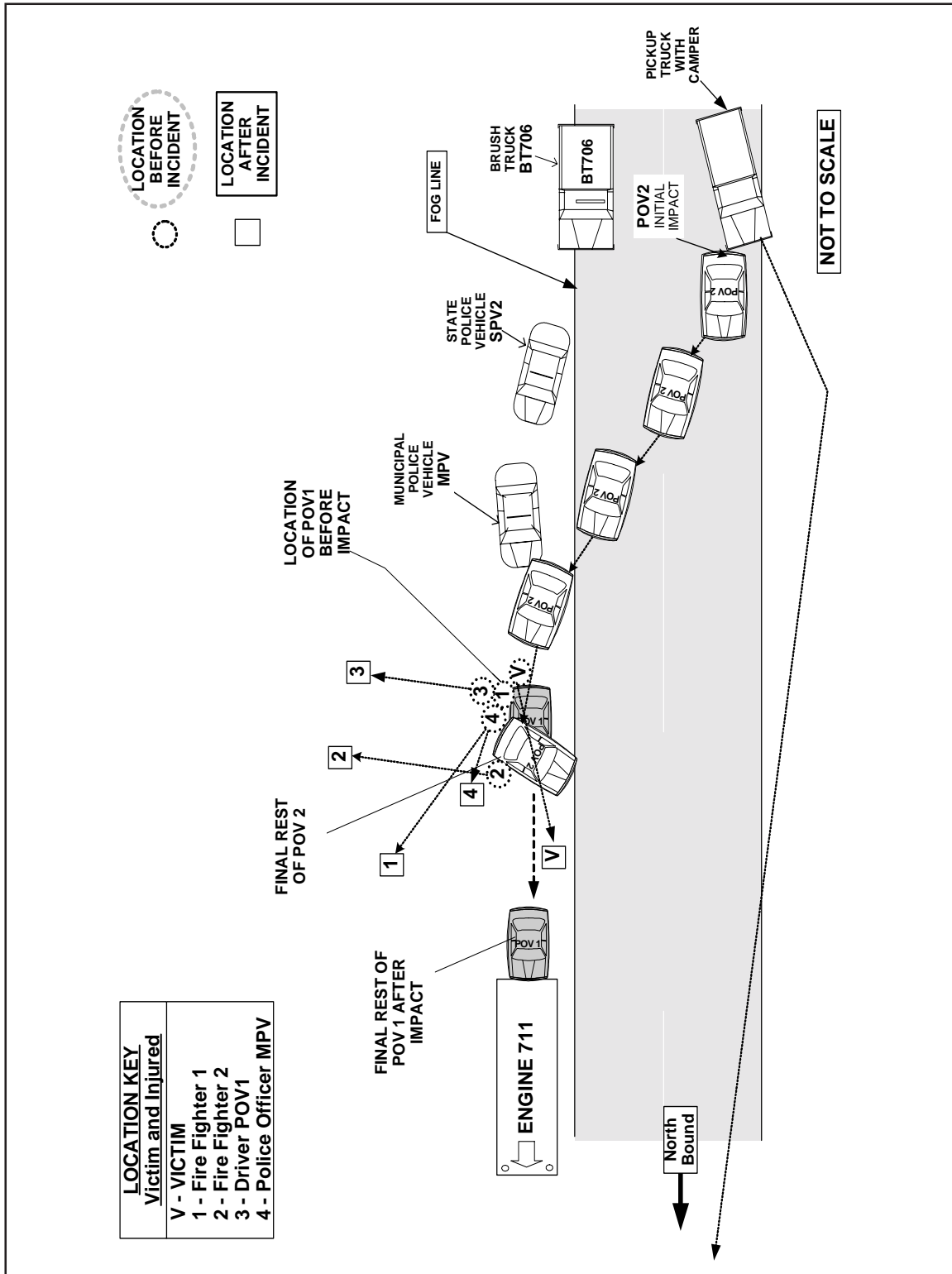


Figure 1. Aerial Diagram of Incident Site



Volunteer Assistant Chief Killed When Struck by Tractor-Trailer While Operating at a Motor Vehicle Crash – North Carolina

SUMMARY

On June 14, 2008, a 51-year-old male volunteer Assistant Chief (the victim) was fatally injured after being struck by a tractor-trailer. The victim was assisting at a motor vehicle incident that had been caused by near-zero visibility conditions. Unforeseen weather conditions had caused smoke from a contained fire on a nearby military range along with fog to move across the four-lane highway. A truck driver attempting to slow his tractor-trailer down after encountering the smoke and fog swerved suddenly to miss a vehicle parked in the highway striking a Sheriff's Deputy's patrol car before striking and killing the victim. A Sheriff's Deputy also lost his life and another was injured during this incident. Key contributing factors identified in this investigation include inability to establish traffic control on both sides of a divided highway, ineffective coordination of the multiple agencies involved in the emergency response, and unsafe vehicle operation of motorists during inclement weather and environmental conditions.

NIOSH investigators concluded that, in order to minimize the risk of similar occurrences, fire departments should:

- ***ensure that fire fighters responding to a scene involving a highway incident control oncoming traffic first, before responding to the emergency***
- ***establish pre-incident traffic control plans and pre-incident agreements with law enforcement and other agencies such as highway departments***

Additionally, Emergency Medical Services (EMS) should:

- ***ensure that emergency vehicles are parked in protected work areas when responding to emergency situations***

Additionally, municipalities should consider:

- ***establishing a multi-agency communication system for response operations to coordinate and communicate incident activities***

Although there is no evidence that the following recommendation could have specifically prevented this fatality, NIOSH investigators recommend that fire departments:

- ***ensure high-visibility vests meet minimum requirements of ANSI/ISEA 107-2004 or ANSI/ISEA 207-2006***

INTRODUCTION

On June 14, 2008, a 51-year-old male volunteer Assistant Chief (the victim) was fatally injured after being struck by a tractor-trailer while assisting at a motor vehicle incident. On June 16, 2008, the U.S. Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. On June 23-27, 2008, a Safety and Occupational Health Specialist and General Engineer from the NIOSH Fire Fighter Fatality Investigation and Prevention Program traveled to North Carolina to investigate this incident. The NIOSH investigators met with the Fire Chief of the victim's department, County Assistant Fire Marshal, County Sheriff, Military Base Fire Chief and Deputy Chief, EMS Supervisor, fire and EMS responders, and representatives of the North Carolina Occupational Safety and Health Administration (NCOSHA). The investigators reviewed the victim's training records and witness statements, visited the incident site and took photographs. The investigators also reviewed the 911 dispatch logs, the North Carolina State Highway Patrol Crash Report, NCOSHA investigation photographs, fire photographs taken by the military base, Fire Marshal photographs of the incident, and the victim's death certificate.

Fire Department

This volunteer fire department has one station with 23 volunteer members that serves a population of approximately 2,000 within an area of about 7 square miles. The department has two engines, a tanker, one tanker/pumper, and a brush truck.

County 911 Dispatch Center

Fire, EMS, and Sheriff's Office each had their own designated console/area and dispatcher at the County 911 Dispatch center. The County 911 Dispatch center needed to be requested by a Fire, EMS, or Sheriff's Office responder to patch the different bands together to enable users to communicate. A multi-agency agreement or memorandum of understanding had not been established between the agencies to automatically establish a common channel during a multi-agency response.

Training and Experience

The victim had served 33 years as a volunteer with this fire department and over 25 years as an officer. The victim had received his state Fire Fighter III certification, Hazardous Materials Level I certification, and he annually received 50 or more recertification hours in various fire service topics. The victim had also received training from the Institute of Transportation Research and Education and the North Carolina Department of Transportation (NCDOT) in flagger training, roadway spill response, and basic, intermediate, and advanced work zone safety.

The fire chief of the victim's department established himself as the incident commander (IC). He has been a volunteer with this department for 34 years and a career fire fighter for 23 years at the

neighboring military base. The fire chief holds numerous certifications and is a state of North Carolina fire instructor.

The fire department has written general operating guidelines (GOGs) regarding the use of personal protective equipment (PPE) during emergency and non-emergency incidents and operations at motor vehicle incidents. These GOGs focus on personal and incident safety, vehicle positioning, potential hazards, and traffic flow.

Road and Weather Conditions

The incident occurred in the northbound lanes of a four-lane coastal highway. This $\frac{3}{4}$ mile section of highway was straight and dry with a slight elevation approaching an overpass. The road surface was comprised of asphalt with a paved shoulder. A grass median separated the north and southbound lanes that are marked with a solid yellow and white line on the outer edges. The northbound lanes measured 24 feet wide with a dotted white center line. The shoulder was 12 feet wide. The road has a posted speed limit of 55 mph.

On the morning of the incident the temperature was 64°F and conditions were foggy with no wind ([Photo 1](#)). White smoke emitting from a contained fire had migrated south overnight to a low lying area on the highway, mixing with fog, and creating near zero visibility conditions. The white smoke was coming from a fire inadvertently started from the impacting of shells during a military training exercise. The military base training ground is located approximately $\frac{1}{2}$ mile west and $\frac{1}{2}$ mile north of the incident site. A spotter on a military fire tower had first noticed smoke coming from the training area on March 13, 2008. Three military brush units were initially dispatched with the forestry division to assess the fire. Forestry officials were unable to access this remote area with heavy machinery. A plowed fire line was placed around the 400 acre fire to contain it. The military fire department checked the fire daily to make sure the fire stayed contained, in hopes it would burn itself out. On May 20, 2008, a flare-up occurred due to dry conditions causing 200 additional acres to burn. A similar containment method was utilized to control the flare-up as the fire continued to smolder.

Personal Protective Equipment

At the time of the incident, the victim was wearing a full array of personal protective clothing and equipment, consisting of turnout gear (coat and pants), helmet, boots, and a high-visibility safety vest over his turnout coat. Both the vest and the turnout gear contained high-visibility reflective material. The vest was orange-red in color with a 1" to 2" wide fluorescent yellow vertical stripe over each shoulder connected to a 3" to 5" fluorescent yellow horizontal stripe with the word "F-I-R-E" in black letters across the front and back ([Photo 2](#)). The vest also contained cut-out sides and Velcro side breakaway points. The vest did not have 360 degrees of retroreflective material and it was not labeled as meeting ANSI/ISEA 107-2004 or ANSI/ISEA 207-2006^a. The victim's turnout gear had 3" standard yellow-green/silver stripping. The turnout coat had two sets of stripes on each arm and a stripe around the coat bottom and mid chest. The bunker pants had a stripe at the bottom of each leg cuff. The victim carried a portable radio.

^a In a graded exposure, the recruit or fire fighter could wear the mask in increasing increments in a safe environment. Flooding is where the recruit or fire fighter is exposed to their phobia at full intensity, such as in an IDLH atmosphere, for an extended amount of time.

Equipment and Personnel

The timeline for this incident listed in order of arrival time and key events, includes:

0433 hours

County 911 Dispatch receives multiple cellular 911 calls for heavy smoke and vehicles stopped on the highway

0437 hours

County 911 Dispatch contacts Military Base Dispatch asking if there is a controlled burn on the base causing decreased visibility

County 911 Dispatch receives a cellular 911 call for a vehicle in a ditch with no injuries

0439 hours

Military Base Dispatch calls County 911 Dispatch back advising them there is a large controlled burn in that area

County 911 Dispatch requests the Military Base to place signs on the highway

0447 hours

Sheriff's Deputy in area looking for vehicle in the ditch

0450 hours

Sheriff's Deputy contacts County 911 Dispatch requesting them to contact NCDOT for warning signs due to near zero visibility conditions

0452 hours

County 911 Dispatch receives cellular 911 call for motor vehicle incident in southbound lanes

0454 hours

EMS Station 6 dispatched for an unknown motor vehicle incident in southbound lanes of highway with decreased visibility

0455 hours

Fire Station 19 Dispatched for motor vehicle incident

County Ambulance (EMS6) enroute with two paramedics

0456 hours

EMS Supervisor (M102) enroute

County 911 Dispatch advised M102 they are calling NCDOT

0457 hours

Engine 1903 (E1903) enroute with victim and Fire Chief

0459 hours

EMS6 in northbound lanes attempting to locate incident scene

0500 hours

Military Base Dispatch calls back stating they are attempting to see if they can move signs to this area

0501 hours

EMS6 advises over the radio, "visibility is less than 5 feet"

0502 hours

Tanker/Pumper 1911 (Unit 1911) enroute with two fire fighters

0502 hours

EMS6 advises there are "no injuries" for the southbound incident

M102 cancels response, but continues to the scene to assess visibility concerns

0503 hours

Brush 1909 (B1909) enroute with a Captain and fire fighter

0504 hours

E1903 on scene establishing command and reporting, "...smoke here is extremely thick, nearly zero visibility...on the southbound lanes, but people are stopped on the northbound lanes"

County 911 Dispatch advises IC, "Base is advising they have signs posted out there, but they're just not in visible locations, they are supposed to be advising me shortly if they are going to move them"

0505 hours

County 911 Dispatch contacts IC to confirm incident location and to advise there is a child involved

0506 hours

IC orders Unit 1911 upon arrival to stop southbound traffic north of the smoke/fog line, turn on all lights, advise motorists of the incident on the overpass, and allow them to "ease through one at a time"

Unit 1911 copies the orders given

0509 hours

Sheriff's Deputy #1 crosses median to assist with the northbound vehicle incident

Sheriff's Deputy #1 states, "...just heard woman yelling, can't find her anywhere...I'm in the northbound lanes"

0512 hours

County Dispatch gets in contact with NCDOT for warning signs

0514 hours

NCDOT enroute to incident

IC requests County 911 Dispatch to contact Military Base for traffic control assistance

0516 hours

Sheriff's Deputy #3 tells County 911 Dispatch to have fire stop all traffic due to visibility conditions prior to his arrival

Note: This deputy was traveling in the southbound lanes approaching the incident site.

0517 hours

County 911 Dispatch radios Sheriff Deputy #3 back to confirm which traffic lanes to shut down

Sheriff's Deputy #2 patrol car and EMS 6 sideswiped by motor vehicle while parked in the left northbound lane

B1909 arrives on scene and does a face-to-face with the IC

M102 traveling in southbound lanes advises, "in the area"

0518 hours

Sheriff's Deputy #2 moving patrol car further south in northbound lanes to stop traffic

EMS6 confirms they are in the northbound lanes

EMS6 advises, "involved in motor vehicle collision, crew is not injured"

County 911 Dispatch advises IC to stop all traffic in the north and southbound lanes per Sheriff Deputy #3, and to be advised of EMS6 involved in collision in the northbound lanes

IC and Unit 1911 acknowledge to stop traffic and to check on the northbound collision

B1909 sent to block all northbound traffic

0521 hours

Broken radio traffic from IC, "just heard an accident, is everyone okay"

Broken radio traffic possibly from B1909, "semi just ran into..."

EMS6 advised, "we have had another collision, two vehicles with major-major damage, we have one person trapped inside their vehicle, we'll advise"

0522 hours

EMS6 advises, "we have a fire fighter down"

INVESTIGATION

On June 14, 2008, at 0433 hours, County 911 Dispatch received several cellular 911 calls complaining of heavy smoke on a major coastal highway. This portion of highway dissected the western section of a military base. Sheriff's Deputies were dispatched to check out the area. The County 911 Dispatch then contacted the Military Base Dispatch to find out if they had a controlled burn in this area. At 0439 hours, the Military Base Dispatch confirmed there was a large contained burn in the area emitting smoke. County 911 Dispatch requested the Military Base to place warning signs for motorists traveling in this area. Sheriff's Deputies were in the area at 0447 hours checking on conditions and a possible vehicle in the ditch. At 0452 hours, a cellular 911 call came in to the County 911 Dispatch center for an unknown vehicle incident in the southbound lanes. The caller complained of heavy smoke or fog conditions causing decreased visibility. EMS Station 6 was dispatched at 0454 hours with initial responding unit EMS6 enroute at 0455 hours from the south, fire station 19 was dispatched at 0455 hours, M102 enroute at 0456 hours from the north (self-dispatched as EMS Supervisor), E1903 enroute at 0457 hours from the north, Unit 1911 enroute at 0502 hours from the north, and B1909 enroute at 0503 hours from the north.

Activities of EMS6

At 0459 hours, EMS6 arrived in the area traveling in the left northbound lane. EMS6 came upon heavy smoke like conditions with less than five feet of visibility. The crew immediately rolled down their windows and turned off their siren to allow them to hear anyone call for help. Their emergency lights were left on. A pedestrian came up to the operator's window and advised the crew that the incident was in the southbound lanes. The operator positioned the ambulance just short of the overpass in the left northbound lane. The operator and attendant-in-charge (AIC) exited the ambulance wearing ANSI 207 approved high-visibility retro-reflective safety vests and crossed the median to look for the traffic incident. They came upon a jack-knifed boat being pulled by a pick-up truck. The two occupants of the vehicle were escorted across the median and into the back of the ambulance to obtain patient care refusals. While the AIC was talking with them, Sheriff's Deputy #2 came to check on them. The ambulance crew advised him they were fine and would be trying to leave as soon as possible. Sheriff's Deputy #2 advised the crew he was going to move his patrol car back and block the area for them because of low visibility. Moments later, the crew heard the sound of screeching tires and felt a sudden impact that rocked the ambulance. The crew, patients, and Sheriff Deputy #2 were unhurt and the AIC immediately contacted County 911 Dispatch about the collision. Their exact location was confirmed and the IC was notified on the state fire mutual aid channel. The County EMS Department operates with a digital audio band 800 MHz system while the fire department operates with an analog VHF system. No radio communications took place between fire and EMS.

The crew exited the ambulance to check for damage and injuries. Sheriff's Deputy #2 was positioning his patrol car in the left northbound lane south of the ambulance with blue emergency lights on. Moments later, the ambulance crew heard the engine noise from a large truck, "as though he had shifted," and then heard someone yell, "Run!" The AIC stated he ran towards the southbound lanes. He remembered hearing multiple impacts and the sound of airbrakes and screeching tires. From the southbound lanes he looked back towards the ambulance

and could not see it, but did see faint blue lights about 60-70 feet south of where the ambulance was parked. He then crossed back towards the location of the ambulance and found that a tractor-trailer had struck the rear of the ambulance ([Photo 3](#)). Minutes later, the AIC found the victim on the left shoulder of the northbound lanes approximately 50 feet south of the ambulance.

Activities of Apparatus from Station 19

At 0504 hours, E1903 arrived on scene with the victim and Fire Department Chief. The Fire Chief established incident command and stated, "...smoke here is extremely thick, nearly zero visibility...on the southbound lanes, but people are stopped on the northbound lanes." The southbound vehicle incident occurred approximately four miles from the fire department just past an overpass. The IC discovered that a pick-up truck towing a boat trailer had jack-knifed in the right southbound lane. From E1903, he spoke to an unknown male subject standing by the pick-up truck to see if he was injured. The male subject stated he was "ok," and advised the IC there was a child involved in another incident further down the road. The child's condition was unknown to the male subject. The IC then radioed Unit 1911 at 0506 hours and advised them upon arrival to stop southbound traffic north of the smoke/fog line (before the overpass), turn on all lights, advise motorists of the incident on the overpass, and allow them to "ease through one at a time." Unit 1911 copied the radio transmission as they were arriving in that location. Unit 1911 positioned their unit at an angle in the right southbound lane, donned turnout gear with reflective vests, and set-up traffic control using reflective traffic control devices ([Photo 4](#)).

E1903 was then positioned in the median across from the southbound incident. The victim and IC exited E1903 in full turnout gear and donned "reflective safety traffic control vests." The IC assisted the victim in setting-up the top mounted night fighter flood lights on the passenger side of E1903. The emergency warning lights were left on. The IC assisted the victim with the lights on the driver side of E1903. The IC then met Sheriff's Deputy #1 and had a face-to-face conversation advising him of a possible child injury. The IC, victim, and Sheriff's Deputy #1 started to walk south from E1903 when the IC was met by M102. M102 needed assistance in positioning her vehicle in the southbound lanes. *Note: Conditions on scene were requiring vehicles to be ground guided by someone on foot.* The victim and Sheriff's Deputy #1 continued to look for a possible injured child while the IC assisted M102. At 0509 hours, Sheriff's Deputy #1 made a radio transmission on the Sheriff's Office incident channel stating, "...just heard woman yelling, can't find her anywhere...I'm in the northbound lanes." It is believed that the victim was with Sheriff's Deputy #1 during this radio transmission.

At 0514 hours, the IC radioed County 911 Dispatch to contact the military base for traffic control assistance. While the IC was guiding M102 into position, B1909 arrived on scene requesting orders. Simultaneously, the first vehicle incident involving Sheriff's Deputy #2 and EMS6 in which they were side-swiped by a motor vehicle occurred. The IC was unaware of any emergency responders in the northbound lanes and the incident until it was radioed to him by County 911 Dispatch on the fire incident channel. At this time, the IC ordered B1909 to continue southbound and take the cut-through to the northbound side and establish a traffic control point. The IC also ordered the southbound lanes to be closed by Unit 1911. B1909, with a ground guide, traveled south in the left southbound lane with its emergency lights on and was within 100 meters of crossing over to the northbound lanes when a tractor-trailer passed in front of them.

Moments later, the IC and B1909 heard a “very loud crashing noise.” The IC could not see the source of the noise and immediately started radioing the victim and B1909. County 911 Dispatch then radioed the IC on the fire incident channel stating there was a second vehicle collision in the northbound lanes with a fire fighter involved. The IC then radioed County 911 Dispatch requesting that a mutual aid fire department respond and block all northbound traffic.

Fatal Crash

The tractor-trailer suddenly swerved left from the right northbound lane to miss a vehicle parked in the roadway ([Diagram 1](#)). The tractor-trailer struck Sheriff’s Deputy #2’s patrol car, positioned partially on the shoulder and left lane, in the right rear quarter-panel ([Photo 5](#)). The patrol car skidded to the left striking Sheriff’s Deputy #2 and knocking him into the median injuring him. The tractor-trailer continued north in the left lane striking the victim and Sheriff’s Deputy #1, killing them on impact. It is believed that Sheriff Deputy #1 had just finished providing instructions to the parked vehicle in the right northbound lane. The tractor-trailer then swerved right striking a vehicle in the right northbound lane that was involved in the first northbound incident. The tractor-trailer finally came to rest against the rear doors of EMS6 parked in the left northbound lane ([Photo 6](#)). The Highway Patrol estimated the speed of the tractor-trailer was 55 mph when approaching this area and 50 mph upon striking the first vehicle. The tractor-trailer tire skid marks before striking the patrol car were 54 feet in length and the tractor-trailer traveled 167 feet after striking the patrol car.

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. NIOSH investigators identified the following items as key contributing factors in this incident that ultimately led to the fatality:

- Inability to establish traffic control on both sides of a divided highway
- Ineffective coordination among the multiple agency response.
- Migration of fog and smoke mixture onto the highway.
- Operator of tractor-trailer not adjusting manner of vehicle operation during poor visibility.

CAUSE OF DEATH

According to the medical examiner, the cause of death for the victim was multiple blunt traumas.

RECOMMENDATIONS

Recommendation #1: Ensure that fire fighters responding to a scene involving a highway incident control oncoming traffic first, before responding to the emergency

Discussion: Upon arrival, the IC should size-up the roadway incident scene and surrounding areas and traffic to ensure safety of all emergency responders, accident victims, and motorists.

The size-up shall take place prior to parking apparatus and positioning personnel. Smoke, fog and night-time conditions create special hazards for roadway incident operations. Apparatus and personnel may be obscured by smoke, fog or darkness and may not be visible to vehicle operators moving past the accident scene. When the IC determines that poor visibility creates an additional hazard the IC should initiate actions to close the highway in both directions.

There are numerous challenges relative to apparatus placement, operational effectiveness, and responder safety when dealing with incidents on busy roadways.¹ As stated in the *Pumping Apparatus Driver/Operator Handbook*, “some of the most dangerous scenarios faced by fire fighters are operations on highways, interstates, turnpikes, and other busy roadways. Fire apparatus should be placed between the flow of traffic and the fire fighters working on the incident at an angle to upstream traffic. The positioning of apparatus (as a shield) is referred to as a “block” that creates a protected area known as the “shadow.” Emergency personnel should never leave the “shadow” for any reason.²

When at all possible on divided multilane highways, fire fighters working on one side of the roadway should not cross the center median and enter into the opposite lane. Additional resources should be called when there is a “split scene.” This is especially critical when there is decreased visibility and/or heavy traffic conditions.

During the incident, it is believed that the victim crossed into the northbound lanes to check on a woman screaming. The IC had not yet established a traffic control zone for the northbound lanes. An apparatus and personnel were enroute to block traffic, and were within 100 meters of positioning their traffic control block when the tractor-trailer passed in front of them.

Recommendation #2: Establish pre-incident traffic control plans and pre-incident agreements with law enforcement and other agencies such as highway departments

Discussion: Pre-incident planning is fundamental to effective traffic control and management. In *The White Paper: Protecting Emergency Responders on the Highways*³, a preplan should: (1) account for possible use of detours; (2) anticipate the likelihood of vehicles transporting hazardous materials or of extraordinary weight or size; (3) accommodate the need to keep commerce flowing; (4) minimize the possibility of secondary incidents; and (5) account for possible impact on neighboring jurisdictions. Agencies that develop effective pre-incident plans that emphasize interagency cooperation when responding to highway incidents are more likely to be successful when these incidents occur.⁴ Initially during this incident, it was unclear who was responsible for placing warning signs on the highway. The smoke was emitting from the Military Base but the visibility problems were occurring on a state highway. Warning signs were eventually placed by NCDOT and Military Base personnel moved their signs into better locations, but not until after the fatal incident occurred ([Photo 7](#)).

Also, the fire department originally set-up traffic control in the southbound lanes. The IC requested Military Base assistance for traffic control for the northbound traffic at about the same time the Sheriff's Office requested the fire department to shut down north and southbound lanes. NFPA 1620 provides guidance to assist departments in establishing pre-incident plans. Pre-incident planning that includes agreements formed by a coalition of all involved parties such as

mutual aid fire departments, EMS companies, police, and highway departments may save valuable time, present a coordinated response, and provide a safer emergency work zone.^{5,6}

Since the fatality, there have been three more responses in the same area for vehicle incidents, and there is improved coordination of the involved agencies. The County 911 Dispatch center now adds the automatic response of NCDOT for warning signs, a mutual aid fire department to block the lanes of northbound traffic, and the victim's department now blocks the southbound traffic. The victim's department will proceed with caution with the Sheriff's Deputies into the area until the incident can be confirmed. The Military Base also now has 24-hour surveillance on contained fires until they burn themselves out.

Additionally, Emergency Medical Services should:

Recommendation #3: Ensure that emergency vehicles are parked in protected work areas when responding to emergency situations

Discussion: An ambulance should be positioned within a "protected zone" when working a highway incident.² The IC should instruct the operator of the ambulance on how and where to position their vehicle upon arrival. The ambulance needs to be positioned so the rear patient loading area is away from the closest lane of moving traffic.² Patient loading exposes responders to increased hazards because responders may have their back to oncoming traffic. A responder on scene should be assigned to face traffic to sound a warning if an errant vehicle enters into the protected area. During this incident, the IC had established a southbound traffic control zone, but was not aware of EMS6 being on scene in the northbound lanes until after the ambulance and sheriff's vehicle were side-swiped. The ambulance was positioned in the left uncontrolled northbound lane upon their arrival to the southbound accident. This position exposed the patient loading area and crew door to oncoming traffic. The ambulance could have been positioned in the median to alleviate this problem, but this still required the ambulance crew to cross the median on foot to gain access to the southbound incident in the right lane. Emergency responders should position their vehicles in a controlled traffic area preferably on the same side of the incident whenever possible. Fortunately, the ambulance crew was not injured, but the crew and ambulance were involved with the initial and fatal northbound accidents.

Additionally, municipalities and 911 Communication Centers should consider:

Recommendation #4: Establishing a multi-agency communication system for response operations to coordinate and communicate incident activities

Discussion: An effective radio communication system is a key factor in fire department operations.⁷ The communication system is used for receiving notification of emergencies, alerting personnel and equipment, coordinating the activities of the units engaged in emergency incidents, and providing nonemergency communications for the coordinating fire departments.⁸ Multiple agencies responding to or engaged at incidents should have access to a common radio frequency/channel to be in contact with each other.

The fire department and sheriff's office operated on an analog VHF radio band, but County EMS operated on a digital audio band 800MHz system. The Sheriff's Office and Fire Department communications system had reportedly not been updated due to budget constraints.

During this incident, Sheriff's Deputy #3 contacted the sheriff's office dispatcher on the Sheriff's Office incident channel to advise the fire department to close the highway. This message was then verbally communicated to the fire dispatcher and transmitted on the fire incident channel. Also, the IC was unaware that EMS6 was on scene in the northbound lanes until after the fire dispatcher relayed information from the EMS dispatcher about the ambulance being side-swiped by a vehicle. Upgrading all agencies to a digital audio band 800MHz system or instituting a memorandum of understanding for a common incident channel could have allowed the fire department, EMS, and sheriff's office responders to better communicate to one another during the incident. Traffic control and operations could have been better communicated directly between the different agencies. Currently, the County 911 Dispatch center is working to resolve these issues.

Although there is no evidence that the following recommendation could have specifically prevented this fatality, NIOSH investigators recommend that fire departments:

Recommendation #5: Ensure high-visibility vests meet minimum requirements of ANSI/ISEA 107-2004 or ANSI/ISEA 207-2006

Discussion: To meet minimum requirements for high visibility apparel, responders should only use vests that meet a Class II requirement of ANSI/ISEA 107-2004 or the requirements of ANSI/ISEA 207-2006 for Public Safety Vests.⁹ These minimum requirements include 1) use of fluorescent background material 2) the fluorescent material may be yellow-green, orange-red, or red 3) retroreflective material arranged for 360 degree visibility and 4) the garments should be labeled as compliant with ANSI/ISEA 107-2004 or ANSI/ISEA 207-2006.⁹ *Federal Regulation 23 CFR 634* states, "the purpose of the regulations in this part is to decrease the likelihood of worker fatalities or injuries caused by motor vehicles...while working within the right-of-way on Federal-aid highways."⁹ NFPA 1500 8.7.10 states, "when members are operating at a traffic incident and their assignment places them in potential conflict with motor vehicle traffic, they shall wear a garment with fluorescent and retroreflective material visible from all directions."¹⁰

During this incident, the victim was wearing a reflective highway safety vest and required personal protective equipment while operating on scene. However, there were no markings or labels on the vest stating it met ANSI/ISEA 107-2004 or ANSI/ISEA 207-2006 requirements for high visibility garments. The vest also did not provide 360 degrees of retrorefelctive material. The sides were open and connected together by black Velcro strips. From pictures, the vest appeared clean and without noticeable wear.

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INVESTIGATOR INFORMATION

This incident was investigated by Stacy C. Wertman, Safety and Occupational Health Specialist, and Matt Bowyer, General Engineer, with the Fire Fighter Fatality Investigation and Prevention Program, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH located in Morgantown, WV. A technical review was provided by Steve Austin from the Cumberland Valley Volunteer Firemen's Association and Emergency Responder Safety Institute.

PHOTOS



Photo 1. Visibility conditions 90 minutes after the incident.

(Photo Courtesy of Fire Marshal)



Photo 2. Highway safety vest worn by fire department personnel on scene.

(NIOSH photo)



Photo 3. Final resting position of tractor-trailer.
(Photo Courtesy of Fire Marshal)



Photo 4. Traffic control devices used by Unit 1911.
(NIOSH photo)



Photo 5. Crash scene looking north from northbound lanes.

(Photo Courtesy of Fire Marshal)

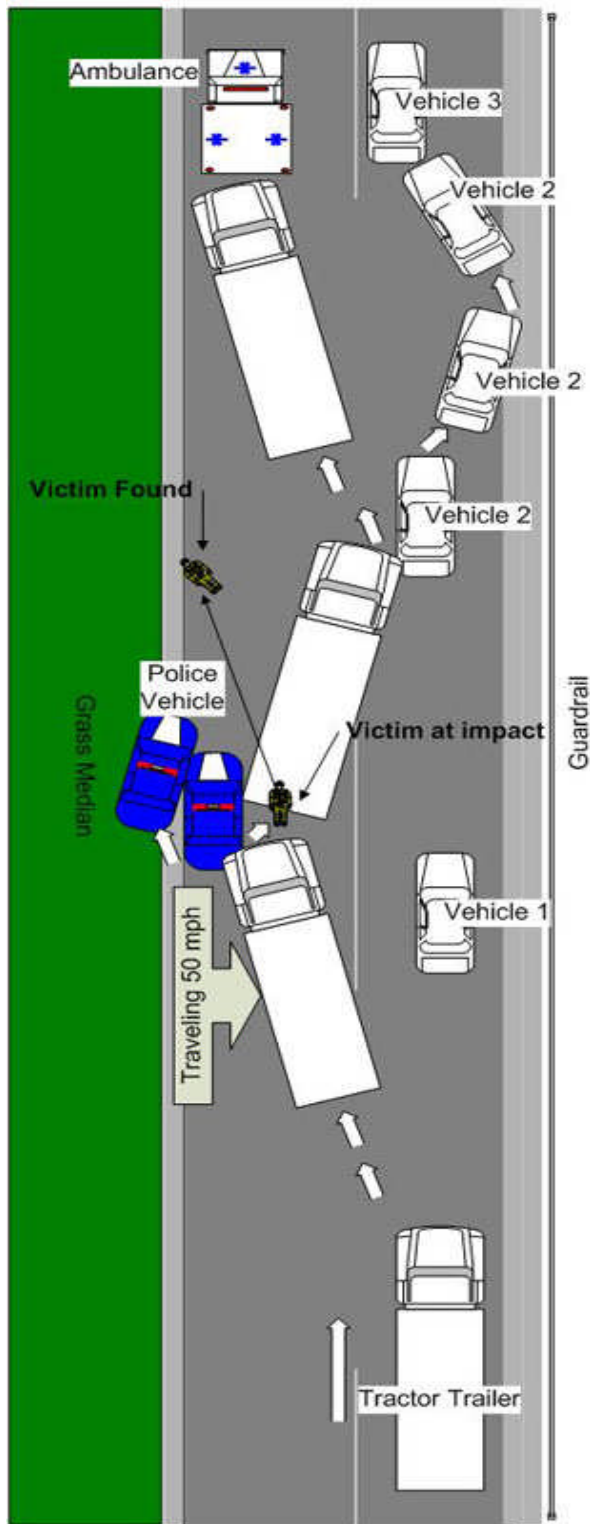


Photo 6. Crash scene looking south from northbound lanes.

(Photo Courtesy of Fire Marshal)



Photo 7. Portable changeable message and NCDOT signs posted immediately after the incident.
(NIOSH photo)



All vehicles were stopped when the tractor-trailer swerved to miss Vehicle 1.

Drawing not to Scale

Diagram 1. Fatal Path

The Manchester Incident

Monday, January 16, 1006

Town Meeting Road & Finley Street

Manchester, CT



From the media:

Tuesday, January 17, 2006

Car crashes into fire truck at accident scene- Apparatus protecting firefighters

By Ethan Fry, Journal Enquirer

A car travelling from Bolton slammed into a fire engine Monday at the scene of a car accident on Camp Meeting Road with enough force to move the 40,000 pound fire truck eight feet from where it had been parked to shield emergency personnel from oncoming traffic, authorities said. A passenger in the car was taken to Hartford Hospital for evaluation after suffering minor facial injuries town Fire Chief Robert Bycholski said in a statement. No other civilian or firefighters were injured in the crash.

At the time of the collision firefighters were already on the scene responding to an accident that occurred at approximately 3:49 P.M., the Chief said. In that accident Bycholski said a vehicle travelling east on Camp Meeting Road swerved across the westbound lane and flipped over on the shoulder of the road just west of Finley Street. Two town vehicles responded to that crash, Bycholski said: a fire engine blocked off the westbound lane of the road on the east side of the accident, and another vehicle blocked the same lane on the opposite side. About twenty minutes after the initial incident, Bycholski said, a car travelling west on the road ran into the fire engine blocking off traffic. One of the firefighters who had been directing traffic saw the approaching car and was able to warn firefighters at the scene of the accident who were able to avoid injury. Serious injuries in Monday's accident were prevented by the department's policy of safely blocking off the scenes of motor vehicle accidents, Bycholski said, noting that the theme for firefighters is "Place yourself inside an immovable barrier." The Chief said that last year "the department totally revised all policies and practices to create a better defense to traffic approaching accident scenes where firefighters were working" The department's motto in such a situation is "Never trust the traffic".

Author Notes:

There is no question that the proper positioning of the first responding apparatus in this case saved the lives of the firefighters on the scene. It was a firefighter who was directing traffic who spotted the oncoming car and because of alertness to his job he was able to shout a warning to his brother firefighters. The blocking apparatus did the rest. A true success story, this event reveals how training and the proper administrative guidelines (SOG's) can save our lives.





General Operating Guideline:

Roadway & Highway Operations

Purpose: To provide responders with a uniform guide for safe operations while working incidents on Manchester's roadway and highway systems.

Policy: MFRE responders will utilize all safety equipment and methods available to provide a safe working area while operating on Manchester's roadway and highway systems.

- **General** – Providing a safe working area is a priority at every scene. MFRE personnel should understand and appreciate the high risk while operating at an incident on a roadway and/or highway system. Personnel must operate in a defensive posture, always considering moving vehicles as a threat to safety. Personnel must be aware that our own actions, inactions and practices can make a scene a more hazardous workplace (i.e. white strobe lights, headlights, non-reflective wear, failure to properly identify and block temporary work zone areas, saturation of work area with non-task assigned personnel).
 - **Assignment** – Any incident (fire, medical, rescue, etc) where the work area is a roadway will receive a minimum of a Level-II response; Code-2 unless otherwise defined. Any call on a limited access highway will receive a minimum Level II response Code 3.
 - **Terminology** – Observe the following:
 1. **Advanced warning** – Notification procedures that advise approaching motorists to transition from normal driving status to that required by the temporary emergency traffic control measured ahead of them.
 2. **Block** – Positioning fire department apparatus on an angle to the lanes of traffic creating a physical barrier between upstream traffic and the work area.
 3. **Buffer zone** – The distance or space between personnel and vehicles in the protected work zones and nearby moving traffic.
 4. **Shadow** – The protected work area at a roadway incident that is shielded by the block from apparatus.
 5. **Downstream** – The direction that traffic is moving as it travels away from the incident scene.
 6. **Upstream** – The direction that traffic is traveling from as the vehicles approach the incident scene.
 7. **Temporary work zone** – The physical area of a roadway, within which emergency personnel perform the fire, EMS and rescue tasks.
 - **Response** – Responding units will make every effort to minimize risk of injury to themselves, customers and those who are using the roadway or highway system:
 1. Use visible and audible warning devices appropriately for mode of response.
 2. Median strip crossovers (usually marked "Authorized Vehicles Only") shall be used for turning around and crossing to other travel lanes only when emergency vehicles can complete the turn without unreasonable risk to the responders or other vehicles in either travel direction.
 3. Use of U-turn in "Jersey" barriers is extremely hazardous and shall be utilized only when the maneuver is necessary (and without unreasonable risk) for immediate lifesaving measure.
 4. Response in the opposing direction on one-way entrance or exit ramps shall not be permitted, unless it is confirmed a public safety agency has stopped opposing traffic from ramp use and the on-board officer has determined that it is a reasonable and safe act to commit based on immediate conditions of the ramp and proximity of the emergency scene. If no officer is on-board, the shift commander (or incident commander) must grant authorization to a specific request by the apparatus/unit operator when the operator has determined it is a reasonable and safe act to commit.
 - **Apparatus positioning** – The initial officer on the scene must assess the parking needs of later arriving apparatus and specifically direct the parking and placement of these vehicles as they arrive to provide protective blocking of the scene. This officer is also the initial safety officer for the incident.
- Responding apparatus, upon arrival, shall position as follows unless circumstances prohibit this guide in which case the incident commander (or operator, if command has not yet been established) shall position apparatus in such a manner as to provide the safest work area possible.
1. First-arriving apparatus shall park to create a temporary work zone that protects personnel from on coming traffic in at least one direction. Block the most critical or highest volume direction first. The apparatus should be placed at a 45-degree angle to the curb. The buffer zone should be no closer than 50 feet to the incident action area. Whenever possible, the angle of the apparatus should protect

anyone at the pump panel or control area. Operators should have front wheels rotated away from the incident. First arriving apparatus will block only those travel lanes necessary to provide a safe working area.

2. Second-arriving apparatus shall position at the next critical position, either further blocking the first arriving apparatus with appropriate distancing, widening the initial blocked area, at least one lane wider than the width of the incident, or "boxing" in the work area, leaving room on the downside for an appropriately sized work area. A 45-degree angle is preferred. The position of the apparatus shall take into consideration all factors that limit the sight distance of the approaching traffic including ambient lighting conditions, road conditions, weather related conditions, curves, bridges, hills and overpasses/underpasses.
- Exiting apparatus – All responders shall take the following precautions:
 1. Always maintain an acute awareness of the high risk of working around moving traffic.
 2. Exit on curb side, or non-traffic side, if possible.
 3. Before exiting the apparatus check to assure you are safely entering the roadway.
 4. Look down to recognize debris that could injure you or be projected into the work zone. Remove debris hazard if/when safe to do so.
 5. NEVER turn your back on traffic.
 6. NEVER trust the traffic.
 7. Don PPE or high-visibility reflective vests once outside apparatus.
 - Parking of support vehicles – Responding support vehicles (shift commander, fly-car, ambulance) should not be used as blocking units and should position downstream and in the shadow of the blocking apparatus. The same precautions and requirements, as applied above to apparatus, shall be observed by personnel assigned to support vehicles.
 - Temporary work zone – The temporary work zone could be considered the "hot zone," in which all personnel are considered to be at risk of being struck by a moving vehicle. The temporary work zone includes the path of travel from apparatus or support vehicles to the area of operations. Personnel staging (unassigned human resources) shall stay within the temporary work zone. Incident commanders and personnel must remain vigilant at all times; even with proper actions personnel remain at risk from moving vehicles. Safety within the temporary work zone must be continually monitored and safety needs must be addressed as they arise.
 - Scene safety – Observe the following:
 1. During daytime operations, all visible warning devices shall be on to provide warning to drivers of vehicles approaching the scene.
 2. During nighttime operations, white strobes should be shut-off and

response apparatus/units headlights, if facing oncoming traffic, should be turned off, emergency lighting should be reduced as much as possible and consideration must be given to overall scene lighting.

3. Staging of vehicles, not involved in the temporary work zone or used for blocking, shall be outside of the immediate work area, generally downstream of the work area or otherwise where opposing traffic is not a significant concern.
4. For anticipated prolonged operations, traffic cones may be utilized to give drivers of opposing vehicles early warning they are approaching a temporary work zone. Utilize the following chart:

POSTED SPEED LIMIT	DISTANCE
35 mph	100 feet
45 mph	150 feet
55 mph	200 feet
Over 55 mph	250 feet

5. Remain vigilant during all phases of highway operations.
6. The Fire-Police are not a viable option for maintaining scene safety on highways.
 - Clearing traffic lanes – Once operational phases are completed, apparatus may be repositioned to allow traffic to flow on as many lanes as possible. Unnecessary closing or restricting lanes increases the risk of a secondary incident. Crews, apparatus and equipment should be removed promptly to reduce exposure to traffic.
 - Terminating the incident – Termination of the incident must be managed with the same aggressiveness as initial actions.
 - PPE and high-visibility vests – Any MFRE personnel on scene (assigned, solicited or self-initiated) shall be required to wear a full PPE ensemble or high-visibility reflective vest while in the temporary work zone or immediate area of incident. This includes line or staff personnel from any division. Apparatus and response vehicles are issued a supply of code compliant high visibility vests and all shift commanders and staff officers have been issued personal vests for use. The incident commander or safety officer is required to challenge any MFRE personnel not in compliance with this requirement.

Traffic Incident Management

Stopping Distance Tables
MPH to FPS conversion table

Stopping Distances



Fire Department City of New York
Safety Inspection Services Command
Chart of Total Stopping Distance
Passenger Vehicles and Light Trucks



Total Stopping Distances: Passenger car / light truck on dry roadway

Reaction Time: 1.60 Secs. Drag Factor: 0.75 G

Speed:	Reaction Distance:	Braking Distance:	Total Distance:	Braking Time	Total Time
5	11.74	1.11	12.85	0.30	1.90
10	23.47	4.44	27.92	0.61	2.21
15	35.21	10.00	45.21	0.91	2.51
20	46.94	17.78	64.72	1.22	2.82
25	58.68	27.78	86.46	1.52	3.12
30	70.42	40.00	110.42	1.83	3.43
35	82.15	54.44	136.60	2.13	3.73
40	93.89	71.11	165.00	2.43	4.03
45	105.62	90.00	195.62	2.74	4.34
50	117.36	111.11	228.47	3.04	4.64
55	129.10	134.44	263.54	3.35	4.95
60	140.83	160.00	300.83	3.65	5.25
65	152.57	187.78	340.35	3.96	5.56
70	164.30	217.78	382.08	4.26	5.86
75	176.04	250.00	426.04	4.56	6.16
80	187.78	284.44	472.22	4.87	6.47

Stopping Distances



Fire Department City of New York
Safety Inspection Services Command
Chart of Total Stopping Distance
Passenger Vehicles and Light Trucks



Total Stopping Distances: Passenger car / light truck on wet roadway

Reaction Time: 1.60 Secs. Drag Factor: 0.45 G

Speed:	Reaction Distance:	Braking Distance:	Total Distance:	Braking Time	Total Time
5	11.74	1.85	13.59	0.51	2.11
10	23.47	7.41	30.88	1.01	2.61
15	35.21	16.67	51.87	1.52	3.12
20	46.94	29.63	76.57	2.03	3.63
25	58.68	46.30	104.98	2.54	4.14
30	70.42	66.67	137.08	3.04	4.64
35	82.15	90.74	172.89	3.55	5.15
40	93.89	118.52	212.41	4.06	5.66
45	105.62	150.00	255.62	4.56	6.16
50	117.36	185.19	302.55	5.07	6.67
55	129.10	224.07	353.17	5.58	7.18
60	140.83	266.67	407.50	6.09	7.69
65	152.57	312.96	465.53	6.59	8.19
70	164.30	362.96	527.27	7.10	8.70
75	176.04	416.67	592.71	7.61	9.21
80	187.78	474.07	661.85	8.11	9.71

Stopping Distances



Fire Department City of New York
 Safety Inspection Services Command
 Chart of Total Stopping Distance



Total Stopping Distances: Large Trucks w/properly adjusted brakes on dry pavement

Reaction Time: **1.60** sec. Air Lag: **0.5** sec. Drag Factor: **0.43 G**

Speed:	Per/React Distance:	Air Lag Distance	Braking Distance:	Total Distance:	Braking Time	Total Time
10	23.47	7.34	7.75	38.56	1.06	3.16
15	35.21	11.00	17.44	63.65	1.59	3.69
20	46.94	14.67	31.01	92.62	2.12	4.22
25	58.68	18.34	48.45	125.47	2.65	4.75
30	70.42	22.01	69.77	162.19	3.18	5.28
35	82.15	25.67	94.96	202.79	3.72	5.82
40	93.89	29.34	124.03	247.26	4.25	6.35
45	105.62	33.01	156.98	295.61	4.78	6.88
50	117.36	36.68	193.80	347.83	5.31	7.41
55	129.10	40.34	234.50	403.93	5.84	7.94
60	140.83	44.01	279.07	463.91	6.37	8.47
65	152.57	47.68	327.52	527.76	6.90	9.00
70	164.30	51.35	379.84	595.49	7.43	9.53
75	176.04	55.01	436.05	667.10	7.96	10.06
80	187.78	58.68	496.12	742.58	8.49	10.59

How fast are they really moving?



Fire Department City of New York
Safety Inspection Services Command
Converting Speed in Miles Per Hour to Velocity in Feet Per Second



Speed:
M.P.H.

Velocity:
Feet Per Second

5	7.34
10	14.67
15	22.01
20	29.34
25	36.68
30	44.01
35	51.35
40	58.68
45	66.02
50	73.35
55	80.69
60	88.02
65	95.36
70	102.69
75	110.03

Traffic Incident Management

SOG
&
Guidelines

General Operating Guideline:

Roadway & Highway Operations

Purpose: To provide responders with a uniform guide for safe operations while working incidents on Manchester's roadway and highway systems.

Policy: MFRE responders will utilize all safety equipment and methods available to provide a safe working area while operating on Manchester's roadway and highway systems.

- **General** – Providing a safe working area is a priority at every scene. MFRE personnel should understand and appreciate the high risk while operating at an incident on a roadway and/or highway system. Personnel must operate in a defensive posture, always considering moving vehicles as a threat to safety. Personnel must be aware that our own actions, inactions and practices can make a scene a more hazardous workplace (i.e. white strobe lights, headlights, non-reflective wear, failure to properly identify and block temporary work zone areas, saturation of work area with non-task assigned personnel).
 - **Assignment** – Any incident (fire, medical, rescue, etc) where the work area is a roadway will receive a minimum of a Level-II response; Code-2 unless otherwise defined. Any call on a limited access highway will receive a minimum Level II response Code 3.
 - **Terminology** – Observe the following:
 1. **Advanced warning** – Notification procedures that advise approaching motorists to transition from normal driving status to that required by the temporary emergency traffic control measured ahead of them.
 2. **Block** – Positioning fire department apparatus on an angle to the lanes of traffic creating a physical barrier between upstream traffic and the work area.
 3. **Buffer zone** – The distance or space between personnel and vehicles in the protected work zones and nearby moving traffic.
 4. **Shadow** – The protected work area at a roadway incident that is shielded by the block from apparatus.
 5. **Downstream** – The direction that traffic is moving as it travels away from the incident scene.
 6. **Upstream** – The direction that traffic is traveling from as the vehicles approach the incident scene.
 7. **Temporary work zone** – The physical area of a roadway, within which emergency personnel perform the fire, EMS and rescue tasks.
 - **Response** – Responding units will make every effort to minimize risk of injury to themselves, customers and those who are using the roadway or highway system:
 1. Use visible and audible warning devices appropriately for mode of response.
 2. Median strip crossovers (usually marked "Authorized Vehicles Only") shall be used for turning around and crossing to other travel lanes only when emergency vehicles can complete the turn without unreasonable risk to the responders or other vehicles in either travel direction.
 3. Use of U-turn in "Jersey" barriers is extremely hazardous and shall be utilized only when the maneuver is necessary (and without unreasonable risk) for immediate lifesaving measure.
 4. Response in the opposing direction on one-way entrance or exit ramps shall not be permitted, unless it is confirmed a public safety agency has stopped opposing traffic from ramp use and the on-board officer has determined that it is a reasonable and safe act to commit based on immediate conditions of the ramp and proximity of the emergency scene. If no officer is on-board, the shift commander (or incident commander) must grant authorization to a specific request by the apparatus/unit operator when the operator has determined it is a reasonable and safe act to commit.
 - **Apparatus positioning** – The initial officer on the scene must assess the parking needs of later arriving apparatus and specifically direct the parking and placement of these vehicles as they arrive to provide protective blocking of the scene. This officer is also the initial safety officer for the incident.
- Responding apparatus, upon arrival, shall position as follows unless circumstances prohibit this guide in which case the incident commander (or operator, if command has not yet been established) shall position apparatus in such a manner as to provide the safest work area possible.
1. First-arriving apparatus shall park to create a temporary work zone that protects personnel from on coming traffic in at least one direction. Block the most critical or highest volume direction first. The apparatus should be placed at a 45-degree angle to the curb. The buffer zone should be no closer than 50 feet to the incident action area. Whenever possible, the angle of the apparatus should protect

anyone at the pump panel or control area. Operators should have front wheels rotated away from the incident. First arriving apparatus will block only those travel lanes necessary to provide a safe working area.

2. Second-arriving apparatus shall position at the next critical position, either further blocking the first arriving apparatus with appropriate distancing, widening the initial blocked area, at least one lane wider than the width of the incident, or "boxing" in the work area, leaving room on the downside for an appropriately sized work area. A 45-degree angle is preferred. The position of the apparatus shall take into consideration all factors that limit the sight distance of the approaching traffic including ambient lighting conditions, road conditions, weather related conditions, curves, bridges, hills and overpasses/underpasses.
- Exiting apparatus – All responders shall take the following precautions:
 1. Always maintain an acute awareness of the high risk of working around moving traffic.
 2. Exit on curb side, or non-traffic side, if possible.
 3. Before exiting the apparatus check to assure you are safely entering the roadway.
 4. Look down to recognize debris that could injure you or be projected into the work zone. Remove debris hazard if/when safe to do so.
 5. NEVER turn your back on traffic.
 6. NEVER trust the traffic.
 7. Don PPE or high-visibility reflective vests once outside apparatus.
 - Parking of support vehicles – Responding support vehicles (shift commander, fly-car, ambulance) should not be used as blocking units and should position downstream and in the shadow of the blocking apparatus. The same precautions and requirements, as applied above to apparatus, shall be observed by personnel assigned to support vehicles.
 - Temporary work zone – The temporary work zone could be considered the "hot zone," in which all personnel are considered to be at risk of being struck by a moving vehicle. The temporary work zone includes the path of travel from apparatus or support vehicles to the area of operations. Personnel staging (unassigned human resources) shall stay within the temporary work zone. Incident commanders and personnel must remain vigilant at all times; even with proper actions personnel remain at risk from moving vehicles. Safety within the temporary work zone must be continually monitored and safety needs must be addressed as they arise.
 - Scene safety – Observe the following:
 1. During daytime operations, all visible warning devices shall be on to provide warning to drivers of vehicles approaching the scene.
 2. During nighttime operations, white strobes should be shut-off and

response apparatus/units headlights, if facing oncoming traffic, should be turned off, emergency lighting should be reduced as much as possible and consideration must be given to overall scene lighting.

3. Staging of vehicles, not involved in the temporary work zone or used for blocking, shall be outside of the immediate work area, generally downstream of the work area or otherwise where opposing traffic is not a significant concern.
4. For anticipated prolonged operations, traffic cones may be utilized to give drivers of opposing vehicles early warning they are approaching a temporary work zone. Utilize the following chart:

POSTED SPEED LIMIT	DISTANCE
35 mph	100 feet
45 mph	150 feet
55 mph	200 feet
Over 55 mph	250 feet

5. Remain vigilant during all phases of highway operations.
6. The Fire-Police are not a viable option for maintaining scene safety on highways.
 - Clearing traffic lanes – Once operational phases are completed, apparatus may be repositioned to allow traffic to flow on as many lanes as possible. Unnecessary closing or restricting lanes increases the risk of a secondary incident. Crews, apparatus and equipment should be removed promptly to reduce exposure to traffic.
 - Terminating the incident – Termination of the incident must be managed with the same aggressiveness as initial actions.
 - PPE and high-visibility vests – Any MFRE personnel on scene (assigned, solicited or self-initiated) shall be required to wear a full PPE ensemble or high-visibility reflective vest while in the temporary work zone or immediate area of incident. This includes line or staff personnel from any division. Apparatus and response vehicles are issued a supply of code compliant high visibility vests and all shift commanders and staff officers have been issued personal vests for use. The incident commander or safety officer is required to challenge any MFRE personnel not in compliance with this requirement.



_____ *Fire Department*
Standard Operating Guideline

SAFE OPERATION ON LIMITED ACCESS HIGHWAYS

Scope: All Department Personnel

Purpose: To establish an operating guideline for all department personnel operating at incidents on limited access highways.

Policy: **IT SHALL BE THE POLICY OF THE _____ FIRE DEPARTMENT TO POSITION APPARATUS AT THE SCENE OF EMERGENCIES ON LIMITED ACCESS HIGHWAYS IN A MANNER THAT BEST PROTECTS THE WORK AREA AND PERSONNEL FROM VEHICLE TRAFFIC AND OTHER HAZARDS.**

OVERVIEW

This procedure identifies practices for the _____ Fire Department apparatus operating on limited access highways. This procedure will provide maximum protection and safety for personnel operating in or near moving vehicle traffic on these types of roadways. It also identifies several approaches for individual practices to keep firefighters safe while exposed to vehicle traffic.

All personnel should understand and appreciate the high risk that firefighters are exposed to when operating in or near moving vehicle traffic. We should always operate from a *defensive* posture. Always consider moving traffic as an immediate threat to your safety. Each day, emergency personnel are exposed to motorists of varying abilities, with or without licenses, with or without legal restrictions, and driving at speeds from creeping to well beyond the speed limit. Some of these motorists are the vision impaired, the alcohol and/or drug impaired. On top of everything else, motorists will often be looking at the scene and not the road.

Nighttime operations are particularly hazardous. Visibility is reduced, and the flashing of emergency lights tend to confuse motorists. Studies have shown that multiple headlights of emergency apparatus (coming from different angles at the scene) tend to blind drivers as they approach.

SAFETY BENCHMARKS

Emergency personnel are at great risk while operating in or around moving traffic. There are approaches that can be taken to protect yourself and all crew members:

1. Never trust the traffic
2. Engage in proper protective parking
3. Wear high visibility reflective vests
4. Reduce motorist vision impairment
5. Use traffic cones and flares

HIGHWAY OPERATIONS

Highway emergencies pose a particular high risk to emergency personnel. Speeds are higher, traffic volume is significant, and motorists have little opportunity to slow, stop or change lanes.

The State and local Police will also have a desire to keep the traffic flowing. Where need be, the highway can be completely shut down. This, however, rarely occurs.

Members operating on highway are subject to the provisions of Chapter 6-I of the ***Manual for Uniform Traffic Control Devices*** (MUTCD) and are considered “highway workers” and are therefore subject to the provisions of the MUTCD.

For highway emergencies, we will continue to block the scene with the first apparatus on the scene to provide a safe work area. The first apparatus will park upstream of the incident on the highway parking between the incident zone and oncoming traffic.

Listed below are benchmarks for safe performance when operating in or near moving vehicle traffic.

1. Always maintain an acute awareness of the high risk of working in or around moving traffic. Never trust moving traffic. Always look before you step! Always keep an eye on the traffic!
2. All highway responses shall consist of a minimum response of two companies consisting of the first due engine & ladder companies.
3. ***Always position apparatus to protect the scene, patients, emergency personnel, and provide a protected work area.*** Park apparatus at an angle of 45 degrees away from curbside upstream of or behind the emergency scene between the scene and oncoming traffic. The first arriving apparatus shall serve as a “blocking” apparatus until the arrival of the second engine company. At a minimum, at least one lane next to the incident lane should be closed when prudent. Additional or all traffic lanes may have to be closed if the extra lane does not provide a safe barrier.

4. Upon arrival the second engine company shall take up a blocking position approximately fifty feet to the rear of the first apparatus. The operator of the second engine will angle his apparatus across the lane in the same fashion as the first apparatus (see figure 1).
5. This will direct motorists around the scene (See Figure 1). Apparatus positioning must also allow for adequate parking space for other fire apparatus (if needed), and a safe work area for emergency personnel. Allow enough distance to prevent a moving vehicle from knocking fire apparatus into the work areas.
6. All highway responses shall consist of a minimum of two engine companies consisting of Headquarters Engine 1 and the appropriate first due volunteer company
7. For first arriving engine companies where a charged hoseline may be needed, angle the engine so that the pump panel is "down stream," on the opposite side of on-coming traffic. This will protect the pump operator (See Figure 5).
8. The initial company officer (or Command) must assess the parking needs of later-arriving fire apparatus and specifically direct the parking and placement of these vehicles as they arrive to provide protective blocking of the scene. This officer must operate as an initial safety officer.
9. During daytime operations, leave all emergency lights on to provide warning to drivers. For NIGHTTIME operations, turn **OFF** fire apparatus headlights. This will help reduce the blinding effect to approaching vehicle traffic. Other emergency lighting should be reduced to yellow lights and emergency flashers where possible.
10. Crews should exit the curb side or non-traffic side of the apparatus whenever possible. Always look before stepping out of apparatus, or into any traffic areas. When walking around fire apparatus parked adjacent to moving traffic, keep an eye on traffic and walk as close to fire apparatus as possible.
11. Members of the Fire Department shall wear a reflective safety vest all times when operating in the highway environment in or near moving traffic.
12. When parking apparatus to protect the scene, be sure to protect the work area also. The area must be protected so that patients can be extricated, treated, moved about the scene, and loaded into Ambulances safely.
14. Place traffic cones at the scene to direct traffic as soon as practical after arrival. This should be initiated by the first company arriving on the scene and expanded, if needed, as later arriving companies arrive on the scene. Always place and retrieve cones while facing oncoming traffic. Traffic cones should be placed farther apart, with the last cone approximately 300 feet upstream," to allow adequate warning to drivers. Taper the cones in the direction in which traffic flow is to be directed. Place and retrieve cones while ***facing*** the traffic. All cones used on highways where speeds are posted in excess of 45

MPH require the standard 28 inch upright traffic cone with two reflective stripes as shown in the appendix.

15. All apparatus should carry a minimum of five (5) traffic cones for use as Temporary Traffic Control. This requirement means that there will be a minimum total of ten (10) traffic cones available for use at such incidents.
16. Placing flares, where safe to do so, adjacent to and in combination with traffic cones for nighttime operations greatly enhances scene safety. Placing highway flares in close proximity to traffic cones allows the illumination from the flare to illuminate the traffic cones as well as warn approaching motorists. Only place flares to direct traffic where it is safe and appropriate to do so.

INCIDENT COMMAND AT HIGHWAY INCIDENTS

The initial company officer, or command, must thoroughly assess the need for apparatus on the highway and their specific positions. Companies should be directed to specific parking locations to protect the work area, patients, and emergency personnel.

Other apparatus should be parked downstream (beyond the incident zone) when possible. This provides a safe parking area.

Staging of ambulances off the highway may be required. Ambulances should be brought into the scene one or two at a time. A safe loading area must be established downstream of the blocking fire apparatus.

MEMBERS OPERATING ON LIMITED ACCESS HIGHWAYS AS FLAGGERS OR WHILE PLACING FLARES AND CONES SHOULD ALWAYS FACE ONCOMING TRAFFIC

Command should establish a liaison with the police agency having jurisdiction as soon as possible to jointly provide a safe parking and work area and to quickly resolve the incident. ***Traffic incidents that are of a duration in excess of thirty minutes require specific traffic control measures be taken as per the MUTCD.*** Additional traffic control measures can be implemented by State DOT officials as per their own and MUTCD guidelines.

The termination of the incident must be managed with the same aggressiveness as initial actions. Crews, apparatus, and equipment must be removed from the highway promptly, to reduce exposure to moving traffic.

Prioritize placement of the apparatus by blocking from the most critical to the least critical side.

To protect pump operator, position apparatus with the pump panel on the opposite side of on-coming traffic.

Position ambulances downstream beyond the incident zone to protect patient loading areas.

TEMPORARY TRAFFIC CONTROL

When responding to incidents on the highway all emergency personnel are considered to be “highway workers” under the provisions of MUTCD Chapter 6-I. As such all personnel operating at a traffic incident (as defined below) must comply with the provisions of MUTCD Chapter 6-I and institute Temporary Traffic Control (TTC) measures.

A traffic incident is an emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic. A traffic incident management area is an area of a highway where temporary traffic controls are imposed by authorized officials in response to a road user incident, natural disaster, hazardous material spill, or other unplanned incident. It is a type of TTC zone and extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where vehicles return to the original lane alignment and are clear of the incident.

Traffic incidents can be divided into three general classes of duration, each of which has unique traffic control characteristics and needs. These classes are:

- A. Major—expected duration of more than 2 hours;
- B. Intermediate—expected duration of 30 minutes to 2 hours; and
- C. Minor—expected duration under 30 minutes.

The primary functions of TTC at a traffic incident management area are to move road users reasonably safely and expeditiously past or around the traffic incident, to reduce the likelihood of secondary traffic crashes, and to preclude unnecessary use of the surrounding local road system. Examples include a stalled vehicle blocking a lane, a traffic crash blocking the traveled way, a hazardous material spill along a highway, and natural disasters such as floods and severe storm damage.

In instances where fire department operations are termed “short term” or under thirty minutes in duration Minor traffic incidents are typically disabled vehicles, car fires and minor crashes that result in lane closures of less than 30 minutes. On-scene responders are typically law enforcement, fire department and towing companies. Diversion of traffic into other lanes is often not needed or is needed only briefly. For short term duration incidents a minimum of five traffic cones supplemented by highway flares is recommended. Traffic control at short term duration incidents is the responsibility of on-scene responders. Which, in the latter case, means that the fire department is responsible for securing the scene via proper temporary traffic control.

In instances where fire department operations are termed as “Intermediate” which includes time periods between thirty minutes and two hours specific TTC measures must be implemented. These additional measures will require a response by Connecticut State DOT officials with the appropriate equipment and personnel needed to set up a TTC zone.

Traffic Incident Management

Federal
Register

[Federal Register: December 5, 2007 (Volume 72, Number 233)]
[Rules and Regulations]
[Page 68480-68491]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr05de07-6]

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DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

23 CFR Part 630

[FHWA Docket No. FHWA-2006-25203]
RIN 2125-AF10

Temporary Traffic Control Devices

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Final rule.

SUMMARY: The FHWA is adding a new Subpart K to 23 CFR part 630 to supplement existing regulations that govern work zone safety and mobility in highway and street work zones to include conditions for the appropriate use of, and expenditure of funds for, uniformed law enforcement officers, positive protective measures between workers and motorized traffic, and installation and maintenance of temporary traffic control devices during construction, utility, and maintenance operations. These regulations are intended to decrease the likelihood of fatalities and injuries to road users, and to workers who are exposed to motorized traffic (vehicles using the highway for purposes of travel) while working on Federal-aid highway projects. The regulations are issued in accordance with section 1110 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), Public Law 109-59, 119 Stat. 1227, codified at 23 U.S.C. 109(e) and 112(g).

DATES: Effective Date: December 4, 2008.
The incorporation by reference of certain publications listed in this rule is approved by the Director of the Federal Register as of December 4, 2008.

FOR FURTHER INFORMATION CONTACT: Mr. Chung Eng, Office of Transportation Operations, HOTO-1, (202) 366-8043; or Mr. Raymond W. Cuprill, Office of the Chief Counsel, HCC-30, (202) 366-0791, U.S. Department of Transportation, Federal Highway Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590. Office hours are from 7:45 a.m. to 4:15 p.m., e.t., Monday through Friday, except Federal holidays.

SUPPLEMENTARY INFORMATION:

Electronic Access

This document, the notice of proposed rulemaking (NPRM), and all comments received may be viewed online through the Federal Rulemaking portal at: <http://www.regulations.gov>. The Web site is available 24 hours each day, 365 days each year. Electronic submission and retrieval help and guidelines are available under the help section of the Web site.

An electronic copy of this document may also be downloaded from the Office of the Federal Register's home page at: <http://www.archives.gov> and the Government Printing Office's Web page at: <http://www.access.gpo.gov/nara>.

Background

History

In 2004, the FHWA published a final rule updating its regulations on Work Zone Safety and Mobility (23 CFR 630, subpart J). Section 630.1006 of subpart J (Work Zone Safety and Mobility Policy) stated that ``Each State shall implement a policy for the systematic consideration and management of work zone impacts on all Federal-aid highway projects. This policy shall address work zone impacts throughout the various stages of the project development and implementation process. This policy may take the form of processes, procedures, and/or guidance, and may vary based on the characteristics and expected work zone impacts of individual projects or classes of projects. The States should institute this policy using a multidisciplinary team and in partnership with the FHWA. The States are encouraged to implement this policy for non-Federal-aid projects as well.'' This final rule on Temporary Traffic Control Devices provides additional guidance on the development of such Work Zone Safety and Mobility Policies, and specifically addresses the requirements of section 1110 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), Public Law 109-59, 119 Stat. 1227, which have been codified at 23 U.S.C. 109(e) and 112(g).

Section 109(e)(2) of title 23, United States Code, states that no funds shall be approved for expenditure on any Federal-aid highway ``unless proper temporary traffic control devices to improve safety in work zones will be installed and maintained during construction, utility, and maintenance operations on that portion of the highway with respect to which such expenditures are to be made. Installation and maintenance of the devices shall be in accordance with the Manual on Uniform Traffic Control Devices.'' Additionally, section 112(g)(1) requires that ``[t]he Secretary, after consultation with appropriate Federal and State officials, shall issue regulations establishing the conditions for the appropriate use of, and expenditure of funds for, uniformed law enforcement officers, positive protective measures between workers and motorized traffic, and installation and maintenance of temporary traffic control devices during construction, utility, and maintenance operations.''

A NPRM proposing the creation of a new Subpart K of 23 CFR part 630 was published on November 1, 2006, at 71 FR 64173. The purpose was to emphasize the need to appropriately consider and manage worker safety

as part of the project development process by providing guidance on key factors to consider in reducing worker exposure and risk from motorized traffic. The FHWA proposed to require that each agency's policy for the systematic consideration and management of work zone impacts be established in accordance with the recently updated 23 CFR part 630 subpart J (effective October 12, 2007), and address the consideration and management of worker safety as follows:

1. Avoid or minimize worker exposure to motorized traffic through the application of appropriate positive protective strategies including, but not limited to, full road closures; ramp closures; crossovers; detours; and rolling road blocks during work zone setup and removal;

2. Where exposure cannot be adequately managed through the application of the above strategies, reduce risk to workers from being struck by motorized traffic through the use of appropriate positive protective devices;

3. Where exposure and risk reduction is not adequate, possible, or practical, manage risk through the application of appropriate intrusion countermeasures including, but not limited to, the use of uniformed law enforcement officers; and

4. Assure that the quality and adequacy of deployed temporary traffic control devices are maintained for the project duration.

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The FHWA received a substantial number of comments in response to the NPRM. On December 19, 2006, at 71 FR 75898, the comment period was extended to February 16, 2007, in response to a concern expressed by the National Committee on Uniform Traffic Control Devices (NCUTCD) that the closing date did not provide sufficient time for discussion of the issues in committee and a subsequent comprehensive response to the docket. The extension provided the NCUTCD and other interested parties additional time to discuss, evaluate, and submit comments to the docket.

A major focus of the comments to the rule as proposed was the need for greater flexibility in selecting and applying the specific strategies advanced for the required policies and procedures. There was also a general interest in providing a balance between the need for ensuring the safety of construction and maintenance workers as they carry out their tasks in work zones, and the safety of road users as they traverse highway work zones.

In developing this final rule the FHWA has carefully considered the comments and suggestions of respondents. Some changes have been made to the overall structure of the rule in order to enhance the clarity and consistency of each section. Other changes have been made to revise the terminology, making it more consistent with the stated intent of section 1110 of SAFETEA-LU, and adjusting the language to clarify the rule's intent.

Among the key issues addressed in the development of this final rule were the following:

Revisions to terms and definitions to address all treatments and traffic control devices;

Presentation of treatments as options, not in priority order;

Provision of appropriate pay items for all traffic control treatments and operations;

Flexibility on pay items, acknowledging that either lump sum or unit pricing may be appropriate, depending upon circumstances; and Reference to the need to manage risks associated with work vehicles and equipment when they are exiting or entering travel lanes.

Summary Discussion of Comments Received in Response to the NPRM

The following discussion provides an overview of the comments received in response to the NPRM, and the FHWA's actions to resolve and address the issues raised by the respondents.

Profile of Respondents

Comments were submitted by a broad cross-section of organizations and individuals, including national organizations representing the interests of State departments of transportation and contractors, respectively; other industry groups representing manufacturers and suppliers of highway construction safety equipment; State and local departments of transportation and public authorities; and law enforcement agencies, as well as private consultants and other individuals. The trade associations providing comments were the Associated General Contractors (AGC) of America; the Association of Road and Transportation Builders of America (ARTBA); the Laborers' Health and Safety Fund of North America (LHSFNA) and the New Jersey State Laborers Health and Safety Fund (NJSLHSF); the NCUTCD; the American Traffic Safety Services Association (ATSSA); the Water Barrier Manufacturers' Association (WBMA); the American Highway Users' Alliance (AHUA); the National Association of County Engineers (NACE); Advocates for Highway and Auto Safety (AHAS); the Maryland Highway Contractors Association (MHCA); and the Colorado Association of Traffic Control Professionals (CATCP). FHWA categorized the comments of the American Association of State Highway and Transportation Officials (AASHTO) with those of State Departments of Transportation (DOTs), because AASHTO represents State DOTs. The AASHTO comments noted that their submission was a consolidated response to the NPRM on behalf of its member States. Many State DOTs provided additional comments individually.

Overall Position of Respondents

Taken as a whole, the responses to the NPRM were supportive of the intent of the rule, noting the vulnerability of highway workers in work zones and the need to reduce work zone hazards to workers and road users alike. Some respondents thought that the rule as proposed went too far in imposing requirements on agencies undertaking highway construction projects, while others felt that the rule as proposed did not go far enough in protecting workers.

In all, there were 80 entries into the docket for comments on the proposed rule. Of these entries, 4 were posted by FHWA (the proposed rule, two background documents providing supporting information to

respondents, and a notice extending the comment period for the NPRM). An additional three comments were requests for an extension of the comment period. Thirteen entries into the docket were duplicates of previous entries, or comments that were substantially the same but provided some additional information in support of the comments. Of the 60 remaining responses to the NPRM, 29 respondents supported the proposed rule; in general, these respondents supported the rule as proposed and agreed with the overall purpose, structure, and language, though their comments may have included specific recommendations for clarification or revisions. Another 27 respondents indicated opposition to the NPRM. These respondents generally opposed the rule as proposed; most of these respondents agreed with the overall purpose of the proposed rule, but may have opposed the structure and language of the NPRM (e.g., most State DOTs agreed with the intent of the rule, but disagreed with some specific language). Other respondents may have been neutral toward the rule as a whole, but had some specific recommendations for changes.

Most respondents restricted their comments to the proposed regulatory language. However, some addressed material contained in the preamble. One respondent suggested that the approach described in the NPRM would have the potential for increased congestion, inconvenience, and increased travel time and cost to deliver goods and services, which would seem inconsistent with the goals set forth in the National Strategy to Reduce Congestion on America's Transportation Network, and that project characteristics, system capacity, and mobility needs may dictate other approaches. FHWA concurs with the comments that safety measures should be implemented on the basis of project characteristics and that agencies should take into consideration the possible impacts of such measures on system capacity and mobility. However, FHWA feels that the final rule provides sufficient flexibility for operating agencies to select measures that will provide an appropriate level of protection both to road users and to workers in work zone activity areas, while maintaining adequate levels of mobility.

Section-by-Section Analysis of the NPRM Comments and FHWA Response

Because of the restructuring of the rule in response to FHWA's review of the comments received, the numbering of sections in the final rule is not entirely consistent with the proposed rule. Therefore, comments will be

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addressed below as they relate to the applicable section of the final rule.

Section 630.1102 Purpose

Most State DOTs agreed in general terms with the purpose as written. Twenty State DOTs (out of 26 submitting comments) explicitly endorsed AASHTO's response, which included suggested changes to the language. Among AASHTO's suggestions was that the purpose recognize that road user safety should not be compromised by the implementation of any of the rule's requirements. The Maryland State Highway Administration (SHA) noted that the ``section-by-section'' discussion in the NPRM for the ``Purpose'' section says, ``[b]y emphasizing worker safety, the proposed rule would attempt to enhance the safety of both

the motorist and worker during the project.'" However, the SHA felt that the proposed rule seems to be tilted in favor of worker safety, and the balance between the safety of workers and those of the traveling public has not been attained.

The FHWA agrees that the objective is to ensure both worker and road user safety. In emphasizing worker safety in the purpose of the proposed rule, the FHWA attempted to provide a better balance between consideration of the safety of workers and those of the traveling public. The FHWA recognizes that the safety of both workers and road users are equally important and has revised the purpose to clearly reflect that this regulation is intended to improve work zone safety for workers and road users alike.

AASHTO's comments also proposed that the final rule should not apply to ``all State and local highway agencies that receive Federal aid highway funding,' but rather make the rule applicable to all ``Federal-aid projects.'" AASHTO also suggested that the FHWA consider including a statement encouraging States to implement these requirements on non-Federal-aid projects as well. In the proposed rule, the first and second sentences under ``Purpose' were meant to be taken together, thus indicating applicability to Federal-aid highway projects and recipients of Federal-aid highway funding. The language in the purpose section has been clarified to indicate that this final rule applies only to Federal-aid projects. Language has also been added to encourage application of this rule to non-Federal-aid projects as well.

One respondent argued that a primary intent of the rule is to get State DOTs and other agencies to ensure adequate funding to promote worker and road user safety in the work zone planning and design process. While acknowledging that FHWA and the Occupational Safety and Health Administration (OSHA) have different responsibilities, the respondent suggested that this rule should ``strike a common ground between the two.'" The respondent went on to urge that FHWA take a more expansive view of worker safety, addressing safety within the work space as well as the interface between workers and motorized traffic. Another respondent suggested that the purpose statement should be changed to ``establish requirements and provide guidance for addressing worker safety by limiting the exposure to hazards and risks inside the work zone as well as to hazards and risks from motorized traffic.'" This change would expand the scope of the rule to include worker safety inside the work zone, whether or not there is an intrusion. In response to the comments regarding worker safety from hazards and risks inside the work area, the FHWA agrees that worker safety related to internal operations is important, but believes that workplace safety requirements are outside the scope of this rulemaking effort and this subpart, and fall under the purview of OSHA.

Some respondents observed that the proposed rule would require changes to the Manual on Uniform Traffic Control Devices (MUTCD). The FHWA agrees that some of the provisions included in the regulation may be appropriate for consideration to be added to the MUTCD; the criteria and provisions for positive protection and law enforcement are, for the most part, good information that can be made more readily available by adding it as guidance or support to the MUTCD. Inclusion of such provisions in the MUTCD may be addressed by the FHWA in a separate and future rulemaking action.

Section 630.1104 Definitions

The FHWA made several changes to the terms used throughout the final rule to clarify the meaning of the term ``positive protective measures.'' Changes have been made to the structure of the rule and definitions to strengthen and clarify the intent of the rule, based on the statutory language.

One respondent suggested that all definitions should be consistent with existing definitions in the MUTCD, while at the same time ensuring that new terms are not so similar to existing terms as to cause confusion. It was also suggested that any term not in the current MUTCD should be included in the next MUTCD. The FHWA generally agrees, and inclusion of appropriate terminology in the MUTCD may be addressed in a separate and future rulemaking action.

In reference to a term used elsewhere in the proposed rule, a respondent suggested that ``[t]he term `live travel lane' as referenced in section 630.1106 should be defined under this section.'' This wording has been revised in the final rule, now under section 630.1108, to read ``travel lanes open to traffic'' to better convey its meaning and as a result, the FHWA does not believe a definition is now required.

The terms appearing in the final rule are discussed below:

Agency. The definition for ``Agency'' was revised to include public authorities.

Exposure Control Measures. This definition was added to address concerns expressed by a number of respondents that terms as presented in the NPRM were somewhat confusing and potentially misleading. ``Exposure Control Measures'' was added in place of ``Positive Protective Strategies'' to reflect the fact that strategies were not aimed solely at preventing vehicles from entering the work space, but to reduce worker and road user exposure through a variety of strategies.

Federal-aid Highway Project. This definition was left unchanged.

Motorized Traffic. This definition was modified to clarify the reference to ``construction or maintenance vehicles and equipment,'' and to emphasize that, while protection of workers and road users is equally important, the strategies used to address road users may be different from strategies primarily affecting construction vehicles and equipment, particularly when they are entering or exiting the protected area of the work zone. We declined to accept a comment suggesting that the term ``motorized traffic'' be expanded to include work vehicles in favor of describing in more detail the need to draw distinctions between vehicles passing through the work zone and vehicles operating within the work zone and its protected areas.

Other Traffic Control Measures. This definition was added to reflect structural changes in the rule that changed the nomenclature for different activities, and to underscore the distinction between the ``exposure control measures,'' ``positive protection devices,'' and any other strategies used to improve worker safety. The term ``Intrusion Countermeasures'' was eliminated because the measures listed were

broader than simply reducing intrusion risk, and the term ``Other Traffic Control Measures'' is more descriptive of these measures.

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Positive Protection Devices. A minor change in the wording was made to clarify that such devices may either contain or redirect vehicles, or perform both functions. The FHWA agrees that the term ``contain and redirect'' may be confusing, because some devices do not redirect impacting vehicles. Many types of crash cushions and arrestor nets contain vehicles, but do not redirect.

The terms ``Positive Protective Strategies'' and ``Positive Protective Measures'' were eliminated, based on the potential confusion involved in using three closely related terms with different meanings. While 23 U.S.C. 112(g)(4) refers to ``Positive Protective Measures,'' the FHWA felt that the intent would be best served by using somewhat different terminology in the final rule.

Work Zone Safety Management. The term ``Work Zone Safety Management'' was added as an ``umbrella'' encompassing all actions taken by an agency to ensure the protection of workers and road users in work zones, including the development of policies, procedures, and guidelines for individual projects or programs. This term was added to respond to comments that the terminology in the NPRM was ambiguous and inconsistent with both current practice and the language of section 1110 of SAFETEA-LU.

Section 630.1106 Policy and Procedures for Work Zone Safety Management

Section 630.1106 was reorganized and refined from the proposed rule, largely in response to comments submitted to the docket. Material in the proposed rule was rearranged to separate elements related to overall policies and procedures to be developed by State DOTs from specifics related to particular traffic control strategies and the implementation of work zone safety measures.

Subsection (a) of section 630.1106 describes the nature of the required work zone safety measures and traffic control strategies, and encourages State DOTs to work in partnership with FHWA in developing policies and procedures. This use of the term ``partnership'' is consistent with existing language in Subpart J--Work Zone Safety and Mobility.

Subsection (b) refers to the MUTCD and the AASHTO Roadside Design Guide (RDG) as sources of information on work zone safety methods and traffic control strategies, and presents some of the project and highway characteristics and factors that the State DOTs should take into consideration when determining which measures and strategies should be employed.

Several respondents to the NPRM were concerned about the specificity of some of the language in the proposed rule, commenting that the proposed rule imposed requirements without any supporting research indicating that the proposed criteria were appropriate. The FHWA acknowledges that there is no definitive research supporting specific criteria. The language in the final rule has been modified to

clarify the intent of the rule, which is to require appropriate consideration and management of worker and road user safety when planning highway construction, maintenance, and utility operations. The new language retains and expands the listing, previously located in subsection (a), of some of the characteristics and factors that should be considered when deciding what work zone safety measures should be used, while giving agencies flexibility in determining the criteria and thresholds that would affect decisions about the use of different strategies.

A comment relating to the specificity of the proposed rule noted that the original language ``contains three specific requirements for the use of longitudinal barrier that cause significant concern, as they are restrictive and will have unintended negative consequences if applied unilaterally to all work zones. These requirements include: (1) Stationary work zones lasting two weeks or more; (2) with a design speed of 45 mph or higher; and (3) where workers are within one-lane-width of a live travel lane.'' In specifying these specific thresholds in the proposed rule, the intent was to use them as triggers for requiring an analysis on the need for positive protection devices rather than as direct requirements for the use of positive protection devices. These factors are now part of a more comprehensive set of considerations, and are not characterized as ``requirements.'' As modified, the final rule still requires consideration of worker and road user safety, but provides more flexibility to agencies along with guidance on the factors that should be taken into account in selecting work zone safety measures.

Several respondents expressed concern about the term ``project design speed.'' The FHWA concurs that ``project design speed'' is inappropriate. While the intended meaning of this term was the work zone design speed rather than the design speed of the completed project, it may still not reflect the actual traffic speeds through the work zone. The language in the final rule has been modified to refer to anticipated traffic speeds through the work zone rather than the project design speed.

A respondent to the NPRM observed that ``the material in the AASHTO Roadside Design Guide is intended to serve as guidance, not as requirements.'' The respondent indicated some discomfort with provisions that seem to suggest that the Guide is to be treated as a specific regulation (e.g., actions shall be ``consistent with'' or ``in accordance with'' that Guide). The commenter believes that such wording suggests that FHWA will be determining whether a State has acted in accordance with the Guide, even though the Guide itself is, as FHWA stated, a ``resource document.'' Language in the final rule has been modified to make clear that guidance included in the AASHTO Roadside Design Guide is not, and should not be construed as a ``regulation.''

Another respondent expressed concern that the requirements in section 630.1106 are ``arbitrary and overly prescriptive.'' The respondent believes that States should be required to develop policies that help protect highway worker safety and that they should begin by examining the application of strategies that would avoid or minimize worker exposure, even though in many, if not most cases, these strategies will not be practical. However, the respondent felt that section 630.1106(a) should be ``softened,'' and that this section

should be written more as recommendations rather than as requirements. The FHWA has modified the language in this section to emphasize that States have the flexibility to develop policies and procedures that are appropriate to the circumstances of a given project or program.

Subsection (c) deals with law enforcement, directing State DOTs and other agencies undertaking construction projects with Federal-aid funds to develop a policy addressing the use of uniformed law enforcement on such projects. The policy may consist of processes, procedures, and/or guidance, as appropriate.

Overall, there is good support and little or no opposition to the concept of agencies developing a policy for work zone law enforcement. The most significant concerns related to the manner of FHWA involvement in development of the policy, and some of the individual provisions to be included. One respondent argued that the language in the proposed rule, which ``states that `Each agency in cooperation with FHWA, shall develop a policy * * *` suggests a possible

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interpretation of some type of joint authority for FHWA to decide how States utilize and pay for law enforcement. This would lead to FHWA involvement in a State's internal management, which is not appropriate.'' In response to this concern, the FHWA changed the term ``cooperation'' to ``partnership.'' This is the same terminology currently used in Subpart J. Some respondents expressed concern that the proposed rule would have required operating agencies to take responsibility for an area over which they had no control--that is, the integration of law enforcement with work zone safety measures. Another respondent noted the difficulty of ensuring compliance due to the numerous entities involved in law enforcement, including State law enforcement agencies, sheriff departments in multiple counties, and a host of local agencies. The respondent suggested that the rule should include accommodations with numerous and widespread layers of law enforcement involved in safeguarding their roads.

The FHWA recognizes that some highway agencies do not have direct connections to law enforcement agencies. However, the FHWA does not believe that is a valid reason for not developing an agency enforcement policy and procedures as stated in the final rule under section 630.1106(c). The final rule does not impose specific requirements on the use of law enforcement and is not prescriptive. While section 630.1108(e) requires the agency to develop a law enforcement policy, it does not dictate what the policy is to contain. Each operating agency has the flexibility to develop a policy suitable for its situation in consideration of the factors listed. Numerous options can be used to acquire law enforcement services. The rule does not limit the required agency policy to consideration of only the State law enforcement agency. In fact, a number of State highway agencies currently have agreements in place with various local law enforcement agencies as well as State law enforcement agencies. Contractors can hire off-duty officers using contract funds as another alternative. Officer training is one of the issues that need to be addressed when developing whatever inter-agency accords may be needed to implement the agency policy.

A number of States have good policies and programs in place for use

of law enforcement in work zones. For example, a comment by the California Highway Patrol (CHP) describes its approach. ``California's work zone law enforcement program, the Construction/Maintenance Zone Enhanced Enforcement Program (COZEEP/MAZEEP), is based on CHP policy and interagency agreements between the California Department of Transportation (Caltrans) and the CHP. The current policy and agreements adequately meet the issues addressed in this proposed rulemaking. However, to improve communication and interaction, CHP and Caltrans are currently working toward joint training for CHP officers and Caltrans staff to clarify the roles and responsibilities of Caltrans and CHP at the COZEEP/MAZEEP details.''

Section 630.1108 Work Zone Safety Management Measures and Strategies

Section 630.1108 is reorganized and refined in this final rule. One comment that was made repeatedly by respondents to the NPRM was that the proposed rule was arbitrary and too prescriptive, and that the proposed rule did not permit State DOTs and other affected agencies to make judgments about which work zone safety measures and traffic control strategies would be most appropriate for a given situation. Respondents generally supported a decision process based on an engineering study including consideration of specific work zone factors and existing guidance in the MUTCD and the RDG. An approach that appears to have support from both agencies and industry is to provide a clear listing of the available options, along with a discussion of the factors and existing guidelines that should be considered. Such an approach would also include the specific requirement that the agency policy developed in response to 23 CFR 630.1006 must address both worker and road user safety, and include consideration of the safety options presented in this final rule.

FHWA agrees with these observations and has modified the language in the final rule to better reflect the intent of the rule, which is to require appropriate consideration and management of worker and road user safety when planning highway construction, maintenance, and utility operations, while giving agencies flexibility in determining the criteria and thresholds that would affect decisions about the use of different strategies. Throughout the final rule, many of the proposed ``shall'' statements were modified to emphasize that the proposed strategies or measures represented the types of actions that should be considered, and to make clear that the suggested actions were not being presented in a prescriptive priority order.

Comments from one group of respondents focused on the use of portable concrete barriers (PCB) as a form of positive protection. The respondents observed that, ``According to the Roadside Design Guide, `As with all types of traffic barriers, a median barrier should be installed only if striking the barrier is less severe than the consequences that would result if no barrier existed.' This is due to the fact that the PCB has such high Occupant Risk Values when impacted.' The respondents continued, ``Due to the fact that the Occupant Risk Values are much greater when impacting PCB than when impacting water-filled barriers, a significant margin of safety could be made available to the motoring public, if water-filled barriers were

utilized in place of PCB.... Based on the serious and fatal injuries to vehicle occupants resulting from a number of crashes involving PCBs, we recommend that language be inserted in this section that would disallow PCBs from being installed on the NHS; or installed only in extreme situations. Instead of PCBs, we recommend that water ballast barriers be used exclusively according to accepted design guidelines and only where needed to shield work zone hazards.'

The FHWA does not agree with the comment or the suggested change. The FHWA does not believe that any significant overall advantage exists for water-filled barrier and it offers some disadvantages such as freezing and icing in cold temperatures. As worded, the rule allows agencies to select from any positive protection devices that meet the performance criteria set forth in NCHRP Report 350, ``Recommended Procedures for the Safety Performance Evaluation of Highway Features.''

Another respondent enumerated other concerns with respect to the use of PCBs as positive protection devices, expressing concern about the impact of strict requirements on primary roadway widening construction in their State. The respondent noted that in general, PCBs are utilized where there is a grade elevation change and where drop-offs (greater than two inches) adjacent to a travel lane are necessary, for a period of longer than one work day or work shift. The respondent felt that a literal reading of the proposed rule would necessitate placement of PCB at all edges of the roadway adjacent to construction activities. The PCB would occupy roadway width normally available for use as part of the adjacent travel lane, reducing the average 24-foot wide road to only 20 feet of available travel area. The respondent indicated that this

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would eliminate opportunities for simultaneous construction on each side of the roadway. Currently, the agency submitting the comment requires construction of temporary pavement in locations adjacent to temporary concrete barrier wall to maintain 12 foot travel lanes. The requirements proposed in this rule would necessitate the construction of miles of temporary pavement to maintain 12 foot travel lanes. Without the temporary pavement, traffic would be restricted to 10 foot travel lanes with a longitudinal barrier on one side of the roadway. The respondent noted that such conditions could be especially hazardous on roadways with substantial truck traffic. Furthermore, the respondent noted that it would be necessary to install breaks in the temporary concrete barrier wall to maintain driveway access, and each break would require the installation of a portable terminal impact attenuator. The respondent felt that in areas with multiple driveways in close proximity to one another, maintenance of a safe installation of temporary concrete barrier wall would be problematic at best. The FHWA agrees that project characteristics need to be considered in decisions involving the use of barriers and language in the final rule requires that the need for positive protection devices be based on an engineering study.

Some respondents commented that the proposed rule did not go far enough, and suggested that the final rule should be strengthened to require minimum work zone safety measures or traffic control measures, based on specific criteria. Others proposed that the final rule should

provide a ``preference of controls,' ' beginning with consideration of positive protection strategies, followed by consideration of positive protection devices, and then use of intrusion countermeasures. This runs counter to many other comments, which argued for greater flexibility in selection of appropriate work zone safety measures. FHWA concurs with the respondents who argued that there is no definitive research available to support highly prescriptive criteria for when specific work zone safety measures should be deployed. Neither is there evidence that there should be a rigid hierarchy or preference of controls. Instead, FHWA believes that the types of controls appropriate for any given work zone depend on the circumstances (location, volume and speed of adjacent traffic, availability of escape routes for workers, duration of the construction project) and the characteristics of the construction activity (drop-offs, proximity of workers to travel lanes, etc.). Agencies responsible for the construction project should determine the appropriate traffic control measures either on the basis of an engineering study for the individual project, or based on policies adopted by the agency for certain classes of projects. Traffic control strategies that provide for the safety of both workers and road users may be selected alone or in combination, after considering the characteristics and circumstances of the construction project.

One respondent argued that without permanent barriers, most maintenance workers are left unprotected from vehicle intrusions. The respondent expressed a preference that all work should be performed behind a permanent barrier, but acknowledged that this would not be possible. When permanent barriers could not be used, the respondent stated that the following measures should be mandated: Uniformed on-duty law enforcement officers in marked cars; marked law enforcement cars to pace traffic to reduce vehicular speeds adjacent to the work zone; buffer lanes between workers and the traveling public (Interstate highways with posted speed limits 55 mph or greater should have at least one buffer lane, and those in excess of 70 mph should have a minimum of two buffer lanes); water-filled barriers; and light towers around the work area to alert the public of highway work. FHWA does not agree, nor do most of the other commenters, that all work should be performed behind a permanent barrier. This is unrealistic and does not necessarily provide the best overall safety for all concerned. The suggestions of alternative measures that should be mandated would appear arbitrary in many respects and would limit an agency's ability to consider the entire range of safety treatments in order to obtain the best balance of worker and road user safety, mobility, constructability, and cost.

Another respondent suggested that FHWA should develop its own guidelines or reference non-proprietary products. The respondent also suggested that State agencies should be required to first look to deploy the most protective devices before being allowed to use a less protective measure. The FHWA strongly supports continued research to develop improved guidelines for application of the various treatments. However, the FHWA believes that such research is most appropriate under the National Cooperative Highway Research Program (NCHRP). In fact, NCHRP just recently released a study on the Design of Construction Work Zones on High-Speed Highways (NCHRP Report 581), which is an excellent example of the kind of emerging research that can guide agencies in designing work zones that will help ensure the safety of both road

users and construction or maintenance workers. It appears that by ``most protective,`` the commenter means temporary traffic barrier. The FHWA does not agree that this should always be the priority. The preferred approach is one that would provide the best overall management of safety, mobility, constructability, and cost. Requiring the highest level of positive protection does not necessarily result in the highest level of any of these objectives.

Some respondents provided extensive comments on such issues as the desirability of full road closures, and the need for Federal funding to encourage such actions; requiring ``Type I and Type II barricades`` in place of plastic or rubber cones and delineators; requiring the use of ``pennant flagging or similar durable warning tape`` to sequester sections of Portland concrete cement (PCC) that have been freshly laid; requiring the presence of an ATSSA Work Zone Supervisor-qualified person on projects; and to require training for contractors on the use of rolling road blocks. While some of these comments have merit, they are generally beyond the scope of this rulemaking action. However, it should be noted that Subpart J does require that both the contractor and State DOT designate a person responsible for implementing the project TMP and that said individual be properly trained in accordance with Subpart J.

The FHWA agrees with many of the suggestions offered by commenters and has substantially revised section 630.1108 as described below.

Section 630.1108(a) requires that agencies undertaking highway construction projects with Federal-aid funding determine the need for positive protection devices on the basis of an engineering study. This responds in part to comments from respondents that the term ``engineering analysis`` used in the proposed rule was not in common use among State DOTs and other agencies, but that the term ``engineering study`` is used in the MUTCD and is well-understood by such agencies. It also serves to address the language in 23 U.S.C. Sec. 109(e)(2), which states that the ``[i]nstallation and maintenance of the [proper temporary traffic control] devices shall be in accordance with the Manual of Uniform Traffic Control Devices.`` Section 630.1108(a) also emphasizes that the conditions enumerated in section 630.1106 should

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be considered when agencies establish what work zone safety measures should be deployed, and identifies some circumstances under which the use of positive protection measures are required to be considered.

In section 630.1108(a), the FHWA also responds to concerns that undertaking an engineering study for every work zone, including situations where routine maintenance of facilities is to be undertaken, would be cost-prohibitive. The final rule notes that an engineering study ``may be used to develop positive protection guidelines for the agency, or to determine the measures to be applied on an individual project.`` In other words, agencies may establish a policy, supported by an engineering study, that dictates the types of work zone safety measures and traffic control strategies that must be implemented at a minimum for certain types of work. Engineering studies could also be undertaken for a specific project based on characteristics of the project or of the circumstances surrounding the project. Factors to be considered in developing a policy for providing traffic control measures for different types of projects, or that might trigger an

engineering study for a particular project, are enumerated in this subsection. Such characteristics and factors include duration of the construction zone, site characteristics that would provide workers no means of escape from motorized traffic (e.g., tunnels, bridges, etc.), operating speeds of traffic in lanes adjacent to the work zone, and other elements.

Section 630.1108(b) discusses the use of ``Exposure Control Measures.'' This term was added in place of ``Positive Protective Strategies'' to reflect the fact that strategies were not aimed solely at preventing vehicles from entering the work space, but to reduce worker exposure through a variety of strategies. One respondent suggested that the use of the phrase ``during work zone set up and removal'' following ``rolling road blocks'' should be clarified to indicate that it only refers to rolling road blocks, and not to the other strategies suggested to minimize worker exposure in the proposed rule. Another respondent suggested adding off-peak or night work as another strategy to be considered. The FHWA agrees with these suggestions. Each suggested strategy has been itemized in the final rule for clarity and night or off-peak work, as well as accelerated construction techniques, have been added as additional strategies.

Section 630.1108(c) addresses ``Other Traffic Control Measures,'' which are designed to reduce the number of work zone crashes or to minimize the risks and consequences of intrusion of motorized vehicles into the work space. Several respondents to the NPRM took exception to the use of the term ``Intrusion Countermeasures'' in the proposed rule. Several respondents noted that some of the measures or strategies included under the rubric of ``Intrusion Countermeasures'' did not have anything to do with preventing a vehicle from ``intruding'' or penetrating barriers into the work space. FHWA has changed the title of this section and the wording to reflect the fact that this class of measures or strategies includes actions that relate to increased driver awareness and alertness in work zones, as well as improvements in worker training, improved worker visibility, and the use of law enforcement personnel. This section clarifies that no single measure or strategy will be effective in all circumstances, and that strategies should be considered in combination in order to provide the maximum protection reasonably available to protect workers and road users alike.

With respect to specific measures, respondents expressed various levels of support (or opposition) for several strategies. One respondent encouraged FHWA to ``strongly recommend automated speed enforcement rather than merely suggesting it.'' Automated speed enforcement is one of the available traffic control measures and is included in the list of strategies for consideration. However, the FHWA recognizes that implementation of this strategy would require legislative action by most States. Another respondent noted that ``automated intrusion alarms present a concern due to problems in linking devices in miles-long, drum-protected work zones.'' FHWA agrees that intrusion alarms, like most of the other tools listed, may not be suitable for all situations. However, the wording in section 630.1108(c) simply lists it as a tool that may be considered. Several additional measures were added in response to comments, including public and traveler information, and temporary traffic signals.

Section 630.1108(d) provides guidance on the use of law enforcement personnel to increase work zone safety. This subsection emphasizes that, while the use of law enforcement personnel can be effective in increasing driver awareness of work zones and compliance with posted warnings, such law enforcement presence is not a substitute for temporary traffic control devices required by the MUTCD. This subsection describes a number of circumstances under which the use of law enforcement personnel may be appropriate, particularly ``on projects with high traffic speeds and volumes, and where the work zone is expected to result in significant disruption to or changes in normal traffic flow patterns.''

This subsection also addresses the issue of pay items for law enforcement, as required by 23 U.S.C. 112(g). Language from the proposed rule on Federal-aid participation in costs associated with the provision of law enforcement personnel for work zone safety is retained, including the stipulation that ``law enforcement activities that would normally be expected in and around highway problem areas requiring routine or ongoing law enforcement traffic control and enforcement activities'' are excluded from eligibility for Federal-aid.

Section 630.1108(e) was added to address concerns expressed by a number of respondents to the NPRM noting that there are hazards associated with the entry or exit of construction vehicles and equipment from the protected area of the work zone, whether for delivery of supplies and material or for other purposes. The new section 630.1108(e) acknowledges this situation, which poses risks to both workers and travelers, and states that agency processes, procedures, and/or guidance should ``address safe means for work vehicles and equipment to enter and exit traffic lanes and for delivery of construction materials to the work space, based on individual project characteristics and factors.''

Section 630.1108(f) addresses the issue of pay items. FHWA strongly supports the concept of providing appropriate payment for all work zone traffic control features needed to address both safety and mobility impacts of a highway project. Most highway agencies (but not all) and contractors also support this concept. However, the real issue is in how best to accomplish this. The FHWA believes that this issue arose because, even at this time, some agencies provide little or no specific payment for work zone safety features, and in extreme cases, provide only minimal information as to what features are required. Any payment provided is either incidental to other items of work, or is grouped into a single item for traffic control. This approach is unacceptable in that conscientious contractors are at a significant disadvantage because they provide more safety, without payment, than other contractors that choose to neglect safety to achieve a cost advantage. This problem gives rise to

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the frequent complaint of the ``lack of a level playing field.''

The FHWA believes that this is the issue that the wording in the Federal statute attempts to address, and the final rule requires that payment for work zone traffic control features and operations ``shall not be incidental to the contract, or included in payment for other items of work not related to traffic control and safety''. A related concern is

that contractors may need to include a ``contingency factor'' in bids to make sure they cover the costs of safety requirements that are not clearly defined in project plans, specifications, and estimates (PS&Es), thus resulting in higher bid prices.

Many agencies include a range of pay items in their project PS&Es that provide adequate payment for traffic control, and provide a range of payment items (both lump sum and unit price) for the various safety features needed. Lump sum and unit price payments represent two different approaches to reimbursing contractors for costs associated with construction activities. In deciding whether to use unit price or lump sum payment methods, agencies generally consider the following:

Unit price payment should be limited to those items where the quantity can either be quantified in advance, or closely controlled by the agency during construction. If the quantity cannot be predicted and controlled, it gives rise to the potential for unbalanced bidding. Both agencies and many responsible contractors realize these risks, and do not generally support unit price pay items where quantities cannot be predicted and controlled by the agency.

Lump sum payment reduces the risks of unbalanced bids for features where the actual quantity is dependent upon the manner the contractor selects to accomplish the work. However, to reduce risks to contractors of uncontrolled costs (which may result in higher bids), allowance for contingency payments on lump sum items when the overall quantity or nature of the work changes is desirable and is provided by some agencies.

Section 112(g)(2) of title 23, United States Code, requires ``separate pay items for the use of uniformed law enforcement officers, positive protective measures between workers and motorized traffic, and installation and maintenance of temporary traffic control devices'', but does not require unit price pay items. In an attempt for clarity, ``positive protective measures'' was broken down into ``positive protective devices'' and ``positive protective measures'' in the proposed rule. The proposed rule addressed payment for positive protective devices and uniformed law enforcement officers, but did not require a separate pay item for the installation and maintenance of temporary traffic control devices because the FHWA felt that doing so would not be substantially different from current practice. Separate payment for positive protective strategies was not specifically addressed in the proposed rule as strategies ultimately translate to devices.

Based on comments received and a broader interpretation of the language in section 112(g)(2), the final rule addresses pay items in a more comprehensive fashion by supplementing the requirements of 23 CFR 630.1012(d) with additional requirements as well as guidance. This includes the requirement that separate pay items be provided for major categories of traffic control devices, safety features, and work zone safety activities, including but not limited to positive protection devices, and uniformed law enforcement activities when funded through the project.

Section 630.1110 Maintenance of Temporary Traffic Control Devices

This section was relatively non-controversial, and retains most of the wording of the proposed rule. One recurring comment is worth mention again here--numerous suggestions called for use of the term ``Guidelines'' in lieu of ``Standards,'' as stated in the language of the proposed rule. Some argued that ``The term `quality standards' will result in significant liability for State DOTs, leading to the need for constant inspection and maintenance.'' After further consideration, and recognizing that the ATSSA reference noted in the NPRM is a guideline, FHWA agrees that the use of the term ``guidelines'' in lieu of ``standards'' would be preferable.

One comment took exception to the use of the term ``assure'' in the proposed rule. The respondent contended that use of the term ``assure'' means to put beyond all doubt, and asserted that maintenance of quality standards to the level of certainty would be cost-prohibitive. The language in the final rule has been revised to eliminate use of the term ``assure.''

Several comments were made about the use of certain colors on warning signs. The FHWA believes that such recommendations are beyond the scope of the rule and the requirements of section 1110 of SAFETEA-LU.

National Congestion Initiative

The final rule includes measures that could further the goals of the Secretary of Transportation's National Strategy to Reduce Congestion on America's Transportation Network, announced on May 16, 2006.\1\ By requiring the development and implementation of guidelines to help maintain the quality and adequacy of temporary traffic control devices on Federal-aid highway projects, the FHWA anticipates that the proposed rule will help reduce congestion by ensuring that road users are always provided with positive guidance while traveling through work zones.

\1\ Speaking before the National Retail Federation's annual conference on May 16, 2006, in Washington, DC, former U.S. Transportation Secretary Norman Mineta unveiled a new plan to reduce congestion plaguing America's roads, rail, and airports. The National Strategy to Reduce Congestion on America's Transportation Network includes a number of initiatives designed to reduce transportation congestion. The transcript of these remarks is available at the following URL: <http://www.dot.gov/affairs/minetasp051606.htm>.

Rulemaking Analysis and Notices

Executive Order 12866 (Regulatory Planning and Review) and U.S. DOT Regulatory Policies and Procedures

The FHWA has determined that this action would not be a significant regulatory action within the meaning of Executive Order 12866 or

significant within the meaning of U.S. Department of Transportation regulatory policies and procedures. A recent synthesis of positive protection practices in highway work zones indicates that a wide range of positive protection devices and other safety treatments are already being used by State highway agencies.\2\ This synthesis found that among positive protection devices, portable concrete barriers and shadow vehicles equipped with truck mounted attenuators (SV/TMAs) were being used by nearly every State highway agency.

The final rule emphasizes the need to consider worker and road user safety as an integral part of each State highway agency's process for considering and managing the overall impacts due to work zones. As such, any additional usage of positive protection devices resulting from the proposed action would be incremental to what many State highway agencies are already using to address work zone safety. In addition, consideration of exposure control and other traffic control measures that would avoid or minimize worker exposure to motorized traffic may decrease the overall need for positive protection devices. Accordingly, it is anticipated that the

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economic impact of this rulemaking would be minimal.

\2\ Transportation Research Board (TRB), National Cooperative Highway Research Program (NCHRP) Project 20-7(174), A Synthesis of Highway Practice--Positive Protection Practices in Highway Work Zones, June 17, 2005. Available in the docket.

The final rule is not anticipated to adversely affect, in a material way, any sector of the economy. In addition, the final rule is not likely to interfere with any action taken or planned by another agency or to materially alter the budgetary impact of any entitlements, grants, user fees, or loan programs.

Regulatory Flexibility Act

In compliance with the Regulatory Flexibility Act (5 U.S.C. 601-612), the FHWA has evaluated the effects of these changes on small entities. This rule applies to all State and local highway agencies that use Federal-aid highway funding in the execution of their highway program. The final rule emphasizes the need to consider worker and road user safety as an integral part of each agency's process for considering and managing the overall impacts due to work zones on Federal-aid highway projects.

As noted previously, a recent synthesis of positive protection practices in highway work zones indicates that a wide range of positive protection devices and other safety treatments are already being used by State highway agencies. This synthesis found that among positive protective devices, portable concrete barriers and SV/TMAs were being used by nearly every State highway agency. The FHWA believes that positive protection devices and other safety treatments are also widely used by many local agencies because the FHWA's research indicates that local agencies usually follow State practice with respect to MUTCD guidance. As such, any additional

usage of positive protection devices resulting from the proposed action would be incremental to what many local highway agencies are already using to address work zone safety. In addition, consideration of exposure control and other traffic control measures that would avoid or minimize worker exposure to motorized traffic may decrease the overall need for positive protection devices. Accordingly, the FHWA has determined that the final rule will not have a significant economic impact on a substantial number of small entities.

Unfunded Mandates Reform Act of 1995

This final rule would not impose unfunded mandates as defined by the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4, 109 Stat. 48, March 22, 1995). This action would not result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$128.1 million or more in any one year period to comply with these changes. Additionally, the definition of "Federal mandate" in the Unfunded Mandate Reform Act excludes financial assistance of the type in which State, local or tribal governments have authority to adjust their participation in the program in accordance with changes made in the program by the Federal government. The Federal-aid highway program permits this type of flexibility to the States.

Executive Order 13132 (Federalism)

This action has been analyzed in accordance with the principles and criteria contained in Executive Order 13132 dated August 4, 1999, and the FHWA has determined that this action will not have a substantial direct effect or sufficient federalism implications on States that would limit the policymaking discretion of the States and local governments. The FHWA has also determined that this final rule will not preempt any State law or State regulation or affect the States' ability to discharge traditional State governmental functions and does not have sufficient federalism implications to warrant the preparation of a federalism assessment. The amendments are in keeping with the Secretary of Transportation's authority under 23 U.S.C. 109(d), 315, and 402(a) to promulgate uniform guidelines to promote the safe and efficient use of highways.

Executive Order 13175 (Tribal Consultation)

The FHWA has analyzed this action under Executive Order 13175, dated November 6, 2000, and believes that it will not have substantial direct effects on one or more Indian tribes; will not impose substantial direct compliance costs on Indian tribal governments; and will not preempt tribal law. The purpose of this final rule is to improve worker and road user safety on Federal-aid highway projects, and will not impose any direct compliance requirements on Indian tribal governments and will not have any economic or other impacts on the viability of Indian tribes. Therefore, a tribal summary impact statement is not required.

Executive Order 13211 (Energy Effects)

The FHWA has analyzed this action under Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use. It has been determined that it is not a

significant energy action under that order because it is not a significant regulatory action under Executive Order 12866 and is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Therefore, a Statement of Energy Effects under Executive Order 13211 is not required.

Executive Order 12372 (Intergovernmental Review)

Catalog of Federal Domestic Assistance Program Number 20.205, Highway Planning and Construction. The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal programs and activities apply to this program.

Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501, et seq.), Federal agencies must obtain approval from the Office of Management and Budget (OMB) for each collection of information they conduct, sponsor, or require through regulations. The FHWA has determined that this action does not contain information collection requirements for purposes of the PRA.

Executive Order 12988 (Civil Justice Reform)

This action meets applicable standards in Sections 3(a) and 3(b)(2) of Executive Order 12988, Civil Justice Reform, to minimize litigation, eliminate ambiguity, and reduce burden.

Executive Order 13045 (Protection of Children)

The FHWA has analyzed this action under Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. The FHWA certifies that this action would not cause an environmental risk to health or safety that may disproportionately affect children.

Executive Order 12630 (Taking of Private Property)

This action would not affect a taking of private property or otherwise have taking implications under Executive Order 12630, Governmental Actions and Interference with Constitutionally Protected Property Rights.

National Environmental Policy Act

The agency has analyzed this action for the purpose of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) and has determined that it would not have any effect on the quality of the environment.

Regulation Identification Number

A regulation identification number (RIN) is assigned to each regulatory

action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading of this document can be used to cross-reference this action with the Unified Agenda.

List of Subjects in 23 CFR Part 630

Government contracts, Grant programs--Transportation, Highway safety, Highways and roads, Project agreement, Traffic regulations, Incorporation by reference.

Issued on: November 29, 2007.
J. Richard Capka,
Federal Highway Administrator.

In consideration of the foregoing, the FHWA adds Subpart K to title 23, Code of Federal Regulations, Part 630, as follows:

Subpart K--Temporary Traffic Control Devices

Sec.

630.1102 Purpose.

630.1104 Definitions.

630.1106 Policy and Procedures for Work Zone Safety Management.

630.1108 Work Zone Safety Management Measures and Strategies.

630.1110 Maintenance of Temporary Traffic Control Devices.

Authority: 23 U.S.C. 109(c) and 112; Sec. 1110 of Pub. L. 109-59; 23 CFR 1.32; and 49 CFR 1.48(b).

Sec. 630.1102 Purpose.

To decrease the likelihood of highway work zone fatalities and injuries to workers and road users by establishing minimum requirements and providing guidance for the use of positive protection devices between the work space and motorized traffic, installation and maintenance of temporary traffic control devices, and use of uniformed law enforcement officers during construction, utility, and maintenance operations, and by requiring contract pay items to ensure the availability of funds for these provisions. This subpart is applicable to all Federal-aid highway projects, and its application is encouraged on other highway projects as well.

Sec. 630.1104 Definitions.

For the purposes of this subpart, the following definitions apply:

Agency means a State or local highway agency or authority that receives Federal-aid highway funding.

Exposure Control Measures means traffic management strategies to avoid work zone crashes involving workers and motorized traffic by eliminating or reducing traffic through the work zone, or diverting traffic away from the work space.

Federal-aid Highway Project means highway construction,

maintenance, and utility projects funded in whole or in part with Federal-aid funds.

Motorized Traffic means the motorized traveling public. This term does not include motorized construction or maintenance vehicles and equipment within the work space.

Other Traffic Control Measures means all strategies and temporary traffic controls other than Positive Protection Devices and Exposure Control Measures, but including uniformed law enforcement officers, used to reduce the risk of work zone crashes involving motorized traffic.

Positive Protection Devices means devices that contain and/or redirect vehicles and meet the crashworthiness evaluation criteria contained in National Cooperative Highway Research Program (NCHRP)

Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features, 1993, Transportation Research Board, National Research Council. The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. This document is available for inspection and copying at FHWA, 1200 New Jersey Avenue, SE., Washington, DC 20590, as provided in 49 CFR part 7. You may also inspect a copy at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call (202) 741 6030, or go to: <http://www.archives.gov/federal--register/code--of--federal--regulations/ibr--locations.html>.

Work Zone Safety Management means the entire range of traffic management and control and highway safety strategies and devices used to avoid crashes in work zones that can lead to worker and road user injuries and fatalities, including Positive Protection Devices, Exposure Control Measures, and Other Traffic Control Measures.

Sec. 630.1106 Policy and Procedures for Work Zone Safety Management.

(a) Each agency's policy and processes, procedures, and/or guidance for the systematic consideration and management of work zone impacts, to be established in accordance with 23 CFR 630.1006, shall include the consideration and management of road user and worker safety on Federal-aid highway projects. These processes, procedures, and/or guidance, to be developed in partnership with the FHWA, shall address the use of Positive Protection Devices to prevent the intrusion of motorized traffic into the work space and other potentially hazardous areas in the work zone; Exposure Control Measures to avoid or minimize worker exposure to motorized traffic and road user exposure to work activities; Other Traffic Control Measures including uniformed law enforcement officers to minimize work zone crashes; and the safe entry/exit of work vehicles onto/from the travel lanes. Each of these strategies should be used to the extent that they are possible, practical, and adequate to manage work zone exposure and reduce the risks of crashes resulting in fatalities or injuries to workers and road users.

(b) Agency processes, procedures, and/or guidance should be based on consideration of standards and/or guidance contained in the Manual on Uniform Traffic Control Devices (MUTCD) and the AASHTO Roadside

Design Guide, as well as project characteristics and factors. The strategies and devices to be used may be determined by a project-specific engineering study, or determined from agency guidelines that define strategies and approaches to be used based on project and highway characteristics and factors. The types of measures and strategies to be used are not mutually exclusive, and should be considered in combination as appropriate based on characteristics and factors such as those listed below:

- (1) Project scope and duration;
- (2) Anticipated traffic speeds through the work zone;
- (3) Anticipated traffic volume;
- (4) Vehicle mix;
- (5) Type of work (as related to worker exposure and crash risks);
- (6) Distance between traffic and workers, and extent of worker exposure;
- (7) Escape paths available for workers to avoid a vehicle intrusion into the work space;
- (8) Time of day (e.g., night work);
- (9) Work area restrictions (including impact on worker exposure);
- (10) Consequences from/to road users resulting from roadway departure;
- (11) Potential hazard to workers and road users presented by device itself and during device placement and removal;
- (12) Geometrics that may increase crash risks (e.g., poor sight distance, sharp curves);
- (13) Access to/from work space;
- (14) Roadway classification; and
- (15) Impacts on project cost and duration.

(c) Uniformed Law Enforcement Policy. Each agency, in partnership with the FHWA, shall develop a policy

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addressing the use of uniformed law enforcement on Federal-aid highway projects. The policy may consist of processes, procedures, and/or guidance. The processes, procedures, and/or guidance should address the following:

- (1) Basic interagency agreements between the highway agency and appropriate law enforcement agencies to address work zone enforcement needs;
- (2) Interaction between highway and law-enforcement agency during project planning and development;
- (3) Conditions where law enforcement involvement in work zone traffic control may be needed or beneficial, and criteria to determine the project-specific need for law enforcement;
- (4) General nature of law enforcement services to be provided, and procedures to determine project-specific services;
- (5) Appropriate work zone safety and mobility training for the officers, consistent with the training requirements in 23 CFR 630.1008(d);

(6) Procedures for interagency and project-level communications between highway agency and law enforcement personnel; and

(7) Reimbursement agreements for law enforcement service.

Sec. 630.1108 Work Zone Safety Management Measures and Strategies.

(a) Positive Protection Devices. The need for longitudinal traffic barrier and other positive protection devices shall be based on an engineering study. The engineering study may be used to develop positive protection guidelines for the agency, or to determine the measures to be applied on an individual project. The engineering study should be based on consideration of the factors and characteristics described in section 630.1106(b). At a minimum, positive protection devices shall be considered in work zone situations that place workers at increased risk from motorized traffic, and where positive protection devices offer the highest potential for increased safety for workers and road users, such as:

(1) Work zones that provide workers no means of escape from motorized traffic (e.g., tunnels, bridges, etc.);

(2) Long duration work zones (e.g., two weeks or more) resulting in substantial worker exposure to motorized traffic;

(3) Projects with high anticipated operating speeds (e.g., 45 mph or greater), especially when combined with high traffic volumes;

(4) Work operations that place workers close to travel lanes open to traffic; and

(5) Roadside hazards, such as drop-offs or unfinished bridge decks, that will remain in place overnight or longer.

(b) Exposure Control Measures. Exposure Control Measures should be considered where appropriate to avoid or minimize worker exposure to motorized traffic and exposure of road users to work activities, while also providing adequate consideration to the potential impacts on mobility. A wide range of measures may be appropriate for use on individual projects, such as:

(1) Full road closures;

(2) Ramp closures;

(3) Median crossovers;

(4) Full or partial detours or diversions;

(5) Protection of work zone setup and removal operations using rolling road blocks;

(6) Performing work at night or during off-peak periods when traffic volumes are lower; and

(7) Accelerated construction techniques.

(c) Other Traffic Control Measures. Other Traffic Control Measures should be given appropriate consideration for use in work zones to reduce work zone crashes and risks and consequences of motorized traffic intrusion into the work space. These measures, which are not mutually exclusive and should be considered in combination as appropriate, include a wide range of other traffic control measures such as:

- (1) Effective, credible signing;
- (2) Changeable message signs;
- (3) Arrow panels;
- (4) Warning flags and lights on signs;
- (5) Longitudinal and lateral buffer space;
- (6) Trained flaggers and spotters;
- (7) Enhanced flagger station setups;
- (8) Intrusion alarms;
- (9) Rumble strips;
- (10) Pace or pilot vehicle;
- (11) High quality work zone pavement markings and removal of misleading markings;
- (12) Channelizing device spacing reduction;
- (13) Longitudinal channelizing barricades;
- (14) Work zone speed management (including changes to the regulatory speed and/or variable speed limits);
- (15) Law enforcement;
- (16) Automated speed enforcement (where permitted by State/local laws);
- (17) Drone radar;
- (18) Worker and work vehicle/equipment visibility;
- (19) Worker training;
- (20) Public information and traveler information; and
- (21) Temporary traffic signals.

(d) Uniformed Law Enforcement Officers. (1) A number of conditions may indicate the need for or benefit of uniformed law enforcement in work zones. The presence of a uniformed law enforcement officer and marked law enforcement vehicle in view of motorized traffic on a highway project can affect driver behavior, helping to maintain appropriate speeds and improve driver alertness through the work zone. However, such law enforcement presence is not a substitute for the temporary traffic control devices required by Part 6 of the MUTCD.

In general, the need for law enforcement is greatest on projects with high traffic speeds and volumes, and where the work zone is expected to result in substantial disruption to or changes in normal traffic flow patterns. Specific project conditions should be examined to determine the need for or potential benefit of law enforcement, such as the following:

- (i) Frequent worker presence adjacent to high-speed traffic without positive protection devices;
- (ii) Traffic control setup or removal that presents significant risks to workers and road users;
- (iii) Complex or very short term changes in traffic patterns with significant potential for road user confusion or worker risk from traffic exposure;
- (iv) Night work operations that create substantial traffic safety risks for workers and road users;
- (v) Existing traffic conditions and crash histories that indicate a potential for substantial safety and congestion impacts related to the work zone activity, and that may be mitigated by improved

driver behavior and awareness of the work zone;

- (vi) Work zone operations that require brief stoppage of all traffic in one or both directions;
- vii) High-speed roadways where unexpected or sudden traffic queuing is anticipated, especially if the queue forms a considerable distance in advance of the work zone or immediately adjacent to the work space; and
- (viii) Other work site conditions where traffic presents a high risk for workers and road users, such that the risk may be reduced by improving road user behavior and awareness.

(2) Costs associated with the provision of uniformed law enforcement to help protect workers and road users, and to maintain safe and efficient travel through highway work zones, are eligible for Federal-aid participation. Federal-aid eligibility excludes law enforcement activities that would normally be expected in and around highway problem areas requiring routine or ongoing law enforcement traffic control and enforcement

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activities. Payment for the services of uniformed law enforcement in work zones may be included in the construction contract, or be provided by direct reimbursement from the highway agency to the law enforcement agency. When payment is included through the construction contract, the contractor will be responsible for reimbursing the law enforcement agency, and in turn will recover those costs through contract pay items. Direct interagency reimbursement may be made on a project-specific basis, or on a program-wide basis that considers the overall level of services to be provided by the law enforcement agency.

Contract pay items for law enforcement service may be either unit price or lump sum items. Unit price items should be utilized when the highway agency can estimate and control the quantity of law enforcement services required on the project. The use of lump sum payment should be limited to situations where the quantity of services is directly affected by the contractor's choice of project scheduling and chosen manner of staging and performing the work. Innovative payment items may also be considered when they offer an advantage to both the highway agency and the contractor. When reimbursement to the law enforcement agency is made by interagency transfer of funds, the highway agency should establish a program-level or project-level budget that is adequate to meet anticipated program or project needs, and include provisions to address unplanned needs and other contingencies.

(e) Work Vehicles and Equipment. In addition to addressing risks to workers and road users from motorized traffic, the agency processes, procedures, and/or guidance established in accordance with 23 CFR 630.1006 should also address safe means for work vehicles and equipment to enter and exit traffic lanes and for delivery of construction materials to the work space, based on individual project characteristics and factors.

(f) Payment for Traffic Control. Consistent with the requirements of 23 CFR 630.1012, Project-level Procedures, project plans, specifications and estimates (PS&Es) shall include appropriate pay item provisions for implementing the project Transportation Management Plan (TMP), which includes

a Temporary Traffic Control (TTC) plan, either through method or performance based specifications. Pay item provisions include, but are not limited to, the following:

(1) Payment for work zone traffic control features and operations shall not be incidental to the contract, or included in payment for other items of work not related to traffic control and safety;

(2) As a minimum, separate pay items shall be provided for major categories of traffic control devices, safety features, and work zone safety activities, including but not limited to positive protection devices, and uniformed law enforcement activities when funded through the project;

(3) For method based specifications, the specifications and other PS&E documents should provide sufficient details such that the quantity and types of devices and the overall effort required to implement and maintain the TMP can be determined;

(4) For method-based specifications, unit price pay items, lump sum pay items, or a combination thereof may be used;

(5) Lump sum payment should be limited to items for which an estimate of the actual quantity required is provided in the PS&E or for items where the actual quantity required is dependent upon the contractor's choice of work scheduling and methodology;

(6) For Lump Sum items, a contingency provision should be included such that additional payment is provided if the quantity or nature of the required work changes, either an increase or decrease, due to circumstances beyond the control of the contractor;

(7) Unit price payment should be provided for those items over which the contractor has little or no control over the quantity, and no firm estimate of quantities is provided in the PS&Es, but over which the highway agency has control of the actual quantity to be required during the project;

(8) Specifications should clearly indicate how placement, movement/relocation, and maintenance of traffic control devices and safety features will be compensated; and

(9) The specifications should include provisions to require and enforce contractor compliance with the contract provisions relative to implementation and maintenance of the project TMP and related traffic control items. Enforcement provisions may include remedies such as liquidated damages, work suspensions, or withholding payment for noncompliance.

Sec. 630.1110 Maintenance of Temporary Traffic Control Devices.

To provide for the continued effectiveness of temporary traffic control devices, each agency shall develop and implement quality guidelines to help maintain the quality and adequacy of the temporary traffic control devices for the duration of the project. Agencies may choose to adopt existing quality guidelines such as those developed by the American Traffic Safety Services Association (ATSSA) or other state

highway agencies.\1\ A level of inspection necessary to provide ongoing compliance with the quality guidelines shall be provided.

\1\ The American Traffic Safety Services Association's (ATSSA) Quality Guidelines for Work Zone Traffic Control Devices uses photos and written descriptions to help judge when a traffic control device has outlived its usefulness. These guidelines are available for purchase from ATSSA through the following URL: <http://www.atssa.com/store/bc--item--detail.jsp?productId=1>. Similar guidelines are available from various State highway agencies. The Illinois Department of Transportation ``Quality Standards for Work Zone Traffic Control Devices'' is available online at <http://dot.state.il.us/workzone/wztc2004r.pdf>. The Minnesota Department of Transportation ``Quality Standards--Methods to determine whether the various traffic control devices are Acceptable, Marginal, or Unacceptable'' is available online at <http://www.dot.state.mn.us/trafficeng/otepubl/fieldmanual2007/FM-2007-QualityStandards.pdf>.

[FR Doc. E7-23581 Filed 12-4-07; 8:45 am]
BILLING CODE 4910-22-P

rule. First, this final rule increases the current \$10,000 civil penalty amount to \$11,000 for violations of most provisions of Chapter 401, including the anti-discrimination provisions of section 401217 (general provision) and 41705 (discrimination against the disabled), and rules and orders issued under those provisions. Second, this final rule raises the current \$5,000 civil penalty amount to \$5,500 for violations of section 41719 regarding essential air service and consumer protection rules or orders issued under that section. The current maximum civil penalty of \$2,500 for violations of section 41712 (unfair and deceptive practices and unfair methods of competition) is not being raised because of the rounding provision discussed above. Finally, the final rule makes a number of non-substantive editorial changes for clarity.

Regulatory Analyses and Notices

The Administrative Procedure Act (APA) (5 U.S.C. 553) provides an exception to the notice and comment procedures when an agency finds there is good cause for dispensing with such procedures when they are impracticable, unnecessary or contrary to the public interest. We find that under 5 U.S.C. 553(b)(3)(B) good cause exists for dispensing with the usual requirements for notice and public comment. This rulemaking is a ministerial action required the Debt Collection Improvement Act of 1996 and the Federal Civil Penalties Inflation Adjustment Act of 1990. It is based on a statutory formula. Accordingly, we find that opportunity for notice and comment is unnecessary and contrary to the public interest, and we are issuing these updates as a final rule.

Executive Order 12866

This final rule has been evaluated in accordance with existing policies and procedures and is considered not significant under Executive Order 12866 or DOT's Regulatory Policies and Procedures. The rule has not been reviewed by the Office of Management and Budget (OMB) under Executive Order 12866. The provisions are required by current regulatory language, without interpretation.

Regulatory Flexibility Act

In addition, we must prepare a regulatory flexibility analysis that is consistent with the Regulatory Flexibility Act (5 U.S.C. 601–602) unless we certify that a regulation will not have a significant economic impact on a substantial number of small entities. In this case the revision of the civil penalty amounts will raise

potential penalties for all aviation businesses; however, there are special reduced penalties for individuals and small businesses with regard to specific kinds of violations. With respect to two categories of violations committed by small businesses and individuals, the inflation adjustment results in no change. Those two categories are the general civil penalty amount of \$1,100 and civil penalty of \$2,500 for violations of 49 U.S.C. 41712, prohibiting unfair and deceptive business practices and unfair methods of competition. A third category of penalty applicable to small businesses, for violations of 49 U.S.C. 41719, does increase from \$5,000 to \$5,500 as a result of the inflation adjustment made by this rulemaking. Violations of this provision, having to do with essential air service requirements, are rare and should affect few, if any, small businesses. Violations of most provisions of Chapter 401 increase from \$10,000 to \$11,000. The aggregate economic impact of this rulemaking on small entities should be minimal. Therefore, we certify that this final rule will not have a significant economic impact on a substantial number of small entities, and that a regulatory flexibility analysis is not required for this rulemaking.

Paperwork Reduction Act

This final rule imposes no new reporting or record keeping requirements necessitating paperwork clearance by OMB.

Unfunded Mandates Reform Act of 1995

OST has determined that the requirements of Title II of the Unfunded Mandates Reform Act of 1995, as amended, do not apply to this rulemaking.

List of Subjects

14 CFR Part 383

Administrative practice and procedures; Penalties.

■ Accordingly, the Department of Transportation revises 14 CFR part 383 to read as follows:

PART 383—CIVIL PENALTIES

Sec.

383.1 Purpose and Periodic Adjustment.

383.2 Amount of Penalty.

Authority: Sec. 503, Public Law 108–176, 117 Stat. 2490; Public Law 101–410, 104 Stat. 890; Public Law 104–134, § 31001.

§ 383.1 Purpose and Periodic Adjustment.

(a) *Purpose.* This part adjusts the civil penalty liability amounts prescribed in 49 U.S.C. 46301(a) for inflation in

accordance with the Acts cited in paragraph (b) of this section.

(b) *Periodic Adjustment.* DOT will periodically adjust the maximum civil penalties set forth in 49 U.S.C. 46301 and this part as required by the Federal Civil Penalties Inflation Adjustment Act of 1990 and the Debt Collection Improvement Act of 1996.

§ 383.2 Amount of penalty.

Civil penalties payable to the U.S. Government for violations of Title 49, Chapters 401 through 421, pursuant to 49 U.S.C. 46301(a), are as follows:

(a) A general civil penalty of not more than \$27,500 (or \$1,100 for individuals or small businesses) applies to violations of statutory provisions and rules or orders issued under those provisions, other than those listed in paragraph (b) of this section, (*see* 49 U.S.C. 46301(a)(1));

(b) With respect to small businesses and individuals, notwithstanding the general \$1,100 civil penalty, the following civil penalty limits apply:

(1) A maximum civil penalty of \$11,000 applies for violations of most provisions of Chapter 401, including the anti-discrimination provisions of sections 40127 (general provision), and 41705 (discrimination against the disabled) and rules and orders issued thereunder (*see* 49 U.S.C. 46301(a)(5)(A));

(2) A maximum civil penalty of \$5,500 applies for violations of section 41719 and rules and orders issued thereunder (*see* 49 U.S.C. 46301(a)(5)(C)); and

(3) A maximum civil penalty of \$2,500 applies for violations of section 41712 or consumer protection rules or orders (*see* 49 U.S.C. 46301(a)(5)(D)).

Issued in Washington, DC on November 14, 2008.

Mary E. Peters,

Secretary.

[FR Doc. E8–27774 Filed 11–20–08; 8:45 am]

BILLING CODE 4910–9X–P

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

23 CFR Part 634

[FHWA Docket No. FHWA–2008–0157]

RIN 2125–AF28

Worker Visibility

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Interim Final Rule (IFR).

SUMMARY: The FHWA is revising its regulations to address safety concerns

raised by the firefighting community regarding high-visibility safety apparel. Due to imminent safety implications to firefighters, the FHWA has determined that there is good cause under the Administrative Procedure Act to dispense with notice and opportunity for comment as it would be contrary to the public interest. Therefore, we are issuing an Interim Final Rule, effective immediately, pursuant to the Administrative Procedure Act, and revising FHWA regulations accordingly.

DATES: *Effective Date:* This rule is effective November 24, 2008.

ADDRESSES: Mail or hand deliver comments to Docket Management Facility: U.S. Department of Transportation, 1200 New Jersey Avenue, SE., Washington, DC 20590-0001, submit comments electronically at <http://www.regulations.gov>, or fax comments to (202) 493-2251.

All comments should include the docket number that appears in the heading of this document. All comments received will be available for examination and copying at the above address from 9 a.m. to 5 p.m., e.t., Monday through Friday, except Federal holidays. Those desiring notification of receipt of comments must include a self-addressed, stamped postcard or may print the acknowledgment page that appears after submitting comments electronically. Anyone is able to search the electronic form of all comments in any one of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, or labor union). You may review the DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70, Pages 19477-78) or you may visit <http://DocketsInfo.dot.gov>.

FOR FURTHER INFORMATION CONTACT: For technical information: Mr. Hari Kalla, Office of Transportation Operations, (202) 366-5915. For legal information: Mr. Raymond Cuprill, Office of Chief Counsel, (202) 366-0791, Federal Highway Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590-0001. Office hours are from 7:45 a.m. to 4:15 p.m., e.t., Monday through Friday, except Federal holidays.

SUPPLEMENTARY INFORMATION:

Electronic Access and Filing

You may submit or retrieve comments online through the Federal eRulemaking portal at <http://www.regulations.gov>. It is available 24 hours each day, 365 days each year. Please follow the instructions online for more information and help.

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Background

In this IFR, the FHWA is revising existing regulations to address safety concerns raised by the firefighting community. On April 24, 2006, at 71 FR 20925, the FHWA published a Notice of Proposed Rulemaking (NPRM) proposing to require the use of high-visibility safety apparel for workers who work within the Federal-aid highway rights-of-way. This regulation implemented section 1402 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) (Pub. L. 109-59; August 10, 2005), which directed the Secretary of Transportation to, within 1 year, issue regulations to decrease the likelihood of worker injury and maintain the free flow of vehicular traffic by requiring workers whose duties place them on or in close proximity to a Federal-aid highway to wear high-visibility safety apparel. The proposed definition of "worker" included any person on foot whose duties place them within the right-of-way of a Federal-aid highway, such as highway construction and maintenance forces, survey crews, utility crews, responders to incidents, including law enforcement personnel, within the highway right-of-way of a Federal-aid highway. "High-visibility safety apparel" was defined as any garment meeting the American National Standards Institute (ANSI) 107-2004 Class 2 or 3 standard.

The comment period for the NPRM closed on June 23, 2006. The FHWA received 117 letters, which were submitted to the docket, containing over 300 individual comments submitted by State and local law enforcement agencies, State departments of transportation, city and county government agencies, consulting firms, private industry, associations, other organizations, and individual private citizens. The FHWA did not receive any comments from the firefighting community either in support of or in opposition to the proposed regulations. Many of the comments received from the law enforcement community, including one from the International Association of Chiefs of Police, requested an exception for law enforcement personnel engaged in law enforcement activities, as opposed to traffic control type activities. The law enforcement community commenters

contended that an officer wearing a high-visibility garment would stand out in situations where the additional conspicuity could be hazardous for the officer. The intent of the regulation was to improve the safety of workers by providing increased visibility to approaching motorists and construction traffic, not to place an officer in a more dangerous position during enforcement activities. Therefore, the FHWA agreed with the recommendation from the International Association of Chiefs of Police and provided an exception for law enforcement personnel in the Final Rule.

On November 24, 2006, at 72 FR 67792, the Final Rule establishing 23 CFR part 634 was published in the **Federal Register**. A compliance date of November 24, 2008, was established to provide a 2-year phase-in period. During this period, the firefighting community became aware of the regulation and the implications for their operations. Many of the letters that the FHWA has received from the firefighting community during the phase-in period indicate support of the regulation in general, but raise concerns about situations where the requirement to wear a high-visibility garment could cause operational problems for firefighters and could result in decreased safety for individual firefighters. During the NPRM comment period, an equipment manufacturer commented that, due to the competing hazards that exist for workers, such as heat and flame, the FHWA should consider incorporating worker categories, or at a minimum, exempt fire services responders, and instead encourage best practices in the use of high-visibility apparel in emergency situations in accordance with hazard assessments or specific environments. In response, in the preamble for the Final Rule, the FHWA indicated, "If an agency determines that the material must be fire resistant, it can include a provision in the specification for the garments that they purchase." It appears that, a material that meets the fluorescent color of the ANSI 107-2004 standard and is heat- and flame-resistant to the degree required by firefighters and the National Fire Protection Association (NFPA) standards has not been developed. Therefore, it is possible that, by complying with 23 CFR part 634, a firefighter wearing a high-visibility garment could be at a greater risk of injury.

The firefighting community has also identified issues related to the amount of other personal protection equipment (PPE) required for firefighters in situations where high heat or flames are

present. In addition to the “turnout gear” worn by most firefighters required by a NFPA 1971 standard, they are often required to wear a Self-Contained Breathing Apparatus. Requiring the use of the high-visibility garment as the outer layer of a firefighter’s apparel in such situations would not be practical. Additionally, the firefighting community contends that wearing a garment outside the turnout gear could create a snag hazard in the extraction operations at some incident scenes. This could hinder the operations and decrease safety for a firefighter.

In certain situations, such as responding to incidents on the roadway, firefighters and other emergency personnel must consider competing hazards. Conflicting regulations to 23 CFR part 634 may also exist. For example, the NFPA standards specify the type of PPE that firefighters must wear based on the different conditions they encounter. The Occupational Safety and Health Association regulations also require employers to complete and certify PPE Hazard Assessments that identify all job hazards and the correct PPE for workers to wear when engaged in work duties. While these regulations do not always conflict with 23 CFR part 634, certain conditions where they do so may exist.

In April 2008, the University of Michigan, Ann Arbor, Transportation Research Institute released a study on the conspicuity of first-responder safety garments. The study was conducted on a closed track in both daytime and nighttime conditions to compare the conspicuity of three different types of safety garments used by first responders: NFPA 1971 turnout gear coats, ANSI/ISEA 107 safety vests, and ANSI/ISEA 207 safety vests. Eight participants, balanced for gender and age, drove instrumented vehicles on the closed track indicating the distance at which they could detect workers at a simulated emergency response scene. The results show no statistically significant difference in the distance at which workers were detected, regardless of which garment was worn. In other words, all three garment standards provided equal levels of conspicuity under the conditions examined. The results suggest that all of the garments studied should be considered equivalent relative to first responder conspicuity when working in close proximity to traffic.¹ Based upon this research, the FHWA believes that the PPE for

firefighters specified in the NFPA 1971 standard is equivalent to the ANSI 107–2004 Class 2 garment.

Section-by-Section Analysis

Section 634.2

This subsection is amended to revise the definition of “worker” to exclude firefighters when they are exposed to flame, fire, high heat or hazardous materials.

Section 634.3

This subsection is amended to exempt firefighters from the requirement to use high-visibility safety apparel, as defined in this rule, when they are exposed to hazardous conditions where the use of such apparel may increase the risk of injury to firefighter personnel.

Rulemaking Analyses and Notices

Due to the imminent safety implications to firefighters, the FHWA has determined that there is good cause under 5 U.S.C. 553(b)(3)(B) to dispense with notice and opportunity for comment as it would be contrary to the public interest. And, in addition, for the same reason, we are making this Interim Final Rule effective immediately under 5 U.S.C. 553(d)(3), and, therefore, revising 23 CFR part 634 accordingly.

Executive Order 12866 (Regulatory Planning and Review) and DOT Regulatory Policies and Procedures

The FHWA has determined that this action is not a significant regulatory action within the meaning of Executive Order 12866 and is not significant within the meaning of U.S. Department of Transportation regulatory policies and procedures. It is anticipated that the economic impact of this rulemaking would be minimal. These changes would not adversely affect, in a material way, any sector of the economy. In addition, these changes would not interfere with any action taken or planned by another agency and would not materially alter the budgetary impact of any entitlements, grants, user fees, or loan programs. Consequently, a full regulatory evaluation is not required.

Regulatory Flexibility Act

In compliance with the Regulatory Flexibility Act (Pub. L. 96–354, 5 U.S.C. 601–612) the FHWA has evaluated the effects of this action on small entities and has determined that the action would not have a significant economic impact on a substantial number of small entities. This action does not affect any funding distributed under any of the programs administered by the FHWA. For these reasons, the FHWA certifies

that this action would not have a significant economic impact on a substantial number of small entities.

Unfunded Mandates Reform Act of 1995

This rule would not impose unfunded mandates as defined by the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4, 109 Stat. 48). This rule would not result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$128.1 million or more in any one year (2 U.S.C. 1532).

Executive Order 13132 (Federalism Assessment)

This action has been analyzed in accordance with the principles and criteria contained in Executive Order 13132, and the FHWA has determined that this action would not have sufficient federalism implications to warrant the preparation of a federalism assessment. The FHWA has also determined that this action would not preempt any State law or State regulation or affect the States’ ability to discharge traditional State governmental functions.

Executive Order 13211 (Energy Effects)

We have analyzed this action under Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use, dated May 18, 2001. We have determined that it is not a significant energy action under that order since it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Therefore, a Statement of Energy Effects is not required.

Executive Order 12372 (Intergovernmental Review)

Catalog of Federal Domestic Assistance Program Number 20.205, Highway Planning and Construction. The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal programs and activities apply to this program.

Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501), Federal agencies must obtain approval from the Office of Management and Budget for each collection of information they conduct, sponsor, or require through regulations. The FHWA has determined that this rule does not contain collection of information requirements for the purposes of the PRA.

¹ Tuttle, S.J., Sayer, J.R., Buonarosa, M.L.; “The conspicuity of first-responder safety garments”; available at <http://hdl.handle.net/2027.42/58734>; University of Michigan, Ann Arbor, Transportation Research Institute (2008).

Executive Order 12988 (Civil Justice Reform)

This action meets applicable standards in sections 3(a) and 3(b)(2) of Executive Order 12988, Civil Justice Reform, to minimize litigation, eliminate ambiguity, and reduce burden.

Executive Order 13045 (Protection of Children)

The FHWA has analyzed this rule under Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. The FHWA certifies that this action would not cause any environmental risk to health or safety that might disproportionately affect children.

Executive Order 12630 (Taking of Private Property)

The FHWA has analyzed this rule under Executive Order 12630, Governmental Actions and Interface with Constitutionally Protected Property Rights. The FHWA does not anticipate that this action would affect a taking of private property or otherwise have taking implications under Executive Order 12630.

National Environmental Policy Act

The agency has analyzed this action for the purpose of the National Environmental Policy Act of 1969 (42 U.S.C. 4321–4347) and has determined that this action would not have any effect on the quality of the environment.

Regulation Identification Number

A regulation identification number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading of this document can be used to cross reference this action with the Unified Agenda.

List of Subjects in 23 CFR Part 634

Design standards, Highways and roads, Incorporation by reference, Workers, Traffic regulations.

Issued on: November 14, 2008.

Thomas J. Madison, Jr.

Administrator, Federal Highway Administration.

■ In consideration of the foregoing, the FHWA amends chapter I of title 23, Code of Federal Regulations, as set forth below:

PART 634—WORKER VISIBILITY

■ 1. The authority citation for part 634 continues to read as follows:

Authority: 23 U.S.C. 101(a), 109(d), 114(a), 315, and 402(a); Sec. 1402 of Pub. L. 109–59; 23 CFR 1.32; and 49 CFR 1.48(b).

■ 2. Amend § 634.2 to revise the definition of “Workers” as follows:

§ 634.2 Definitions.

* * * * *

Workers means people on foot whose duties place them within the right-of-way of a Federal-aid highway, such as highway construction and maintenance forces; survey crews; utility crews; responders to incidents within the highway right-of-way; firefighters and other emergency responders when they are not directly exposed to flame, fire, heat, and/or hazardous materials; and law enforcement personnel when directing traffic, investigating crashes, and handling lane closures, obstructed roadways, and disasters within the right-of-way of a Federal-aid highway.

■ 3. Revise § 634.3 to read as follows:

§ 634.3 Rule.

All workers within the right-of-way of a Federal-aid highway who are exposed either to traffic (vehicles using the highway for purposes of travel) or to construction equipment within the work area shall wear high-visibility safety apparel. Firefighters or other emergency responders working within the right-of-way of a Federal-aid highway and engaged in emergency operations that directly expose them to flame, fire, heat, and/or hazardous materials may wear retroreflective turn-out gear that is specified and regulated by other organizations, such as the National Fire Protection Association. Firefighters or other emergency responders working within the right-of-way of a Federal-aid highway and engaged in any other types of operations shall wear high-visibility safety apparel.

[FR Doc. E8–27671 Filed 11–20–08; 8:45 am]

BILLING CODE 4910–22–P

ENVIRONMENTAL PROTECTION AGENCY**40 CFR Part 3**

[EPA–HQ–OEI–2003–0001; FRL–8743–3]

RIN 2025–AA23

Extension of Cross-Media Electronic Reporting Rule Deadline for Authorized Programs

AGENCY: Environmental Protection Agency (EPA).

ACTION: Withdrawal of direct final rule.

SUMMARY: Because EPA received comment, we are withdrawing the direct final rule for extension of the Cross-Media Electronic Reporting Rule (CROMERR) deadline for authorized programs (states, tribes, or local governments) with existing electronic document receiving systems to submit applications for EPA approval under CROMERR, published on October 17, 2008.

DATES: Effective November 21, 2008, EPA withdraws the direct final rule published at 73 FR 61737, on October 17, 2008.

FOR FURTHER INFORMATION CONTACT: Evi Huffer, Office of Environmental Information (2823T), Environmental Protection Agency, 1200 Pennsylvania Avenue, NW., Washington, DC 20460; (202) 566–1697; huffer.evi@epa.gov, or David Schwarz, Office of Environmental Information (2823T), Environmental Protection Agency, 1200 Pennsylvania Avenue, NW., Washington, DC 20460; (202) 566–1704; schwarz.david@epa.gov.

SUPPLEMENTARY INFORMATION: Because EPA received comment, we are withdrawing the direct final rule for extension of the Cross-Media Electronic Reporting Rule (CROMERR) deadline for authorized programs (states, tribes, or local governments) with existing electronic document receiving systems to submit applications for EPA approval under CROMERR, published on October 17, 2008. We stated in that direct final rule that if we received comment by November 3, 2008, the direct final rule would not take effect and we would publish a timely withdrawal in the **Federal Register**. We subsequently received comment on that direct final rule. We will address those comments in any subsequent final action, which will be based on the parallel proposed rule also published on October 17, 2008 (73 FR 61737). As stated in the direct final rule and the parallel proposed rule, we will not institute a second comment period on this action.

List of Subjects in 40 CFR Part 3

Environmental protection, Conflict of interests, Electronic records, Electronic reporting requirements, Electronic reports, Intergovernmental relations.

Connecticut General Statutes



Traffic Incident Management Program

Traffic Control for Emergency Responders

Sec. 7-313a. Fire Police. The authorities having the supervision of the fire department of any town, city, borough or district may appoint such number of persons, within available appropriations, as they deem necessary to be fire police officers of such municipality or district, who shall have the powers and perform the duties in such municipality or district as designated and authorized by the fire chief of such municipality or district, and such fire police officers may exercise such powers and duties in any adjoining municipality or district while on duty with the fire department or with a cooperating fire department, where the department is engaged in mutual assistance.

Such powers and duties shall include traffic control and regulation and may be exercised by such fire police during any fire drill or fire call or at any other time when such fire police are serving with the fire department, with any other fire department in an adjoining municipality or district or with any fire department rendering mutual assistance.

Each such fire police officer while in the performance of fire police duties shall wear the badge of office in plain view of any observer. Each such fire police officer, while directing traffic in performance of the duties of fire police, (1) shall wear a white helmet with the words "Fire Police" in red letters on the front thereof or regulation fire-police dress uniform cap and after dark or in inclement weather, a traffic safety vest, orange or lime green raincoat or any reflectorized orange or lime green outer clothing, that meets national, state and local traffic safety standards, (2) carry a flashlight, which shall have a red or orange wand and be capable of projecting a clear light for the purpose of illumination at nighttime, and (3) utilize hand-held or portable traffic control devices appropriate for the time of day, weather and traffic flow. Such helmet, cap, vest, raincoat or outer clothing, badge, traffic control equipment and flashlight may be supplied by the appointing municipality or district.

Traffic Control for Emergency Responders

Sec.7-313b. Authority of fire department officer to order removal of persons. The officer of a fire company or a fire department in charge of directing the activities at a fire or other emergency to which his company or department responds shall have the authority to order any person to leave any building or place in the vicinity of such fire or emergency for the purpose of protecting such person from injury. Any person, upon being so ordered, who willfully refuses to leave the vicinity of a fire or other emergency situation shall be fined not more than fifty dollars or imprisoned not more than seven days or both. The provisions of this section shall not apply to any person who has been issued a press card by the state police.

Connecticut General Statutes

Sec.7-313e. Authority of fire officer during emergency.

Notwithstanding any provision in the general statutes or a municipal ordinance to the contrary, the fire chief of the municipality, or any member serving in the capacity of fire officer-in-charge, shall, when any fire department or company is responding to or operating at a fire, service call, or other emergency, within such municipality, have the authority to:

(a) Control and direct emergency activities at such scene;

(b) Order any person to leave any building or place in the vicinity of such fire for the purpose of protecting such person from injury;

(c) Blockade any public highway, street, or private right-of-way temporarily while at such scene;

(d) At any time of the day or night, enter any building, including a private dwelling, or upon any premises where a fire is in progress or near the scene of any fire, or where there is reasonable cause to believe a fire is in progress, for the purpose of extinguishing the fire or preventing its spread;

(e) Inspect for the purposes of preventing fires and preplanning the control of fire all buildings, structures or other places in their fire district, except the interior of private dwellings, where any combustible material, including but not limited to waste paper, rags, shavings, waste, leather, rubber, crates, boxes, barrels or rubbish, that is or may become dangerous as a fire menace to such buildings, structures or other places has been allowed to accumulate or where such chief or his designated representative has reason to believe that such material has accumulated or is liable to be accumulated;

(f) Order disengagement or discouplement of any convoy, caravan or train of vehicles, craft or railway cars for the purpose of extinguishing a fire or preventing its spread;
and

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(g) Take command of any industrial fire brigade or fire chief when such fire company or department has been called to such industry.

Connecticut General Statutes

Sec.7-314a. Death, disability and injury benefits: Presumption.

(a) Except as provided in subsections (e) and (f) of this section, active members of volunteer fire departments and active members of organizations certified as a volunteer ambulance service in accordance with section 19a-180 shall be construed to be employees of the municipality for the benefit of which volunteer fire services or such ambulance services are rendered while in training or engaged in volunteer fire duty or such ambulance service and shall be subject to the jurisdiction of the Workers' Compensation Commission and shall be compensated in accordance with the provisions of chapter 568 for death, disability or injury incurred while in training for or engaged in volunteer fire duty or such ambulance service.

(b) For the purpose of this section, the average weekly wage of a volunteer fireman or volunteer ambulance service member shall be construed to be the average production wage in the state as determined by the Labor Commissioner under the provisions of section 31-309.

(c) For the purpose of this section, there shall be no prorating of compensation benefits because of other employment by a volunteer fireman or volunteer ambulance service provider.

(d) For the purpose of adjudication of claims for the payment of benefits under the provisions of chapter 568, any condition of impairment of health occurring to an active member of a volunteer fire department or organization certified as a volunteer ambulance service in accordance with section 19a-180 while such member is in training for or engaged in volunteer fire duty or such ambulance service, caused by hypertension or heart disease resulting in death or temporary or permanent total or partial disability, shall be presumed to have been suffered in the line of duty and within the scope of his employment, provided such member had previously successfully passed a physical examination by a licensed physician appointed by such department or ambulance service which examination failed to reveal any evidence of such condition.

Connecticut General Statutes

(e) Any member of a volunteer fire company or department or organization certified as a volunteer ambulance service in accordance with section 19a-180 performing fire duties or such ambulance service pursuant to a mutual aid understanding between municipalities shall be entitled to all benefits pursuant to this section and shall be construed to be an employee of the municipality in which his fire company or department or such ambulance service is located.

(f) Any member of a volunteer fire company or department and any person summoned by the State Forest Fire Warden or by any state forest fire personnel or district or deputy fire warden under the supervision of the State Forest Fire Warden pursuant to section 23-37, who performs fire duties under the direction of such personnel or warden pursuant to section 23-37, shall be construed to be an employee of the state for the purpose of receiving compensation in accordance with the provisions of chapter 568 for death, disability or injury incurred while performing such fire duties under such direction.

Connecticut General Statutes

Sec.7-313b. Authority of fire department officer to order removal of persons.

The officer of a fire company or a fire department in charge of directing the activities at a fire or other emergency to which his company or department responds shall have the authority to order any person to leave any building or place in the vicinity of such fire or emergency for the purpose of protecting such person from injury. Any person, upon being so ordered, who willfully refuses to leave the vicinity of a fire or other emergency situation shall be fined not more than fifty dollars or imprisoned not more than seven days or both. The provisions of this section shall not apply to any person who has been issued a press card by the state police.

Connecticut General Statutes

Sec.7-313e. Authority of fire officer during emergency.

Notwithstanding any provision in the general statutes or a municipal ordinance to the contrary, the fire chief of the municipality, or any member serving in the capacity of fire officer-in-charge, shall, when any fire department or company is responding to or operating at a fire, service call, or other emergency, within such municipality, have the authority to:

(a) Control and direct emergency activities at such scene;

(b) Order any person to leave any building or place in the vicinity of such fire for the purpose of protecting such person from injury;

(c) Blockade any public highway, street, or private right-of-way temporarily while at such scene;

(d) At any time of the day or night, enter any building, including a private dwelling, or upon any premises where a fire is in progress or near the scene of any fire, or where there is reasonable cause to believe a fire is in progress, for the purpose of extinguishing the fire or preventing its spread;

(e) Inspect for the purposes of preventing fires and preplanning the control of fire all buildings, structures or other places in their fire district, except the interior of private dwellings, where any combustible material, including but not limited to waste paper, rags, shavings, waste, leather, rubber, crates, boxes, barrels or rubbish, that is or may become dangerous as a fire menace to such buildings, structures or other places has been allowed to accumulate or where such chief or his designated representative has reason to believe that such material has accumulated or is liable to be accumulated;

(f) Order disengagement or discouplement of any convoy, caravan or train of vehicles, craft or railway cars for the purpose of extinguishing a fire or preventing its spread;
and

Connecticut General Statutes

(g) Take command of any industrial fire brigade or fire chief when such fire company or department has been called to such industry.

Connecticut General Statutes

***Sec.7-314a. Death, disability and injury benefits:
Presumption.***

(a) Except as provided in subsections (e) and (f) of this section, active members of volunteer fire departments and active members of organizations certified as a volunteer ambulance service in accordance with section 19a-180 shall be construed to be employees of the municipality for the benefit of which volunteer fire services or such ambulance services are rendered while in training or engaged in volunteer fire duty or such ambulance service and shall be subject to the jurisdiction of the Workers' Compensation Commission and shall be compensated in accordance with the provisions of chapter 568 for death, disability or injury incurred while in training for or engaged in volunteer fire duty or such ambulance service.

(b) For the purpose of this section, the average weekly wage of a volunteer fireman or volunteer ambulance service member shall be construed to be the average production wage in the state as determined by the Labor Commissioner under the provisions of section 31-309.

(c) For the purpose of this section, there shall be no prorating of compensation benefits because of other employment by a volunteer fireman or volunteer ambulance service provider.

(d) For the purpose of adjudication of claims for the payment of benefits under the provisions of chapter 568, any condition of impairment of health occurring to an active member of a volunteer fire department or organization certified as a volunteer ambulance service in accordance with section 19a-180 while such member is in training for or engaged in volunteer fire duty or such ambulance service, caused by hypertension or heart disease resulting in death or temporary or permanent total or partial disability, shall be presumed to have been suffered in the line of duty and within the scope of his employment, provided such member had previously successfully passed a physical examination by a licensed physician appointed by such department or ambulance service which examination failed to reveal any evidence of such condition.

Connecticut General Statutes

(e) Any member of a volunteer fire company or department or organization certified as a volunteer ambulance service in accordance with section 19a-180 performing fire duties or such ambulance service pursuant to a mutual aid understanding between municipalities shall be entitled to all benefits pursuant to this section and shall be construed to be an employee of the municipality in which his fire company or department or such ambulance service is located.

(f) Any member of a volunteer fire company or department and any person summoned by the State Forest Fire Warden or by any state forest fire personnel or district or deputy fire warden under the supervision of the State Forest Fire Warden pursuant to section 23-37, who performs fire duties under the direction of such personnel or warden pursuant to section 23-37, shall be construed to be an employee of the state for the purpose of receiving compensation in accordance with the provisions of chapter 568 for death, disability or injury incurred while performing such fire duties under such direction.

Connecticut General Statutes

Sec. 14-96q. Special restrictions on lamps. Flashing lights.

(a) Any lighted lamp or illuminating device upon a motor vehicle, other than head lamps, spot lamps or auxiliary driving lamps, which projects a beam of light of an intensity greater than three hundred candle power shall be so directed that no part of the beam will strike the level of the roadway on which the vehicle stands at a distance of more than seventy-five feet from the vehicle.

(b) No person shall drive or move any vehicle or equipment upon any highway with any lamp or device thereon displaying a red light visible from directly in front of the center thereof. The provisions of this subsection and subsection (c) shall not apply to authorized emergency and maintenance vehicles.

(c) Flashing lights are prohibited on motor vehicles other than school buses, except

(1) as a means for indicating a right or left turn,

(2) flashing blue lights used by members of volunteer or civil preparedness fire companies, as provided by subsection (b) of section 14-96p,

(3) on certain emergency and maintenance vehicles by written permit from the commissioner,

(4) flashing or revolving yellow lights on (A) wreckers registered pursuant to section 14-66, or (B) vehicles of carriers in rural mail-delivery service or vehicles transporting or escorting any vehicle or load or combinations of vehicles or vehicles and load which is or are either oversize or overweight, or both, and operated or traveling under a permit issued by the Commissioner of Transportation pursuant to section 14-270,

(5) flashing red lights

(A) on a motor vehicle accommodating fifteen or fewer handicapped students used only during the time

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such vehicle is stopped for the purpose of receiving or discharging such handicapped students,

(B) used by members of the fire police on a stationary vehicle as a warning signal during traffic directing operations at the scene of a fire,

(C) on rescue vehicles,

(D) used by chief executive officers of emergency medical service organizations as provided in subsection (a) of section 14-96p,

(E) ambulances, as defined in section 19a-175, or

(F) used by local fire marshals or directors of emergency management,

(6) flashing green lights used by members of volunteer ambulance associations or companies as provided in subsection (c) of section 14-96p, or

(7) flashing white lights or flashing lights of other colors specified by federal requirements for the manufacture of an ambulance used in conjunction with flashing red lights or flashing head lamps and a flashing amber light on an ambulance responding to an emergency call.

The prohibitions in this section shall not prevent the operator of a motor vehicle who while traveling on a limited access divided highway, because of the grade, is unable to maintain the minimum speed of forty miles per hour, or who while traveling on any other highway is operating such motor vehicle at such slow speed as to obstruct or endanger following traffic, or the operator of a disabled vehicle stopped on a hazardous location on the highway, or in close proximity thereto, from flashing lights, installed on the vehicle primarily for other purposes, in any manner that the operator selects so as to indicate that such vehicle is traveling slowly, obstructing traffic or is disabled and is a hazard to be avoided.

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The commissioner is authorized, at such commissioner's discretion, to issue special permits for the use of flashing or revolving lights on emergency vehicles, on escort vehicles and on maintenance vehicles, provided any person, firm or corporation other than the state or any metropolitan district, town, city or borough shall pay an annual permit fee of two dollars for each such vehicle, provided vehicles not registered in this state used for transporting or escorting any vehicle or load or combinations of vehicles or vehicles and load which is or are either oversize or overweight, or both, when operating under a permit issued by the Commissioner of Transportation pursuant to section 14-270, shall not require such permit. Such annual permit fee shall be twenty dollars.

(d) Use of lamps and flashing lights except as authorized by this section shall be an infraction.

Connecticut General Statutes

Sec.14-223. Failure to bring motor vehicle to full stop when signaled. Disregard of signal.

Penalty.

(a) Whenever the operator of any motor vehicle fails promptly to bring his motor vehicle to a full stop upon the signal of any officer in uniform or prominently displaying the badge of his office, or disobeys the direction of such officer with relation to the operation of his motor vehicle, he shall be deemed to have committed an infraction and be fined thirty-five dollars for a first offense and shall be fined not less than thirty-five dollars nor more than fifty dollars for any subsequent offense.

(b) No person operating a motor vehicle, when signaled to stop by an officer in a police vehicle using an audible signal device or flashing or revolving lights, shall increase the speed of the motor vehicle in an attempt to escape or elude such police officer. Any person who violates this subsection shall be guilty of a class A misdemeanor, except that, if such violation causes the death or serious physical injury, as defined in section 53a-3, of another person, such person shall be guilty of a class D felony, and shall have such person's motor vehicle operator's license suspended for one year for the first offense, except that the Commissioner of Motor Vehicles may, after a hearing, as provided for in subsection (k) of section 14-111, and upon a showing of compelling mitigating circumstances, reinstate such person's license before the expiration of such one-year period.

For any subsequent offense such person shall be guilty of a class D felony, except that if any prior offense by such person under this subsection caused, and such subsequent offense causes, the death or serious physical injury, as defined in section 53a-3, of another person, such person shall be guilty of a class D felony for which one year of the sentence imposed may not be suspended or reduced by the court, and shall have such person's motor vehicle operator's license suspended for not less than eighteen months nor more than two years, except that said commissioner may, after a hearing, as provided for in subsection (k) of section 14-111, and upon a showing of

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compelling mitigating circumstances, reinstate such person's license before such period.

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Sec. 14-223a. Striking an officer with a motor vehicle. Penalties.

Any operator of a motor vehicle who strikes any officer, as defined in section 14-1, or any fire police officer, appointed in accordance with section 7-313a, with such motor vehicle while such officer or fire police officer is engaged in traffic control or regulation, provided such officer is in uniform or prominently displaying the badge of his office, and such fire police officer is in compliance with the provisions of section 7-313a, such operator shall be deemed to have committed an infraction and shall be fined not less than one hundred fifty dollars nor more than two hundred dollars and, for a subsequent offense, shall be fined not more than two hundred fifty dollars or imprisoned not more than thirty days or both

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Sec.14-283. Rights of emergency vehicles. Obstruction of.

(a) "Emergency vehicle", as used in this section, means any ambulance or emergency medical service organization vehicle responding to an emergency call, any vehicle used by a fire department or by any officer of a fire department while on the way to a fire or while responding to an emergency call but not while returning from a fire or emergency call, any state or local police vehicle operated by a police officer or inspector of the Department of Motor Vehicles answering an emergency call or in the pursuit of fleeing law violators or any Department of Correction vehicle operated by a Department of Correction officer while in the course of such officer's employment and while responding to an emergency call.

(b) The operator of any emergency vehicle may (1) park or stand such vehicle, irrespective of the provisions of this chapter, (2) proceed past any red light or stop signal or stop sign, but only after slowing down or stopping to the extent necessary for the safe operation of such vehicle, (3) exceed the posted speed limits or other speed limits imposed by or pursuant to section 14-218a or 14-219 as long as such operator does not endanger life or property by so doing, and (4) disregard statutes, ordinances or regulations governing direction of movement or turning in specific directions.

(c) The exemptions herein granted shall apply only when an emergency vehicle is making use of an audible warning signal device, including but not limited to a siren, whistle or bell which meets the requirements of subsection (f) of section 14-80, and visible flashing or revolving lights which meet the requirements of sections 14-96p and 14-96q, and to any state or local police vehicle properly and lawfully making use of an audible warning signal device only.

(d) The provisions of this section shall not relieve the operator of an emergency vehicle from the duty to drive with due regard for the safety of all persons and property.

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(e) Upon the immediate approach of an emergency vehicle making use of such an audible warning signal device and such visible flashing or revolving lights or of any state or local police vehicle properly and lawfully making use of an audible warning signal device only, the operator of every other vehicle in the immediate vicinity shall immediately drive to a position parallel to, and as close as possible to, the right-hand edge or curb of the roadway clear of any intersection and shall stop and remain in such position until the emergency vehicle has passed, except when otherwise directed by a state or local police officer or a firefighter.

(f) Any officer of a fire department may remove, or cause to be removed, any vehicle upon any public or private way which obstructs or retards any fire department, or any officer thereof, in controlling or extinguishing any fire.

(g) Any person who willfully or negligently obstructs or retards any ambulance or emergency medical service organization vehicle while answering any emergency call or taking a patient to a hospital, or any vehicle used by a fire department or any officer or member of a fire department while on the way to a fire, or while responding to an emergency call, or any vehicle used by the state police or any local police department, or any officer of the Division of State Police within the Department of Public Safety or any local police department while on the way to an emergency call or in the pursuit of fleeing law violators, shall be fined not more than two hundred dollars or imprisoned not more than seven days or both.

(h) Nothing in this section shall be construed as permitting the use of a siren upon any motor vehicle other than an emergency vehicle, as defined in subsection (a) of this section, or a rescue service vehicle which is registered with the Department of Motor Vehicles pursuant to section 19a-181.

(i) A police officer may issue a written warning or a summons to the owner of a vehicle based upon an affidavit signed by the operator of an emergency vehicle specifying (1) the license plate number, color and type of any vehicle observed violating any provision of subsection (e) or (g)

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of this section, and (2) the date, approximate time and location of such violation.

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Sec.14-296. General penalty.

Any person who violates any provision of this chapter for which no other penalty is provided or is not designated an infraction shall be fined not more than fifty dollars.

Sec.14-296b. Following or parking near fire apparatus, driving over hose prohibited.

(a) No driver of a vehicle other than one on official business relating to the emergency shall follow any fire apparatus traveling in response to a fire alarm closer than five hundred feet or park such vehicle within the block where fire apparatus has stopped in answer to a fire alarm.

(b) No vehicle shall be driven over any unprotected hose of a fire department when laid down on any street or private driveway to be used at any fire or alarm of fire, without the consent of the fire department official in command.

(c) Violation of any provision of this section shall be an infraction.